

**COMMODITY FUTURES TRADING COMMISSION****SUPPLEMENT S-1 to FORM FBOT****CLEARING ORGANIZATION SUPPLEMENT TO  
FOREIGN BOARD OF TRADE APPLICATION FOR REGISTRATION**

BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros  
**Name of clearing organization as specified in organizational documents**

Praça Antônio Prado, 48  
Centro – São Paulo/SP Brazil 1010901  
**Address of principal executive Office**

BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros  
**Name of the foreign board of trade on associated Form FBOT**

- If this Supplement S-1 is accompanying a new application for registration, please complete in full and check here.
- If this Supplement S-1 is an amendment to a pending application for registration, or to a final application that resulted in the issuance of an Order of Registration, please list all items that are amended or otherwise updated and check here.  
When appropriate, please attach additional page(s) containing a list and explanatory statement of amendment(s) or update(s).

**REGISTERED DERIVATIVES CLEARING ORGANIZATIONS**

If the clearing organization is registered with the Commission in good standing as a derivatives clearing organization (DCO), please indicate by checking here:

- CFTC-registered DCO.  
If the clearing organization is registered with the Commission in good standing as a DCO, the clearing organization need not complete the remainder of the Supplement S-1.

**GENERAL INFORMATION**

1. Name under which the business of the clearing organization will be conducted, if different than name specified above:

2. List of principal office(s) where clearing organization activities are/will be conducted (please use multiple entries, when applicable):

|                                |  |
|--------------------------------|--|
| Office (name and/or location): | BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros       |
| Address:                       | Praça Antônio Prado, 48<br>Centro – São Paulo/SP Brazil, 1010901 |
| Phone Number:                  | 55-11-2565-4000  |
| Fax Number:                    | 55-11-2565-4500  |

|                                |   |
|--------------------------------|---|
| Office (name and/or location): | BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros        |
| Address:                       | Rua XV de Novembro, 275<br>Centro – São Paulo/SP Brazil, 01013001 |
| Phone Number:                  | 55-11-2565-4000   |
| Fax Number:                    | 55-11-2565-7890   |

3. Contact Information.

3a. Primary Contact for Supplement S-1 (i.e., the person authorized to receive Commission correspondence in connection with this Supplement S-1 and to whom questions regarding the submission should be directed):

|                  |  |
|------------------|--|
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| Fax Number:      | 1-202-633-6363   |
| Name:            | Henrique de Rezende Vergara  |
| Title:           | General Council  |
| Email Address:   | Rua XV de Novembro, 275, 5 <sup>th</sup> floor<br>São Paulo/SP Brazil 01013001 |
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|               |                 |
|---------------|-----------------|
| Phone Number: | 55-11-2565-6815 |
| Fax Number:   | 55-11-2565-7890 |

- 3b. If different than above, primary contact at the clearing organization that is authorized to receive all forms of Commission correspondence:

### **BUSINESS ORGANIZATION**

Describe organization history, including date and, if applicable, location of filing of original organizational documentation, and describe all substantial amendments or changes thereto.

BM&FBOVESPA is a corporation, having filed its bylaws with the Board of Trade of the City of São Paulo, State of São Paulo, Brazil, on December 14, 2007.

BM&FBOVESPA is the result of the integration of the Brazilian Mercantile & Futures Exchange—BM&F S.A. and BOVESPA Holding S.A., as approved by their respective Extraordinary General Meetings of Shareholders held on May 8, 2008.

### **SIGNATURES**

By signing and submitting this Supplement S-1, the clearing organization agrees to and consents that the notice of any proceeding before the Commission in connection with the associated foreign board of trade's application for registration or registration with the Commission may be given by sending such notice by certified mail or similar secured correspondence to the persons specified in sections 3a and 3b above.

BM&FBOVESPA has duly caused this Supplement S-1 to be signed on its behalf by the undersigned, hereunto duly authorized, this 17th day of August, 2012.

BM&FBOVESPA and the undersigned represent that all information and representations contained in this Supplement S-1 (and exhibits) are true, current, and complete. It is understood that all information, documentation, and exhibits are considered integral parts of this Supplement S-1. The submission of any amendment to a Supplement S-1 represents that all items and exhibits not so amended remain true, current, and complete as previously filed.

**Signature of Chief Executive Officer (or functional equivalent), on behalf of the Clearing Organization**

---

Eduardo Refinetti Guardia

Chief Financial, Corporate Affairs, and IR Officer

BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros



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Cicero Augusto Vieira Neto

Chief Operating, Clearing, and Depository Officer

BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros

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BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros

**Name of Clearing Organization**

## FORM FBOT SUPPLEMENT S-1—EXHIBIT A-1

**Request:** A description of the following for the clearing organization:

Location, history, size, ownership and corporate structure, governance and committee structure, and current or anticipated presence of staff in the United States.

**Response:**

BVMF provided a description of its location, history, size, ownership and corporate structure, governance and committee structure, and current or anticipated presence of offices or staff in the United States in Form FBOT Exhibit A-1.

BVMF includes within its corporate organization four integrated clearinghouses and a settlement bank. Only the Derivatives Clearinghouse (the “Clearinghouse”) is involved in clearing and settlement of futures and related options on financial and commodities contracts on BVMF. The Clearinghouse is made up as an in-house body, as per the BVMF Bylaws. The Chief Operating Officer reports to the CEO, who reports to the Board of Directors. Its powers and duties include the coordination of the Clearinghouse activities—transaction registration, clearing and settlement process management, central counterparty and risk management, as well as custody services.

The Clearinghouse includes the following offices: Risk Management, Settlement, Central Depository, and Trade and Post-Trade Projects. The Clearinghouse offices have complementary functions and act in an integrated manner in many of their activities. The Market Risk Committee provides technical assistance to the CEO and to BVMF’s executive body in terms of risk management. It is the Market Risk Committee’s responsibility to review the Clearinghouse risk management policies and mechanisms, such as those concerning the methodology and relevant parameters for measuring and controlling risks, the systems, the definition and establishment of operational limits, the definition of criteria for accepting transactions and collateral, and for collateral valuation, among others.

Although the Clearinghouse maintains a settlement bank in the U.S., it does not have offices or staff in the U.S.

**FORM FBOT SUPPLEMENT S-1—EXHIBIT A-2**

**Request:** Articles of association, constitution, or other similar organizational documents.

**Response:**

BVMF provided its Bylaws in response to Form FBOT Exhibit A-2 as Attachment A-2-1. BVMF's clearinghouse does not maintain separate bylaws.

**FORM FBOT SUPPLEMENT S-1—EXHIBIT A-3**

**Request:** Attach the following:

- (1) Membership and participation agreements.
- (2) Clearing agreements.

**Response:**

BVMF provided these documents in response to Form FBOT Exhibit A-3 as Attachments A-3-1 and A-3-2.

**FORM FBOT SUPPLEMENT S-1—EXHIBIT A-4**

**Request:** The national statutes, laws and regulations governing the activities of the clearing organization and its members.

**Response:**

The relevant national statutes, laws and regulations governing the activities of the clearing organization and its members are included as Attachment A-4-1.



## **FORM FBOT SUPPLEMENT S-1—EXHIBIT A-5**

**Request:** The current rules, regulations, guidelines and bylaws of the clearing organization.

**Response:**

Current versions of the Risk Management Manual of the BVMF Derivatives Clearinghouse, the Operating Procedure Manual of the BVMF Derivatives Clearinghouse, and the BVMF Derivatives Clearinghouse Rulebook are included as Attachments SA-5-1, SA-5-2, and SA-5-3, respectively. The BVMF Segment Operating Rules also apply to the Clearinghouse and were provided in response to Form FBOT Exhibit A-6.

*This is a free translation offered only as a convenience for English language readers. Any questions arising from the text should be clarified by consulting the original in Portuguese.*

# **RISK MANAGEMENT MANUAL OF THE BM&FBOVESPA DERIVATIVES CLEARINGHOUSE**

This document is a revised, expanded version of the Risk Management Manual of the BM&FBOVESPA Derivatives Clearinghouse and is in the process of being approved by the Central Bank.

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# 1. INTRODUCTION

This Risk Management Manual describes the methodologies adopted by the Derivatives Clearinghouse to calculate margin and control the adequacy of participants to the operating limits it defines. Complete information on the Clearinghouse's organization, its participants, safeguards, rules and operating procedures and risk mitigation mechanisms may be found in the Derivatives Clearinghouse Rulebook and Operating Procedures Manual.

This Manual was submitted to the Central Bank of Brazil for assessment.

Listed below are the definitions, acronyms and mathematical functions used throughout this document.

|   |   |
|---|---|
| <b>BM&amp;FBOVESPA</b>                            | Brazilian Securities, Commodities & Futures Exchange  |
| <b>Bacen</b>                                      | Central Bank of Brazil  |
| <b>Clearinghouse or Derivatives Clearinghouse</b> | The BM&FBOVESPA Derivatives Clearinghouse.  |
| <b>Customer</b>                                   | Investor holder of the transactions carried out and/or registered for his account and order in BM&FBOVESPA's markets with settlement guaranteed by the Clearinghouse.                                   |
| <b>Economic / financial conglomerate</b>          | Group of institutions that maintain a corporate colligation or control, or a contractual and/or administrative ties.  |
| <b>Delivery</b>                                   | The Settlement of the obligations resulting from a Transaction through the physical delivery of the traded assets or Commodities by the Clearinghouse or the selling Customer, as the case may be.      |
| <b>Specification</b>                              | The procedure which indicates the Customer in a Transaction and the Clearing Member responsible for its registration and settlement.  |
| <b>Default</b>                                    | The failure of a Clearing Member, Settlement Bank, Trader, Intermediary for the Account or Participant to fulfill an obligation with the Clearinghouse or the other Participants.                       |
| <b>Intermediary</b>                               | Participant who operates for the account and order of third parties, by relaying trading orders to a Trader.  |
| <b>Settlement</b>                                 | The fulfillment of obligations with the Clearinghouse or the Clearing Members and the other participants resulting from one or more Transactions;   |
| <b>Clearing Member</b>                            | Participant who is allowed to register, clear, and settle Transactions registered in the Clearinghouse's registration, clearing, and settlement systems.  |
| <b>Trader</b>                                     | Participant with direct access to BM&FBOVESPA's trading and registration systems, who receives orders and carries out the Transaction in floor trading and/or registers it in the registration systems. |
| <b>Transaction</b>                                | A trade carried out on the BM&FBOVESPA floor or in any of its systems, and/or registered in its systems, the settlement of which takes place by means of the Clearinghouse settlement service.          |
| <b>Participant</b>                                | The individual or legal entity that is bound to the Clearinghouse and is subject to   |

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|                            |  |
|----------------------------|--|
|                            | its rules and regulations  |
| <b>Position</b>            | The balance of contracts resulting from a Customer's Transactions. |
| <b>WTr BM&amp;FBOVESPA</b> | WebTrading BM&FBOVESPA - the Internet-based trading platform.      |
| <b>cd</b>                  | Abbreviation of calendar days.                                     |
| <b>bd</b>                  | Abbreviation of business days.                                     |
| <b>FPR</b>                 | Abbreviation of primitive risk factor.                             |
| <b>bp</b>                  | Abbreviation of base points (100 bp = 1 %)                         |

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|   |  |
|---|--|
| Minimum value function  | $\min x, y = \begin{cases} x & \text{if } x \leq y \\ y & \text{if } x > y \end{cases}$ $\min a_1, a_2, \dots, a_n \text{ is the lowest value between the values of } a_1, a_2, \dots, a_n$  |
| Maximum value function  | $\max x, y = \begin{cases} y & \text{if } x \leq y \\ x & \text{if } x > y \end{cases}$ $\max a_1, a_2, \dots, a_n \text{ is the highest value between the values of } a_1, a_2, \dots, a_n$ |
| Sign function   | $\text{sgn } x = \begin{cases} -1 & \text{if } x \leq 0 \\ +1 & \text{if } x > 0 \end{cases}$  |
| Absolute value function   | $\text{abs } x =  x  = \begin{cases} -x & \text{if } x \leq 0 \\ x & \text{if } x > 0 \end{cases}$   |
| Sum   | $\sum_{i=1}^n a_i = a_1 + a_2 + \dots + a_{n-1} + a_n$   |
| Product   | $\prod_{i=1}^n a_i = a_1 \times a_2 \times \dots \times a_{n-1} \times a_n$  |
| The Cartesian product of sets $A = a_1, a_2, \dots, a_n$ and $B = b_1, b_2, \dots, b_m$   |  |
| $A \times B = a_1, b_1, a_1, b_2, \dots, a_1, b_m, a_2, b_1, a_2, b_2, \dots, a_2, b_m, \dots, a_n, b_1, a_n, b_2, \dots, a_n, b_m$ |  |

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The next chapter will present the methodologies adopted by the Clearinghouse to calculate collateral. Chapter 3 presents the criteria to monitor the intraday risk of the Clearinghouse's participants. Finally, Attachments 1 and 2 contain the rules to map futures contracts and the models for pricing option contracts, respectively.

## 2. COLLATERAL CALCULATION

For the purpose of this Manual, Exchange Market is the set of markets managed by BM&FBOVESPA where transactions with derivatives and commodities contracts – standardized futures, options, and forward contracts and the spot gold contract – are carried out in their open outcry or electronic trading systems; OTC Market is the market of transactions with swap, forward, and flexible option transactions, carried out directly between the counterparties and not in trading systems, registered with BM&FBOVESPA's *guarantee feature*, either total or partial.

The Exchange and OTC markets thus defined are the markets for which the Clearinghouse acts as a guaranteeing central party for settlement purposes and, therefore, whose participants are required to post collateral. Collateral is the name for an amount given as a guarantee, with the following variations:

**Margin required** is the minimum amount the participant must maintain deposited at the Clearinghouse to guarantee the settlement of the obligations resulting from the transactions assigned to him.

**Margin posted** is the amount the participant maintains deposited at the Clearinghouse to guarantee the settlement of the obligations resulting from the transactions assigned to him.

**Margin call** is the negative difference between the margin required and the margin posted, that is, the amount which the participant must deposit with the Clearinghouse in order to meet the margin requirement.

The margin required from the Customer must be sufficient to cover the total settlement cost of his portfolio's positions – selling of long positions and buying of short positions, in case of participant's default.

Until the defaulting participant's portfolio is totally settled, market prices, rates and indicators may undergo alterations, thus modifying the amount of the corresponding settlement cost. For this reason, the amount of the margin required from the portfolio must be sufficient to cover its settlement cost at market value and the potential increase of that cost, defined as the portfolio's market risk and assessed by means of stress scenario testing methodologies.

The Clearinghouse also determines additional terms of margin in view of the characteristics related to contracts, settlement rules, position-limiting criteria and any other conditions deemed necessary to be established.

The margin required may then be represented, in a very general way, by the following equation

$$M \text{ a r g i n} = S \text{ e t t l e m e n t C o s t} - M \text{ a r k e t R i s k} + A \text{ d d i t i o n a l T e r m s}$$

under the convention that the margin is a positive value and the market risk, a negative one.

The margin required from participants is updated on a daily basis after the day's trades are cleared. The resulting margin call must be met with the posting of cash collateral or, upon the Clearinghouse's discretion, with assets and/or other financial instruments. By monitoring the intraday risk, the Clearinghouse can, along the day and as many times as needed, advance the margin call, based on the transactions carried out by the participants and on their update open positions in the Exchange and OTC markets with the *guarantee feature*. The criteria for setting up, transferring and using the collateral, as well as to meet the advancing of margin call are described in the Clearinghouse's Operating Procedures Manual.

The next sections of this chapter describe the methodologies for assessing the market risk and the Margin required for derivatives contracts portfolios. Such methodologies are defined by BM&FBOVESPA's Risk Committee and

submitted to Bacen's approval. The Committee also has to define the values of the parameters of the methodologies and ensure that they are frequently revised, and it may alter them at any moment upon its own discretion.

The rules and criteria established for such methodologies do not exhaust the means available for risk assignment, and the Clearinghouse can require, at any moment and upon its own discretion, an additional margin from any participant or group of participants.

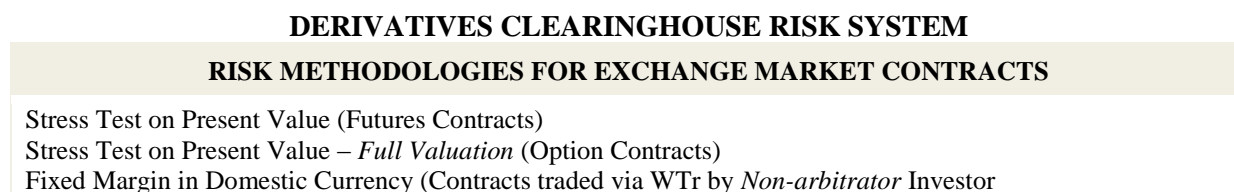
## 2.1. Margin Calculation Methodologies

A derivatives portfolio margin is calculated from different methodologies, basically differing in terms of the features of each derivative contract (p. ex., daily marking to market, linearity of variations, etc.). The margin calculation methodologies adopted by the Clearinghouse are based on stress test models, which consist of assessing a portfolio of positions in derivatives contracts under variation scenarios for the variables relevant to determine their value.

For the purpose of calculating the margin and defining the methodologies, derivatives contracts are grouped as follows:

- Futures contracts: financial, agricultural, and energy futures contracts and exchange swaps with adjustments<sup>1</sup> (SCC and SC3);
- Standardized options contracts: options on available cash and futures, plain vanilla or futures-style, traded in the Exchange Market;
- WTr Contracts – *Non-arbitrator*: Exchange Market contracts traded via WTr by Customer classified as *Non-arbitrator*;
- Swap contracts: swap and forward contracts traded in OTC Market and registered with *BM&FBOVESPA's guarantee feature*;
- Flexible options contracts: flexible options traded in the OTC Market and registered with *BM&FBOVESPA with the guarantee feature*; and
- Other contracts: it includes the Exchange Market's Gold Forward Contract.

The figure below describes the methodologies to calculate the margin corresponding to such groups of contracts, which make up the Clearinghouse's risk system.



<sup>1</sup> The existence of a reset for such swap contracts allows them to be included in the futures contracts category. If there is no mention to the contrary, its inclusion is valid whenever a reference is made to the futures contracts category.



Margin for Gold Forward Contracts

**RISK METHODOLOGY FOR OTC MARKET CONTRACTS**

Stress Test on Cash Flow – Swap and Forward  
Test Stress on Flexible Options

**Figure 1.1-1 – Methodologies for Margin calculation**

Considering this grouping of the contracts, a portfolio of positions in derivatives contracts – called simply portfolio – is expressed as

**The application of different methodologies to a portfolio occurs along the groups of contracts covered by each one, so that the portfolio's margin required from a portfolio may be thus broken down**

(1)

Term *Portfolio* refers to a Customer's group of positions registered under the responsibility of a same Intermediary for the Account, if any, a same Trader and a same Clearing Member. In general, the margin required from the Customer with several accounts – attributed to a same Trader or to different Traders, associated to one or more Clearing Members – is determined as the sum of the margin values calculated, in an independent manner, for each portfolio associated to a trio (Clearing Member, Trader, Customer), or account, according to the description of the accounts structure, as set forth in the Operating Procedures Manual. The Clearinghouse, upon its own discretion, may allow, for margin requirement and call, the consolidation of different accounts linked to the same Customer.

The next sections present in a more detailed manner the calculation of each part of the margin of equation (1). First the main concepts common to the methodologies are defined – the concepts of primitive risk factor, variation scenario for a primitive risk factor, scenarios area and financial variation under a scenario. Next we present the methodologies to calculate risk and margin for positions in Exchange Market contracts and the methodologies for positions *with BM&FBOVESPA's guarantee feature* in the OTC Market.

## 2.2. Main Concepts and Definitions

Margin calculation methodologies have in common the concepts of primitive risk factor, scenario for primitive risk factor, scenarios area and financial variation under a scenario, defined below.

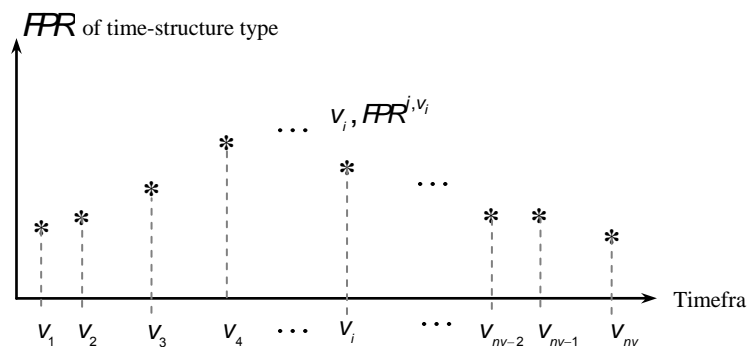
### 2.2.1. Primitive Risk Factor

**Primitive risk factor** (FPR) associated to a derivatives contract is the name given to the financial variable relevant to the make-up of the contract value, or price. Upon determining the value of a derivatives contract by means of a well-defined mathematical relationship involving a group of economic variables, such as that resulting from the assumption of the Non-Arbitration system, such variables are defined as representing the contract's primitive risk factors.

The list of FPRs taken into consideration in the margin calculation methodologies encompasses the prices of spot and futures markets, interest rates, volatilities and inflation indicators, among others.

Let  $C_{FPR} = FPR^1, FPR^2, \dots, FPR^{N_{FPR}}$  be a set of  $N_{FPR}$  primitive risk factors. Throughout this manual, whenever convenient, an  $FPR^i$  factor is identified by the variable associated to it, for example  $FPR^{Ibovespa}$ , or simply *Ibovespa*.

The FPR representing a variable associated to a time frame, such as, for example, a futures price or an interest rate, is defined by a time structure, that is,  $FPR^i = FPR^{i,1}, \dots, FPR^{i,T}, FPR^{i,T+1}, FPR^{i,T+2}, \dots$ . For simplification purposes, a finite amount, restricted to time frames, taken as reference time frames and called **vertices**. For instance, one can set up as vertices of the pre-fixed interest rate FPR the time frame of 1 day and time frames multiple of 21 business days, with the factor being represented by the set  $FPR^{Pre} = FPR^{Pre,1}, FPR^{Pre,21}, FPR^{Pre,42}, FPR^{Pre,63}, \dots$ .



**Figure 2.2-1 - Primitive risk factor of a time structure type**

Throughout this document, reference is made to an FPR of this type sometimes in a general way, without referring to the vertex(s), sometimes explicitly mentioning it(them), whenever such identification is necessary.

The **identification of FPRs** is the definition of a set of FPRs associated to a contract.

The **decomposition**, or mapping, of a position in FPRs, once the FPRs associated to it are identified, consists in expressing their exposure to risk as a function of the exposures to the FPRs.

Whereas the identification of FPRs is a stage common to the methodologies to calculate the margin of futures and options contracts, the decomposition procedure is part only of the methodology to calculate the margin of futures positions and allows to express the variation of the value of a position as a linear combination of variations of the FPRs. In the following examples the FPRs of spot exchange market options contracts and futures of pre-fixed interest rate and spot exchange rate.

**Example 1:** An option contract has its price, or premium, usually determined by a pricing model as a function of such variables as underlying object, risk-free interest rate, opportunity cost and volatility:

$$\text{Option premium} = f(S, K, r, rc, t, \sigma)$$

where

- $f$  : function of option pricing;
- $S$  : value of the underlying object (exchange rate, in this example);
- $K$  : the option strike price;
- $r$  : risk-free internal interest rate;
- $rc$  : risk-free external interest rate;
- $t$  : time frame up to maturity of the option; and
- $\sigma$  : volatility.

Thus, except for  $K$  and  $t$ , these variables are the option's FPRs.  $K$  and  $t$  are not considered as risk factors, since  $K$  is a constant parameter of the contract and  $t$  is a deterministic variable.

**Example 2:** The value of the futures contract of 1-day interfinancial deposit rate (FUT DI1 contract) represents the present value of \$100,000, expressed as a function of the pre-fixed interest rate in domestic currency for the period up to contract maturity,  $r$ :

$$F = 100,000 \times (1+r)^{-1} = 100,000 \times PU_r$$

where  $PU_r = (1+r)^{-1}$  is the present value of 1 currency unit.

Therefore, the interest rate is the only risk factor of the contract.

Relative variation  $\Delta F/F$ , assuming that the interest rate varies from  $r$  to  $r'$ , or similarly, that  $PU_r$  varies to  $PU_{r'}$  is

$$\frac{\Delta F}{F} = \frac{\Delta PU_r}{PU_r}$$

**Example 3:** The futures contract of exchange rate of domestic currency by a foreign currency has its value expressed as a function of the spot price of the foreign currency and of the pre-fixed interest rates in the domestic and foreign currencies, as follows:

$$F = S \times (1+r) \times (1+rc)^{-1}$$

where

- $F$  : future value of the exchange rate;
- $S$  : spot value of the exchange rate;
- $r$  : exchange rate pre-fixed in domestic currency for the period until the maturity of the contract; and

$rc$  : exchange rate pre-fixed in foreign currency (I.D. x U.S. Dollar spread rate) for the period until the maturity of the contract.

Assuming that the spot exchange rate  $S$  and interest rates  $r$  and  $rc$  vary to  $S'$ ,  $r'$  and  $rc'$ , respectively, value  $F$  varies to  $F' = S' \times 1+r' \times 1+rc'^{-1}$ .

### 2.2.2. Scenario for a Primitive Risk Factor

A scenario for a primitive risk factor represents a hypothetical variation of the factor value to occur along a certain period, expressed as a relative or absolute variation ( $\Delta$ ) of an FPR reference value (usually its market value).

The period associated to the variation defined by the scenario is called *holding period*. When utilizing the scenario to assess a position's risk, the holding period of the scenario represents the period necessary for totally closing the position under assessment. Thus, in view of the characteristics of the contracts, for an FPR common to different contracts, scenarios may be defined for different holding periods.

A scenario can be neutral, bullish or bearish, depending on  $\Delta$  assuming a null, positive, or negative value, respectively. The neutral scenario is called a reference scenario, since under this scenario the factor undergoes no variation.

In general, relative variations are defined by factors expressed in terms of price, whereas absolute variations refer to factors such as interest rate, as well as to volatilities, whenever applicable. The factor's reference value is denoted by  $FPR_{Ref}$  and its value under the scenario by  $FPR_{scenario}$ , that is, assuming the variation defined by it occurs on the reference value.

- A relative variation scenario defines the variation  $\Delta_{scenario} = \frac{FPR_{scenario} - FPR_{Ref}}{FPR_{Ref}}$
- An absolute variation scenario defines the variation  $\Delta_{scenario} = FPR_{scenario} - FPR_{Ref}$

A set of  $nc_j$  scenarios for the  $j$ -th primitive risk factor,  $FPR^j$ , is denoted by  $C_{Scen}^{FPR^j} = Scen_1^j, Scen_2^j, \dots, Scen_{nc_j}^j$ .

The table below shows, on each line, the scenarios attributed to a same primitive risk factor.

| FPR     | VARIATION SCENARIOS |            |     |                 |
|---------|---------------------|------------|-----|-----------------|
| $FPR^1$ | $Scen_1^1$          | $Scen_2^1$ | ... | $Scen_{nc_1}^1$ |
| $FPR^2$ | $Scen_1^2$          | $Scen_2^2$ | ... | $Scen_{nc_2}^2$ |
| ⋮       |                     |            |     |                 |
| $FPR^j$ | $Scen_1^j$          | $Scen_2^j$ | ... | $Scen_{nc_j}^j$ |
| ⋮       |                     |            |     | ...             |
| $FPR^N$ | $Scen_1^N$          | $Scen_2^N$ | ... | $Scen_{nc_N}^N$ |

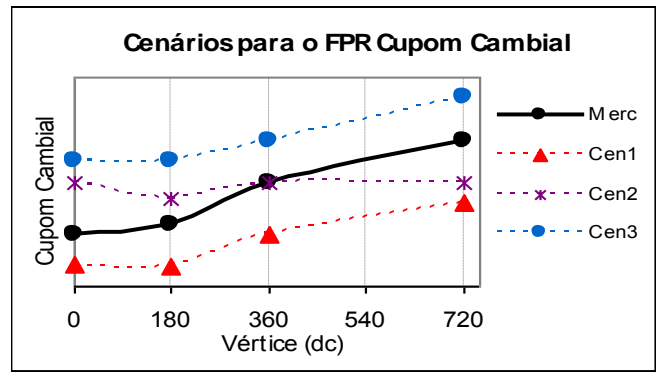
**Table 2.2-1 – Scenarios for Primitive Risk Factors**

A scenario  $Scen_k^j$  for a factor  $FPR^j$  of the time-structure type represents a group of scenarios, with a scenario  $Scen_k^{j,v}$  for each vertex  $v$  of factor  $FPR^j$ .

**Example 4:** Consider the Ibovespa index and Ibovespa index volatility FPRs and the following scenarios: a 20 % fall for Ibovespa and a 50 % high for volatility. Assuming that the reference values of the factors are 40,000 points for Ibovespa and 15 % p.a.p.a. for Volatility, under the respective scenarios, their values are 32,000 points and 22.5 % p.a., respectively.

**Example 5:** The ID x U.S. Dollar Spread FPR ( $rc$ ) is a time structure-type factor. Let us consider it as being defined in vertices  $v_1 = 1$  dc,  $v_2 = 180$  dc,  $v_3 = 360$  dc and  $v_4 = 720$  dc, and that 3 scenarios of variation on the reference value,  $C_{Scen}^{rc} = Scen_1^{rc}, Scen_2^{rc}, Scen_3^{rc}$ , are established. Each scenario  $Scen_k^{rc}$  corresponds to a set of 4 scenarios – one for each vertex. The following table and chart present an example of scenarios and their effect on the factor's market values.

| $FPR^c$       | $Cen_1^{rc}$ | $Cen_2^{rc}$ | $Cen_3^{rc}$ |
|---------------|--------------|--------------|--------------|
| $FPR^{c,1}$   | -150         | +250         | +350         |
| $FPR^{c,180}$ | -200         | +120         | +300         |
| $FPR^{c,360}$ | -250         | +0           | +200         |
| $FPR^{c,720}$ | -300         | -200         | +200         |



A **contiguous scenario** for a set of  $N$  primitive risk factors is a combination of  $N$  scenarios – one for each FPR. A contiguous scenario contains one element from each line of table 2.2-1. Given the scenario sets  $C_{Scen}^{FPR^1}, C_{Scen}^{FPR^2}, \dots, C_{Scen}^{FPR^N}$ , a contiguous scenario is an element among all the elements generated by the Cartesian product of such sets. Contiguous scenarios are explicitly utilized in the stress testing methodology for options and for swaps.

A contiguous scenario is denoted by  $Scen^{Contiguous} = [Scen_{c_1}^1, Scen_{c_2}^2, \dots, Scen_{c_N}^N]$ , where  $Scen_{c_j}^j$  is the  $c_j$ -th scenario for factor  $FPR^j$ , keeping in mind that, for factors of the time-structure type, this element is a group of scenarios. Under such notation, indices  $c_j$  and  $c_k$ ,  $j \neq k$ , are not necessarily the same. For instance, scenario  $[Scen_2^1, Scen_4^2, Scen_1^3, Scen_2^4]$  is a contiguous scenario for risk factors  $FPR^1, FPR^2, FPR^3$  e  $FPR^4$ , whose scenarios are shown in the following table, with highlight for those making up the contiguous scenario.

| FPR | VARIATION SCENARIOS |
|-----|---------------------|
|-----|---------------------|

|         |           |           |           |
|---------|-----------|-----------|-----------|
| $FPR^1$ | $Cen_1^1$ | $Cen_2^1$ | $Cen_3^1$ |
| $FPR^2$ | $Cen_1^2$ | $Cen_2^2$ | $Cen_3^2$ |
| $FPR^3$ | $Cen_1^3$ | $Cen_2^3$ | $Cen_3^3$ |
| $FPR^4$ | $Cen_1^4$ | $Cen_2^4$ |           |

### 2.2.3. FINANCIAL VARIATION UNDER SCENARIO

Variation scenarios are utilized to estimate the market risk of a portfolio with positions in derivatives contracts. Such an estimate is carried out by assessing the potential loss of the portfolio, arising from variations in FPR values, expressed through the scenarios defined by them. The following examples illustrate, in a summarized manner, with just one scenario for each FPR, the use of scenarios in calculating the potential loss for positions in futures and options contracts. Specific sections later on present, in a detailed manner, the respective methodologies.

**Example 6:** Let us consider a position long in 1 unit ( $q = 1$ ) of the futures contract of Real x USD exchange rate, equal to 50,000 US dollars, denominated in R\$ / 1,000 US\$ (FUT DOL contract). The following table shows the reference values of the primitive risk factors of the contract as well as the variation scenarios defined by them and its values under a scenario.

| FPR  | REFERENCE VALUE | VARIATION SCENARIO | VALUE UNDER SCENARIO |
|--|-----------------|--------------------|----------------------|
| $DOL$ (R\$ / US\$)   | 2.300           | - 7%               | 2.139                |
| $r$ (% in period)  | 19.00           | - 100 bp           | 18.00                |
| $FU_r$ (R\$)   | 0.8403          | 0.86%              | 0.8475               |
| $rc$ (% in period)   | 9.48            | 0 bp               | 9.48                 |
| $FU_{rc}$ (US\$)   | 0.9134          | 0%                 | 0.9134               |
| <b>Future value of the exchange rate (R\$ / 1000 US\$)</b> | <b>2,500.00</b> | <b>-7.78%</b>      | <b>2,305.46</b>      |
| <b>Value of position in FUT DOL (R\$) contract</b>         | <b>125,000</b>  |                    | <b>115,273.11</b>    |

- Under the reference scenarios of FPRs, the future value of the exchange rate is worth 2,500 R\$ / 1,000 US\$, and the position, R\$ 125,000:

$$F_{Ref} = DOL_{Ref} \times 1 + r_{Ref} \times 1 + rc_{Ref}^{-1} = 2,300 \times 1.19 \times 1,0948^{-1} = 2,500.00$$

$$VF_{Ref} = q \times F_{Ref} \times 50 = 125,000.00$$

- Under the stress scenarios defined for the FPRs, the contract and the position are worth, respectively:

$$F_{scen} = DOL_{scen} \times 1 + r_{scen} \times 1 + rc_{scen}^{-1} = 2,139 \times 1.18 \times 1.0948^{-1} = 2,305.46$$

$$FV_{scen} = q \times F_{scen} \times 50 = 115,273.11$$

The variation of value  $FV$  of the position, under the scenarios defined for factors  $DOL$ ,  $r$  and  $rc$  is the difference between  $FV_{scen}$  and  $FV_{Ref}$ , that is,  $\Delta VF = 115,273.11 - 125,000.00 = -9,726.89$  R\$, or,

equivalent to the -7.78 % variation in relation to the reference value of the position.

**Example 7:** Let us consider a position short in 1 unit of the US dollar call option, expiring within 78 bd / 113 cd, with an exercise price of R\$ 2.10 / US\$ and whose size is 50,000 US dollars. Let us consider the same scenarios of the previous example for factors  $DOL$ ,  $r$  and  $rc$  and, for the exchange rate Volatility factor,  $\sigma$ , let us consider the 20 % fall scenario. The table below presents the reference and under scenario values of the FPRs of the position and option contract.

| FPR                         | REFERENCE VALUE  | VARIATION SCENARIO | VALUE UNDER SCENARIO |
|-----------------------------|------------------|--------------------|----------------------|
| $DOL$ (R\$ / US\$)          | 2.300            | - 7%               | 2.139                |
| $r$ (% in period)           | 19.00            | -100 bp            | 18.00                |
| $rc$ (% in period)          | 9.48             | 0 bp               | 9.48                 |
| $\sigma$ (% aa)             | 12.00            | -20%               | 9.60                 |
| <b>Option premium (R\$)</b> | <b>0.246</b>     |                    | <b>0.097</b>         |
| <b>Position value (R\$)</b> | <b>12,300.00</b> | <b>-60.62%</b>     | <b>4,843.56</b>      |

Let  $f$  the option pricing function. The option premium and the position value are worth

- under the reference scenarios of the FPRs:

$$\text{Premium}_{\text{Ref}} = f(2.300, 2.100, 19\%, 9.48\%, 78 \text{ bd}, 12\%) = 0.246 \text{ R\$}$$

$$FV_{\text{Ref}} = q \times \text{Premium}_{\text{Ref}} \times 50,000 = 12,300.00$$

- under the variation scenarios of the FPRs:

$$\text{Premium}_{\text{scen}} = f(2.139, 2.100, 18\%, 9.48\%, 78 \text{ bd}, 9.6\%) = 0.097 \text{ R\$}$$

$$FV_{\text{scen}} = q \times \text{Premium}_{\text{scen}} \times 50,000 = 4,843.56$$

The variation of the position value under the scenarios for  $DOL$ ,  $r$ ,  $rc$  and  $\sigma$ , is therefore worth

$$\Delta FV = 4,843.56 - 12,300.00 = -7,456.44 \text{ R\$}$$

#### 2.2.4. SCENARIOS AREA

When evaluating a portfolio which presents exposure to several risk factors, contiguous scenarios of variation are utilized for such factors, formed by combining the scenarios defined for each factor. The adoption of all the combinations of the Cartesian product of the sets of scenarios for each FPR eliminates the subjectivity of forming contiguous scenarios. However, from the macroeconomic standpoint, extremely improbable scenarios may be created. In order to avoid the use of such scenarios and maintain the subjectivity level in their formation to a minimum, scenarios areas are defined.

A **scenarios area** is a group of subsets of scenarios so that each subset is associated to an FPR. An area can be represented as

$$\text{Scenarios Area} = SC_{Scen}^{FPR^1}, SC_{Scen}^{FPR^2}, \dots, SC_{Scen}^{FPR^N}$$

where  $SC_{Scen}^{FPR^j}$  is a subset of the scenarios defined for factor  $FPR^j$ , that is,  $SC_{Scen}^{FPR^j}$  contains part of the scenarios of the  $j$ -th line of table 2.2-1.

**Example 8:** Let us consider the scenarios for the Spot exchange rate of Real for US Dollar ( $DOL$ ) and Ibovespa spot index ( $IBV$ ), defined according to the following table:

| FPR   | VARIATION SCENARIOS |                |                |                |                |                |
|-------|---------------------|----------------|----------------|----------------|----------------|----------------|
| $DOL$ | $Scen_1^{DOL}$      | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ | $Scen_4^{DOL}$ | $Scen_5^{DOL}$ | $Scen_6^{DOL}$ |
|       | -7%                 | -4%            | 0              | +2%            | +4%            | +7%            |
| $IBV$ | $Scen_1^{IBV}$      | $Scen_2^{IBV}$ | $Scen_3^{IBV}$ | $Scen_4^{IBV}$ | $Scen_5^{IBV}$ |                |
|       | -12%                | -6%            | 0              | +3%            | +10%           |                |

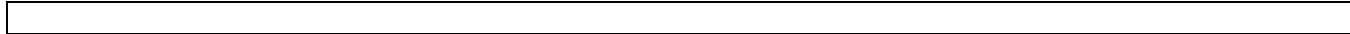
One can define an area representing a situation of *economic improvement* ( $A_+$ ) by grouping bearish scenarios for the exchange rate and bullish ones for Ibovespa. Similarly, an area which expresses a situation of *economic decline* ( $A_-$ ) is obtained with the bullish scenarios for  $DOL$  and bearish for  $IBV$ . Assuming that areas  $A_+$  and  $A_-$  are defined as indicated in the following table, with the scenarios related to the economic improvement and decline areas indicated in light and dark shades, respectively.

| FPR   | VARIATION SCENARIOS |                |                |                |                |                |
|-------|---------------------|----------------|----------------|----------------|----------------|----------------|
| $DOL$ | $Scen_1^{DOL}$      | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ | $Scen_4^{DOL}$ | $Scen_5^{DOL}$ | $Scen_6^{DOL}$ |
|       | -7%                 | -4%            | -              | +2%            | +4%            | +7%            |
| $IBV$ | $Scen_1^{IBV}$      | $Scen_2^{IBV}$ | $Scen_3^{IBV}$ | $Scen_4^{IBV}$ | $Scen_5^{IBV}$ |                |
|       | -12%                | -6%            | -              | +3%            | +10%           |                |

This definition of areas produces the contiguous scenarios listed in the following table, among which there are no scenarios which combine simultaneous fall for  $DOL$  and for  $IBV$  or simultaneous high for  $DOL$  and for  $IBV$ .

| CONTIGUOUS SCENARIOS                               |                      |
|--|----------------------|
| $Scen^{Contiguous} = [Scen_i^{DOL}, Scen_k^{IBV}]$ |                      |
| Scenarios Area $A_+$                               | Scenarios Area $A_-$ |
| -7%, +3%   | +4%, -12%            |
| -7%, +10%  | +4%, -6%             |
| -4%, +3%   | +7%, -12%            |
| -4%, +10%  | +7%, -6%             |
| 0%, +3%  |                      |
| 0%, +10%   |                      |





### ***2.2.5. Maximum Theoretical Margin***

The maximum theoretical margin of a contract is the name for its unit margin, that is, for the margin required from a position in 1 contract unit. Since the margin calculation methodologies entail a risk diversification, in general it is not possible to use the maximum theoretical margin values to determine the value of the margin of a portfolio with various positions – in different contracts and maturities. The risk diversification implies a portfolio margin equal to or smaller than the sum of the margins of each portfolio position, taken on an individual basis.

The rules for risk diversification are a part of the margin calculation methodologies, covered in the following sections of this chapter.

## **2.3. STRESS TEST ON PRESENT VALUE – MARGIN CALCULATION METHODOLOGY FOR FINANCIAL FUTURES CONTRACTS PORTFOLIO**

The margin for the portion of a derivatives portfolio which comprises the positions in futures contracts derives from the general equation defined for the margin. Not taking into account the terms of the additional margin, and under the convention that the value attributed to the market risk is either negative or null and that the value of the margin is either positive or null, it follows that

$$\text{Margin} = \text{Settlement Cost} - \text{Market Risk}$$

The settlement cost represents the value involved in closing the position – the purchase (sale) of contracts for unwinding short (long) positions. Given the characteristics of marking to market and daily settlement, the settlement cost of futures contracts is null.

The market risk is assessed through the stress test model, by analyzing variations of the position value under the stress scenarios defined by the FPRs associated to it, using, for estimating variations under scenario, the linear breakdown of the positions in futures contracts in exposures to primitive risk factors.

Therefore, the above equation, when restricted to a position in futures contracts, is simplified to

$$\text{Margin Futures Portfolio} = -\text{Market Risk Futures Portfolio} \quad (2)$$

The methodology of Stress Test on Present Value is the methodology used to estimate the market risk of positions in futures contracts. Its presentation is organized according to the following topics:

- Identification and breakdown of futures contracts in FPRs;
- Financial variation under scenario;
- Market risk calculation – scenarios analysis, local risk, and global risk;
- Control of risk offsetting between positions at different maturities of a contract;
- Hedging Factor;
- Subportfolio 2 Procedure – risk offsetting between short and long maturities positions; and
- Subportfolios of futures contracts – calculation of subportfolio risk and margin of a portfolio.

The methodology presented here does not encompass features related to cash settlement, covered in the section dedicated to futures contracts of agricultural commodities, neither to risk offsetting between futures and futures-style options, covered in the section dealing with the methodology to calculate the margin for that type of option.

### **2.3.1. Identification and breakdown of futures contracts in FPRs**

The identification of primitive risk factors of a futures contract and the breakdown of the contract into FPRs derive from the contract pricing model.

The value of a futures contract, when defined based on the Non-Arbitration Principle, which provides that the result of a financial transaction does not depend on the instruments used to carry it out, may be expressed as a function as follows

$$F = A \times B \times C^{-1} \quad (3)$$

where terms  $A$ ,  $B$  and  $C$  refer to the value of the underlying asset of the futures contract, to the yield provided by the investment in the underlying asset (dividends of a share, for example), and to the financing cost, respectively, all represented as a price.

Equation (3) defines a theoretical value for the future price, which is closer to the actual future value the more accurately one includes in its formulation the variables affecting its price formation. For example, variables related to liquidity, tax and storage costs may be relevant, as well as those related to specific features of the underlying asset, such as price or production seasonality etc. In some cases, it may be more convenient to obtain  $F$  directly from the curve of future prices of the underlying asset, without resorting to the above formulation. The following results, although expressed as a function of  $A$ ,  $B$  and  $C$ , can be generalized for any number of terms in equation (3).

The continuous variation rate of  $F$ , assuming that  $A$ ,  $B$  e  $C$  vary to  $A'$ ,  $B$  and  $C'$ , respectively, is given by

$$R_F = \ln\left(\frac{F'}{F}\right) = \ln\left(\frac{A' \times B \times C^{-1}}{A \times B \times C^{-1}}\right) = \ln\left(\frac{A'}{A}\right) + \ln\left(\frac{B}{B}\right) - \ln\left(\frac{C'}{C}\right) = R_A + R_B - R_C \quad (4)$$

where  $R_A$ ,  $R_B$  and  $R_C$  are the continuous variation rates of  $A$ ,  $B$  and  $C$ , respectively.

A position in  $q$  units of futures contract with value  $F$  and size  $TM$  assume a value  $FV$  and undergoes variation  $\Delta FV$  corresponding to the price variation of the futures contract, that is,

$$FV = q \times F \times TM \quad (5)$$

$$\Delta FV = FV \times \tilde{R}_F \quad (6)$$

where  $\tilde{R}_F$  is the variation rate of  $F$ ,  $\tilde{R}_F = F'/F - 1$ .

The approximation of discrete rates by continuous rates allows us to estimate  $\Delta FV$  through a linear function of the variations of  $A$ ,  $B$  and  $C$ . Indeed, by approximating the discrete variation rate  $\tilde{R}_F$  by continuous rate  $R_F$ , as well as continuous rates  $R_A$ ,  $R_B$  and  $R_C$  by the respective discrete rates  $\tilde{R}_A$ ,  $\tilde{R}_B$  and  $\tilde{R}_C$ , one obtains, from equations (4) and (6), the following approximation for  $\Delta FV$

$$\Delta FV = FV \times \tilde{R}_F \cong FV \times \tilde{R}_A + FV \times \tilde{R}_B + -FV \times \tilde{R}_C \quad (7)$$

Equations (4) and (7) are linear combinations of the variation rates of  $A$ ,  $B$  and  $C$ . In equation (4), the coefficients of the combination are 1 or -1; in equation (7) they are  $FV$  or  $-FV$ . The sign of each part is the same as that of the exponents of the corresponding variable in equation (3). The error of the linear approximation is greater as the values of  $\tilde{R}_F$ ,  $\tilde{R}_A$ ,  $\tilde{R}_B$ , and  $\tilde{R}_C$  increase.

**Example 1:** The value of the futures contract of Real x USD exchange rate is a function of the spot exchange rate,  $DOL$ , of local USD interest rate  $rc$  and of the exchange rate pre-fixed in Real  $r$

$$F = DOL \times 1 + rc^{-1} \times 1 + r = DOL \times PU_{rc} \times \frac{1}{PU_r}$$

The variation of  $F$  to  $F = DOL' \times 1 + r' \times 1 + rc'^{-1}$  is expressed as a function of the variations of risk factors  $DOL$ ,  $r$  and  $rc$ , according to the following equation

$$\tilde{R}_F = \frac{\Delta F}{F} \cong \ln\left(\frac{DOL'}{DOL}\right) + \ln\left(\frac{1+r'}{1+r}\right) + \ln\left(\frac{1+rc}{1+rc'}\right) \cong \frac{\Delta DOL}{DOL} - \frac{\Delta PU_r}{PU_r} + \frac{\Delta PU_{rc}}{PU_{rc}}$$

The position resulting from the purchase (sale) of such contract equals the long (short) position in foreign currency, short (long) in PU of the exchange rate pre-fixed in domestic currency and long (short) in PU of the spread rate.

Variation  $\Delta FV$  of the position worth  $FV = q \times F \times TM$  is the sum of the portions of variation derived from each FPR

$$\Delta FV = FV \times \tilde{R}_F \cong \left( FV \times \frac{\Delta DOL}{DOL} \right) + \left( -FV \times \frac{\Delta PU_r}{PU_r} \right) + \left( FV \times \frac{\Delta PU_{rc}}{PU_{rc}} \right)$$

**Example 2:** Let us consider a position long in 1 unit of the futures contract of Real x USD exchange rate, equal to 50,000 US dollars, denominated in R\$ / 1,000 US\$ (FUT DOL contract), under the same conditions as in **Example 6** of the preceding section.

In **Example 6** variation  $\Delta FV$  of the position was calculated in an exact manner, assuming that the variations given by the scenarios of a 7 % fall for  $DOL$ , from 100 bp to  $r$  and a null variation for  $rc$ , we obtain a variation of -9,726.89 R\$ or -7.78 % of the position's value, of 125,000 R\$.

In this example, we calculate  $\Delta FV$  by using the linear decomposition, as derived in **Example 1**. The following table presents the reference values and the values under scenario of the contract's FPRs and, in the last column, the parts of variation associated to each FPR under the respective variation scenario, which make up the linear approximation to  $\Delta FV$ .

| FPR                | REFERENCE VALUE | EXACT CALCULATION  |                      | APPROXIMATED CALCULATION            |
|--------------------|-----------------|--------------------|----------------------|-------------------------------------|
|                    |                 | VARIATION SCENARIO | VALUE UNDER SCENARIO | PART OF TOTAL VARIATION $\Delta FV$ |
| $DOL$ (R\$ / US\$) | 2.300           | - 7%               | 2.139                | -8,750.00                           |
| $r$ (% in period)  | 19.00           | - 100 bp           | 18.00                | -1,071.05                           |
| $PU_r$ (R\$)       | 0.8403          | 0.86%              | 0.8475               |                                     |
| $rc$ (% in period) | 9.48            | 0 bp               | 9.48                 | -                                   |
| $PU_{rc}$ (US\$)   | 0.9134          | 0%                 | 0.9134               |                                     |

|                                 |          |        |            |            |
|---------------------------------|----------|--------|------------|------------|
| Financial variation of position | -        |        | -9,726.89  | -9,821.05  |
| Position value                  | 125,000  |        | 115,273.11 | 115,178.95 |
| Future price                    | 2,500.00 | -7.78% | 2,305.46   | 2,346.42   |

The relative variation of the position value obtained by the approximated calculation derived from the linear decomposition is

$$\frac{\Delta FV}{FV} \cong \frac{\Delta DOL}{DOL} - \frac{\Delta PU_r}{PU_r} + \frac{\Delta PU_{rc}}{PU_{rc}} = -7\% - 0.86\% + 0 = -7.86\%$$

The absolute variations concerning each FPR are as follows:

- variation derived from the exposure to  $DOL$ :  $FV \times \frac{\Delta DOL}{DOL} = 125,000 \times -7\% = -8,750.00$
- variation derived from the exposure to  $r$ :  $-FV \times \frac{\Delta PU_r}{PU_r} = -125,000 \times 0.86\% = -1,071.05$
- variation derived from the exposure to  $rc$ :  $FV \times \frac{\Delta PU_{rc}}{PU_{rc}} = 125,000 \times 0 = 0$
- approximated financial variation of the position:  $FV \times \frac{\Delta DOL}{DOL} - FV \times \frac{\Delta PU_r}{PU_r} + FV \times \frac{\Delta PU_{rc}}{PU_{rc}} = -9,821.05$

Upon estimating  $\Delta VF$  from the linear decomposition of  $\tilde{R}_F$ , one incurs the approximation error – the difference between the approximated and the exact variations. In this example, the approximated and exact financial variations are worth -9,821.05 R\$ and -9,726.89 R\$, respectively, and the approximation error is -94.16 R\$, or 0.97% of the exact value of the variation.

Generally, equation (3), (4) and (7) for  $F$ ,  $R_F$  and  $\Delta VF$ , respectively, may be re-written as follows:

$$F = Y_1^{s_1} \times Y_2^{s_2} \times \dots \times Y_N^{s_N}, \quad s_k = \pm 1, \quad k = 1, 2, \dots, N$$

$$R_F = s_1 \times R_{Y_1} + s_2 \times R_{Y_2} + \dots + s_N \times R_{Y_N} = \sum_{k=1}^N s_k \times R_{Y_k}$$

$$\Delta FV \cong s_1 \times FV \times \tilde{R}_{Y_1} + s_2 \times FV \times \tilde{R}_{Y_2} + \dots + s_N \times FV \times \tilde{R}_{Y_N} = \sum_{k=1}^N s_k \times FV \times \tilde{R}_{Y_k}$$

Terms  $Y_k$  of the equation for price  $F$  represent the contract's primitive risk factors. Term  $s_k \times FV$  of the equation for  $\Delta VF$  is the position's **financial exposure** to risk factor  $Y_k$ .

From that representation for  $R_F$  is the **linear decomposition** of a futures contract in FPRs – the variation of the contract value derives from the joint variation observed in the primitive variables, which can be obtained, in an approximate manner, as the sum of such variations.

Due to the linear decomposition of the futures contracts, the financial variation of a portfolio of futures contracts can also be approximated by a linear function, that is, the sum of the linear decompositions of the variations of each contract in the variations of their respective risk factors.

The assessment of the portfolio's potential variation under scenario for the FPRs therefore requires determining the portfolio's financial exposure to each FPR – once the primitive risk factors of the futures contracts present in the portfolio are identified, the position's linear decomposition consists in expressing it in terms of the financial exposures to the FPRs.

The mapping into primitive risk factors of the other financial futures contracts is similar to that described in *Example 1* for the exchange rate futures contract. **Table 2.3-1** presents the FPRs associated to BM&FBOVESPA's main financial futures contracts.

| PRIMITIVE RISK FACTOR         | FUTURES CONTRACTS               |  |                          |                         |                |         |      |             |                |       |                   |      |                  |  |
|-------------------------------|---------------------------------|--|--------------------------|-------------------------|----------------|---------|------|-------------|----------------|-------|-------------------|------|------------------|--|
|                               | DI 1, Long DI                   | Local U.S. Dollar int. rate, SCC, SC3S | R\$ / US\$ exchange rate | R\$ / EUR exchange rate | Ibovespa Index | IBrX-50 | Gold | Global Bond | US T- Note 10Y | IGP-M | IGP-M spread rate | IPCA | IPCA spread rate |  |
| EXCHANGE RATE TIME STRUCTURES | Pre-fixed interest rate         | *                                      |                          | *                       | *              | *       | *    | *           |                |       | *                 |      | *                |  |
|                               | Local U.S. Dollar interest rate |  | *                        | *                       | *              |         |      | *           | *              |       |                   |      |                  |  |
|                               | US\$ x EUR Spread               |  |                          |                         | *              |         |      |             |                |       |                   |      |                  |  |
|                               | Convenience Yield Brazil        |  |                          |                         |                | *       | *    |             |                |       |                   |      |                  |  |
|                               | IGP-M spread rate               |  |                          |                         |                |         |      |             |                | *     | *                 |      |                  |  |
|                               | IPC-A spread rate               |  |                          |                         |                |         |      |             |                |       |                   | *    | *                |  |
| SPOT MARKETS                  | R\$ / US\$ exchange rate        |  | *                        | *                       |                |         |      |             |                |       |                   |      |                  |  |
|                               | R\$ / EUR exchange rate         |  |                          |                         | *              |         |      |             |                |       |                   |      |                  |  |
|                               | IBVSP                           |  |                          |                         |                | *       |      |             |                |       |                   |      |                  |  |
|                               | IBrX-50                         |  |                          |                         |                |         | *    |             |                |       |                   |      |                  |  |
|                               | Gold                            |  |                          |                         |                |         |      | *           |                |       |                   |      |                  |  |
|                               | Global Bonds                    |  |                          |                         |                |         |      |             | *              |       |                   |      |                  |  |
|                               | US T- Note 10Y                  |  |                          |                         |                |         |      |             | *              |       |                   |      |                  |  |
| INFLATION INDICES             | IGP-M                           |  |                          |                         |                |         |      |             |                | *     | *                 |      |                  |  |
|                               | IGP-M Premium                   |  |                          |                         |                |         |      |             |                | *     |                   |      |                  |  |
|                               | IPC-A                           |  |                          |                         |                |         |      |             |                |       |                   | *    | *                |  |

**Table 2.3-1 – Primitive Risk Factors Associated to BM&FBOVESPA Financial Futures Contracts**

For simplification purposes, when mapping futures contracts on Global Bonds and US Treasury Notes, the vertices of the time structure of the respective interest curves are not utilized. As far as Global Bonds are concerned, one must also factor in the impact of the differences in liquidity of the various securities. In view of this, one utilizes the prices of the respective securities as a primitive risk factor when mapping such contracts.

Generally speaking, the transformation of a portfolio of derivatives contracts into a portfolio of exposures to primitive risk factors is equivalent to the *horizontal sum along each line* of **Table 2.3-1**. The portfolio's total exposure to an FPR as a sum of the exposures of each position to such a factor is thus obtained.

The detailed mapping of the futures contracts – calculation of the financial value and exposures to the respective FPRs – is found in Appendix 1 – Rules for Mapping Futures Contracts in Primitive Risk Factors.

In view of the adoption of fixed vertices for time-structure type FPRs, a position with an exposure to such a factor for a period  $t$  not coinciding with any of its vertices is mapped in the vertices adjacent to the original exposure period.

By denoting the vertices immediately adjacent to  $t$  ( $v_{low} \leq t < v_{upp}$ ) as  $v_{low}$  and  $v_{upp}$ , original exposure  $Exposure^{FPR,t}$  is replaced by exposures

$$Exposure^{FPR,v_{low}} = s_{FPR} \times FV \times \alpha^{v_{low}} t \quad \text{and} \quad Exposure^{FPR,v_{upp}} = s_{FPR} \times FV \times \alpha^{v_{upp}} t \quad (8)$$

$$\alpha^{v_{low}} t = 1 - \frac{t - v_{low}}{v_{upp} - v_{low}} \quad \text{and} \quad \alpha^{v_{upp}} t = 1 - \alpha^{v_{low}} t \quad (9)$$

Please observe that  $Exposure^{FPR,v_{low}} + Exposure^{FPR,v_{upp}} = Exposure^{FPR,t} = s_{FPR} \times FV$ .

Therefore, one can express the exposure of a position with financial value  $FV$  to any FPR as

$$Exposure^{FPR,v} = s_{FPR} \times FV \times \alpha^v \quad (10)$$

where  $s_{FPR}$  is the sign ( $\pm 1$ ) corresponding to factor  $FPR$  in the linear decomposition of the contract in question and  $\alpha^v$  is a distribution factor of the financial exposure between the vertices of the  $FPR$ .

For the FPR which is not of the time-structure type, one assumes a single vertex  $v$  and  $\alpha^v = 1$ , thus obtaining  $Exposure^{FPR} = s_{FPR} \times FV$ .

The following example illustrates the mapping in vertices.

**Example 3:** The FPRs of the futures contract of Real x USD exchange rate is a function of the spot exchange rate,  $DOL$ , and the interest rates pre-fixed in Real and USD, fixed interest rate  $r$  and local US Dollar interest rate  $rc$ , respectively. Consider that the vertices of fixed-interest rate and local US Dollar interest rate FPRs are the multiple 21-business day (bd) and 30-calendar day (cd) periods, respectively, in addition to the 1-day vertex,

$$Vertices_r = 1, 21, 42, 63, 84, \dots \quad \text{and} \quad Vertices_{rc} = 1, 30, 60, 90, 120, \dots$$

Consider a position worth  $FV$  in this contract, with maturity in 78 bd / 113 cd. Since this period does not coincide with vertices of  $r$  and  $rc$ , the position is mapped

- in the vertices of factor  $r$  adjacent to 78 bd – the vertices of 63 bd and 84 bd and
- in the vertices of factor  $rc$  adjacent to 113 bd – the vertices of 90 bd and 120 bd.

The position thus mapped presents the following exposures:

- Exposure to spot exchange rate FPR:  $Exposure^{DOL} = FV$
- Exposure to prefixed rate FPR:  $\alpha^{63\text{ bd } 78} = 1 - \frac{78-63}{84-63} = 0.285712$

$$Exposure^{r,63} = -FV \times 0.285712 \quad \text{and} \quad Exposure^{r,84} = -FV \times 0.714288$$

- Exposure to spread rate FPR:  $\alpha^{90\text{ cd } 113} = 1 - \frac{113-90}{120-90} = 0.233333$

$$Exposure^{rc,90} = FV \times 0.233333 \quad \text{and} \quad Exposure^{rc,120} = FV \times 0.766667$$

The table below brings the mapping of a position with a value of  $FV=125.000$ .

| FPR |               | FINANCIAL EXPOSURE                     |             |
|-----|---------------|--|-------------|
| DOL |               | FV                                     | 125,000.00  |
| r   | 63 bd vertex  | $-FV \times \alpha^{63\text{ bd}}$     | - 35,714.00 |
|     | 84 bd vertex  | $-FV \times 1 - \alpha^{63\text{ bd}}$ | - 89,286.00 |
| rc  | 90 cd vertex  | $FV \times \alpha^{90\text{ cd}}$      | 29,167.00   |
|     | 120 cd vertex | $FV \times 1 - \alpha^{90\text{ cd}}$  | 95,833.00   |

As one can observe from **Table 2.3-1**, there are risk factors common to different futures contracts and, thus, a portfolio's exposure to a primitive risk factor may arise from positions in different contracts. Not taking into account, for the time being, control mechanisms for risk offsetting between positions with different maturities in the same contract, one calculates the part of the portfolio's financial variation, associated to factor **FPR**, in its vertex  $v$ , from the value of the portfolio's total exposure to such factor, given by the sum of the exposures generated by each contract and each maturity.

One denotes by  $Exposure_{c,T}^{FPR,v}$  the financial exposure to factor **FPR** derived from a position with maturity  $T$  of a contract  $c$ , calculated according to equation (10). If there are  $M$  different contracts, each with different  $Q$  maturities, then the portfolio's total exposure to factor **FPR**, in vertex  $v$  is

$$Exposure^{FPR,v} = \sum_{m=1}^M \sum_{q=1}^Q Exposure_{c_m,T_q}^{FPR,v}$$

The combination of long and short positions in different contracts can result in the reduction of the exposure to one or more risk factors. Such is the case, for example, of a position long in Real for USD exchange rate futures and short in spread rate futures, with the reduction of exposure to the spot exchange rate FPR.

Another example of reduction of exposure to a risk factor is the combination of positions in DI1 futures contracts, spread rate contracts and Real for USD exchange rate contracts, in which the exposures to all the FPRs can be offset, provided the number of contracts of long and short positions follow the correct proportions.



**Example 4:** Consider the portfolio formed by a position short in spread rate futures contract (FUT DDI) and a position long in Real for USD exchange rate futures contract (FUT DOL), with similar maturities, for a period of 78 bd / 113 cd, and values equal to R\$ 120,000 and R\$ 125,000, respectively.

When mapping these positions, the financial exposures to the spot exchange market *DOL* are offset and result in a total exposure of R\$ 5,000 to this risk factor. The exposures to the spread rate factor are also offset. The table below brings the mapping of each position and the resulting exposures. "C" and "V" indicate purchase and sale of contracts, respectively.

| PORTFOLIO                     |          |          |  |
|-------------------------------|----------|----------|--|
| <b>Contract</b>               | FUT DDI  | FUT DOL  |  |
| <b>Period (bd / cd)</b>       | 78 / 113 | 78 / 113 |  |
| <b>C / V No, of contracts</b> | V 1      | C 1      |  |
| <b>VF</b>                     | -120,000 | 125,000  |  |

| FPR        |               | FINANCIAL EXPOSURE |          |                 |
|------------|---------------|--------------------|----------|-----------------|
|            |               | FUT DDI            | FUT DOL  | TOTAL           |
| <i>DOL</i> |               | -120,000           | 125,000  | <b>5,000</b>    |
| <i>r</i>   | 63 bd vertex  |                    | - 35,714 | <b>- 35,714</b> |
|            | 84 bd vertex  |                    | - 89,286 | <b>- 89,286</b> |
| <i>rC</i>  | 90 cd vertex  | -28,000            | 29,167   | <b>1,167</b>    |
|            | 120 cd vertex | -92,000            | 95,833   | <b>3,833</b>    |

### 2.3.2. Financial variation under scenario

From the linear mapping of a futures contract in primitive risk factors, we obtained, in the previous section, the financial variation of a position in such contract as the sum of the parts of the variation derived from the exposure to each FPR.

Under scenario  $Scen_k^{FPR,v}$ , the part of the financial variation of the position with value  $FV$ , derived from the variation of factor  $FPR$ , in its vertex  $v$ , is given by

$$\Delta FV^{FPR,v} k = Exposure^{FPR,v} \times \Delta^{FPR,v} k \quad (11)$$

$$\Delta^{FPR,v} k = \frac{FPR_k - FPR_{Ref}}{FPR_{Ref}}$$

Term  $\Delta^{FPR,v} k$  of equation (11) is the variation of the primitive risk factor when expressed as price, even if the factor is indicated as a rate—type variable. For example, in the case of pre-fixed rate in Real factor, term  $\Delta^{r,v} k$ , in equation (11) for variation  $\Delta FV^{r,v} k$ , is the relative variation between prices  $FU_r$  corresponding to the rates under scenarios  $Scen_k^{r,v}$  and  $Scen_{Ref}^{r,v}$ ,  $FU_r = 1 + r^{-1}$ .

Given  $nv$  vertices of factor  $FPR - v_1, v_2, \dots, v_{nv}$  - the financial variation of a position relative to  $FPR$ , under its  $k$ -th scenario, is denoted as  $\Delta FV^{FPR} k$  and

$$\Delta FV^{FPR} k = \sum_{i=1}^{nv} \Delta FV^{FPR, v_i} k = \sum_{i=1}^{nv} Exposure^{FPR, v_i} \times \Delta^{FPR, v_i} k \quad (12)$$

The following table shows the financial variations under scenario, by vertex of factor  $FPR$ , under each one of the  $nc$  scenarios. The total financial variations related to factor  $FPR$ , under each scenario, are indicated on the last line of the table.

| FPR                     | FINANCIAL VARIATION UNDER SCENARIO    |     |                                       |     |  |
|-------------------------|---------------------------------------|-----|---------------------------------------|-----|--|
|                         | $Scen_1^{FPR}$                        | ... | $Scen_k^{FPR}$                        | ... | $Scen_{nc}^{FPR}$                      |
| $FPR$ , vertex $v_1$    | $\Delta FV^{FPR, v_1} 1$              |     | $\Delta FV^{FPR, v_1} k$              |     | $\Delta FV^{FPR, v_1} nc$              |
| $\vdots$                | $\vdots$                              |     | $\vdots$                              |     | $\vdots$                               |
| $FPR$ , vertex $v_{nv}$ | $\Delta FV^{FPR, v_{nv}} 1$           |     | $\Delta FV^{FPR, v_{nv}} k$           |     | $\Delta FV^{FPR, v_{nv}} nc$           |
| <b><math>FPR</math></b> | <b><math>\Delta FV^{FPR} 1</math></b> |     | <b><math>\Delta FV^{FPR} k</math></b> |     | <b><math>\Delta FV^{FPR} nc</math></b> |

Sum of variations along the vertices

**Table 2.3-2 – Financial variations under scenario associated to an FPR, by vertex**

Given  $N$  primitive risk factors to which a position is exposed and one scenario for each one of them, combined into contiguous scenario  $Scen_k^{Contiguous} = [Scen_{k_1}^1, Scen_{k_2}^2, \dots, Scen_{k_N}^N]$ , it follows from the linear decomposition of futures contracts that the total financial variation of the position's value under that scenario is the sum of the variations associated to each FPR, under the respective scenario

$$\Delta FV k = \Delta FV^1 k_1 + \Delta FV^2 k_2 + \dots + \Delta FV^N k_N \quad (13)$$

where  $\Delta FV^j k_j$  is the part of the position's financial variation under scenario  $Scen_{k_j}^j$  of risk factor  $FPR^j$ , given according to equation (12) for  $j = 1, 2, \dots, N$ .

Thus

$$\Delta FV k = \sum_{j=1}^N \Delta FV^j k_j = \sum_{j=1}^N \sum_{i=1}^{nv_j} Exposure^{j, v_i} \times \Delta^{j, v_i} k_j \quad (14)$$

**Table 2.3-3** highlights the financial variations under the scenario of each factor which makes up contiguous scenario  $Scen_k^{Contiguous}$ . According to equation (13), the sum of such variations results in the position's total variation,  $\Delta FV k$ .

| FPR   | FINANCIAL VARIATION UNDER SCENARIO |     |                   |     |                    |
|-------|------------------------------------|-----|-------------------|-----|--------------------|
|       | $Scen_1^1$                         |     | $Scen_{k_1}^1$    |     | $Scen_{nc_1}^1$    |
| $FPR$ | $\Delta FV^1 1$                    | ... | $\Delta FV^1 k_1$ | ... | $\Delta FV^1 nc_1$ |
| ...   |                                    |     |                   |     |                    |

|         |                               |     |                                       |     |   |
|---------|-------------------------------|-----|---------------------------------------|-----|---|
| $FPR^j$ | $Scen_1^j$<br>$\Delta FV^j_1$ | ... | $Scen_{k_j}^j$<br>$\Delta FV^j_{k_j}$ | ... | $Scen_{nc_j}^j$<br>$\Delta FV^j_{nc_j}$ |
| ...     |                               |     |                                       |     |   |
| $FPR^N$ | $Scen_1^N$<br>$\Delta FV^N_1$ | ... | $Scen_{k_N}^N$<br>$\Delta FV^N_{k_N}$ | ... | $Scen_{nc_N}^N$<br>$\Delta FV^N_{nc_N}$ |

**Table 2.3-3 – Composition of the financial variation under a combination of scenarios**

**Example 5:** Let us consider again a position long in 1 unit of the futures contract of Real x USD exchange rate, equal to 50,000 US dollars, denominated in 2,500 R\$ / 1,000 US\$, with maturity in 78 bd / 113 cd.

Suppose 5 scenarios defined for the fixed-interest rate risk factor, 3 scenarios for the local USD interest rate, and 3 scenarios for the spot exchange rate, under which we obtain the financial variations associated to each FPR, according to the following table.

| FPR        | FINANCIAL EXPOSURE | FINANCIAL VARIATION UNDER SCENARIO |                |                |            |            |
|------------|--------------------|------------------------------------|----------------|----------------|------------|------------|
| $r$        |                    | $Scen_1^r$                         | $Scen_2^r$     | $Scen_3^r$     | $Scen_4^r$ | $Scen_5^r$ |
| $v_{low}$  | -35,714            | -43                                | 38             | -              | -38        | 43         |
| $v_{upp}$  | -89,286            | -230                               | 183            | -              | -184       | 237        |
| $rc$       |                    | $Scen_1^{rc}$                      | $Scen_2^{rc}$  | $Scen_3^{rc}$  |            |            |
| $v'_{low}$ | 29,167             | 96                                 | -              | -155           |            |            |
| $v'_{upp}$ | 95,833             | 624                                | -              | -993           |            |            |
| $DOL$      |                    | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |            |            |
|            | 125,000            | -8,750                             | -              | 8,750          |            |            |

Consider the contiguous scenario formed by the scenarios highlighted in the table,  $Scen^{Contiguous} = [Scen_2^r, Scen_3^{rc}, Scen_3^{DOL}]$  According to equation (13), the occurrence of such scenario implies valuing the position in the amount of \$ 7,823, since

$$\Delta FV = \Delta FV^r_2 + \Delta FV^{rc}_3 + \Delta FV^{DOL}_3 = 38 + 183 + (-155 - 993) + 8,750 = 7,823$$

### 2.3.3. Market Risk Calculation

The scenarios testing methodology determines for the worst financial variation of a position when assessed under a set of previously-defined scenarios.

An ample and diversified set of scenarios is defined for each FPR, derived from technical and/or statistical analysis (historical simulation, econometric models, extreme-values theory etc.), as well as consensual market

conjecture assessments. Also defined are the scenarios areas, so as to avoid using improbable contiguous scenarios from the macroeconomic standpoint.

It follows from the linear mapping of the futures contracts, that is, from the linearity of the total financial variation in relation to the variations associated to each FPR, that, in order to obtain the worst total variation under scenario,  $Min\Delta FV$ , all is needed is to take the minimum variation under scenario associated to each factor,  $Min\Delta FV^j$ ,

$$Min\Delta FV = \sum_{j=1}^N Min\Delta FV^j$$

The **local market risk** of a set of positions is defined as the worst financial variation of a portfolio under the scenarios belonging to a certain scenarios area.

The minimum financial variation under scenario associated to an  $FPR$  factor in an area  $A$  is denoted by  $Min\Delta FV^{FPR} A$  and expressed as

$$Min\Delta FV^{FPR} A = \min_{1 \leq k \leq nc} \Delta FV^{FPR} k, A = \min \Delta FV^{FPR} 1, A, \dots, \Delta FV^{FPR} nc, A \quad (15)$$

$$\Delta FV^{FPR} k, A = \begin{cases} \Delta FV^{FPR} k & \text{if scenario } Scen_k^{FPR} \text{ belongs to area } A \\ 0 & \text{otherwise} \end{cases}$$

Thus, among all the scenarios defined for factor  $FPR$  -  $Scen_1^{FPR}, \dots, Scen_{nc}^{FPR}$  only those belonging to area  $A$  are considered for local assessment in  $A$ .

The local risk in  $A$  is then obtained as the sum, along the risk factors, of the worst financial variations under scenario in area  $A$ , if negative

$$Local Risk A = \min \left( 0, \sum_{j=1}^N Min\Delta FV^j A \right) \quad (16)$$

$$\sum_{j=1}^N Min\Delta FV^j A = Min\Delta FV^1 A + \dots + Min\Delta FV^N A =$$

$$= \underbrace{\min \Delta FV^1 1, A, \dots, \Delta FV^1 nc_1, A}_{\text{Worst financial variation associated to factor } FPR^1, \text{ given the scenarios for this factor belonging to area } A} + \dots + \underbrace{\min \left( \Delta FV^N (A), \dots, \Delta FV^N (nc_N, A) \right)}_{\text{Worst financial variation associated to factor } FPR^N, \text{ given the scenarios for this factor belonging to area } A}$$

**Table 2.3-4** shows the financial variations of a portfolio associated to each risk factor, under the various scenarios defined for each one of them. The minimum variations, in area  $A$ , associated to each factor are indicated in the last column.

| FPR     | FINANCIAL VARIATION UNDER SCENARIOS OF AREA A |                     |     |                        | WORST VARIATION IN AREA A |
|---------|---|---------------------|-----|------------------------|---------------------------|
| $FPR^1$ | $\Delta FV^1_{1,A}$                           | $\Delta FV^1_{2,A}$ | ... | $\Delta FV^1_{nc_1,A}$ | $Min\Delta FV^1_A$        |
| ...     |   |                     |     |                        | ...                       |
| $FPR^j$ | $\Delta FV^j_{1,A}$                           | $\Delta FV^j_{2,A}$ | ... | $\Delta FV^j_{nc_j,A}$ | $Min\Delta VF^j_A$        |
| ...     |   |                     |     |                        | ...                       |
| $FPR^N$ | $\Delta FV^N_{1,A}$                           | $\Delta FV^N_{2,A}$ | ... | $\Delta FV^N_{nc_N,A}$ | $Min\Delta FV^N_A$        |

Choice of minimum financial variation  
financeira under scenario, associated  
with each FPR

**Table 2.3-4 – Assessment of local risk measurement in scenarios area A**

One takes as the portfolio's risk measurement the smaller between the local risk values corresponding to the various scenarios areas  $A_1, A_2, \dots$ .

$$Market Risk = \min Local Risk Area_1, Local Risk Area_2, Local Risk Area_3, \dots \quad (17)$$

The following example illustrates the calculation of the unit risk of the futures contract of Real x USD exchange rate (its theoretical maximum margin) taking into account two scenarios areas.

**Example 6:** Calculation of the margin of the futures contract of Real x USD exchange rate, with maturity  $T$ .

Assuming that the contract price is R\$ 2,500 / US\$ 1,000 and that the contract size is 50,000 dollars, the value of the long position in 1 unit of the contract is  $VF = 2,500 \times 50 = 125,000$ .

According to **Example 1**, the FPRs of this contract are the spot exchange rate,  $DOL$ , and the interest rates prefixed in Real and USD, fixed interest rate ( $r$ ) and local US Dollar interest rate ( $rc$ ), respectively. The following table presents the scenarios of the contract's FPRs, in the vertices where the position is mapped. The scenarios for  $r$  and  $rc$  are expressed in base points.

| FPR        | VARIATION SCENARIOS FOR FPR |                |                |            |            |
|------------|-----------------------------|----------------|----------------|------------|------------|
| $r$        | $Scen_1^r$                  | $Scen_2^r$     | $Scen_3^r$     | $Scen_4^r$ | $Scen_5^r$ |
| $V_{low}$  | -162                        | +145           | -              | -145       | +166       |
| $V_{UPP}$  | -175                        | +141           | -              | -140       | +183       |
| $rc$       | $Scen_1^{rc}$               | $Scen_2^{rc}$  | $Scen_3^{rc}$  |            |            |
| $V'_{low}$ | -396                        | -              | +642           |            |            |
| $V'_{upp}$ | -392                        | -              | +634           |            |            |
| $DOL$      | $Scen_1^{DOL}$              | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |            |            |
|            | -7%                         | -              | +7%            |            |            |

Consider scenarios areas

$$A_1 = Scen_1^r, Scen_3^r, Scen_4^r, Scen_2^{rc}, Scen_3^{rc}, Scen_1^{DOL}, Scen_2^{DOL}, Scen_3^{DOL}$$

and

$$A_2 = Scen_2^r, Scen_3^r, Scen_5^r, Scen_1^{rc}, Scen_2^{rc}, Scen_1^{DOL}, Scen_2^{DOL}, Scen_3^{DOL} .$$

The following table presents the financial variations under scenario for calculating the position's margin:

| FPR        | FINANCIAL EXPOSURE | FINANCIAL VARIATION UNDER SCENARIOS OF AREA $A_1$ |                |                | FINANCIAL VARIATION UNDER SCENARIOS OF AREA $A_2$ |                |                |
|------------|--------------------|---|----------------|----------------|---|----------------|----------------|
|            |                    | $Scen_1^r$  | $Scen_3^r$     | $Scen_4^r$     | $Scen_2^r$  | $Scen_3^r$     | $Scen_5^r$     |
| $r$        |                    | $Scen_1^r$  | $Scen_3^r$     | $Scen_4^r$     | $Scen_2^r$  | $Scen_3^r$     | $Scen_5^r$     |
| $v_{low}$  | -35,714            | -43   | -              | -38            | 38  | -              | 43             |
| $v_{upp}$  | -89,286            | -230  | -              | -184           | 183   | -              | 237            |
|            |                    | <b>-273</b>                                       | -              | <b>-222</b>    | 221   | -              | 280            |
| $rc$       |                    |   | $Scen_2^{rc}$  | $Scen_3^{rc}$  | $Scen_1^{rc}$                                     | $Scen_2^{rc}$  |                |
| $v'_{low}$ | 29,167             |   | -              | -155           | 96  | -              |                |
| $v'_{upp}$ | 95,833             |   | -              | -993           | 624   | -              |                |
|            |                    |   | -              | <b>-1,148</b>  | 720   | -              |                |
| $DOL$      |                    | $Scen_1^{DOL}$                                    | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ | $Scen_1^{DOL}$                                    | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |
|            | 125,000            | -8,750  | -              | 8,750          | -8,750  | -              | 8,750          |
|            |                    | <b>-8,750</b>                                     | -              | 8,750          | <b>-8,750</b>                                     | -              | 8,750          |

$$Local Risk A_1 = \min 0, Min\Delta FV^r A_1 + Min\Delta FV^{rc} A_1 + Min\Delta FV^{DOL} A_1 = \\ = \min 0, -273 - 1,148 - 8,750 = -10,171$$

$$Local Risk A_2 = \min 0, Min\Delta FV^r A_2 + Min\Delta FV^{rc} A_2 + Min\Delta FV^{DOL} A_2 = \min 0, 0 + 0 - 8,750 = -8,750$$

$$Market Risk = \min Local Risk A_1, Local Risk A_2 = \min -10,171, -8,750 = -10,171$$

To obtain the opposite position's margin, that is, the position short in 1 contract unit, just reverse the signs of the variations under the scenario of the previous table, with the following results:

$$Local Risk A_1 = \min 0, 0 + 0 - 8,750 = -8,750$$

$$Local Risk A_2 = \min 0, -280 - 720 - 8,750 = -9,750$$

$$Market Risk = \min Local Risk A_1, Local Risk A_2 = \min -8,750, -9,750 = -9,750$$

The **global market risk** of a set of positions is defined as the worst financial variation of a portfolio, taking into account all the scenarios defined for the primitive risk factors, if negative, without any restriction to combination of scenarios. Similarly to the local risk, the global risk is obtained as the sum, along the risk factors, of the worst financial variations under scenario, considering all the scenarios defined for the risk factors. If there is no restriction to combinations of scenarios, this minimum variation is denoted as  $Min\Delta FV^{FPR}$ .

$$Global Risk = \min \left( 0, \sum_{j=1}^N Min\Delta FV^j \right) \quad (18)$$

$$\begin{aligned} \sum_{j=1}^N Min\Delta FV^j &= Min\Delta FV^1 + \dots + Min\Delta FV^N = \\ &= \underbrace{\min \Delta FV^1_1 ; \dots ; \Delta FV^1_{nc_1}}_{\text{Minimum financial variation associated to factor } FPR^1, \text{ considering all the scenarios for this factor}} + \dots + \underbrace{\min \Delta FV^N_1 ; \dots ; \Delta FV^N_{nc_N}}_{\text{Minimum financial variation associated to factor } FPR^N, \text{ considering all the scenarios for this factor}} \end{aligned}$$

The **global market risk** and **local market risk** differ only as to the set of scenarios involved in calculating financial variations  $\Delta FV^{FPR}$ , with the global risk measurement assuming a value equal to or smaller than the local risk value, that is,  $|Global Risk| \geq |Local Risk A|$ , for any scenarios area  $A$ . Equality  $Global Risk = Local Risk A$  applies when area  $A$  contains all the scenarios of all the primitive risk factors.

**Example 7:** Let us consider a futures portfolio with positions representing exposures to spot exchange rate of Real for US Dollar (*DOL*) and Ibovespa index (*IBV*) FPRs, both for a value equal to \$1,000. For these FPRs, consider the following scenarios:

$$\begin{aligned} C_{Scen}^{DOL} &= Scen_1^{DOL}, Scen_2^{DOL}, Scen_3^{DOL}, Scen_4^{DOL}, Scen_5^{DOL}, Scen_6^{DOL} = -7\%, -4\%, 0, +2\%, +4\%, +7\% \quad e \\ C_{Scen}^{IBV} &= Scen_1^{IBV}, Scen_2^{IBV}, Scen_3^{IBV}, Scen_4^{IBV}, Scen_5^{IBV} = -12\%, -6\%, 0, +3\%, +10\% \end{aligned}$$

The following table presents the variations under such scenarios, as well as the minimum variation associated to each FPR.

| FPR        | FINANCIAL EXPOSURE | VARIATION SCENARIO                 |                |                |                |                |                | MINIMUM VARIATION |
|------------|--------------------|------------------------------------|----------------|----------------|----------------|----------------|----------------|-------------------|
|            |                    | FINANCIAL VARIATION UNDER SCENARIO |                |                |                |                |                |                   |
| <i>DOL</i> | 1.000              | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ | $Scen_4^{DOL}$ | $Scen_5^{DOL}$ | $Scen_6^{DOL}$ | $Scen_1^{DOL}$    |
|            |                    | -7%                                | -4%            | -              | +2%            | +4%            | +7%            | -7%               |
|            |                    | -70                                | -40            | -              | 20             | 40             | 70             | -70               |
| <i>IBV</i> | 1.000              | $Scen_1^{IBV}$                     | $Scen_2^{IBV}$ | $Scen_3^{IBV}$ | $Scen_4^{IBV}$ | $Scen_5^{IBV}$ |                | $Scen_1^{IBV}$    |
|            |                    | -12%                               | -6%            | -              | +3%            | +10%           |                | -12%              |
|            |                    | -120                               | -60            | -              | 30             | 100            |                | -120              |

$$Min\Delta VF^{DOL} = \min \Delta VF^{DOL}_1, \dots, \Delta VF^{DOL}_6 = \min -70, -40, 0, 20, 40, 70 = -70$$

$$Min\Delta VF^{IBV} = \min \Delta VF^{IBV}_1, \dots, \Delta VF^{IBV}_5 = \min -120, 60, 0, 30, 100 = -120$$

$$Global Risk = \min 0, Min\Delta VF^{DOL} + Min\Delta VF^{IBV} = \min 0, -70 - 120 = -190$$

Since there is no restriction to combining scenarios,  $Market Risk = Global Risk = -190$

Consider two scenarios areas – an *bullish* area ( $A_+$ ) and a *bearish* area ( $A_-$ ) of the economic situation – thus defined:  $A_+$  contains scenarios 1 and 2 of factor *DOL* and scenarios 4 and 5 of factor *IBV*;  $A_-$

contains scenarios 5 and 6 of factor *DOL* and scenarios 1 and 2 of factor *IBV*. The portfolio's local risk in area  $A_+$  is -40 \$ and in area  $A_-$  is -80 \$.

| FPR        | FINANCIAL EXPOSURE | SCENARIO IN THE BULLISH AREA ( $A_+$ )<br>FINANCIAL VARIATION UNDER SCENARIO |                | MINIMUM VARIATION |
|------------|--------------------|--|----------------|-------------------|
| <i>DOL</i> | 1.000              | $Scen_1^{DOL}$   | $Scen_2^{DOL}$ | $Scen_1^{DOL}$    |
|            |                    | -7%<br>-70   | -4%<br>-40     | -7%<br>-70        |
| <i>IBV</i> | 1.000              |  | $Scen_4^{IBV}$ | $Scen_5^{IBV}$    |
|            |                    |  | +3%<br>30      | +12%<br>120       |

| FPR        | FINANCIAL EXPOSURE | SCENARIO IN THE BEARISH AREA ( $A_-$ )<br>FINANCIAL VARIATION UNDER SCENARIO |                | MINIMUM VARIATION |
|------------|--------------------|--|----------------|-------------------|
| <i>DOL</i> | 1.000              |  | $Scen_5^{DOL}$ | $Scen_6^{DOL}$    |
|            |                    |  | +4%<br>40      | +7%<br>70         |
| <i>IBV</i> | 1.000              | $Scen_1^{IBV}$   | $Scen_2^{IBV}$ | $Scen_1^{IBV}$    |
|            |                    | -12%<br>-120   | -6%<br>-60     | -12%<br>-120      |

$$Local Risk A_+ = \min 0, Min\Delta FV^{DOL} A_+ + Min\Delta FV^{IBV} A_+ = \min 0, -70 + 30 = -40$$

$$Local Risk A_- = \min 0, Min\Delta FV^{DOL} A_- + Min\Delta FV^{IBV} A_- = \min 0, 40 - 120 = -80$$

$$Market Risk = \min Local Risk A_+, Local Risk A_- = \min -40, -80 = -80$$

The market risk of the portfolio – the local minimum risk – refers to area  $A_-$ , under which the worst financial variation is -80 \$, lower than the loss under scenarios area  $A_+$  (-40 \$). Not considering the areas, that is, allowing for any combination of individual scenarios, the portfolio's loss reaches the value of 190 \$ (global market risk), derived from scenarios 1 of each FPR, which represent a loss for both factors, a situation excluded from the portfolio risk calculation with the definition of areas  $A_-$  and  $A_+$ .

### 2.3.4. Control of risk offsetting between positions at different maturities of a contract

Due to the existence, for some commodities/contracts, of an asymmetry of price fluctuations regarding maturity, and inefficiencies in the position-reversal process, as well as differences in liquidity between maturities, between other factors, the margin calculation methodology allows for controlling risk offsetting between different maturities of the same contract.

The control mechanism for risk offsetting between maturities assumes that positive financial variations associated to an FPR do not materialize in their entirety. From that hypothesis, the mechanism promotes, in calculating the total financial variation associated to an FPR, the reduction of the benefit of positive financial variations under scenario, derived from positions with different maturities of a same contract. Such reduction



is determined by multiplying each positive variation times a parameter, called **offsetting factor**, defined per contract and maturity.

Let  $\Delta FV_{c,T}^{FPR,v} k$  be the financial variation associated to factor  $FPR$ , in its vertex  $v$ , and under the  $k$ -th scenario, derived from the position in maturity  $T$  of contract  $C$

$$\Delta FV_{c,T}^{FPR,v} k = Exposure_{c,T}^{FPR,v} \times \Delta^{FPR,v} k \quad (19)$$

**Offsetting factor**  $\lambda$ , defined for maturity  $T$  of contract  $C$ , alters the value of positive financial variations  $\Delta FV_{c,T}^{FPR,v} k$  for the following adjusted variation:

$$\Delta FV_{c,T}^{FPR,v} k, \lambda = \begin{cases} \Delta FV_{c,T}^{FPR,v} k \times \lambda & \text{if } \Delta FV_{c,T}^{FPR,v} k > 0 \\ \Delta FV_{c,T}^{FPR,v} k & \text{otherwise} \end{cases}, \quad 0 \leq \lambda \leq 1 \quad (20)$$

Such alteration encompasses the financial variations associated to all the contract's risk factors.

**Example 8:** Let us consider two opposite positions in maturities  $T_1$  and  $T_2$  of a same contract  $C$ , a factor  $FPR$  common to both positions, with only one vertex and a variation scenario  $\Delta$ .

The financial variation associated to the factor is the sum of the variations derived from each position,  $\Delta FV_{c,T_1}^{FPR} \text{ scenario} = Exposure_{c,T_1}^{FPR} \times \Delta$  and  $\Delta FV_{c,T_2}^{FPR} \text{ scenario} = Exposure_{c,T_2}^{FPR} \times \Delta$ . Since the positions have opposite directions, the parts have opposite signs and offset each other. Suppose that the variations under scenario are worth  $\Delta FV_{c,T_1}^{FPR} \text{ scenario} = -1,000$  and  $\Delta FV_{c,T_2}^{FPR} \text{ scenario} = 2,000$ .

The total variation associated to the factor is calculated in three situations, taking into account three values for the offsetting factor of maturity  $T_2$ : 1, 0.8 and 0.3, respectively in (i), (ii) and (iii):

- (i)
- (ii)
- (iii)

Observe that, in (ii), in spite of the lower gain associated to the position in maturity  $T_2$ , from 2,000 to 1,600, variation  $\Delta FV^{FPR}$  is still positive and, thus, does not encumber the portfolio's risk.

The financial variation of the positions in the various maturities of contract  $C$ , associated to factor  $FPR$  and under its  $k$ -th scenario, is given by

$$\Delta FV_c^{FPR} k = \sum_{q=1}^Q \sum_{i=1}^{nv} \Delta FV_{c,T_q}^{FPR,v_i} k, \lambda \quad (21)$$

where  $Q$  is the amount of maturities of contract  $C$  and  $nv$  is the number of vertices of factor  $FPR$ .

Finally, the financial variation of positions in  $M$  contracts  $c_1, c_2, \dots, c_M$ , associated to factor  $FPR$  and assessed under its  $k$ -th scenario is the sum of the variations derived from each contract with exposure to the same factor,

$$\Delta FV^{FPR} k = \Delta FV_{c_1}^{FPR} k + \dots + \Delta FV_{c_M}^{FPR} k \quad (22)$$

Maximum compensation of risk is allowed under the hypothesis that gains and losses estimated under a stress scenario are fully realized, regardless of contract and maturity of positions, in which case offsetting values are 1. Under this situation, the financial variation under scenario associated to a factor may be obtained by applying the scenario to the net exposure to the factor,  $Exposure^{FPR,v}$ :

$$\Delta FV^{FPR,v} k = Exposure^{FPR,v} \times \Delta^{FPR,v} k$$

$$Exposure^{FPR,v} = Exposure_{c_1}^{FPR,v} + Exposure_{c_2}^{FPR,v} + \dots + Exposure_{c_M}^{FPR,v}$$

$$Exposure_c^{FPR,v} = Exposure_{c,T_1}^{FPR,v} + \dots + Exposure_{c,T_Q}^{FPR,v}$$

$$\text{that is, } Exposure^{FPR,v} = \sum_{m=1}^M \sum_{q=1}^Q Exposure_{c_m, T_q}^{FPR,v}$$

### 2.3.5. Hedging Factor

The margin of a position in a futures contract in which the Customer is classified by the Clearinghouse as *Non-hedger*<sup>2</sup> is superior to the margin calculated for a similar position, but owned by a Hedger Customer for the contract. The increase arises from the application of a multiplication factor, called *Hedger factor* and defined by a primitive risk factor, to the financial exposure of the position in the contract in which the Customer is classified as *Non-hedger*.

With the *Hedger* factor being defined by FPR and applied according to the Customer's classification for the contract, such factor is applied to the financial exposure to each primitive risk factor. Thus, the exposure to factor  $FPR^v$  derived from a position at maturity  $T$  of a contract  $c$  and adjusted by the *Hedger* factor defined for that FPR,  $H_{FPR}$ , is given by

$$Exposure_{c,T}^{FPR,v} = \begin{cases} S_{FPR} \times FV \times \alpha_{verice}^v T & \text{if hedger customer in contract } c \\ S_{FPR} \times FV \times \alpha_{verice}^v T \times H_{FPR} & \text{otherwise} \end{cases}, H_{FPR} \geq 1 \quad (23)$$

When factor  $H_{FPR}$  assumes the same value for all primitive risk factors of a contract, the *Non-hedger* Customer's position margin for the contract is increased, in relation to the *Hedger* Customer's margin, by the same proportion.

<sup>2</sup>*Hedger* is the Customer, an individual or corporation, producer, financial institution or institutional investor whose activity is directly related to the goods traded at BM&FBOVESPA.

**Example 9:** Resuming **Example 6**, where we calculate the margin of the futures contract of Real x USD exchange rate, with no adjustment of exposure values as related to the Customer's classification as a *Hedger* or *Non-Hedger*, that is, the *Hedger* Customer's required margin in the contract. Considering the position in just one contract, application of equation (23) implies multiplying the values presented in Example 6 by the respective *Hedger* factors. Assuming a *Hedger* factor equal to 1.2 for all FPRs of the contract, the following table presents the results for a long position.

| FPR       | FINANCIAL EXPOSURE | FINANCIAL VARIATION UNDER SCENARIOS OF AREA $A_1$ |                |                  | FINANCIAL VARIATION UNDER SCENARIOS OF AREA $A_2$ |                |                |
|-----------|--------------------|---|----------------|------------------|---|----------------|----------------|
|           |                    | $Scen_1^r$  | $Scen_3^r$     | $Scen_4^r$       | $Scen_2^r$  | $Scen_3^r$     | $Scen_5^r$     |
| $r$       |                    |   |                |                  |   |                |                |
| $V_{inf}$ | -42,856.80         | -51.60  | -              | -45.60           | 45.60   | -              | 51.60          |
| $V_{sup}$ | -107,143.20        | -276.60   | -              | -220.80          | 219.60  | -              | 284.40         |
|           |                    | <b>-327.60</b>                                    | -              | -266.40          | 265.20  | -              | 336            |
| $rc$      |                    |   | $Scen_2^{rc}$  | $Scen_3^{rc}$    | $Scen_1^{rc}$                                     | $Scen_2^{rc}$  |                |
| $V_{inf}$ | 35,000.40          |   | -              | -186             | 115.20  | -              |                |
| $V_{sup}$ | 114,999.60         |   | -              | -1,191.60        | 748.80  | -              |                |
|           |                    |   | -              | <b>-1,377.60</b> | 864   | -              |                |
| $DOL$     |                    | $Scen_1^{DOL}$                                    | $Scen_2^{DOL}$ | $Scen_3^{DOL}$   | $Scen_1^{DOL}$                                    | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |
|           | 150,000            | -10,500   | -              | 10,500           | -10,500   | -              | 10,500         |
|           |                    | <b>-10,500</b>                                    | -              | 10,500           | <b>-10,500</b>                                    | -              | 10,500         |

$$Local Risk A_1 = -327.60 - 1,377.60 - 10,500 = -12,205.20$$

$$Local Risk A_2 = 0 + 0 - 10,500 = -10,500.00$$

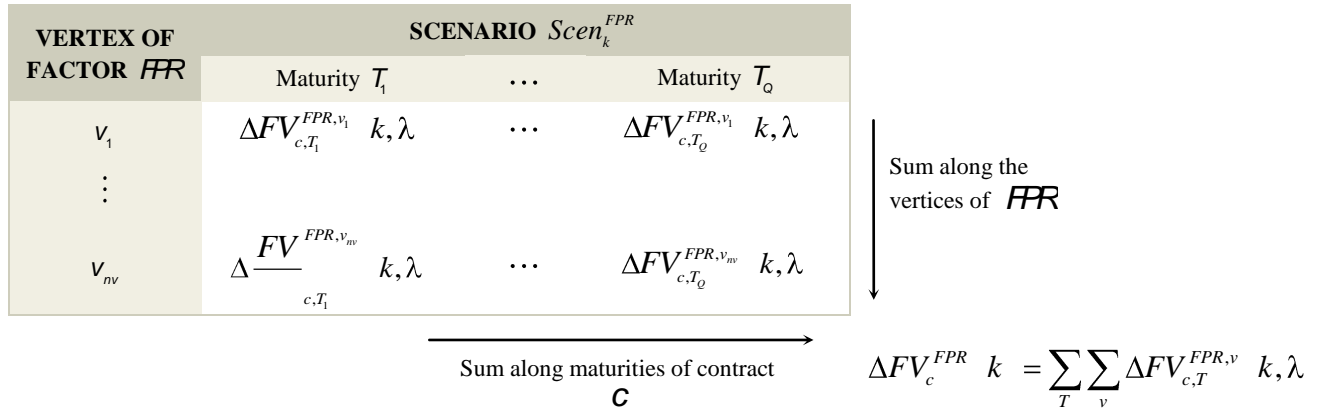
$$Market Risk = \min Local Risk A_1, Local Risk A_2 = -12,205.20$$

By inverting the exposure signs, we obtain the margin values for the short position:

$$Market Risk = \min Local Risk A_1, Local Risk A_2 = \min -10,500 - 11,700 = -11,700$$

### 2.3.6. Summary

The illustrations below show the consolidation stages of the financial variations under scenario for calculating the margin for the part of positions in a portfolio's futures contracts.



**Figure 2.3-5 – Calculation of financial variations under scenario associated to factor  $FPR$ , derived from position at various maturities of a contract  $C$**

The calculation in **Figure 2.3-5**, for all risk factors of a same contract, produces all the financial variations under scenario associated to the contract, that is, all values  $\Delta FV_c^j k_j$ , for  $k_j = 1, 2, \dots, nc_j$  and  $j = 1, 2, \dots, N$ .

The sum, along the contracts, of the variations associated to a same FPR, generates the total financial variation associated to the factor, according to **Figure 2.3-6**.

| FPR      | CONTRACT       | FINANCIAL VARIATION UNDER SCENARIO |                       |                          |
|----------|----------------|------------------------------------|-----------------------|--------------------------|
|          |                | Per Contract and Total per FPR     |                       |                          |
| $FPR^1$  | Contract $C_1$ | $\Delta FV_{c_1}^1 1$              | $\Delta FV_{c_1}^1 k$ | $\Delta FV_{c_1}^1 nc_1$ |
|          | $\vdots$       | $\vdots$                           | $\vdots$              | $\vdots$                 |
|          | Contract $C_M$ | $\Delta FV_{c_M}^1 1$              | $\Delta FV_{c_M}^1 k$ | $\Delta FV_{c_M}^1 nc_1$ |
|          |                | $\Delta FV^1 1$                    | $\Delta FV^1 k$       | $\Delta FV^1 nc_1$       |
| $\vdots$ |                |                                    |                       |                          |
| $FPR^N$  | Contract $C_1$ | $\Delta FV_{c_1}^N 1$              | $\Delta FV_{c_1}^N k$ | $\Delta FV_{c_1}^N nc_N$ |
|          | $\vdots$       | $\vdots$                           | $\vdots$              | $\vdots$                 |
|          | Contract $C_M$ | $\Delta FV_{c_M}^N 1$              | $\Delta FV_{c_M}^N k$ | $\Delta FV_{c_M}^N nc_N$ |
|          |                | $\Delta FV^N 1$                    | $\Delta FV^N k$       | $\Delta FV^N nc_N$       |

Sum of variations along the contracts

↓

Sum of variations along the contracts

↓

**Table 2.3-6 – Consolidation of financial variations under scenario per contract associated to each FPR**

Once the financial variations under each scenario of each FPR are obtained, that is,  $\Delta FV^j k_j$ , for  $j = 1, 2, \dots, N$  and  $k_j = 1, 2, \dots, nc_j$ , we select, for each primitive risk factor, the minimum variation along the scenarios associated to it and belonging to scenarios area  $A$ , according to equation (15). Finally, the sum of the minimum financial variations in area  $A$  associated to each FPR determines the local risk in  $A$ , as indicated in **Figure 2.3-7**.

| FPR | FINANCIAL VARIATION UNDER SCENARIO | MINIMUM VARIATION UNDER SCENARIO IN |
|-----|------------------------------------|-------------------------------------|
|-----|------------------------------------|-------------------------------------|

|                                |                 |     |                      | AREA <i>A</i>              |
|--------------------------------|-----------------|-----|----------------------|----------------------------|
| <i>FPR</i> <sup>1</sup>        | $\Delta FV^1_1$ | ... | $\Delta FV^1_{nc_1}$ | <i>Min</i> $\Delta FV^1_A$ |
| ⋮                              |                 |     |                      |                            |
| <i>FPR</i> <sup><i>j</i></sup> | $\Delta FV^j_1$ | ... | $\Delta FV^j_{nc_j}$ | <i>Min</i> $\Delta FV^j_A$ |
| ⋮                              |                 |     |                      |                            |
| <i>FPR</i> <sup><i>N</i></sup> | $\Delta FV^N_1$ | ... | $\Delta FV^N_{nc_N}$ | <i>Min</i> $\Delta FV^N_A$ |

Sum of minimum variations under scenarios of area *A* associated with each FPR

Choice of minimum financial variation under scenario associated with each FPR

$$Local Risk_A = \min \left( 0, \sum_{j=1}^N Min \Delta FV^j_A \right)$$

**Figure 2.3-7 – Choice of the smallest financial variation under scenario per FPR, in area *A* and calculation of local risk**

The assessment of the minimum financial variations in all scenarios areas provides the respective measurements of local risk, among which the smallest one is taken as the risk measurement.

### 2.3.7. Subportfolio 2 Procedure – risk offsetting between short and long maturities positions

Under certain situations, the maturity of a position can cause a sudden alteration of the margin values, such as, for example, when positions in contracts with short maturity serve as hedge for positions in longer-maturity contracts. The possible increase in risk due to the maturity of positions is anticipated, when determining the margin value, by imposing restrictions on the diversification of market risk between positions in contracts with short and long maturities in relation to the same underlying asset, depending on the proximity of the maturity of the shorter position.

Such procedure is called **Subportfolio 2 Procedure** and applies to futures contracts with cash settlement or physical delivery. The details concerning the contract with settlement by physical delivery are presented in the section dealing with the margin of agricultural futures contracts.

In the period between the beginning of the validity of Subportfolio 2 Procedure and the last day of contract risk, the latter included therein, an assessment of scenarios is made on two subsets of the positions being assessed: the original set and the original set excluding the positions close to maturity. After the last day of risk and until the date of the last contract settlement, the position is excluded from the scenario analysis, although the margin still has a part concerning such position, corresponding to the adjustment values to be settled.

The following figure illustrates the margin calculation as a function of how close the contract is to maturity.

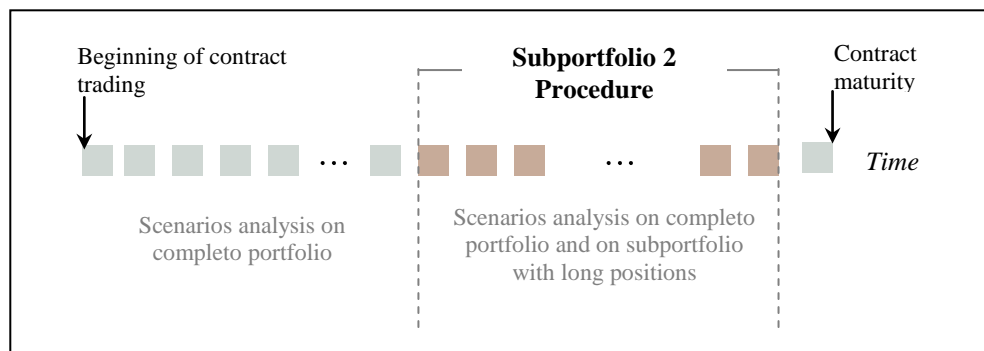


Figure 2.3-8 - Subportfolio 2 Procedure

Let

- $Ndays_{Sub2\ c}$  : the number of days prior to maturity of contract  $C$ , which defines the beginning of the period during which Subportfolio 2 Procedure applies to the positions in said contract;
- $Subportfolio_{All}$  : the set of all contracts, except those that are on the last day of risk or whose last day of risk has already elapsed (portfolio completed); and
- $Subportfolio_{Long}$  : the set that contains only those contracts which are more than  $Ndays_{Sub2}$  days from their respective maturities (long contracts portfolio).

A contract  $C$  belongs to  $Subportfolio_{Long}$  if the number of business days between the reference day of assessment of portfolio ( $D$ ) and its maturity ( $T$ ) is greater than  $Ndays_{Sub2\ c}$ , that is, if  $Ndays_{Sub2\ c} < T - D$ .

Equation (17), defined for calculating a portfolio's market risk,

$$\text{Market Risk Futures Portfolio} = \min_A \text{Local Risk } A, \text{Futures Portfolio}$$

is then modified to contemplate the Subportfolio 2 Procedure. The market risk in relation to the closing position of day  $D$ , which defines the margin to be met on the subsequent business day  $D+1$ , is given by

$$\begin{aligned} \text{Market Risk Futures Portfolio} &= \\ &= \min_A \min \left[ \text{Local Risk } A, \text{Subportfolio}_{All}, \text{Local Risk } A, \text{Subportfolio}_{Long} \right] \end{aligned} \quad (24)$$

In the absence of a position in contract which is less than  $Ndays_{Sub2} - c$  days from maturity, the subportfolios indicated by *All* and *Long*

$$\text{Market Risk Futures Portfolio} = \text{Risk Subportfolio}_{All} = \text{Risk Subportfolio}_{Long}$$

Consider a contract with maturity on  $T$ , last day of risk on  $T^* = T - k$  and last day for adjustment settlement on  $T^{**} = T + x$ . As maturity  $T$  approaches the reference date of the portfolio's risk assessment,  $D$ , such position is included in subportfolios *All* and *Long*, as follows:

- In  $D < T - Ndays_{Sub2} - c$  Subportfolio 2 Procedure does not apply, which is the same as including the position in both subportfolios;
- On  $D = T - Ndays_{Sub2} - c$  there starts Subportfolio 2 Procedure; from date on until date  $T^* - 1$  - the day before the last day of contract risk - the position is excluded from *Subportfolio}\_{Long}*; and
- As of  $D = T^*$  analysis of stress scenarios no longer applies to that position; until the last date of adjustment settlement concerning the position,  $T^{**}$ , the debtor Customer is required to post the margin corresponding to the value of the adjustments to be settled.

**Example 11:** Consider the portfolio with positions in spread rate futures contract (FUT DDI) and in Real for USD exchange rate futures contract (FUT DOL), with the latter being the short-maturity contract, as described in the following table, where "C" and "V" indicate purchase and sale of contracts, respectively.

| PORTFOLIO                     |           |           |
|-------------------------------|-----------|-----------|
| <b>Contract</b>               | FUT DDI   | FUT DOL   |
| <b>Period (bd / cd)</b>       | 24 / 36   | 6 / 4     |
| <b>C / V No. of contracts</b> | V 50      | C 50      |
| <b>FV</b>                     | 6,380,403 | 6,416,997 |

Suppose only one scenarios area ,  $A$ , is defined and that the margin is calculated for the period when Subportfolio 2 Procedure applies to FUT DOL contract, on a date before the last day of contract risk. The values of all financial variations under scenario and the risk of subportfolios *All* and *Long* are presented on the following tables – consider them adjusted according to offsetting factors and with the condition of the Customer holder of the portfolio as *Hedger/Non-Hedger*.

| FPR   | CONTRACT | FINANCIAL EXPOSURE | FINANCIAL VARIATION UNDER SCENARIO |                |                |               |               |
|-------|----------|--------------------|------------------------------------|----------------|----------------|---------------|---------------|
| $r$   |          |                    | $Scen_1^r$                         | $Scen_2^r$     | $Scen_3^r$     | $Scen_4^r$    | $Scen_5^r$    |
| 1 bd  | FUT DOL  | -5,454.447         | -288                               | 284            | -              | -288          | 284           |
| 21 bd | FUT DOL  | -962.550           | -1,152                             | 1,019          | -              | -1,029        | 1,162         |
|       |          |                    | <b>-1,440</b>                      | 1,303          | -              | -1,317        | 1,446         |
| $rc$  |          |                    | $Scen_1^{rc}$                      | $Scen_2^{rc}$  | $Scen_3^{rc}$  | $Scen_4^{rc}$ | $Scen_5^{rc}$ |
| 1 cd  | FUT DOL  | 5,310.618          | 589                                | 589            | -              | -957          | -957          |
|       | FUT DOL  | 1,106.379          | 3,646                              | 3,644          | -              | -5,857        | -5,860        |
| 30 cd | FUT DDI  | -5,104.322         | -16,819                            | -16,813        | -              | 27,022        | 27,033        |
| 60 cd | FUT DDI  | -1,276.081         | -8,310                             | -8,307         | -              | 13,208        | 13,213        |
|       |          |                    | <b>-20,894</b>                     | -20,887        | -              | 33,415        | 33,429        |
| $DOL$ |          |                    | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |               |               |
|       | FUT DOL  | 6,416.997          | -449,190                           | -              | 449,190        |               |               |
|       | FUT DDI  | -6,380.403         | 446,628                            | -              | -446,628       |               |               |
|       |          |                    | <b>-2,562</b>                      | -              | 2,562          |               |               |

$$Local Risk A, Subportfolio_{All} = \min 0, -1,440 - 20,894 - 2,562 = -24,896$$

| FPR   | CONTRACT | FINANCIAL EXPOSURE | FINANCIAL VARIATION UNDER SCENARIO |                |                 |               |               |
|-------|----------|--------------------|------------------------------------|----------------|-----------------|---------------|---------------|
| $rc$  |          |                    | $Scen_1^{rc}$                      | $Scen_2^{rc}$  | $Scen_3^{rc}$   | $Scen_4^{rc}$ | $Scen_5^{rc}$ |
| 30 cd | FUT DDI  | -5.104.322         | -16.819                            | -16.813        | -               | 27.022        | 27.033        |
| 60 cd | FUT DDI  | -1.276.081         | -8.310                             | -8.307         | -               | 13.208        | 13.213        |
|       |          |                    | <b>-25.129</b>                     | -25.120        | -               | 40.230        | 40.246        |
| $DOL$ |          |                    | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$  |               |               |
|       | FUT DDI  | -6.380.403         | 446.628                            | -              | -446.628        |               |               |
|       |          |                    | 446.628                            | -              | <b>-446.628</b> |               |               |

$$Local Risk A, Subportfolio_{Long} = \min 0, -25,129 - 446,628 = -471,757$$

In case Subportfolio 2 Procedure did not apply, the margin of this portfolio would assume the value of \$ 24,896.

Given this procedure, the exclusion of the position to mature (position in FUT DOL contract) is equivalent, in this case, to not considering the benefit, in terms of risk, which such position represents for the portfolio in view of the long position, especially regarding the spot exchange rate FPR.

$$Market Risk = \min [Local Risk A, Subportfolio_{All}, Local Risk A, Subportfolio_{Long}] = -471,757$$

Suppose both positions are long, that is, there is a sign reversal of the exposures to the FPRs and the variations



under scenarios associated to the position in FUT DDI. When calculating the values of the risk, by excluding the short-maturity positions, one obtains a risk value smaller than the risk value of the whole portfolio, so that the risk derives from the complete position. The values are presented in the following table:

| FPR   | CONTRACT | FINANCIAL EXPOSURE | VARIATION SCENARIO                 |                |                |               |                |
|---|----------|--------------------|------------------------------------|----------------|----------------|---------------|----------------|
|   |          |                    | FINANCIAL VARIATION UNDER SCENARIO |                |                |               |                |
| <i>r</i>  |          |                    | $Scen_1^r$                         | $Scen_2^r$     | $Scen_3^r$     | $Scen_4^r$    | $Scen_5^r$     |
| 1 bd  | FUT DOL  | -5,454,447         | -288                               | 284            | -              | -288          | 284            |
| 21 bd   | FUT DOL  | -962,550           | -1,152                             | 1,019          | -              | -1,029        | 1,162          |
|   |          |                    | <b>-1,440</b>                      | 1,303          | -              | -1,317        | 1,446          |
| <i>rc</i>   |          |                    | $Scen_1^{rc}$                      | $Scen_2^{rc}$  | $Scen_3^{rc}$  | $Scen_4^{rc}$ | $Scen_5^{rc}$  |
| 1 cd  | FUT DOL  | 5,310,618          | 589                                | 589            | -              | -957          | -957           |
| 30 cd   | FUT DOL  | 1,106,379          | 3,646                              | 3,644          | -              | -5,857        | -5,860         |
|   | FUT DDI  | 5,104,322          | 16,819                             | 16,813         | -              | -27,022       | -27,033        |
| 60 cd   | FUT DDI  | 1,276,081          | 8,310                              | 8,307          | -              | -13,208       | -13,213        |
|   |          |                    | 29,364                             | 29,353         | -              | -47,044       | <b>-47,063</b> |
| <i>DOL</i>  |          |                    | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |               |                |
|   | FUT DOL  | 6,416,997          | -449,190                           | -              | 449,190        |               |                |
|   | FUT DDI  | 6,380,403          | -446,628                           | -              | 446,628        |               |                |
|   |          |                    | <b>-895,818</b>                    | -              | 895,818        |               |                |
| <i>Local Risk A, Subportfolio<sub>All</sub></i> = min 0, -1,440 - 47,063 - 895,818 = -944,321 |          |                    |                                    |                |                |               |                |

| FPR  | CONTRACT | FINANCIAL EXPOSURE | VARIATION SCENARIO                 |                |                |               |                |
|--|----------|--------------------|------------------------------------|----------------|----------------|---------------|----------------|
|  |          |                    | FINANCIAL VARIATION UNDER SCENARIO |                |                |               |                |
| <i>rc</i>  |          |                    | $Scen_1^{rc}$                      | $Scen_2^{rc}$  | $Scen_3^{rc}$  | $Scen_4^{rc}$ | $Scen_5^{rc}$  |
| 30 bd  | FUT DDI  | 5,104,322          | 16,819                             | 16,813         | -              | -27,022       | -27,033        |
| 60 bd  | FUT DDI  | 1,276,081          | 8,310                              | 8,307          | -              | -13,208       | -13,213        |
|  |          |                    | 25,129                             | 25,120         | -              | -40,230       | <b>-40,246</b> |
| <i>DOL</i>   |          |                    | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |               |                |
|  | FUT DDI  | 6,380,403          | -446,628                           | -              | 446,628        |               |                |
|  |          |                    | <b>-446,628</b>                    | -              | 446,628        |               |                |
| <i>Local Risk A, Subportfolio<sub>Long</sub></i> = min 0, -40,246 - 446,628 = -486,874 |          |                    |                                    |                |                |               |                |

$$\text{Market Risk} = \min \text{Local Risk } A, \text{Subportfolio}_{All}, \text{Local Risk } A, \text{Subportfolio}_{Long} = -944,321$$

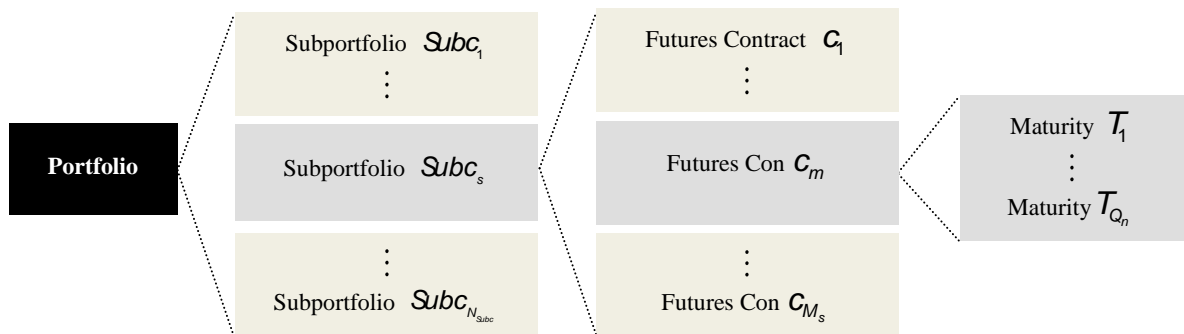
The margin of this portfolio corresponds to the risk of the complete portfolio, which includes the short-maturity positions. The portfolio containing only the long positions represents a smaller risk, since it presents no exposure to the fixed-rate in local currency FPR and the exposures to common FPRs - *rc* and *DOL* are smaller in comparison to the complete portfolio.

### 2.3.8. Subportfolios of futures contracts – calculation of subportfolio risk and margin of a subportfolio.

A **subportfolio** is a disjoint group of futures contracts, defined with the purpose of both dealing with specific situations and controlling risk diversification. By risk diversification we mean offsetting exposures to primitive risk factors common to positions derived from different contracts.

A direct result from grouping futures contracts in subportfolios is the grouping of a portfolio's positions in subportfolios. Thus, the term subportfolio is utilized to refer to both.

Therefore, a futures contracts portfolio is represented by a set of subportfolios, a subportfolio is a set of contracts, and each contract, in turn, is traded at several maturities, as illustrated below, where  $N_{Subp}$  indicates the number of subportfolios,  $M_s$  the number of contracts belonging to the  $s$ -th subportfolio and  $n$  maturities, the number of maturities traded from the  $m$ -th futures contract.



**Figure 4 – Grouping of futures contracts in subportfolios**

The following subportfolios are an example of grouping of futures contracts:

- Subportfolio 1 – containing all maturities of interest rates, exchange rates, stock indices and inflation futures contracts;
- Subportfolio 2 – containing all maturities of futures contracts on foreign debt securities (Global Bonds); and
- Subportfolio 3 – containing all maturities of the futures contract on a certain agricultural commodity.

Respecting the control rules for offsetting positions at different maturities of a contract, as well as the Subportfolio 2 Procedure, one can offset risk derived from positions belonging to a same subportfolio. Nevertheless, offsetting positions belonging to different subportfolios is forbidden. The margin required from a portfolio is thus defined as the sum of the margins required from the subportfolios. Considering the grouping of contracts into  $N_{Subp}$  subportfolios,

$$\text{Margin Futures Portfolio} = \sum_{s=1}^{N_{Subp}} \text{Margin Subp}_s = \text{Margin Subp}_1 + \dots + \text{Margin Subp}_{N_{Subp}} \quad (25)$$

$$\text{Margin Subp}_s = -\text{Market Risk Subp}_s \quad (26)$$

where  $\text{Margin Subp}_s$  and  $\text{Market Risk Subp}_s$  represent, respectively, the margin and the market risk of the portfolio's positions in the contracts belonging to the  $S$ -th subportfolio. The market risk of a subportfolio is obtained from the assessment of stress scenarios, as presented in the preceding sections:

$$\text{Market Risk Subp}_s = \min_A \left[ \min \left( \text{Local Risk } A, \text{Subp}_{s,All}, \text{Local Risk } A, \text{Subp}_{s,Long} \right) \right] \quad (27)$$

$$\text{Local Risk } A, \text{Subp} = \min \left( 0, \sum_{j=1}^{N_{FPR}} \text{Min}\Delta FV_{Subp}^j A \right) \quad (28)$$

where  $\text{Min}\Delta FV_{Subp}^j A$  is the minimum financial variation under scenario, associated to risk factor  $FPR^j$ , derived from the positions belonging to subportfolio  $S$  and from the scenarios belonging to area  $A$ .

It follows that the portfolio's risk market is given by

$$\begin{aligned} \text{Market Risk Futures Portfolio} &= \sum_{s=1}^{N_{subp}} \text{Market Risk Subp}_s = \\ &= \text{Market Risk Subp}_1 + \dots + \text{Market Risk Subp}_{N_{Subp}} \end{aligned} \quad (29)$$

The following example illustrates the impact, on the margin, of grouping contracts in portfolios.

**Example 12:** Consider the portfolio with positions long in 1 unit of the spread rate futures contract (FUT DDI) and in Global 2040 (FUTGB40), as described in the following table, where "C" and "V" indicate purchase and sale of contracts, respectively.

| PORTFOLIO                     |         |          |
|-------------------------------|---------|----------|
| <b>Contract</b>               | FUT DDI | FUT GB40 |
| <b>Period (bd / cd)</b>       | 17 / 23 | 18 / 26  |
| <b>C / V No. of contracts</b> | C 1     | C 1      |
| <b>FV</b>                     | 105,050 | 140,816  |

The primitive risk factors associated to the portfolio are the spread rate ( $rc$ ), in vertices of 1 and 30 cd, the spot exchange rate of Real for US Dollar ( $DOL$ ) and the spot price of the Global 2040 ( $G40$ ) security. Consider the following variation scenarios, expressed as percent variation for  $DOL$  and  $G40$  and in base points for  $rc$ .

| FPR   | VARIATION SCENARIOS |                |                |               |               |
|-------|---------------------|----------------|----------------|---------------|---------------|
| $rc$  | $Scen_1^{rc}$       | $Scen_2^{rc}$  | $Scen_3^{rc}$  | $Scen_4^{rc}$ | $Scen_5^{rc}$ |
| 1 dc  | -600                | -400           | -              | +100          | +300          |
| 30 dc | -500                | -400           | -              | +300          | +300          |
| $G40$ | $Scen_1^{G40}$      | $Scen_2^{G40}$ | $Scen_3^{G40}$ |               |               |
|       | -3%                 | -              | +3%            |               |               |
| $DOL$ | $Scen_1^{DOL}$      | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |               |               |
|       | -7%                 | -              | +7%            |               |               |

We then calculate the portfolio's margin under two situations:

- i. the two contracts belong to the same subportfolio,  $Subp$ ; and
- ii. the contracts belong to different subportfolios,  $Subp_1$  and  $Subp_2$ .

Assuming there is only one scenarios area and that none of the contracts is in the Subportfolio 2 Procedure period, the calculation of any subportfolio's market risk, according to equation (27), is simplified to

$$\text{Market Risk } Subportfolio = -Local Risk A, Subportfolio$$

In situation (i), since there is only subportfolio  $Subp$ , the portfolio's margin is R\$11,648.00, according to the details in the following table, where the minimum variations associated to each FPR are indicated in bold.

$$\text{Margin } Futures Portfolio = -Local Risk A, Subp = 11,648.80$$

| FPR   | CONTRACT | FINANCIAL EXPOSURE | FINANCIAL VARIATION UNDER SCENARIO |                |                |               |               |
|-------|----------|--------------------|------------------------------------|----------------|----------------|---------------|---------------|
| $rc$  |          |                    | $Scen_1^{rc}$                      | $Scen_2^{rc}$  | $Scen_3^{rc}$  | $Scen_4^{rc}$ | $Scen_5^{rc}$ |
| 1 cd  | FUT DDI  | 14,490             | 2.42                               | 1.61           | -              | -0.40         | -1.21         |
|       | FUT GB40 | -33,990            | -5.66                              | -3.78          | -              | 0.94          | 2.83          |
| 30 cd | FUT DDI  | 90,560             | 376.26                             | 300.76         | -              | -224.27       | -224.27       |
|       | FUT GB40 | -106,826           | -443.84                            | -354.78        | -              | 264.55        | 264.55        |
|       |          |                    | <b>-70.83</b>                      | -56.18         | -              | 40.83         | 41.91         |
| $G40$ |          |                    | $Scen_1^{G40}$                     | $Scen_2^{G40}$ | $Scen_3^{G40}$ |               |               |
|       | FUT GB40 | 140,816            | -4,224.49                          | -              | 4,224.49       |               |               |
|       |          |                    | <b>-4,224.49</b>                   | -              | 4,224.49       |               |               |
| $DOL$ |          |                    | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |               |               |
|       | FUT DDI  | 105,050            | -7,353.48                          | -              | 7,353.48       |               |               |
|       |          |                    | <b>-7,353.48</b>                   | -              | 7,353.48       |               |               |

$$Local Risk A, Subp = \min(0, -70.83 - 4,224.49 - 7,353.48) = -11,648.80$$

In situation (ii), the portfolio's margin is the sum of the margins of each subportfolio. Consider that contract FUT GB40 belongs to  $Subp_1$  and contract FUT DDI belongs to  $Subp_2$ . According to the details presented in the following tables,

$$\text{Margin } Futures Portfolio = \text{Margin } Subp_1 + \text{Margin } Subp_2 = 4,673.99 + 7,578.96 = 12,252.95$$

| Subportfolio $Subp_1$ |          |                    |                                    |                |                |               |               |
|-----------------------|----------|--------------------|------------------------------------|----------------|----------------|---------------|---------------|
| FPR                   | CONTRACT | FINANCIAL EXPOSURE | FINANCIAL VARIATION UNDER SCENARIO |                |                |               |               |
| $rc$                  |          |                    | $Scen_1^{rc}$                      | $Scen_2^{rc}$  | $Scen_3^{rc}$  | $Scen_4^{rc}$ | $Scen_5^{rc}$ |
| 1 cd                  | FUT GB40 | -33,990            | -5.66                              | -3.78          | -              | 0.94          | 2.83          |
| 30 cd                 | FUT GB40 | -106,826           | -443.84                            | -354.78        | -              | 264.55        | 264.55        |
|                       |          |                    | <b>-449.50</b>                     | -358.56        | -              | 265.49        | 267.38        |
| $G40$                 |          |                    | $Scen_1^{G40}$                     | $Scen_2^{G40}$ | $Scen_3^{G40}$ |               |               |
|                       | FUT GB40 | 140,816            | -4,224.49                          | -              | 4,224.49       |               |               |
|                       |          |                    | <b>-4,224.49</b>                   | -              | 4,224.49       |               |               |

$$Local Risk A, Subp_1 = \min(0, -449.50 - 4,224.49) = -4,673.99$$

**Subportfolio  $Subp_2$**

| FPR        | CONTRACT | FINANCIAL EXPOSURE | FINANCIAL VARIATION UNDER SCENARIO |                |                |               |                |
|------------|----------|--------------------|------------------------------------|----------------|----------------|---------------|----------------|
| <i>rc</i>  |          |                    | $Scen_1^{rc}$                      | $Scen_2^{rc}$  | $Scen_3^{rc}$  | $Scen_4^{rc}$ | $Scen_5^{rc}$  |
| 1 cd       | FUT DDI  | 14,490             | 2.42                               | 1.61           | -              | -0.40         | -1.21          |
| 30 cd      | FUT DDI  | 90,560             | 376.26                             | 300.76         | -              | -224.27       | -224.27        |
|            |          |                    | 378.68                             | 302.37         | -              | -224.67       | <b>-225.48</b> |
| <i>DOL</i> |          |                    | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |               |                |
|            | FUT DDI  | 105,050            | -7,353.48                          | -              | 7,353.48       |               |                |
|            |          |                    | <b>-7,353.48</b>                   | -              | 7,353.48       |               |                |

$$Local Risk A, Subp_2 = \min 0, -225.48 - 7,353.48 = -7,578.96$$

In situation (ii), the allocation of the contracts in different subportfolios does not cause the offsetting of the risk associated to the spread rate risk factor which takes place in situation (i). The market risk value is approximately 5 % higher than the market risk value obtained by grouping them in the same subportfolio.

## ***2.4. Margin of Agricultural Futures Contracts***

The margin of agricultural futures contracts is assessed according to the test methodology for stress scenarios, in a way very similar to that presented along the previous sections.

The main difference lies in the type of settlement for these contracts, that is, settlement by delivery, or physical settlement. Due to such type of settlement, the margin calculation of agricultural futures contracts is differentiated depending on the risk of the position being assessed in the delivery period or outside of it.

The **delivery period** of a contract is the period during which the seller Customer may express his decision, or intention, depending on the contract, to proceed with the delivery of the contracted underlying commodity, thus starting the procedures for settling his position by physical delivery; beginning and extension of the delivery period are defined according to the underlying asset and contract maturity.

By expressing his decision for physical delivery, through specific registration in the physical delivery system, the seller informs the Clearinghouse the part of his position to be physically settled, and the buying positions which will participate in such settlement are defined. Short positions not assigned for delivery on the timeframe established therefor must be closed or transferred.

### ***2.4.1. Decomposition into FPR and Grouping into subportfolios***

Due to specific characteristics of the agricultural markets, such as the existence of seasonality and convenience yield, asymmetry of transfer between different maturities, physical delivery, among others, positions in agricultural futures contracts are mapped in only one risk factor – the curve of future price of the contract's respective underlying commodity – as presented in **Table 2.4-1**.

| PRIMITIVE RISK FACTOR         | FUTURES CONTRACT |                 |               |             |               |        |         |         |      |
|-------------------------------|------------------|-----------------|---------------|-------------|---------------|--------|---------|---------|------|
|                               | Arabica Coffee   | Conillon Coffee | Crystal sugar | Live Cattle | Feeder Cattle | Cotton | Ethanol | Soybean | Corn |
| FUTURES PRICE TIME STRUCTURES | Arabica Coffee   | *               |               |             |               |        |         |         |      |
|                               | Conillon Coffee  |                 | *             |             |               |        |         |         |      |
|                               | Crystal sugar    |                 |               | *           |               |        |         |         |      |
|                               | Live Cattle      |                 |               |             | *             |        |         |         |      |
|                               | Feeder Cattle    |                 |               |             |               | *      |         |         |      |
|                               | Cotton           |                 |               |             |               |        | *       |         |      |
|                               | Ethanol          |                 |               |             |               |        |         | *       |      |
|                               | Soybean          |                 |               |             |               |        |         |         | *    |
|                               | Corn             |                 |               |             |               |        |         |         |      |

**Table 2.4-1 – Primitive Risk Factors Associated to BM&FBOVESPA main agricultural futures contracts**

With the futures price curve being a primitive factor of the time-structure type, the positions are mapped in the vertices of that curve, according to decomposition equations (8), (9) and (10).

Due to the peculiarities of each market and/or commodity and the specificity of the primitive risk factors, offsetting of the risk between positions in contracts with different commodities is not allowed, so that, in order to estimate the market risk under the scenarios test methodology, contracts on different underlying assets belong to different subportfolios.

#### 2.4.2. Calculation of margin outside the delivery period

The only way of closing a position in a futures contract with physical delivery that is not in the delivery period is by carrying out the transaction whose nature is the opposite of that of the position on trading floor.

Thus, we calculate the margin of a position in agricultural futures contracts which are not in their delivery period according to the Methodology for Stress Testing under Present Value, presented in sections 2.2 and 2.3. Below are two examples of such an assessment.

**Example 13:** Consider a portfolio with long positions in a futures contract of Arabica Coffee (FUT ICF), with different maturities  $T_1$  and  $T_2$ , distant enough from each other for one to ignore the Subportfolio 2 Procedure.

This contract's FPR is the future price of Arabica Coffee,  $P$ . The following table presents the portfolio and the financial exposures derived from mapping in FPR, assuming factor  $P$  as defined in vertices of 1 bd and multiples of 21 bd. The breakdown procedure follows according to equations (8), (9) and (10).

| FUT ICF CONTRACTS PORTFOLIO   |            |            |
|-------------------------------|------------|------------|
| <b>Maturity</b>               | $T_1$      | $T_2$      |
| <b>Timeframe (bd / cd)</b>    | 52 / 76    | 196 / 285  |
| <b>P / S No. of contracts</b> | C 10       | C 10       |
| <b><math>\sqrt{F}</math></b>  | 282,688.08 | 310,262.26 |

| FPR      |               | FINANCIAL EXPOSURE |               |                   |
|----------|---------------|--------------------|---------------|-------------------|
|          |               | FUT ICF $T_1$      | FUT ICF $T_2$ | TOTAL             |
| <i>P</i> | Vertex 42 bd  | 148,074.70         | -             | <b>148,074.70</b> |
|          | Vertex 63 bd  | 134,613.38         | -             | <b>134,613.38</b> |
|          | Vertex 189 bd | -                  | 206,841.51    | <b>206,841.51</b> |
|          | Vertex 210 bd | -                  | 103,420.75    | <b>103,420.75</b> |

Suppose 3 scenarios are defined for the time structure of coffee prices: the variation scenarios of  $\pm 4\%$  and the neutral scenario, constant by timeframe and grouped in only one scenarios area.

The following table presents the results of the stress scenarios, taking into account offsetting factors equal to 1 for any maturity.

| FPR      | CONTRACT      | FINANCIAL EXPOSURE | VARIATION UNDER SCENARIO |            |               |
|----------|---------------|--------------------|--------------------------|------------|---------------|
|          |               |                    | $Scen_1^P$               | $Scen_2^P$ | $Scen_3^P$    |
| <i>P</i> |               |                    |                          |            |               |
| 42 bd    | FUT ICF $T_1$ | 148,074.70         | -5,923                   | -          | 5,923         |
| 63 bd    | FUT ICF $T_1$ | 134,613.38         | -5,385                   | -          | 5,385         |
| 189 bd   | FUT ICF $T_2$ | 206,841.51         | -8,274                   | -          | 8,274         |
| 210 bd   | FUT ICF $T_2$ | 103,420.75         | -4,137                   | -          | 4,137         |
|          |               |                    | <b>-23,719</b>           | -          | <b>23,719</b> |

According to equations (25) to (28), the margin of this portfolio, which involves only one contract and, therefore, only one subportfolio, is easily calculated:

$$\text{Margin} = -\text{Market Risk} = -\text{Local Risk}_{A, Subp} = -\min(0, \text{Min}\Delta FV^P) = 23,719$$

**Example 14:** Consider the portfolio in the previous example, but with opposite positions in maturities  $T_1$  and  $T_2$  - long in the short-maturity contract and short in the long-maturity one.

The following table presents the results of the stress test, with the same scenarios for factor  $P$ , but under two different parameterizations of the model:

- i. with offsetting factors equal to 1 for both maturities; and
- ii. with offsetting factors equal to 0,7 for both maturities.



| FPR    | CONTRACT      | FINANCIAL EXPOSURE | VARIATION UNDER SCENARIO                    |            |            | VARIATION UNDER SCENARIO                      |            |            |
|--------|---------------|--------------------|---|------------|------------|---|------------|------------|
|        |               |                    | $\lambda_{ICF,T_1} = \lambda_{ICF,T_2} = 1$ |            |            | $\lambda_{ICF,T_1} = \lambda_{ICF,T_2} = 0,7$ |            |            |
| $P$    |               |                    | $Scen_1^P$                                  | $Scen_2^P$ | $Scen_3^P$ | $Scen_1^P$                                    | $Scen_2^P$ | $Scen_3^P$ |
| 42 bd  | FUT ICF $T_1$ | 148,074.70         | -5,923                                      | -          | 5,923      | -5,923  | -          | 4,146      |
| 63 bd  | FUT ICF $T_1$ | 134,613.38         | -5,385                                      | -          | 5,385      | -5,385  | -          | 3,769      |
| 189 bd | FUT ICF $T_2$ | -206,841.51        | 8,274                                       | -          | -8,274     | 5,792   | -          | -8,274     |
| 210 bd | FUT ICF $T_2$ | -103,420.75        | 4,137                                       | -          | -4,137     | 2,896   | -          | -4,137     |
|        |               |                    | 1,103                                       | -          | -1,103     | -2,620  | -          | -4,496     |

Note, on the table lines related to the position in contract with maturity  $T_1$ , that when offsetting factors equal to 0.7 are used, the positive variations under scenario 3 (a 4 % high) are 30 % lower than those obtained with unit offsetting factors, which is equivalent to using a scenario of just a 2.8 % high, rather than 4 %, as originally defined. Such positive variations which reflect a 2.8 % high in the futures price of Coffee offset the negative financial variations of the short position at maturity  $T_2$ , under the 4 % high scenario.

The same occurs with the variations under scenario 1, with a 4 % fall in the futures price of Coffee, but in the opposite direction vis-à-vis maturities  $T_1$  and  $T_2$ .

Therefore, with offsetting factors equal to 0,7, the offsetting benefit is thus restricted. The total variations under scenarios 1 and 3 are worth -2,620\$ and -4,496\$, respectively, compared to +1,103\$ and -1,103\$, respectively, obtained with offsetting factors equal to 1.

The portfolio's margin changes from 1,103 \$, in the situation where offsetting between positions with different maturities is total, to 4,496 \$, with partial offsetting.

### 2.4.3. Calculation of margin within the delivery period

The closing of a position in an agricultural futures contract with physical delivery which is within the delivery period may involve transactions in futures market and/or spot market of the underlying asset, respectively through an opposite-nature transaction, on the trading floor, and/or commodity delivery, depending on whether the position has been assigned for delivery or not. Thus, the risk assessment of the positions in such contracts must contemplate, in addition to settlement of the positions on the trading floor, the possibility that part of the position be assigned for physical delivery.

On the physical delivery of futures contracts, it is worth highlighting that:

- i. In case of Customer's (buyer or seller) default, the Clearinghouse is required to settle the position in the physical market, incurring specific risks of that market, such as, for example, the possibility of reduced liquidity and greater differences between buying and selling prices. The cost arising from such situation is added to the margin as a part of an additional margin, since it is not foreseen in the part of the margin determined through assessment of stress scenarios; and

- ii. Positions allocated for physical delivery<sup>3</sup> are not marked to market and, therefore, there is no risk offsetting between them and the position not assigned for delivery, neither between long and short positions assigned for delivery. The contribution of positions assigned for physical delivery to the portfolio's risk is calculated in a manner independent from any other position.

Due to the facts mentioned in (i) and (ii), the margin required from the position in a contract with physical delivery from the beginning of the **delivery period** is made up of a part obtained from the stress scenarios assessment and additional part

$$\text{Margin} = \text{Margin}^{\text{Scenarios Analysis}} + \text{Margin}^{\text{Additional Phys.Deliv.}} \quad (30)$$

The calculation of each term of equation (30) is based on the breakdown of a position in a contract with physical delivery into 3 parts:

- one part not assigned for physical delivery;
- one long part assigned for delivery; and
- one short part assigned for delivery.

Since there is no risk offsetting between these position parts, as mentioned in (ii), a subportfolio is defined for each one of them, respectively

- the subportfolio of positions not assigned for physical delivery,  $Subp^{\text{Not assigned}}$  ;
- the subportfolio of long positions assigned for physical delivery,  $Subp_L^{\text{Assigned}}$  ; and
- the subportfolio of short positions assigned for physical delivery,  $Subc_S^{\text{Assigned}}$  ; and

The part of margin determined by assessment of stress scenarios is obtained according to equations (25) to (28), with Subportfolio 2 Procedure not applying to the subportfolios of assigned positions. Therefore,

$$\text{Margin}^{\text{Scenarios Analysis}} = \text{Margin Subp}^{\text{Not assigned}} + \text{Margin Subp}_L^{\text{Assigned}} + \text{Margin Subp}_S^{\text{Assigned}} \quad (31)$$

where

$$\text{Margin Subp}^{\text{Not Assigned}} = -\min_A \left[ \min \text{Local Risk } A, \text{Subp}_{\text{All}}^{\text{Not Assigned}}, \text{Local Risk } A, \text{Subp}_{\text{Long}}^{\text{Not Assigned}} \right]$$

$$\text{Margin Subp}_L^{\text{Assigned}} = -\min_A \text{Local Risk } A, \text{Subp}_L^{\text{Assigned}}$$

$$\text{Margin Subp}_S^{\text{Assigned}} = -\min_A \text{Local Risk } A, \text{Subp}_S^{\text{Assigned}}$$

The part of the additional margin also covers positions assigned and not assigned for delivery and does not foresee offsetting between long and short positions. The value of the additional margin depends on the proximity of the maturity of the contract in question, of the parts of the position assigned for delivery and of the conformity of Customers to the requirements concerning physical delivery<sup>4</sup>.

<sup>3</sup> The procedures for assignment of position for delivery are described in the Clearinghouse's Operating Procedures Manual.

<sup>4</sup> The requirements of each contract can be found in the contractual specifications, and the physical delivery procedure is described in the Clearinghouse's Operating Procedures Manual.

The margin addition for a position in  $x$  contract units, subject to percentage  $\delta$  of additional margin, concerning the mismatch between futures and spot markets, defined by contract maturity, is given by

$$\text{Addition } x, \delta = \text{Abs } FV \times \delta \quad (32)$$

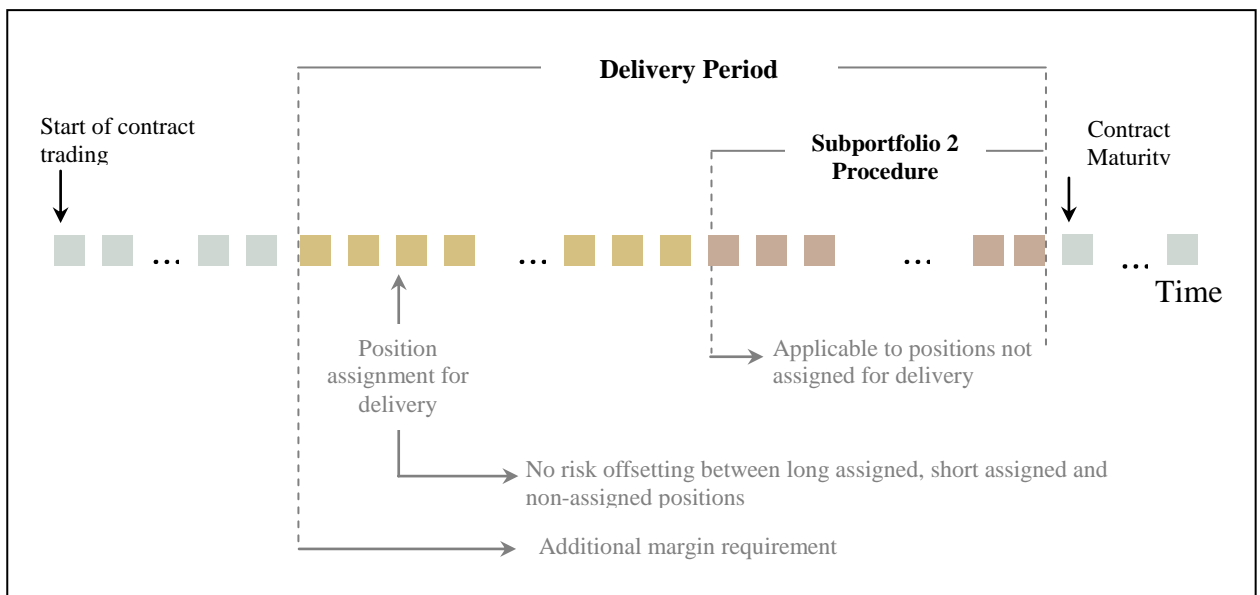
Let  $q$  be the number of contracts of the position in a subportfolio and  $q_i$  the part of quantity  $q$  subject to a percent addition of  $\delta_i$ . The margin addition for the subportfolio position is given by

$$\text{MgA Subportfolio} = \text{Addition } q_1, \delta_1 + \text{Addition } q_2, \delta_2 + \dots + \text{Addition } q_n, \delta_n$$

Finally, the total additional margin associated to the contract is the sum of the additions associated to subportfolios  $\text{Sub}^{\text{Not Assigned}}$ ,  $\text{Sub}_L^{\text{Assigned}}$  and  $\text{Sub}_S^{\text{Assigned}}$ .

$$\text{Margin}_{\text{Phys. Deliv.}}^{\text{Additional}} = \text{MgA Sub}^{\text{Not Assigned}} + \text{MgA Sub}_C^{\text{Assigned}} + \text{MgA Sub}_S^{\text{Assigned}} \quad (33)$$

The following figure illustrates the relevant periods for calculating the margin of a futures contract position with physical delivery.



**Figure 2.4-2 – Margin of contracts with physical delivery**

**Example 15:** Consider the portfolio resulting from including, to the portfolio in *Example 14*, positions with short maturity in contract FUT ICF – long and short assigned for delivery and long not assigned for delivery, as per the following table. Consider also the same criteria utilized in *Example 14*, grouped into just one area, and offsetting factors between maturities equal to 1 for any maturity. Consider that all positions with short maturity  $T_0$ , whether or not assigned for physical delivery, with additional percent margin  $\delta = 1\%$  are subject to the additional margin.

| FUT ICF CONTRACTS PORTFOLIO |            |             |              |              |              |  |
|-----------------------------|------------|-------------|--------------|--------------|--------------|--|
| Assigned / Not Assigned     | Assigned   | Assigned    | Not Assigned | Not Assigned | Not Assigned |  |
| Maturity                    | $T_0$      | $T_0$       | $T_0$        | $T_1$        | $T_2$        |  |
| Timeframe (bd / cd)         | 10 / 14    | 10 / 14     | 10 / 14      | 52 / 76      | 196 / 285    |  |
| L / S No. of contracts      | L 10       | S 10        | L 10         | L 10         | S 10         |  |
| VF                          | 269,300.40 | -269,300.40 | 269,300.40   | 282,688.08   | -310,262.26  |  |

| FPR |               | FINANCIAL EXPOSURE |             |            |            |             |
|-----|---------------|--------------------|-------------|------------|------------|-------------|
| P   | Vertex 1 bd   | 148,115.22         | -148,115.22 | 148,115.22 | -          | -           |
|     | Vertex 21 bd  | 121,185.18         | -121,185.18 | 121,185.18 | -          | -           |
|     | Vertex 42 bd  | -                  | -           | -          | 148,074.70 | -           |
|     | Vertex 63 bd  | -                  | -           | -          | 134,613.38 | -           |
|     | Vertex 189 bd | -                  | -           | -          | -          | -206,841.51 |
|     | Vertex 210 bd | -                  | -           | -          | -          | -103,420.75 |

The assigned, long and short, positions for delivery belong to subportfolios  $Subp_C^{Assigned}$  and  $Subp_V^{Assigned}$ , respectively, whereas the other positions belong to subportfolio  $Subp^{Not Assigned}$ . The results of the scenario analysis applied to each subportfolio are presented in the following tables.

**Subportfolio  $Subp^{Not Assigned}$**

| FPR    | CONTRACT      | FINANCIAL EXPOSURE | VARIATION UNDER SCENARIO  |            |              |
|--------|---------------|--------------------|---|------------|--------------|
|        |               |                    | $\lambda_{ICF,T_0} = \lambda_{ICF,T_1} = \lambda_{ICF,T_2} = 1$ |            |              |
| P      |               |                    | $Scen_1^P$  | $Scen_2^P$ | $Scen_3^P$   |
| 1 bd   | FUT ICF $T_0$ | 148,115.22         | -5,925  | -          | 5,925        |
| 21 bd  | FUT ICF $T_0$ | 121,185.18         | -4,847  | -          | 4,847        |
| 42 bd  | FUT ICF $T_1$ | 148,074.70         | -5,923  | -          | 5,923        |
| 63 bd  | FUT ICF $T_1$ | 134,613.38         | -5,385  | -          | 5,385        |
| 189 bd | FUT ICF $T_2$ | -206,841.51        | 8,274   | -          | -8,274       |
| 210 bd | FUT ICF $T_2$ | -103,420.75        | 4,137   | -          | -4,137       |
|        |               |                    | <b>-9,669</b>   | -          | <b>9,669</b> |

**Subportfolio  $Subp_L^{Assigned}$**

| FPR   | CONTRACT      | FINANCIAL EXPOSURE | VARIATION UNDER SCENARIO |            |               |
|-------|---------------|--------------------|--------------------------|------------|---------------|
|       |               |                    | $Scen_1^P$               | $Scen_2^P$ | $Scen_3^P$    |
| P     |               |                    |                          |            |               |
| 1 bd  | FUT ICF $T_0$ | 148,115.22         | -5,925                   | -          | 5,925         |
| 21 bd | FUT ICF $T_0$ | 121,185.18         | -4,847                   | -          | 4,847         |
|       |               |                    | <b>-10,772</b>           | -          | <b>10,772</b> |

**Subportfolio  $Subp_S^{Assigned}$**

| FPR   | CONTRACT      | FINANCIAL EXPOSURE | VARIATION UNDER SCENARIO |            |                |
|-------|---------------|--------------------|--------------------------|------------|----------------|
|       |               |                    | $Scen_1^P$               | $Scen_2^P$ | $Scen_3^P$     |
| P     |               |                    |                          |            |                |
| 1 bd  | FUT ICF $T_0$ | -148,115.22        | 5,925                    | -          | -5,925         |
| 21 bd | FUT ICF $T_0$ | -121,185.18        | 4,847                    | -          | -4,847         |
|       |               |                    | <b>10,772</b>            | -          | <b>-10,772</b> |

$$\begin{aligned} \text{Margin}^{\text{Scenarios Analysis}} &= \text{Margin Subp}^{\text{Not Assigned}} + \text{Margin Subp}_L^{\text{Assigned}} + \text{Margin Subp}_S^{\text{Assigned}} = \\ &= 9,669 + 10,772 + 10,772 = 31,213 \end{aligned}$$

$$\text{Margin}_{\text{Phys.Deliv.}}^{\text{Additional}} = 3 \times 2,693.00 = 8,079.00 \quad \text{since}$$

$$\text{MgA Subp}^{\text{Not Assigned}} = \text{MgA Subp}_L^{\text{Assigned}} = \text{MgA Subp}_S^{\text{Assigned}} = 269,300.40 \times 0.01 = 2,693.00$$

$$\text{Margin} = \text{Margin}^{\text{Scenarios Analysis}} + \text{Margin}_{\text{Phys.Deliv.}}^{\text{Additional}} = 39,292.00$$

## 2.5. *Stress Test on Present Value – Margin Calculation Methodology for Standardized Option Contracts Portfolio*

The margin for a part of a derivatives portfolio which comprises the position in option contracts – on cash or on futures contract, plain vanilla or futures-style – is given, as well as the marking of the positions in futures and adding the criteria for consolidation of positions with risk offsetting, by

$$\text{Margin} = \max \text{ Settlement Cost} - \text{Market Risk} ; 0 \quad (34)$$

A maximum is taken in this equation so as to ensure that the margin assumes a non-negative value. Therefore, term *Settlement Cost* is abbreviated as **CLC**.

Similarly to the positions in futures contracts, the market risk of positions in options is assessed by means of the stress test on the position's market value, by using stress scenarios for FPRs in assessing the potential financial variation of the position.

Regular option and futures-style option contracts are not treated under the same margin calculation methodology, due to some of their distinguishing features. The features of the futures-style option contract that justify the differentiation between the methodologies and allow for offsetting risk with futures positions are, mostly, daily marking to market and daily settlement until the contract's maturity date. The existence of a daily cashflow derived from the marking to market process, as is occurs with futures positions, makes the offsetting of opposite results arising from positions in futures contracts and in futures-style options an immediate event, therefore promoting a reduction of the required margin of opposite positions in futures and in futures-style option, as compared to that resulting from the addition of margins to each of such portfolios.

Now, positions in futures and option contracts (plain vanilla) have margins calculated in an independent manner, without any risk offsetting between contracts, since their cashflows do not necessarily coincide. Since the Clearinghouse must maintain enough margin to ensure the daily settlement of the obligations and the options do not affect such settlement, except for the cases of premium payment and settlement by exercise, the expectation on the value of the daily cashflow cannot be derived from unrealized results from positions in options. For example, a negative settlement associated to a short position in a futures contract cannot be offset by increasing the market value in a position short in a European call option on the same underlying asset, since, except for the positions only one day from maturity, the gain with the option represents an increase in its market value but does not generate a financial flow on the following day, as it occurs with the loss in the position in the futures contract, whose result is realized by paying the daily settlement. In the event of the Customer's default, his collateral must be enough to pay for the negative position settlement in the futures contract, which therefore cannot have its value reduced due to the positive result of the position in the option contract.

The margin calculation methodology for options, therefore, is presented in two parts, the first being dedicated to the model for regular options and the second for futures-style option contracts. The methodologies have in common the assessment under scenarios and the search for the worst financial variation under scenario. However, risk offsetting between positions in futures and option contracts, as well as between positions with different maturities, only occurs in the case of futures-style options. Therefore, offsetting rules define the assignment of options in subportfolios – the options are grouped in subportfolios of options on the same underlying object and with the same type of exercise, and the futures-style options can belong to subportfolios which contain futures contracts with FPRs common to their own.

### 2.5.1. Identification of Primitive Risk Factors

Whereas the value of a futures contract can be represented so that its variation under a stress scenario is well approximated by a linear function of the variations of its primitive risk factors, the premium of an option contract does not admit a linear approximation for such a precise variation under a stress scenario. The variations of an option premium are then obtained in a direct manner, as the exact difference between the values of the premium in different scenarios, which methodology is called *full valuation*.

In general, the value, or premium, of an option is given by a pricing function  $f$ , usually defined analytically in a pricing model, whose variables represent contract and market characteristics.

$$\text{Premium} = f(S, X, r, rc, t, \sigma) \quad (35)$$

Variables  $X$  and  $t$ , respectively, option strike price and timeframe till contract maturity, as from the assessment date, are contract characteristics. The other parameters of the pricing function are market variables:

- $S$  : value of the underlying asset of the option;
- $r$  : risk-free interest rate;
- $rc$  : opportunity cost; and
- $\sigma$  : implicit volatility of the underlying asset of the option.

An option contract value variation is given by

$$\Delta \text{Premium} = f(S', X, r', rc', t, \sigma') - f(S, X, r, rc, t, \sigma) \quad (36)$$

so that, since contract variables  $X$  and  $t$  are not random ones, only market variables  $S$ ,  $r$ ,  $rc$ , and  $\sigma$  make up primitive risk factors, and, for the purpose of calculation Margin, all of them are contemplated in the stress test model.

### 2.5.2. Contiguous scenarios

The stress scenario methodology via full valuation is based on contiguous variation scenarios for the group of FPRs of the option contracts -  $S$ ,  $r$ ,  $rc$  and  $\sigma$ . The  $k$ -th contiguous scenario for this group of factor is called  $Scen_k^{Contiguous}$ .

$$Scen_k^{Contiguous} = \left[ Scen_{k_S}^S, Scen_{k_r}^r, Scen_{k_{rc}}^{rc}, Scen_{k_\sigma}^\sigma \right]$$

where  $Scen_i^{FPR}$  is a variation scenario defined for factor  $FPR$ , under which it assumes the value  $FPR$ , corresponding to variation  $\Delta^{FPR} i$  in relation to its reference value. Reference scenario  $Scen_{Ref}^{Contiguous} = S_{Ref}, r_{Ref}, rc_{Ref}, \sigma_{Ref}$  implies null variations for the risk factors. Throughout this section, reference is made to scenario  $Scen_k^{Contiguous}$  through the values of FPRs under scenario or the variations given by the scenario or only indices  $k_{FPR}$ , as appropriate.

Given  $nc_S$  scenarios for  $S$ ,  $nc_r$  scenarios for  $r$ ,  $nc_{rc}$  scenarios for  $rc$  and  $nc_\sigma$  scenarios for  $\sigma$ ,  $NC = nc_S \times nc_r \times nc_{rc} \times nc_\sigma$  contiguous scenarios are formed.

In spite of the existence of risk factors common to futures and option contracts, the stress scenarios utilized in assessing the margin of positions in futures, of positions in options and of positions in futures-style options, as well as the respective time horizons, are not necessarily the same, basically due to different liquidity conditions of each market.

### 2.5.3. Margin of Options

In this section, the term option designates the plain vanilla option contract, not the futures-style option contract, with explicit identification of contracts whenever necessary.

The margin required from positions in option contracts derives from the margin general equation

$$\text{Margin Position in Options} = \max \text{CLC} - \text{Market Risk}, 0 \quad (37)$$

The **settlement cost** of an options portfolio is the value resulting from settling the Company or, on an equivalent basis, the opposite of its financial reference value. This reference value is obtained from the market reference values of pricing variables,  $P_{Ref}$ .

The settlement cost of a position in  $q$  units of an option contract is

$$\text{CLC} = -FV, \quad FV = P \times q \times TM \times TC \quad (38)$$

where

- $FV$  : financial value of the position;
- $P$  : option premium,  $P = f(S, X, r, rc, t, \sigma)$  ;
- $TM$  : the contract size; and
- $TC$  : exchange rate, if applicable,

The market reference premium is  $P_{Ref} = f(S_{Ref}, X, r_{Ref}, rc_{Ref}, t, \sigma_{Ref})$ .

Considering the bid-ask spread – the difference between the market purchase and sale prices - a factor  $F_\gamma$  is applied to calculate the financial value, in order to reduce the value of long positions ( $q > 0$ ) and increase the absolute value of short positions ( $q < 0$ ), given by

$$F_\gamma = 1 - \text{sgn } q \times \gamma, \quad 0 \leq \gamma \leq 1 \quad (39)$$

where parameter  $\gamma$  is defined by series<sup>5</sup> of option.

The option premium and the position value under scenario  $Scen_k^{Contiguous} = [Scen_{k_S}^S, Scen_{k_r}^r, Scen_{k_{rc}}^{rc}, Scen_{k_\sigma}^\sigma]$  are given by

$$P_k = f(S_{k_S}, X, r_{k_r}, rc_{k_{rc}}, t, \sigma_{k_\sigma}) \quad \text{and} \quad FV_k = P_k \times F_\gamma \times q \times TM \times TC \quad (40)$$

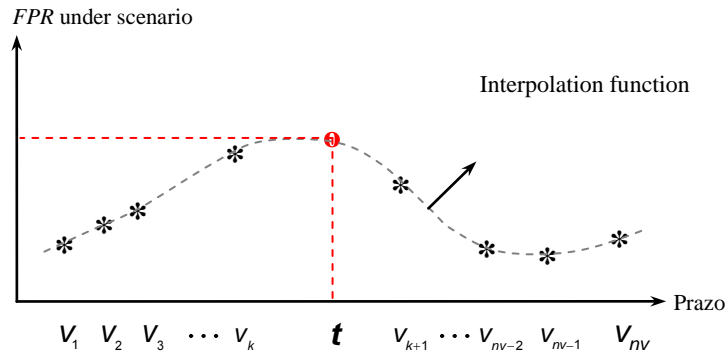
<sup>5</sup> A series is defined by type of option (call or put option), underlying asset, maturity, strike price, and exercise style.



Variables  $r$  and  $rc$  required in option pricing depend on timeframe  $t$ . Under any scenario, including market scenario, its values are obtained by interpolating the values of the respective FPRs, defined in vertices, under the same scenario.

$$r_{scen} t = \text{Interpolation Function } t, r_{scen} v_1, \dots, r_{scen} v_{nv} \quad e$$

$$rc_{scen} t = \text{Interpolation Function } t, rc_{scen} v_1, \dots, rc_{scen} v_{nv}$$



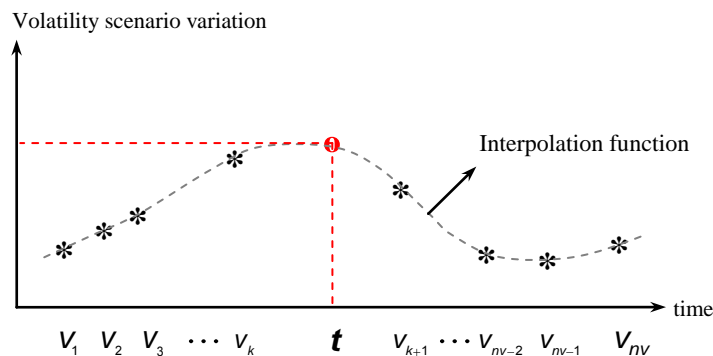
**Figure 2.5-1 – Interpolation of time-structure type FPR**

Volatility variable  $\sigma$  corresponds to a point of the volatility surface of the option's underlying asset, a function of the timeframe and price of the contract strike price. The variation scenarios for the volatility FPR can be defined in two ways - in a multiplicative (relative variation scenarios) or additive (absolute variation scenarios) form.

The multiplicative scenarios are defined in a constant manner regarding the timeframe until the option maturity, that is, for any timeframe  $t$ ,

$$\sigma_{cen} t = \sigma_{Ref} t \times 1 + \Delta^\sigma scen$$

In the additive case, a variation scenario corresponds to a set of variations associated to fixed timeframes which generate, by interpolation, a variation for the volatility in the specific timeframe of an option.



**Figure 2.5-2 – Interpolation of additive scenarios of variation for volatility**

Once the variation corresponding to the option's timeframe, the volatility under scenario is obtained the usual way, that is,

$$\sigma_{cen} t = \sigma_{Ref} t + \Delta^{\sigma,t} cen$$

$$\Delta^{\sigma,t} scen = Interpolation Function t, \Delta^{\sigma,v_1} scen, \dots, \Delta^{\sigma,v_{nv}} scen$$

In order to facilitate understanding the margin methodology for options, the examples shown here consider only multiplicative scenarios.

The position's **market risk** is estimated from the financial variations under scenario, that is, the differences between the value of the position under contiguous scenarios and their market reference value

$$\Delta FV k = FV k - FV Ref = [P k - P Ref] \times F_y \times q \times TM \times TC \quad (41)$$

The worst scenario, denoted by  $Scen_{k^*}^{Contiguous} = [Scen_{k_S^*}^S, Scen_{k_r^*}^r, Scen_{k_{rc}^*}^{rc}, Scen_{k_\sigma^*}^\sigma]$ , is that, among the contiguous scenarios  $NC$ , associated to the position's minimum financial variation. This minimum variation, denoted as  $Min\Delta FV$ , is the measurement of the position's market risk.

$$Market Risk = Min\Delta FV = \min_{Contiguous Scenario k} \Delta FV k = \min \Delta FV 1 ; \Delta FV 2 ; \dots ; \Delta FV NC \quad (42)$$

Therefore, equation (34) for the margin is rewritten as

$$Margin = \max CLC Ref - Min\Delta FV ; 0 = \max -FVF k^* ; 0 \quad (43)$$

where  $k^*$  indicates the worst scenario.

According to this equation, the required margin of a portfolio which contains only long positions is null. That portfolio has a negative  $CLC$ , and terms  $\Delta FV$ , if negative, are inferiorly limited by the value of  $CLC$ , so that term  $CLC Ref - Min\Delta FV$  of equation (43) is always negative or null.

**Example 1:** Consider an option contract and the definition of 3 scenarios for the value of underlying asset  $S$ , 1 scenario for  $r$ , 1 scenario for  $rc$  and 2 scenarios for volatility  $\sigma$ . All combined, these scenarios generate 6 contiguous scenarios, which in turn generate 6 values for the option premium and the respective variations of such premiums in relation to the market reference premium, as shown in the following table.

|                       | CONTIGUOUS SCENARIO |       |        |            | OPTION PREMIUM | FINANCIAL VARIATION UNDER SCENARIO |
|-----------------------|---------------------|-------|--------|------------|----------------|------------------------------------|
|                       | S                   | r     | rc     | $\sigma$   |                |                                    |
| $Scen_1^{Contiguous}$ | $S_1$               | $r_1$ | $rc_1$ | $\sigma_1$ | $P 1$          | $\Delta FV 1$                      |
| $Scen_2^{Contiguous}$ | $S_1$               | $r_1$ | $rc_1$ | $\sigma_2$ | $P 2$          | $\Delta FV 2$                      |
| $Scen_3^{Contiguous}$ | $S_2$               | $r_1$ | $rc_1$ | $\sigma_1$ | $P 3$          | $\Delta FV 3$                      |
| $Scen_4^{Contiguous}$ | $S_2$               | $r_1$ | $rc_1$ | $\sigma_2$ | $P 4$          | $\Delta FV 4$                      |
| $Scen_5^{Contiguous}$ | $S_3$               | $r_1$ | $rc_1$ | $\sigma_1$ | $P 5$          | $\Delta FV 5$                      |
| $Scen_6^{Contiguous}$ | $S_3$               | $r_1$ | $rc_1$ | $\sigma_2$ | $P 6$          | $\Delta FV 6$                      |

Suppose a short position Real for USD exchange rate call option, with strike price of R\$ 2.150 / US\$, maturity in 1 month (21 bd / 30 cd) and size US\$ 50,000.

The following table presents the scenarios, values of FPRs under scenario, as well as the option premiums and the financial variations of the position under the scenarios.

|                           | CONTIGUOUS SCENARIO |                  |                  |                | OPTION PREMIUM<br>(per 1,000 US\$) | FINANCIAL VALUE  | FINANCIAL VARIATION UNDER SCENARIO |
|---------------------------|---------------------|------------------|------------------|----------------|------------------------------------|------------------|------------------------------------|
|                           | DOL                 | r                | rc               | $\sigma_{DOL}$ |                                    |                  |                                    |
| $Scen_{Ref}^{Contiguous}$ | 2.131               | 13.09%           | 6.53%            | 12%            | 26.40                              | -1,319.98        | -                                  |
| $Scen_1^{Contiguous}$     | -7%                 | +50 bp<br>13.59% | -100 bp<br>5.53% | -50%<br>6%     | 0                                  | 0                | 1,319.98                           |
| $Scen_2^{Contiguous}$     | 1.982               |                  |                  | +50%<br>18%    | 3.88                               | -194.06          | 1,125.92                           |
| $Scen_3^{Contiguous}$     | -                   |                  |                  | -50%<br>6%     | 12.45                              | -622.41          | -697.57                            |
| $Scen_4^{Contiguous}$     | 2.131               |                  |                  | +50%<br>18%    | 42.375                             | -2,118.76        | -798.78                            |
| $Scen_5^{Contiguous}$     | +7%                 |                  |                  | -50%<br>6%     | 143.03                             | -7,151.49        | -5,831.51                          |
| $Scen_6^{Contiguous}$     | 2.280               |                  |                  | +50%<br>18%    | <b>149.26</b>                      | <b>-7,463.19</b> | <b>-6,143.21</b>                   |

The market risk of the contract is worth, according to equation (42), - 6,143.21 \$ and corresponds to the financial variation of the position under scenario  $Scen_6^{Contiguous}$ .

The margin required from this position therefore is

$$Margin = \max CLC_{Ref} - Market Risk ; 0 = \max 1,319.98 + 6,143.21 ; 0 = 7,463.19$$

### Minimum Margin

In order to establish a minimum margin value, with effect especially on short positions in call options too far from cash, a minimum margin  $MM$  is defined, whose value is determined based on a percentage of the position's notional value. By incorporating the minimum margin term to the margin calculation, we have

$$Margin \text{ Position in Options} = \max CLC - Market Risk , MM , 0 \quad (44)$$

or yet  $Margin \text{ Position in Options} = \max -FV k^* , MM , 0 \quad (45)$

The minimum margin of a position in  $q$  units of an option contract is given by

$$MM = VAR^{MM} \times \max -q , 0 \times TC \times TM \quad (46)$$

$$VAR^{MM} = \mu \times S_{Ref}$$

where  $VAR^{MM}$  is the minimum margin for each unit of the underlying asset and  $\mu$  is the minimum margin factor, defined by option series,  $\mu \geq 0$ .

For an options portfolio, the mere determination of a minimum margin value for each short position of the portfolio can generate relevant inconsistencies in assessing the portfolio risk. One of them refers to covered short positions, which generally do not present a positive settlement cost.

A short call is covered if there is a long call of same type<sup>6</sup> and maturity, in an amount equal or superior to the short position and with a strike price lower than that of the short position.

Similarly, a short put is covered if there is a long put of same type and maturity, in an amount equal or superior to the short position and with a strike price lower than that of the short position.

The graphs in the following figure present the values of the positions which form a covered short position and that of the covered position, at maturity, as a function of the value of the underlying asset. Since the worst result of the portfolio (lower charts) is the null result, a non-negative value, the minimum margin must also be null.

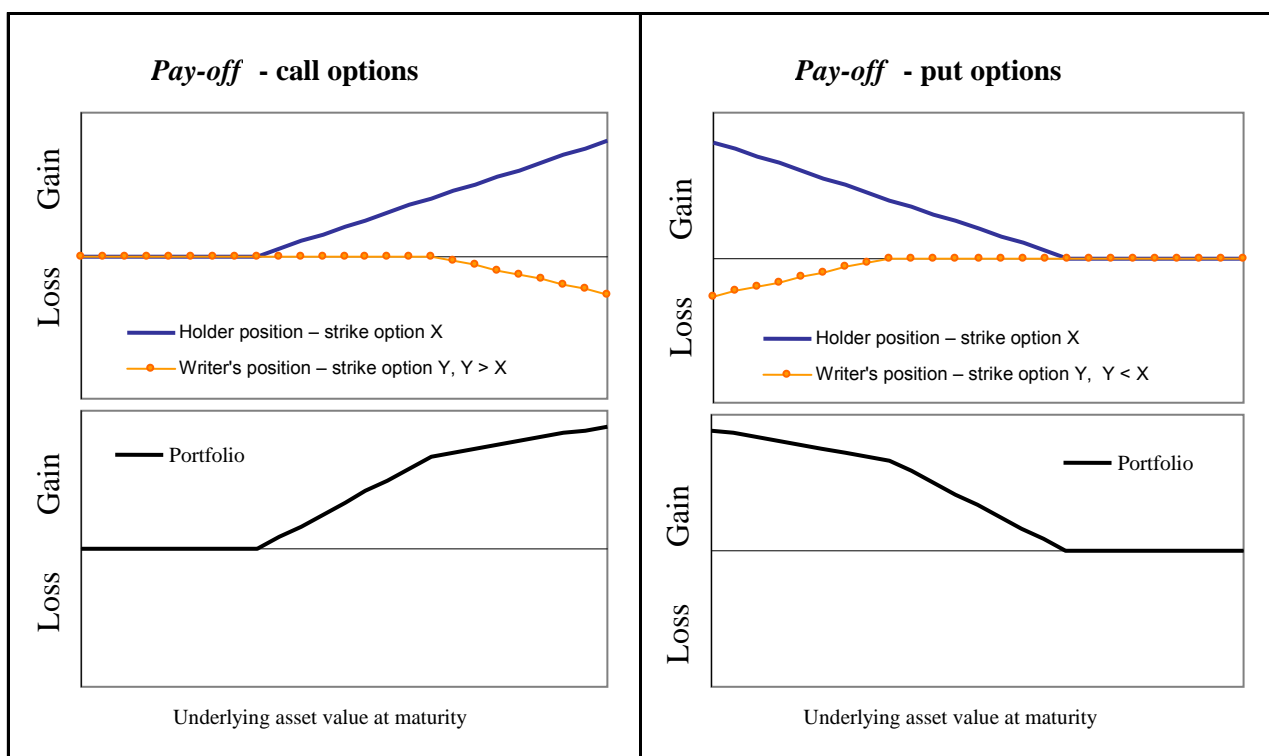


Figure 2.5-2 – Payoff of covered short positions

Thus, in order for the portfolio's minimum margin value to be consistent with its risk profile, the portfolio's largest potential loss on maturity date is assessed. Additionally, the portfolio's minimum margin cannot exceed the value of the sum of each position's minimum margins, which imposes, as far as calculation of minimum margin is concerned, a limit to the maximum loss of each short position, in an amount equal to that of the corresponding minimum margin. In practice, we obtain that limitation by creating a long position for each short position of the *original portfolio* – that for which one wishes the minimum margin to be determined. The portfolio resulting from creating such long positions is called *protected portfolio*.

<sup>6</sup> Same-type options refer to options on the same underlying assets and same exercise style.

The *protected portfolio* is made up of the *original portfolio* and new long positions, as follows:

- i. for each original position short in  $q$  units of call option with strike price  $X$ , there is created a long position in  $q$  units of the call option with strike price  $X + VAR^{MM}$ ; and
- ii. for each original position short in  $q$  units of the put option with strike price  $X$ , there is created a long position in  $q$  units of the put option with strike price  $X - VAR^{MM}$ .

Once the *protected portfolio* is defined, the *original portfolio*'s minimum margin is given by

$$MM = -\min \{0, VV^{CP} X_1^{CP}, VV^{CP} X_2^{CP}, \dots, VV^{CP} X_{M_{CP}}^{CP}\} \quad (47)$$

$$VV^{CP} s = \sum_{j=1}^{M_{CP}} VV_j^{CP} s, \quad VV_j^{CP} s = \begin{cases} \max \{s - X_j^{CP}, 0\} \times q_j \times TM \times TC & \text{if call option} \\ \max \{X_j^{CP} - s, 0\} \times q_j \times TM \times TC & \text{if put option} \end{cases}$$

where

$VV^{CP} s$  : value of the *protected portfolio* on maturity date, assuming the underlying asset is worth  $s$  on that date;

$X_j^{CP}$  : the strike price of the  $j$ -th option in the *protected portfolio*;

$VV_j^{CP} s$  : value of the  $j$ -th option of the *protected portfolio* on maturity date, and assuming the underlying asset is worth  $s$  on that date;

$q_j$  : number of contracts of the position on the  $j$ -th position of the *protected portfolio*;  $q_j > 0$  if the position is long and  $q_j < 0$  if the position is short; and

$M_{CP}$  : number of options of the *protected portfolio*.

One observes that the calculation of the minimum margin is defined for options with price-denominated strike prices. Thus, for minimum margin assessment purposes, one must change the nature of an option with rate-denominated strike price – from rate-denominated short option to price-denominated long option and vice-versa.

Observe that equation (44) is the particular case of equation (14) for a portfolio with only one position. In fact,

- in the case of a long position in exercise option  $X$ , the corresponding *protected portfolio* is equal to the *original portfolio*, that is,  $X_1^{CP} = X$  and it follows from (13) that

$$MM = -\min \{0, VV^{CP} X_1^{CP}\} = -\min \{0, 0\} = 0$$

- in the case of a short position in exercise option  $X$ , the corresponding *protected portfolio* is equal contains exercise options  $X_1^{CP} = X$  and  $X_2^{CP} = X \pm VAR^{MM}$  and it follows from (47) that

$$MM = -\min \{0, VV^{CP} X_1^{CP}, VV^{CP} X_2^{CP}\} = VAR^{MM} \times -q \times TM \times TC$$

The following example illustrates a portfolio's minimum margin calculation.

**Example 2:** Consider the portfolio of options on the Real for USD spot exchange rate, of same maturities, for a timeframe of 177 bd / 257 cd, standard size of US\$50,000 and prices expressed by 1,000 US\$, according to the following table.

Consider the following values for the primitive risk factors:

Under the reference scenario:  $DOL_{Ref} = 2,564.50$ ,  $r_{Ref} = 19.42\%$  aa,  $rc_{Ref} = 3.563\%$  aa e  $\sigma_{Ref} = 12.50\%$  aa.

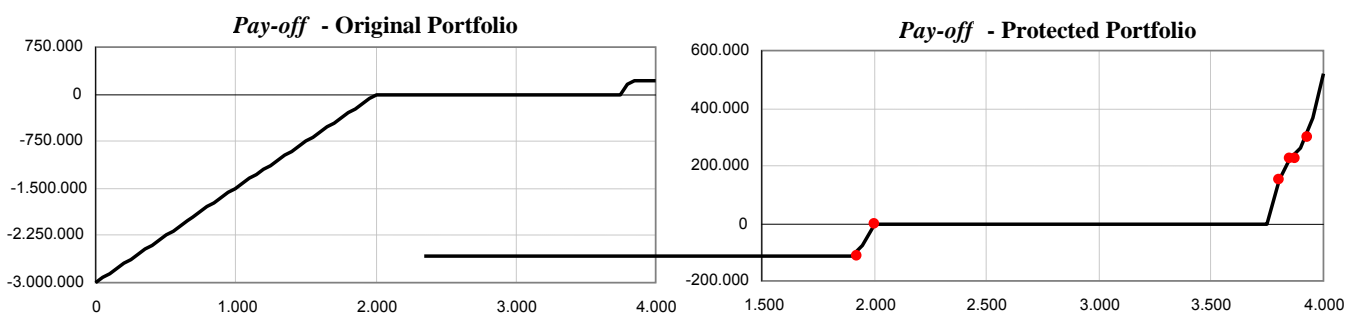
Under the *worst scenario*:  $DOL = 2,333.70$ ,  $r = 16.57\%$ ,  $rc = 8.030\%$  and  $\sigma = 15\%$ .

| PORTFOLIO |             |              |                      |      |         |                              |                          |
|-----------|-------------|--------------|----------------------|------|---------|------------------------------|--------------------------|
| POSITION  | OPTION TYPE | STRIKE PRICE | TIMEFRAME<br>bd / cd | QTY. | PREMIUM | ORIGINAL POSITION VALUE      |                          |
|           |             |              |                      |      |         | Under the reference scenario | Under the worst scenario |
| Opt 1     | CALL        | 3,800.00     | 177 / 257            | -30  | 0.2280  | -342.00                      | -34.80                   |
| Opt 2     | CALL        | 3,850.00     |                      | -30  | 0.1498  | -224.70                      | -23.10                   |
| Opt 3     | PUT         | 2,000.00     |                      | -30  | 0.0256  | -38.40                       | -7.908.60                |
| Opt 4     | CALL        | 3,750.00     |                      | 60   | 0.3440  | 1.032.00                     | 103.80                   |
|           |             |              |                      |      |         | <b>-426.90</b>               | <b>-7,862.70</b>         |

The *protected portfolio* is made up of 4 original positions and of the 3 long positions created corresponding to the original short positions.

Considering minimum margin factor  $\mu = 3\%$  for all the options, term  $VAR^{MM}$  which defines the strike prices of the options of the long positions added to the *original portfolio*, calculated by truncating after the second decimal place, is worth  $VAR^{MM} = 2.564,50 \times 3\% = 76,93$ .

Calculation of a portfolio's minimum margin is detailed in the following table from the pay-off graphs of the *original* and *protected* portfolios.



| POSITION      | TYPE | QTY,<br>STRIKE PRICE | POSITION'S VALUE AT MATURITY<br>BASED ON THE UNDERLYING ASSET'S VALUE |          |          |          |          |          |          |
|---------------|------|----------------------|---|----------|----------|----------|----------|----------|----------|
|               |      |                      | 1,923.07  | 2,000.00 | 3,750.00 | 3,800.00 | 3,850.00 | 3,876.93 | 3,926.93 |
|               |      |                      | 1- original   | CALL     | -30      | -        | -        | -        | -        |
| 2- additional | CALL | 30                   | -   | -        | -        | -        | -        | -        | 75,000   |
| 3- original   | CALL | -30                  | -   | -        | -        | -        | -        | -40,395  | -115,395 |
| 4- additional | CALL | 30                   | -   | -        | -        | -        | -        | -        | -        |
| 5- original   | PUT  | -30                  | -115,395  | -        | -        | -        | -        | -        | -        |
| 6- additional | PUT  | 30                   | -   | -        | -        | -        | -        | -        | -        |
|               |      |                      | 1,923.00  |          |          |          |          |          |          |

|                                     |                  |    |                 |          |          |                |                |                |                |
|-------------------------------------|------------------|----|-----------------|----------|----------|----------------|----------------|----------------|----------------|
| 7- original                         | CALL<br>3,750.00 | 60 | -               | -        | -        | 150,000        | 300,000        | 380,790        | 530,790        |
| <b>Value of protected portfolio</b> |                  |    | <b>-115,395</b> | <b>-</b> | <b>-</b> | <b>150,000</b> | <b>225,000</b> | <b>225,000</b> | <b>300,000</b> |

The minimum margin is worth \$115,395, which is the minimum value of the *protected portfolio* at maturity, assuming prices of the underlying asset are equal to the strike prices of their positions.

The minimum margin of this portfolio is determined in accordance with the value ascribed to the short position in the put option, since short positions in call options are covered by a call option at a lower strike price.

The required margin of the *original portfolio* is then worth

$$Margin = \max(7,862.60; 115,395.00; 0) = 115,395.00$$

### Subportfolios of options – calculation of subportfolio risk and margin of a portfolio

Similarly to futures contracts, option contracts are grouped in subportfolios and the margin of an options portfolio is given by the sum of the margins of the corresponding subportfolios, that is, the subportfolios to which the option contracts present in the portfolio belong.

$$\begin{aligned} \text{Margin Position in Options} &= \sum_{s=1}^{N_{Subp}} \text{Margin Subp}_s = \\ &= \text{Margin Subp}_1 + \text{Margin Subp}_2 + \dots + \text{Margin Subp}_{N_{Subp}} \end{aligned} \quad (48)$$

The margin for the set of positions of a same subportfolio, in turn, is the sum of the margins of the groups of such positions by underlying asset ( $AO$ ) and the strike style ( $Ex$ ) and maturity date ( $T$ )

$$\text{Margin Subportfolio} = \text{Margin}_{G_1} + \text{Margin}_{G_2} + \text{Margin}_{G_3} + \dots \quad (49)$$

where  $G_1, G_2, G_3, \dots$  indicate the groups per  $AO, Ex, T$  of the options belonging to the subportfolio.

The margin of the positions of a same group  $G$ ,  $\text{Margin}_G$ , is calculated according to equations (44) and (45), restricted to the group's positions.

$$\text{Margin}_G = \max(CLC_G \text{ Ref} - \text{Min}\Delta FV_G, MM_G, 0) = \max(-FV_G k^*, MM_G, 0) \quad (50)$$

$$\text{Min}\Delta FV_G = \min_{\text{Contiguous scenario } k} \Delta FV_G k = \min(\Delta FV_G 1; \Delta FV_G 2; \dots; \Delta FV_G NC)$$

$$\Delta FV_G k = \sum_i [FV_{G,i} k - FV_{G,i} \text{ Ref}]$$

where

- $FV_{G,i} k$  is the financial value of the position in the  $i$ -th option of group  $G$ , under the  $k$ -th contiguous scenario of their risk factors; and
- minimum margin  $MM_G$  is given by equation (47), restricted to the positions of group  $G$ .

The margin of a position is a function of the worst scenario associated to each group  $AO, Ex, T$  of the underlying asset, exercise style and maturity, in each subportfolio. Therefore, there is no risk offsetting between positions in options with different maturities, underlying assets and exercise style. Since there is no offsetting between maturities, the Subportfolio 2 Procedure has no effect on the portfolio of options.

**Example 3:** Consider the portfolio described in the following table, involving options on the same underlying asset (Real for USD spot exchange rate), of same exercise style but with 3 different maturities,  $T_1, T_2$  and  $T_3$ .

Therefore, in order to calculate the portfolio's margin, the options are arranged into 3 groups, differentiated by maturities  $T_1, T_2$  and  $T_3$ , and the margin is given by the sum of each group's margins.

$$\text{Margin} = M \arg in_{G_1} + M \arg in_{G_2} + M \arg in_{G_3}$$

Considering minimum margin factor  $\mu = 3\%$  for all maturities, the portfolio's mm is worth  $MM_{G_i} = 3.196,50$ .

Consider constant volatility per maturity and the contiguous scenarios generated by combining the following scenarios for the portfolio's risk factors:

Spot exchange rate,  $DOL$ : reference scenario and variations of  $\pm 7\%$

Pre-fixed interest rate  $r$ : variation of  $+50$  bp

Spread rate  $rc$ : variation of  $-100$  bp

Exchange rate volatility  $\sigma$ : variation of  $\pm 50\%$

| PORTFOLIO |             |              |                          |      |                               |
|-----------|-------------|--------------|--------------------------|------|-------------------------------|
| POSITION  | OPTION TYPE | STRIKE PRICE | TIMEFRAM<br>E<br>bd / cd | QTY. | PREMIUM<br>(R\$ / 1,000 US\$) |
| Opt 1     | CALL        | 2,400.00     | 32 / 48 $T_1$            | -1   | 33.58                         |
| Opt 2     | CALL        | 2,300.00     | 54 / 78 $T_2$            | -1   | 7.16                          |
| Opt 3     | CALL        | 2,100.00     |                          | 1    | 77.68                         |
| Opt 4     | CALL        | 2,100.00     | 74 / 109 $T_3$           | -1   | 90.08                         |
| Opt 5     | CALL        | 2,150.00     |                          | 1    | 61.20                         |
| Opt 6     | PUT         | 2,100.00     |                          | -1   | 28.04                         |

- Margin of the position with maturity on  $T_1$  (short call):



| CONTIGUOUS SCENARIO       |              |                  |                  |                | OPTION PREMIUM<br>(R\$ / 1,000 US\$) | POSITION'S FINANCIAL VALUE | POSITION'S FINANCIAL VARIATION |
|---------------------------|--------------|------------------|------------------|----------------|--------------------------------------|----------------------------|--------------------------------|
|                           | DOL          | r                | rc               | $\sigma_{DOL}$ |                                      |                            |                                |
| $Scen_{Ref}^{Contiguous}$ | 2.131        | 12.55%           | 6.45%            | 12%            | 0.127                                | -6.37                      | -                              |
| $Scen_1^{Contiguous}$     | -7%<br>1.982 | +50 bp<br>13.05% | -100 bp<br>5.45% | -50%<br>6%     | 0                                    | 0                          | 6.37                           |
| $Scen_2^{Contiguous}$     |              |                  |                  | +50%<br>18%    | 0.09                                 | -4.45                      | 1.92                           |
| $Scen_3^{Contiguous}$     | -<br>2.131   |                  |                  | -50%<br>6%     | 0                                    | 0                          | 6.37                           |
| $Scen_4^{Contiguous}$     |              |                  |                  |                | +50%<br>18%                          | 2.509                      | -125.46                        |
| $Scen_5^{Contiguous}$     | +7%<br>2.280 |                  |                  | -50%<br>6%     | 0.432                                | -21.62                     | -15.25                         |
| $Scen_6^{Contiguous}$     |              |                  |                  |                | +50%<br>18%                          | 22.554                     | -1,127.68                      |

$$Margin_{G_1} = \max CLC_{G_1}^{Ref} - Min\Delta VF_{G_1}, MM_{G_1}, 0 = \max 6,37 + 1.121,31, 3.196,50, 0 = 3.196,50$$

- margin of the position with maturity at  $T_2$  (long position in bullish spread):

According to the information in the following table, the minimum margin of this positions is worth  $MM_{G_2} = 0$

$$Margin_{G_2} = \max CLC_{G_2}^{Ref} - Min\Delta FV_{G_2}, MM_{G_2}, 0 = \max -3,525.94 + 3,455.97, 0, 0 = 0$$

| CONTIGUOUS SCENARIO       |              |                  |                  |                | OPTIONS PREMIUMS<br>(R\$ / 1,000 US\$) | POSITION'S FINANCIAL VALUE | POSITION'S FINANCIAL VARIATION |
|---------------------------|--------------|------------------|------------------|----------------|--|----------------------------|--------------------------------|
|                           | DOL          | r                | rc               | $\sigma_{DOL}$ |  |                            |                                |
| $Scen_{Ref}^{Contiguous}$ | 2,131        | 12,48%           | 6,50%            | 12%            | 7,16<br>77,68                          | 3,525,94                   | -                              |
| $Scen_1^{Contiguous}$     | -7%<br>1,982 | +50 bp<br>12,98% | -100 bp<br>5,50% | -50%<br>6%     | 0<br>1,399                             | 69,97                      | <b>-3.455,97</b>               |
| $Scen_2^{Contiguous}$     |              |                  |                  | +50%<br>18%    | 3,92<br>31,86                          | 1,396,75                   | -2.129,19                      |
| $Scen_3^{Contiguous}$     | -<br>2,131   |                  |                  | -50%<br>6%     | 0,27<br>64,75                          | 3,223,73                   | -302,21                        |
| $Scen_4^{Contiguous}$     |              |                  |                  |                | +50%<br>18%                            | 24,03<br>103,32            | 3,964,80                       |
| $Scen_5^{Contiguous}$     | +7%<br>2,280 |                  |                  | -50%<br>6%     | 31,92<br>207,82                        | 8,794,76                   | 5.268,82                       |
| $Scen_6^{Contiguous}$     |              |                  |                  |                | +50%<br>18%                            | 81,34<br>218,67            | 6.866,49                       |

- Margin of position with maturity on  $T_3$ :

| CONTIGUOUS SCENARIO       |       |        |       |                | OPTIONS PREMIUMS<br>(R\$ / 1.000 US\$) | POSITION'S FINANCIAL VALUE | POSITION'S FINANCIAL VARIATION |
|---------------------------|-------|--------|-------|----------------|--|----------------------------|--------------------------------|
|                           | DOL   | r      | rc    | $\sigma_{DOL}$ |  |                            |                                |
| $Scen_{Ref}^{Contiguous}$ | 2.131 | 12.40% | 6.30% | 12%            | 90.08<br>61.20<br>28.04                | -2,846.25                  | -                              |

|                       |              |                  |                  |             |                           |           |                  |
|-----------------------|--------------|------------------|------------------|-------------|---------------------------|-----------|------------------|
| $Scen_1^{Contiguous}$ | -7%<br>1.982 | +50 bp<br>12.90% | -100 bp<br>5.30% | -50%<br>6%  | 3.94<br>0.76<br>78.91     | -4,104.77 | -1,258.52        |
| $Scen_2^{Contiguous}$ |              |                  |                  | +50%<br>18% | 45.58<br>31.62<br>120.56  | -6,726.09 | <b>-3,879.84</b> |
| $Scen_3^{Contiguous}$ | -<br>2.131   |                  |                  | -50%<br>6%  | 76.77<br>40.53<br>4.86    | -2,054.99 | 791.26           |
| $Scen_4^{Contiguous}$ |              |                  |                  | +50%<br>18% | 121.25<br>93.54<br>49.34  | -3,852.15 | -1,005.90        |
| $Scen_5^{Contiguous}$ | +7%<br>2.280 |                  |                  | -50%<br>6%  | 218.85<br>170.76<br>0.02  | -2,405.30 | 440.95           |
| $Scen_6^{Contiguous}$ |              |                  |                  | +50%<br>18% | 234.53<br>195.43<br>15.69 | -2,739.76 | 106.49           |

$$Margin_{G_3} = \max \{ CLC_{G_3} \text{ Ref} - Min\Delta FV_{G_3}, MM_{G_3}, 0 \} = \max \{ 2,846.25 + 3,879.84, 3,196.50, 0 \} = 6,726.09$$

$$Margin = Margin_{G_1} + Margin_{G_2} + Margin_{G_3} = 7,917.04 + 0 + 6,726.09 = 14,643.13$$

#### 2.5.4. Margin of Futures-Style Options

The futures-style option has, at maturity, the same pay-off of the conventional options and presents a daily cashflow similar to that of a futures contract. The main features which differentiate it from the conventional option are:

- no premium payment to the buyer by the seller;
- marking to market and settlement transfer, on a daily basis, until maturity date;
- collateral required from both buyer and seller;
- risk offsetting, to determine the value of the required margin, between positions in futures contracts and futures-style option; and
- risk offsetting, to determine the value of the required margin, between positions in futures-style option on the same underlying asset and with different maturities.

The margin calculation of Futures-Style Options is based on the full valuation mode, as described in the preceding section, incorporating thereto the peculiarities of the Futures-Style Options. The model is applied with no alterations in the rules and general pricing criteria, that is, all contiguous scenarios are considered for risk factors  $S$ ,  $r$ ,  $rC$ , and  $\sigma$ . Due to the absence of premium payment and to the daily settlement, the risk of such contracts is related solely to the value of the settlement to be made, which represents the variation of the position's cash value, a direct consequence of the variation of the (settlement) premiums between two consecutive days. Premium variation is based on the (market) reference price and on the price assessed under a contiguous scenario of pricing variables.

The following sections deal with definition of the stress scenarios used, calculation of financial variations under scenario and consolidation of risk of positions in futures contracts and in Futures-Style Options.

## Contiguous Scenarios Utilized in Assessing the Risk of Futures-Style Options

In spite of the daily settlement mechanism associated to the futures-style options mitigating the problem of non-coinciding cashflows of futures and options contracts, risk offsetting between both contracts is defined with caution, especially due to a possible difference of liquidity between futures and options markets. For the purpose of controlling the degree of risk offsetting between futures and futures-style options, the stress scenarios applied to futures and futures-style option contracts when calculating the margin present some differences.

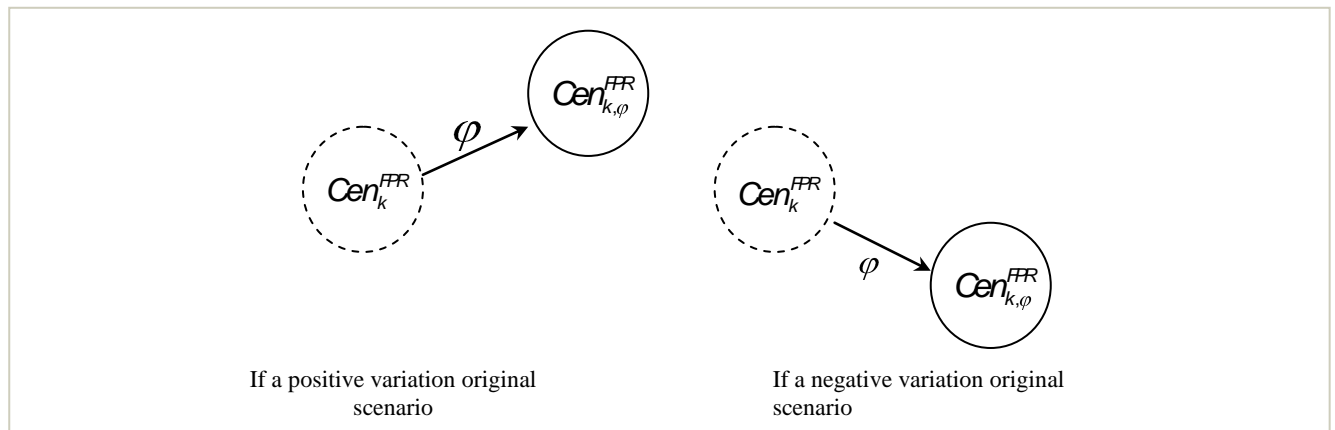
Such differentiation derives from the use of two class of parameters -  $\varphi$  and  $\delta$  - which modify the scenarios originally defined for the primitive risk factors.

Below are presented the criteria for generating, from the original scenarios, of  $\varphi$  and of  $\delta$ , of the scenarios used to calculate the Margin.

### Scenarios generated from parameter $\varphi$

The use of parameter  $\varphi$  aims to incorporate into the margin calculation the liquidity difference between the futures and futures-style option markets and the possible increase of the period necessary for settling/closing the positions, thus potentializing the stress scenarios.

The scenarios of any FPR, originally defined for assessing the positions in futures contracts and which make up the original contiguous scenarios are potentialized by adding (subtracting)  $\varphi$  to/from the bullish (bearish) variations associated to them. Each original scenario gives rise to a new scenario – either bullish or bearish, depending on the original scenario being bullish or bearish, respectively.



**Figure 2.5-3 – Scenarios replacement through parameter  $\varphi$**

The resulting scenario from applying  $\varphi$  to original scenario  $Scen_k^{FPR,v}$  is denoted as  $Scen_{k,\varphi}^{FPR,v}$  and the variation associated to it,  $\Delta_\varphi^{FPR,v} k$ , is given by equation (51-a) or (51-b), with  $\varphi \geq 0$  being expressed in percentage or absolute variation ( $bp$ ), depending on the FPR being of the price or rate type, respectively.

$$\Delta_\varphi^{FPR,v} k = 1 + \varphi \times \Delta^{FPR,v} k \quad (51-a)$$

$$\Delta_{\varphi}^{FPR,v} k = \begin{cases} \Delta^{FPR,v} k + \varphi & \text{if } \Delta^{FPR,v} k > 0 \text{ (bullish scenario)} \\ \Delta^{FPR,v} k - \varphi & \text{if } \Delta^{FPR,v} k < 0 \text{ (bearish scenario)} \end{cases} \quad (51-b)$$

Under the new scenario, the factor assumes the values given by equations (52-a) or (52-b), depending on the FPR being of the price or rate type, respectively.

$$FPR_{k,\varphi} = FPR_{ref} \times \left[ 1 + \Delta^{FPR} \times \varphi \times k \right] \quad (52-a)$$

$$FPR_{k,\varphi} = \begin{cases} FPR_k + \varphi & \text{if } \Delta^{FPR,v} k > 0 \text{ (original bullish scenario)} \\ FPR_k - \varphi & \text{if } \Delta^{FPR,v} k < 0 \text{ (original bearish scenario)} \end{cases} \quad (52-b)$$

According to the above equations, the scenario generated by applying  $\varphi$  on an original scenario is more aggressive than the original scenario, that is, it represents a variation greater than that given by the original scenario.

The new scenarios – and only them – are used in assessing the risk of the positions in futures-style options, thus not affecting the assessment of positions in futures.

Therefore, one uses scenario  $Scen_{k,\varphi}^{Contiguous} = [Scen_{k_S,\varphi_S}^S, Scen_{k_r,\varphi_r}^r, Scen_{k_{rc},\varphi_{rc}}^{rc}, Scen_{k_{\sigma},\varphi_{\sigma}}^{\sigma}]$ , derived from original scenario  $Scen_k^{Contiguous} = [Scen_{k_S}^S, Scen_{k_r}^r, Scen_{k_{rc}}^{rc}, Scen_{k_{\sigma}}^{\sigma}]$  and from the  $\varphi$  parameters defined for each FPR.

### Scenarios generated from parameter $\delta$

The use of parameter  $\delta$  aims to incorporate into the margin calculation the effect of the imperfect risk offsetting between positions in futures contracts and contracts in futures-style option arising from the impossibility of simultaneously reversing positions in both types of contact, that is, under coinciding scenarios. The application of  $\delta$  results in the decrease of the risk offsetting degree between futures and options and the increase of the required margin of portfolios with opposite positions.

Whereas the scenario generated by applying  $\varphi$  replaces the scenario which originated it, the scenarios generated from  $\delta$  are added to the list of scenarios used in assessing the position in futures-style options, that is, both the modified scenario and that which gave rise to it are used in assessing the portfolios.

Parameter  $\delta$  is applied only to the scenarios of factor  $\mathbf{S}$  of the options, with the application of  $\varphi$  preceding the application of  $\delta$ , that is, we apply  $\delta$  to the scenario resulting from the daily settlement of the original scenario by parameter  $\varphi$ . Therefore,

- for assessing the positions in futures contracts,  $\delta$  modifies the  $\mathbf{S}$  scenario originally defined for such assessment; and
- for assessing the positions in futures-style options,  $\delta$  modifies the scenario derived from applying  $\varphi$  on the original scenario.

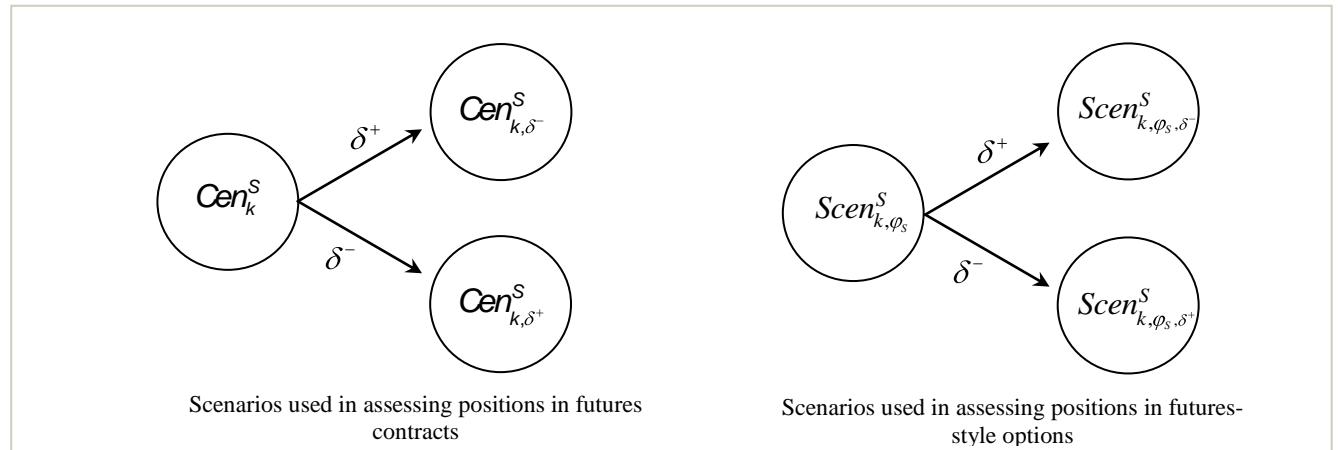
Expressed as a percentage variation and applied to a variation scenario  $\Delta$  for  $\mathbf{S}$ , parameter  $\delta$  generates a new variation scenario  $\Delta_{\delta}$ , given by

$$\Delta_{\delta} = \Delta + \delta \cong 1 + \Delta \times 1 + \delta - 1 \quad (53)$$

For each scenario  $Scen_k^S$  two  $\delta$  values are defined, a negative shock  $\delta_k^-$  and a positive shock  $\delta_k^+$ , which generate, respectively, scenarios  $Scen_{k,\delta^-}^S$  and  $Scen_{k,\delta^+}^S$ , under which  $S$  assumes, respectively, the values

$$S_{Ref} \times [1 + \Delta^S k + \delta_k^-] \quad \text{a} \quad S_{Ref} \times [1 + \Delta^S k + \delta_k^+] \quad \text{for position in futures} \quad (54-a)$$

$$S_{k\phi} \times [1 + \Delta^S k + \delta_k^-] \quad \text{and} \quad S_{k\phi} \times [1 + \Delta^S k + \delta_k^+] \quad \text{for position in futures-style options} \quad (54-b)$$



**Figure 2.5-4 – Replacement of additional scenarios through parameter  $\delta$**

The following table illustrates the construction and utilization of scenarios for FPRs involved in futures-style options, depending on whether one assesses positions in futures-style option or in futures contracts. The original scenarios of the factors not mentioned in the table are utilized.

| FPR                        | ORIGINAL SCENARIO         | SCENARIOS FOR ASSESSING POSITIONS IN FUTURES-STYLE OPTIONS |  |                                 | SCENARIOS FOR ASSESSING POSITIONS IN OPTIONS WITH IN FUTURES CONTRACTS |  |                          |
|----------------------------|---------------------------|--|--|---------------------------------|--|--|--------------------------|
|                            |                           | Generated by $\phi$  | Generated by $\delta^-$ and $\delta^+$ |                                 | Originals  | Generated by $\delta^-$ and $\delta^+$ |                          |
|                            |                           |  |  |                                 |  |  |                          |
| <b>S</b>                   | $Scen_1^S$                | $Scen_{1,\phi_S}^S$  | $Scen_{1,\phi_S,\delta^-}^S$           | $Scen_{1,\phi_S,\delta^+}^S$    | $Scen_1^S$   | $Scen_{1,\delta^-}^S$                  | $Scen_{1,\delta^+}^S$    |
|                            | $\vdots$                  | $\vdots$   | $\vdots$                               | $\vdots$                        | $\vdots$   | $\vdots$                               | $\vdots$                 |
|                            | $Scen_{nc_S}^S$           | $Scen_{nc_S,\phi_S}^S$                                     | $Scen_{nc_S,\phi_S,\delta^-}^S$        | $Scen_{nc_S,\phi_S,\delta^+}^S$ | $Scen_{nc_S}^S$  | $Scen_{nc_S,\delta^-}^S$               | $Scen_{nc_S,\delta^+}^S$ |
| <b>r</b>                   | $Scen_1^r$                | $Scen_{1,\phi_r}^r$  |  |                                 | $Scen_1^r$   |  |                          |
|                            | $\vdots$                  | $\vdots$   |  |                                 | $\vdots$   |  |                          |
|                            | $Scen_{nc_r}^r$           | $Scen_{nc_r,\phi_r}^r$                                     |  |                                 | $Scen_{nc_r}^r$  |  |                          |
| <b>rc</b>                  | $Scen_1^{rc}$             | $Scen_{1,\phi_{rc}}^{rc}$                                  |  |                                 | $Scen_1^{rc}$  |  |                          |
|                            | $\vdots$                  | $\vdots$   |  |                                 | $\vdots$   |  |                          |
|                            | $Scen_{nc_{rc}}^{rc}$     | $Scen_{nc_{rc},\phi_{rc}}^{rc}$                            |  |                                 | $Scen_{nc_{rc}}^{rc}$  |  |                          |
| <b><math>\sigma</math></b> | $Scen_1^\sigma$           | $Scen_{1,\phi_\sigma}^\sigma$                              |  |                                 |  |  |                          |
|                            | $\vdots$                  | $\vdots$   |  |                                 |  |  |                          |
|                            | $Scen_{nc_\sigma}^\sigma$ | $Scen_{nc_\sigma,\phi_\sigma}^\sigma$                      |  |                                 |  |  |                          |

**Table 2.5-5 – Stress scenarios for assessing positions in futures contracts and in contracts with daily settlement**

Therefore, the assessment of risk in futures-style options utilizes contiguous scenarios  $Scen_{k,\varphi}^{Contiguous}$ ,  $Scen_{k,\varphi,\delta^-}^{Contiguous}$  and  $Scen_{k,\varphi,\delta^+}^{Contiguous}$  generated from each original contiguous scenario  $Scen_k^{Contiguous}$  :

$$Scen_{k,\varphi}^{Contiguous} = \left[ Scen_{k_S,\varphi_S}^S, Scen_{k_r,\varphi_r}^r, Scen_{k_{rc},\varphi_{rc}}^{rc}, Scen_{k_\sigma,\varphi_\sigma}^\sigma \right]$$

$$Scen_{k,\varphi,\delta^-}^{Contiguous} = \left[ Scen_{k_S,\varphi_S,\delta^-}^S, Scen_{k_r,\varphi_r}^r, Scen_{k_{rc},\varphi_{rc}}^{rc}, Scen_{k_\sigma,\varphi_\sigma}^\sigma \right]$$

$$Scen_{k,\varphi,\delta^+}^{Contiguous} = \left[ Scen_{k_S,\varphi_S,\delta^+}^S, Scen_{k_r,\varphi_r}^r, Scen_{k_{rc},\varphi_{rc}}^{rc}, Scen_{k_\sigma,\varphi_\sigma}^\sigma \right]$$

**Example 3:** Consider three scenarios defined for each of FPRs  $S$ ,  $r$ ,  $rc$  and  $\sigma$  of any option – original scenarios of bearish, neutral, and bullish type – and respective parameters  $\delta$  and  $\varphi$ .

The following table presents the original scenarios, the values of parameters  $\varphi$  and  $\delta$  and derivated scenarios for assessing positions in futures-style options and in futures. Following the table is the detailed form of obtaining the generated scenarios.

| FPR                        | ORIGINAL SCENARIO | PARAMETERS |            |            | SCENARIOS FOR ASSESSING POSITIONS IN FUTURES-STYLE OPTIONS |  |           | SCENARIOS FOR ASSESSING POSITIONS IN OPTIONS WITH IN FUTURES CONTRACTS |     |     |
|----------------------------|-------------------|------------|------------|------------|--|--|-----------|--|-----|-----|
|                            |                   | $\varphi$  | $\delta^-$ | $\delta^+$ | Generated by $\varphi$                                     | Generated by $\delta^-$ and $\delta^+$ | Originals | Generated by $\delta^-$ and $\delta^+$                                 |     |     |
| <b>S</b>                   | -6%               | 20%        | 0%         | 2%         | -7.2%  | -7.2%                                  | -5.2%     | -6%  | -6% | -4% |
|                            | -                 | -          | -2%        | 3%         | -  | -2%                                    | 3%        | -  | -2% | 3%  |
|                            | +6%               | 30%        | -1%        | 0%         | +7.8%  | 6.8%                                   | 7.8%      | +6%  | 5%  | 6%  |
| <b>r</b>                   | -100 bp           | 10         |            |            | -110 bp  |  |           | -100 bp  |     |     |
|                            | -                 | -          |            |            | -  |  |           | -  |     |     |
|                            | +150 bp           | 10         |            |            | +160 bp  |  |           | +150 bp  |     |     |
| <b>rc</b>                  | -50 bp            | -          |            |            | -50 bp   |  |           | -50 bp   |     |     |
|                            | -                 | -          |            |            | -  |  |           | -  |     |     |
|                            | +10 bp            | -          |            |            | +10 bp   |  |           | +10 bp   |     |     |
| <b><math>\sigma</math></b> | -20%              | 200        |            |            | -22%   |  |           |  |     |     |
|                            | -                 | -          |            |            | -  |  |           |  |     |     |
|                            | +50%              | -          |            |            | +50%   |  |           |  |     |     |

- Application of parameters  $\varphi$  :

Scenarios for  $S$  :  $Scen_{1,\varphi}^S : \Delta_\varphi^S 1 = \Delta^S 1 \times 1 + \varphi = -0.06 \times 1.20 = -7.2\%$   
 $Scen_{3,\varphi}^S : \Delta_\varphi^S 3 = \Delta^S 3 \times 1 + \varphi = 0.06 \times 1.30 = 7.8\%$

Scenarios for  $r$  :  $Scen_{1,\varphi}^r : \Delta_\varphi^r 1 = \Delta^r 1 - \varphi = -100 - 10 = -110$  bp  
 $Scen_{3,\varphi}^r : \Delta_\varphi^r 3 = \Delta^r 3 + \varphi = 150 + 10 = +160$  bp

Scenarios for  $\sigma$  :  $Scen_{1,\varphi}^\sigma : \Delta_\varphi^\sigma 1 = \Delta_1^\sigma 1 - \varphi = -2000 - 200 = -22\%$

$$Scen_{3,\varphi}^{\sigma} : \Delta_{\varphi}^{\sigma} 3 = \Delta^{\sigma} 3 + \varphi = 5000 + 0 = 50\%$$

Scenarios for  $RC$ : are equal to the original scenarios, since  $\varphi = 0$  for the  $RC$  scenarios.

- Application of parameters  $\delta^-$  and  $\delta^+$  for generating the scenarios utilized in assessing positions in futures-style options:

$$Scen_{1,\varphi,\delta^-}^S : \Delta_{\varphi,\delta^-}^S 1 = \Delta_{\varphi}^S 1 + \delta^- = -0.072 + 0 = -7.2\%$$

$$Scen_{1,\varphi,\delta^+}^S : \Delta_{\varphi,\delta^+}^S 1 = \Delta_{\varphi}^S 1 + \delta^+ = -0.072 + 0.02 = -5.2\%$$

$$Scen_{2,\varphi,\delta^-}^S : \Delta_{\varphi,\delta^-}^S 2 = \Delta_{\varphi}^S 2 + \delta^- = 0 - 0.02 = -2\%$$

$$Scen_{2,\varphi,\delta^+}^S : \Delta_{\varphi,\delta^+}^S 2 = \Delta_{\varphi}^S 2 + \delta^+ = 0 + 0.03 = 3\%$$

$$Scen_{3,\varphi,\delta^-}^S : \Delta_{\varphi,\delta^-}^S 3 = \Delta_{\varphi}^S 3 + \delta^- = 0.078 - 0.01 = 6.8\%$$

$$Scen_{3,\varphi,\delta^+}^S : \Delta_{\varphi,\delta^+}^S 3 = \Delta_{\varphi}^S 3 + \delta^+ = 0.078 + 0 = 7.8\%$$

- Application of parameters  $\delta^-$  and  $\delta^+$  for generating the scenarios utilized in assessing positions in futures contracts:

$$Scen_{1,\delta^-}^S : \Delta_{\delta^-}^S 1 = \Delta^S 1 + \delta^- = -0.06 + 0 = -6\%$$

$$Scen_{1,\delta^+}^S : \Delta_{\delta^+}^S 1 = \Delta^S 1 + \delta^+ = -0.06 + 0.02 = -4\%$$

$$Scen_{2,\delta^-}^S : \Delta_{\delta^-}^S 2 = \Delta^S 2 + \delta^- = 0 - 0.02 = -2\%$$

$$Scen_{2,\delta^+}^S : \Delta_{\delta^+}^S 2 = \Delta^S 2 + \delta^+ = 0 + 0.03 = 3\%$$

$$Scen_{3,\delta^-}^S : \Delta_{\delta^-}^S 3 = \Delta^S 3 + \delta^- = 0.06 - 0.01 = 5\%$$

$$Scen_{3,\delta^+}^S : \Delta_{\delta^+}^S 3 = \Delta^S 3 + \delta^+ = 0.06 + 0 = 6\%$$

Once the stress scenarios are defined, determination of margin follows from the calculation of the financial variation of the positions under scenario and the grouping of such variations.

### Calculation of Financial Variation under Scenario and Consolidation of Financial Variations under Scenario of Positions in Futures and in Futures-Style Options

The full valuation model utilized to calculate the market risk of positions in futures-style options is based on the same formulas adopted for conventional options.

Under contiguous scenario  $Scen_k$ , the estimated value of the daily settlement of a position in  $q$  units of an futures-style option is the financial variation given by equation (41).

$$\Delta FV_k = FV_k - FV_{Ref} = [P_k - P_{Ref}] \times F_{\gamma} \times q \times TC \times TM$$

For what comes next, the financial variations associated to positions in futures contracts and in futures-style options are represented by  $\Delta FV^{FPR}$  and  $\Delta FV_{OptA}$ , respectively.

#### Financial variations under scenario – positions in futures contracts

Let  $\Delta FV^{FPR} k$ ,  $\Delta FV^{FPR} k^-$  and  $\Delta FV^{FPR} k^+$  be the financial variations associated to factor  $FPR$ , respectively under scenarios  $Scen_k^{FPR}$ ,  $Scen_{k,\delta^-}^{FPR}$  and  $Scen_{k,\delta^+}^{FPR}$ , derived from the position in futures contracts, obtained by the sum of the variations per contract  $C$  and maturity  $T$  under the respective scenarios, that is,

$$\begin{aligned}\Delta FV^{FPR} k &= \sum_c \sum_T \Delta FV_{c,T}^{FPR} k & \Delta FV^{FPR} k^- &= \sum_c \sum_T \Delta FV_{c,T}^{FPR} k^- \\ \Delta FV^{FPR} k^+ &= \sum_c \sum_T \Delta FV_{c,T}^{FPR} k^+\end{aligned}\quad (55)$$

Given the approximation to variation  $\Delta_\delta^S k$  associated to scenario  $Scen_{k,\delta}^{FPR}$  (equation (53)) and considering that  $\delta$  is not big enough to invert the direction (bullish/bearish) of scenario  $Scen_k^{FPR}$ , the variations per contract and maturity are given by

$$\begin{aligned}\Delta FV_{c,T}^{FPR} k^- &= \Delta FV_{c,T}^{FPR} k + Exposure_{c,T}^{FPR} \times \delta^- \\ \Delta FV_{c,T}^{FPR} k^+ &= \Delta FV_{c,T}^{FPR} k + Exposure_{c,T}^{FPR} \times \delta^+\end{aligned}\quad (56)$$

where terms  $\Delta FV_{c,T}^{FPR} k$  and  $Exposure_{c,T}^{FPR}$  are given, respectively, by equations (20) and (22).

The minimum financial variation associated with factor  $FPR$  and to scenario  $Scen_k^{FPR}$  is defined as

$$\Delta FV^{FPR} k^* = \min \Delta FV^{FPR} k, \Delta FV_{\delta^-}^{FPR} k^-, \Delta FV_{\delta^+}^{FPR} k^+ \quad (57)$$

#### Financial variations under scenario – positions in futures-style options

Let  $\Delta FV_{OptA, S, T} k$ ,  $\Delta FV_{OptA, S, T} k^-$  and  $\Delta FV_{OptA, S, T} k^+$  be the financial variations of the position in futures-style options  $S$ , of the same type of exercise and maturity at  $T$ , respectively under scenarios  $Scen_{k,\varphi}^{Contiguous}$ ,  $Scen_{k,\varphi,\delta^-}^{Contiguous}$  and  $Scen_{k,\varphi,\delta^+}^{Contiguous}$ . The minimum variation between them is denoted as  $\Delta FV_{OptA, S, T} k^*$

$$\Delta FV_{OptA, S, T} k^* = \min \Delta FV_{OptA, S, T} k, \Delta FV_{OptA, S, T} k^-, \Delta FV_{OptA, S, T} k^+ \quad (58)$$

By assuming the minimum financial variations according to equations (57) and (58), one considers that positions in futures contracts and futures-style options can be reversed under any of the three scenarios associated with a same original scenario - that scenario proper and the ones derived through  $\delta^-$  and  $\delta^+$ . Thus, it is possible to assess futures-style options and futures under different scenarios, by reducing the degree of risk offsetting between them.



Risk consolidation of positions in futures and futures-style options

The margin of the portfolio of futures and futures-style options results from the consolidation of the financial variations under scenario, obtained from differentiated scenarios under each type of contract – futures-style options or futures – by applying parameters  $\varphi$  and  $\delta$  to the originally defined scenarios. Such risk consolidation between positions in futures contracts and futures-style options is represented through the *risk consolidation matrix*, whose constructions is described below.

The factors associated with the risk-free interest rates and to the opportunity cost of Futures-Style Options, whose scenarios make up the contiguous scenarios used to assess the Futures-Style Options, are considered as type *rr* risk factors. Consider the scenarios generated from the Cartesian product only of the scenarios defined for such factors, that is, contiguous scenarios  $Scen_i^{r,rc} = [i_1, i_2, i_3, \dots, i_x]$ , where  $i_n$  indicates the  $i_n$ -th scenario for the  $n$ -th factor of type *rr*.

The *risk consolidation matrix* is a matrix of financial variations under scenario, whose columns are associated to primitive risk factors, except volatilities, and whose rows correspond to the contiguous scenarios for type-*rr* factors.

**RISK CONSOLIDATION MATRIX**

|                           | $FPR^1$ | $FPR^2$ | ... | $FPR^j$     | ... |
|---------------------------|---------|---------|-----|-------------|-----|
| $Scen_1^{Contiguous\ rr}$ |         |         |     |             |     |
| $Scen_2^{Contiguous\ rr}$ |         |         |     |             |     |
| ⋮                         |         |         |     |             |     |
| $Scen_i^{Contiguous\ rr}$ |         |         |     | $MCR\ i, j$ |     |
| ⋮                         |         |         |     |             |     |

**Figure 2.5-6 – Risk consolidation matrix of positions in futures contracts and in futures-style options**

The element of position  $i, j$  of *risk consolidation matrix*  $RCM\ i, j$  represents the consolidation of two risks, that is:

- (i) the risk of the position in futures-style options on the underlying asset whose price/quotation variation is factor  $FPR^j$  and
- (ii) the risk associated with factor  $FPR^i$  resulting from the positions in futures contracts,

both being assessed under the restriction of contiguous scenario  $Scen_i^{Contiguous\ rr}$  for the factors which represent risk-free interest rates and opportunity costs of futures-style options.

For example, the *risk consolidation matrix* of a portfolio with positions in futures contracts and futures-style options, both on the Real for USD spot exchange rate, has columns related to spot interest rate,  $DOL$ , pre-fixed interest rate  $r$  and spread rate  $rc$  FPRs, and as many rows as the number of contiguous scenarios for the pair of factors  $r, rc$  obtained by combining the scenarios for  $r$  and for  $rc$ .

Following is the methodology for obtaining  $RCM_{i,j}$ .

Let  $\Delta CFV$  be the consolidated financial variation under scenario of the positions in futures-style options and in futures contracts, defined by risk factor and scenario, according to equation (59) below. If factor  $FPR$  is not the underlying asset of any futures-style option,  $Scen$  represents an individual scenario for factor  $FPR$ ; if factor  $FPR$  is the underlying asset of any futures-style option,  $Scen$  represents a contiguous scenario for the option's primitive risk factors.

(59)

where

$\Delta FV_{OptA,FPR}^{Scen}$  : minimum financial variation concerning contiguous scenario  $Scen$ , associated with the positions in futures-style options on underlying asset  $FPR$ , of same exercise style and different maturities

$$\Delta FV_{OptA,FPR}^{Scen} = \sum_{\substack{\text{Maturities} \\ T}} \Delta FV_{OptA,FPR,T}^{Scen}^*$$

$\Delta FV_{OptA,FPR,T}^{Scen}^*$  according to equation (58)

$\Delta FV^{FPR}^{Scen}^*$  : financial variation of the position in futures contracts under the scenario of factor  $FPR$  which makes up contiguous scenario  $Scen$ , according to equation (57).

If factor  $FPR$  is not the underlying asset of any futures-style options, the first term of the sum in equation (59) is null, that is,  $\Delta CFV_{FPR,Scen}$  represents only the financial variation of the position in futures, associated to factor  $FPR$  and under scenario  $Scen$  of this factor, that is,

$$\Delta CFV_{FPR,Scen} = \Delta FV^{FPR}^{Scen}^*$$

The risk represented by element  $MCR_{i,j}$  of the *risk consolidation matrix* is given by

$$RCM_{i,j} = \min_{Scen_k | Scen_i^{Contiguous\ rr}} \left[ \Delta CFV_{FPR^j, Scen_k} \right] \quad (60)$$

Observe that the determination of minimum consolidated variation  $\Delta CFV_{FPR^j, Scen_k}$ , in equation (60), is a choice restricted, or conditional, to the  $i$ -th contiguous scenario of the risk factors which represent risk-free interest rates and opportunity costs of futures-style option,  $Scen_i^{Contiguous\ rr}$ . Consider the following possibilities for factor  $FPR^j$ :

- (A) there is no futures-style option on underlying asset  $FPR^j$  and  $FPR^j$  is not of the  $rr$ -type
- (B) there is no futures-style option on underlying asset  $FPR^j$  and  $FPR^j$  is of the  $rr$ -type
- (C) there is an futures-style option on underlying asset  $FPR^j$ .

In case (A), the restriction to scenario  $Scen_i^{Contiguous\ rr}$  is not active in the minimization of equation (60), which is then reduced to  $RCM_{i,j} = \min_{Scen_k^j} \Delta FV^{FPR^j} k^*$ .

In case (B), the minimization restricted to scenario  $Scen_i^{Contiguous rr}$  results in the utilization of the scenario of factor  $FPR^j$  which makes up scenario  $Scen_i^{Contiguous rr}$ ; by denoting this scenario by  $Scen_*^j$ , equation (60) is simplified to  $RCM_{i,j} = \Delta VF^{FPR^j} Scen_*^j$ .

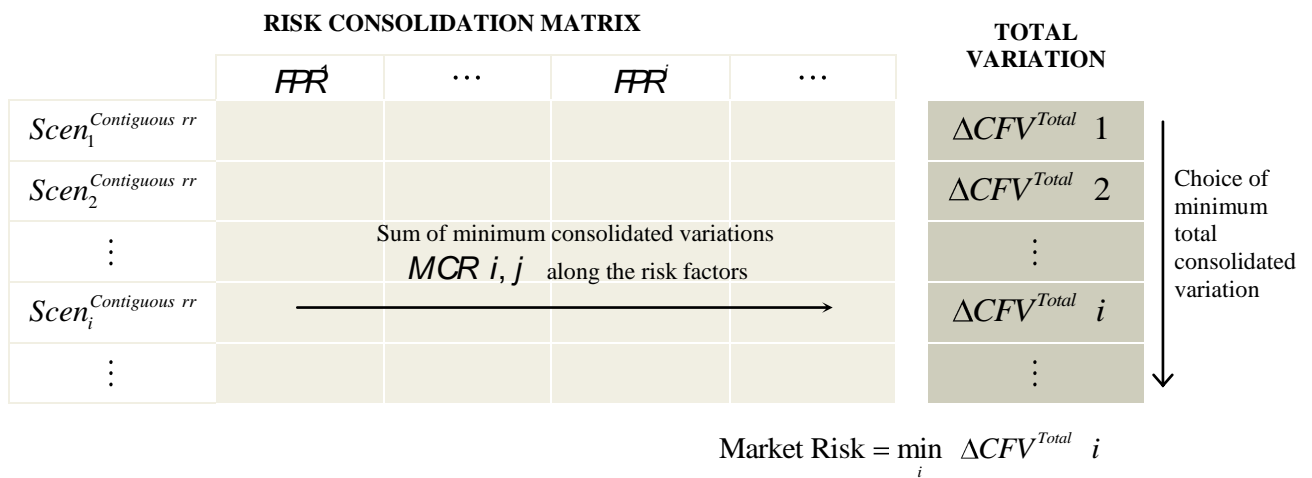
In case (C), one takes the smallest consolidated variation  $\Delta CFV_{FPR^j, Scen_k}$  among those assessed by contiguous scenarios  $Scen_k^{Contiguous}$ , whose scenarios for  $r$  and  $rc$  make up  $Scen_i^{Contiguous rr}$ .

The sum of the variations consolidated per risk factor, restricted to scenario  $Scen_i^{Contiguous rr}$  (the sum of the elements of the  $i$ -th row of the risk consolidation matrix), defines the total consolidated variation restricted to  $Scen_i^{Contiguous rr}$ .

$$\Delta CFV^{Total}_i = RCM_{i,FPR^1} + RCM_{i,RCM^2} + RCM_{i,FPR^3} \dots \quad (61)$$

Finally, the total minimum consolidated variation determines the risk of the portfolio with futures contracts and futures-style options contracts.

$$\text{Market Risk} = \min_i \Delta CFV^{Total}_i = \min \Delta CFV^{Total}_1, \Delta CFV^{Total}_2, \dots \quad (62)$$



**Figure 2.5-7 – Market risk calculation from the risk consolidation matrix**

**Example 4:** Consider a portfolio with position in futures contracts FUT DOL, FUT DDI and FUT DI1 and in futures-style options contracts on the Real for USD spot exchange rate, whose risk factors are the spot exchange rate, the pre-fixed exchange rate, the spread rate and the exchange rate volatility,  $DOL$ ,  $r$ ,  $rc$  and  $\sigma_{DOL}$ , respectively. Assuming scenarios  $Scen_1^r$ ,  $Scen_2^r$  and  $Scen_3^r$  are defined for  $r$  and scenarios  $Scen_1^{rc}$  and  $Scen_2^{rc}$  are defined for  $rc$ , the risk consolidation matrix has 6 rows, corresponding to the 6 contiguous scenarios for  $r, rc$ , and 3 columns, corresponding to the portfolio's FPRs, excluding volatility  $\sigma_{DOL}$ .

Following is a description of the elements of a matrix row – the elements of the remaining rows are similar.

|                                | $r$         | $rc$        | $DOL$       |
|--------------------------------|-------------|-------------|-------------|
| $[Scen_1^r \quad Scen_1^{rc}]$ |             |             |             |
| $[Scen_1^r \quad Scen_2^{rc}]$ |             |             |             |
| $[Scen_2^r \quad Scen_1^{rc}]$ |             |             |             |
| $[Scen_2^r \quad Scen_2^{rc}]$ |             |             |             |
| $[Scen_3^r \quad Scen_1^{rc}]$ | $RCM \ 5,1$ | $RCM \ 5,2$ | $RCM \ 5,3$ |
| $[Scen_3^r \quad Scen_2^{rc}]$ |             |             |             |

Since there is no futures-style option on  $r$ , term  $RCM \ 5,1$  represents only the position's variation in futures contracts associated to factor  $r$  and under scenario  $r$  which is in contiguous scenario  $Scen_5^{Contiguous \ rr}$ ,  $Scen_3^r$ .

Likewise, term  $RCM \ 5,2$  represents only the position's variation in futures contracts associated to factor  $rc$  and under scenario for  $rc$  which is in contiguous scenario  $Scen_5^{Contiguous \ rr}$ ,  $Scen_1^{rc}$ .

Term  $RCM \ 5,3$  represents variations of the position in option and of the positions in futures which have the spot exchange rate as a risk factor. Thus, to calculate  $MCR \ 5,3$ , consolidated variation  $\Delta CFV \ DOL, Scen_k$  is considered in minimization, such that:

- i. its part of variation of the position in futures-style option,  $\Delta FV_{OptA,FPR}$ , involves only the variations calculated under contiguous scenarios  $Scen_k$  that are formed with scenarios  $Scen_3^r$  and  $Scen_1^{rc}$ , in addition to the scenarios for  $DOL$  and  $\sigma_{DOL}$ .
- ii. Its part of variation of the futures positions,  $\Delta VF^{FPR} \ Scen^*$ , refers only to the positions in FUT DDI and FUT DOL contracts and involves the same sc of the  $DOL \ FPR$  of the contiguous scenario  $Scen_k$  utilized to calculate the variation of the option position.

**Example 5:** Consider a portfolio with position in futures contract and futures-style options contracts on the Real for USD spot exchange rate, grouped in the same subportfolio.

| PORTFOLIO |                     |              |           |       |
|-----------|---------------------|--------------|-----------|-------|
| Contract  | FUT DOL             |              | OPT DOL   |       |
|           | Timeframe (bd / cd) | Maturity     | ETLM.     |       |
|           | 29 / 43             | $T_1$        | 29 / 43   | $T_1$ |
| L / S     | No. of contracts    | V 15         | C 20      |       |
|           | Strike Price        |              | 2,050.00  |       |
|           | $VF$                | 1,566,022.50 | 48,478.00 |       |

Consider the following scenarios for the FPRs grouped in the same area:

$Scen_1^r$ ,  $Scen_2^r$  and  $Scen_3^r$  for  $r$ : of decreasing, null, and increasing rate

$Scen_1^{rc}$  and  $Scen_2^{rc}$  for  $rc$ : null and increasing rate

$Scen_1^{DOL}$ ,  $Scen_2^{DOL}$  and  $Scen_3^{DOL}$  for  $DOL$ : of  $\pm 7\%$  and null variations

$Scen_1^\sigma$  of null variation for  $\sigma$ .

The following table presents the scenarios utilized to assess the positions in futures contracts and futures-style options, given parameters  $\varphi$  (only for the  $DOL$  FPR) and  $\delta$ .

| FPR                        | ORIGINAL SCENARIO | PARAMETER |            |            | SCENARIOS FOR ASSESSING POSITIONS IN FUTURES-STYLE OPTIONS |  |  | SCENARIOS FOR ASSESSING POSITIONS IN OPTIONS WITH IN FUTURES CONTRACTS |  |  |
|----------------------------|-------------------|-----------|------------|------------|--|--|--|--|--|--|
|                            |                   | $\varphi$ | $\delta^-$ | $\delta^+$ | Generated by $\varphi$                                     | Generated by $\delta^-$ and $\delta^+$ | Generated by $\delta^-$ and $\delta^+$ | Originals  | Generated by $\delta^-$ and $\delta^+$ | Generated by $\delta^-$ and $\delta^+$ |
| <b>DOL</b>                 | -7%               | 25%       | 0%         | 1%         | -8.75%   | -8.75%                                 | -7.75%                                 | -7%  | -7%                                    | -6%                                    |
|                            | -                 | -         | -1%        | 1%         | -  | -1%                                    | 1%                                     | -  | -1%                                    | +1%                                    |
|                            | +7%               | 25%       | -1%        | 0%         | 8.75%  | 7.75%                                  | 8.75%                                  | +7%  | +6%                                    | +7%                                    |
| <b>r</b>                   | $Scen_1^r$        | -         |            |            | $Scen_1^r$   |  |  | $Scen_1^r$   |  |  |
|                            | $Scen_2^r$        | -         |            |            | $Scen_2^r$   |  |  | $Scen_2^r$   |  |  |
|                            | $Scen_3^r$        | -         |            |            | $Scen_3^r$   |  |  | $Scen_3^r$   |  |  |
| <b>rc</b>                  | $Scen_1^{rc}$     | -         |            |            | $Scen_1^{rc}$  |  |  | $Scen_1^{rc}$  |  |  |
|                            | $Scen_2^{rc}$     | -         |            |            | $Scen_2^{rc}$  |  |  | $Scen_2^{rc}$  |  |  |
| <b><math>\sigma</math></b> | $Scen_1^\sigma$   | -         |            |            | $Scen_1^\sigma$  |  |  | $Scen_1^\sigma$  |  |  |

Calculation of variations under scenarios of positions in futures contracts:

| FPR        | FINANCIAL VARIATION UNDER SCENARIO |                            |                               |
|------------|------------------------------------|----------------------------|-------------------------------|
|            | $Scen_1^{FPR}$                     | $Scen_2^{FPR}$             | $Scen_3^{FPR}$                |
| <b>r</b>   | $Scen_1^r$<br>2,624.27             | $Scen_2^r$<br>-            | $Scen_3^r$<br>-2,647.67       |
| <b>rc</b>  | $Scen_1^{rc}$<br>-                 | $Scen_2^{rc}$<br>11,708.24 |                               |
| <b>DOL</b> | $Scen_1^{DOL}$<br>109,621.57       | $Scen_2^{DOL}$<br>-        | $Scen_3^{DOL}$<br>-109,621.57 |
|            | 109,621.57                         | 15,660.23                  | -93,961.35                    |
|            | 93,961.35                          | -15,660.23                 | -109,621.57                   |
|            | 93,961.35                          | -15,660.23                 | -109,621.57                   |

$\leftarrow$  under the original scenario  
 $\leftarrow$  under the scenario modified by  $\delta^-$   
 $\leftarrow$  under the scenario modified by  $\delta^+$   
 $\leftarrow \Delta FV^{DOL} Scen^*$

Assessment of the position in futures-style options and consolidation with the position in futures:

| CONTIGUOUS SCENARIO   |                |               |                |                                  | FINANCIAL VARIATION UNDER SCENARIO  |                                   |         |                     | TOTAL  |        |
|-----------------------|----------------|---------------|----------------|----------------------------------|-------------------------------------|-----------------------------------|---------|---------------------|--------|--------|
|                       |                |               |                |                                  | POSITION IN OPTION – MATURITY $T_1$ |                                   |         | POSITION IN FUTURES |        |        |
| $DOL$                 | $r$            | $rc$          | $\sigma_{DOL}$ | Scenarios generated by $\varphi$ | Scenarios generated by $\delta^+$   | Scenarios generated by $\delta^-$ | Minimum |                     |        |        |
| $Scen_1^{Contiguous}$ | $Scen_1^{DOL}$ | $Scen_1^{rc}$ | $Scen_1^{rc}$  | $Scen_1^\sigma$                  | -48,361                             | -48,162                           | -48,361 | -48,361             | 93,961 | 45,601 |

|                          |                |               |               |  |  |         |         |         |         |          |                |
|--------------------------|----------------|---------------|---------------|--|--|---------|---------|---------|---------|----------|----------------|
| $Scen_2^{Contiguous}$    | $Scen_2^{DOL}$ |               |               |  |  | -2,546  | 13,547  | -16,299 | -16,299 | -15,660  | <b>-31,959</b> |
| $Scen_3^{Contiguous}$    | $Scen_3^{DOL}$ |               |               |  |  | 168,910 | 168,910 | 146,252 | 146,252 | -109,622 | 36,630         |
| $Scen_4^{Contiguous}$    | $Scen_1^{DOL}$ |               |               |  |  | -48,424 | -48,323 | -48,424 | -48,424 | 93,961   | 45,537         |
| $Scen_5^{Contiguous}$    | $Scen_2^{DOL}$ | $Scen_1^{rc}$ | $Scen_1^{rc}$ |  |  | -12,730 | 1,608   | -24,475 | -24,475 | -15,660  | <b>-40,135</b> |
| $Scen_6^{Contiguous}$    | $Scen_3^{DOL}$ |               |               |  |  | 152,560 | 152,560 | 130,084 | 130,084 | -109,622 | 20,462         |
| $Scen_7^{Contiguous}$    | $Scen_1^{DOL}$ |               |               |  |  | -48,339 | -48,108 | -48,339 | -48,339 | 93,961   | 45,623         |
| $Scen_8^{Contiguous}$    | $Scen_2^{DOL}$ | $Scen_1^{rc}$ | $Scen_1^{rc}$ |  |  | 0       | 16,465  | -14,198 | -14,198 | -15,660  | <b>-29,858</b> |
| $Scen_9^{Contiguous}$    | $Scen_3^{DOL}$ |               |               |  |  | 172,708 | 172,708 | 150,009 | 150,009 | -109,622 | 40,387         |
| $Scen_{10}^{Contiguous}$ | $Scen_1^{DOL}$ |               |               |  |  | -48,413 | -48,294 | -48,413 | -48,413 | 93,961   | 45,548         |
| $Scen_{11}^{Contiguous}$ | $Scen_2^{DOL}$ | $Scen_1^{rc}$ | $Scen_1^{rc}$ |  |  | -10,499 | 4,264   | -22,717 | -22,717 | -15,660  | <b>-38,377</b> |
| $Scen_{12}^{Contiguous}$ | $Scen_3^{DOL}$ |               |               |  |  | 156,329 | 156,329 | 133,809 | 133,809 | -109,622 | 24,187         |
| $Scen_{13}^{Contiguous}$ | $Scen_1^{DOL}$ |               |               |  |  | -48,312 | -48,045 | -48,312 | -48,312 | 93,961   | 45,649         |
| $Scen_{14}^{Contiguous}$ | $Scen_2^{DOL}$ | $Scen_1^{rc}$ | $Scen_1^{rc}$ |  |  | 2,643   | 19,470  | -11,995 | -11,995 | -15,660  | <b>-27,656</b> |
| $Scen_{15}^{Contiguous}$ | $Scen_3^{DOL}$ |               |               |  |  | 176,554 | 176,554 | 153,814 | 153,814 | -109,622 | 44,192         |
| $Scen_{16}^{Contiguous}$ | $Scen_1^{DOL}$ |               |               |  |  | -48,400 | -48,261 | -48,400 | -48,400 | 93,961   | 45,561         |
| $Scen_{17}^{Contiguous}$ | $Scen_2^{DOL}$ | $Scen_1^{rc}$ | $Scen_1^{rc}$ |  |  | -8,167  | 7,014   | -20,859 | -20,859 | -15,660  | <b>-36,519</b> |
| $Scen_{18}^{Contiguous}$ | $Scen_3^{DOL}$ |               |               |  |  | 160,146 | 160,146 | 137,583 | 137,583 | -109,622 | 27,961         |

In the table above, columns under heading **Contiguous Scenario** present the contiguous scenarios as well as the individual FPR scenarios which form them.

The columns under heading **Financial variation under scenario – Position in Futures-Style Options maturity  $T_1$**  present the variations, of the position in futures-style option, under contiguous scenario – for each row, one calculates the variations under the contiguous scenario formed by the **DOL** scenario altered by  $\varphi$  and (i) without impact from  $\delta$ , (ii) with impact from  $\delta^+$  and (iii) with impact from  $\delta^-$ ; finally, for each original contiguous scenario (each row), one takes the minimum variation between the variations under each of the 3 contiguous scenarios derived from the original scenario.

On the last column of the table, each row contains the financial variation of the position in futures associated to the **DOL** FPR and under the **DOL** scenario corresponding to the row, that is, the minimum between those

(i) under the original scenario, (ii) under the scenario altered by  $\delta^-$  and (iii) under the scenario altered by  $\delta^+$ .

The last column of the table represents the sum of the variations of the two preceding columns. The values in bold correspond to the minimum variation, among the variations under contiguous scenarios with the same pair of scenarios for  $r, rc$  - these are the minimum consolidated variations of the column of the risk consolidation matrix referring to the *DOL* FPR.

The risk consolidation matrix has, in each row of the column referring to FPR  $r$  the variation of the position in futures associated to  $r$  and under the scenario of  $r$  which forms the contiguous scenario for pair  $r, rc$  corresponding to the row. Similarly, each row of the column referring to FPR  $rc$  contains the value of the variation of the position in futures associated to factor  $rc$  and under the scenario of  $rc$  of the contiguous scenario for pair  $r, rc$  corresponding to the row. The column corresponding to factor *DOL* contains, in each row, the minimum consolidated variation of the positions in futures and in futures-style options – highlighted in bold in the last column of the table above.

|                            | $r$       | $rc$      | <i>DOL</i>     | TOTAL VARIATION<br>$\Delta CFV^{Total}$ |
|----------------------------|-----------|-----------|----------------|---|
| $[Scen_1^r \ Scen_1^{rc}]$ | 2,624.27  | -         | <b>-31,959</b> | -29,335                                 |
| $[Scen_1^r \ Scen_2^{rc}]$ | 2,624.27  | 11,708.24 | <b>-40,135</b> | -25,802                                 |
| $[Scen_2^r \ Scen_1^{rc}]$ | -         | -         | <b>-29,858</b> | -29,858                                 |
| $[Scen_2^r \ Scen_2^{rc}]$ | -         | 11,708.24 | <b>-38,377</b> | -26,669                                 |
| $[Scen_3^r \ Scen_1^{rc}]$ | -2,647.67 | -         | <b>-27,656</b> | <b>-30,304</b>                          |
| $[Scen_3^r \ Scen_2^{rc}]$ | -2,647.67 | 11,708.24 | <b>-36,519</b> | -27,458                                 |

$$\text{Market Risk} = \min_i \Delta CFV^{Total} = -30,304$$

**Example 6:** Consider the portfolio in **Example 5** and add a position long in futures-style option of maturity  $T_2$ , a position long in Ibovespa futures contract and a position long in spread rate futures contract, all belonging to the same subportfolio.

| PORTFOLIO                       |              |       |                 |       |                  |       |              |       |              |       |
|---------------------------------|--------------|-------|-----------------|-------|------------------|-------|--------------|-------|--------------|-------|
| Contract                        | FUT DOL      |       | OPT DOL<br>FLM. |       | OPT DOL<br>ETLM. |       | FUT IND      |       | FUT DDI      |       |
| Timeframe (bd / cd)<br>Maturity | 29 / 43      | $T_1$ | 29 / 43         | $T_1$ | 73 / 51          | $T_2$ | 85 / 58      | $T_3$ | 29 / 43      | $T_1$ |
| L / S No. of contracts          | V            | 15    | C               | 20    | C                | 20    | C            | 30    | C            | 20    |
| Strike Price                    |              |       | 2.050,00        |       | 2.050,00         |       |              |       |              |       |
| $\sqrt{F}$                      | 1.566.022,50 |       | 48.478,00       |       | 62.639,70        |       | 1.351.710,00 |       | 2.060.713,35 |       |

Consider the same scenarios for factors  $r$ ,  $rc$ , *DOL* and  $\sigma$  defined in **Example 5**, as well as parameters  $\varphi$  and  $\delta$  and, for the additional risk factors, consider a null variation scenario for convenience yield rate,  $cy$ , and 3 scenarios for the spot Ibovespa value FPR – null and  $\pm 10\%$  variation scenarios – grouped in a single area,

so that the scenarios table is omitted.

Calculation of variations under scenarios of positions in futures contracts: in addition to the variations associated with additional factors  $cy$  and  $IBV$ , the variations associated with factor  $r$  are also altered.

| FPR   | FINANCIAL VARIATION UNDER SCENARIO |                |                |
|-------|------------------------------------|----------------|----------------|
|       | $\Delta FV^{FPR}$                  | $Scen^{FPR}_1$ | $Scen^{FPR}_2$ |
| $r$   | $Scen_1^r$                         | $Scen_2^r$     | $Scen_3^r$     |
|       | -2,213.44                          | -              | 2,308.77       |
| $rc$  | $Scen_1^{rc}$                      | $Scen_2^{rc}$  |                |
|       | -                                  | -3,698.51      |                |
| $DOL$ | $Scen_1^{DOL}$                     | $Scen_2^{DOL}$ | $Scen_3^{DOL}$ |
|       | -34,628.36                         | -              | 34,628.36      |
|       | -34,628.36                         | -4,946.91      | 29,681.45      |
|       | -29,681.45                         | 4,946.91       | 34,628.36      |
|       | -34,628.36                         | -4,946.91      | 29,681.45      |
| $cy$  | $Scen_1^{cy}$                      |                |                |
|       | -                                  |                |                |
| $IBV$ | $Scen_1^{IBV}$                     | $Scen_2^{IBV}$ | $Scen_3^{IBV}$ |
|       | -135,171                           | -              | 135,171        |

← under the original scenario  
 ← under the scenario modified by  $\delta^-$   
 ← under the scenario modified by  $\delta^+$   
 ←  $\Delta FV^{DOL} Scen^*$

**Assessment of the position in Futures-Style Options:** if there are positions in options with different maturities, one selects, per maturity, the minimum variation associated with an original contiguous scenario – among the variation under each of the 3 contiguous scenarios generated from parameters  $\varphi$ ,  $\delta^-$  and  $\delta^+$ . This means that the table for assessing the portfolio of futures-style options has as many blocks under heading

**Financial variation under scenario** as the number of different maturities of options in the portfolio. The minimum variation of the options portfolio is given by the sum of the minimum variations of each maturity.



| CONTIGUOUS SCENARIO      |                |               |               |                 | FINANCIAL VARIATION UNDER SCENARIO |                                 |                                 |                                |                                 |                                 |
|--------------------------|----------------|---------------|---------------|-----------------|------------------------------------|---------------------------------|---------------------------------|--------------------------------|---------------------------------|---------------------------------|
|                          |                |               |               |                 | POSITION OPTIONS MATUR. $T_1$      |                                 |                                 | POSITION OPTIONS MATUR. $T_2$  |                                 |                                 |
|                          | $DOL$          | $r$           | $rc$          | $\sigma_{DOL}$  | Scenarios altered by $\varphi$     | Scenarios altered by $\delta^+$ | Scenarios altered by $\delta^-$ | Scenarios altered by $\varphi$ | Scenarios altered by $\delta^+$ | Scenarios altered by $\delta^-$ |
| $Scen_1^{Contiguous}$    | $Scen_1^{DOL}$ | $Scen_1^{rc}$ | $Scen_1^{rc}$ | $Scen_1^\sigma$ | -48,361                            | -48,162                         | -48,361                         | 61,515                         | 60,566                          | 61,515                          |
| $Scen_2^{Contiguous}$    | $Scen_2^{DOL}$ |               |               |                 | -2,546                             | 13,547                          | -16,299                         | 4,645                          | -10,927                         | 18,395                          |
| $Scen_3^{Contiguous}$    | $Scen_3^{DOL}$ |               |               |                 | 168,910                            | 168,910                         | 146,252                         | -162,617                       | -162,617                        | -140,001                        |
| $Scen_4^{Contiguous}$    | $Scen_1^{DOL}$ | $Scen_1^r$    | $Scen_2^{rc}$ |                 | -48,424                            | -48,323                         | -48,424                         | 62,161                         | 61,698                          | 62,161                          |
| $Scen_5^{Contiguous}$    | $Scen_2^{DOL}$ |               |               |                 | -12,730                            | 1,608                           | -24,475                         | 21,668                         | 8,615                           | 32,699                          |
| $Scen_6^{Contiguous}$    | $Scen_3^{DOL}$ |               |               |                 | 152,560                            | 152,560                         | 130,084                         | -134,092                       | -134,092                        | -111,943                        |
| $Scen_7^{Contiguous}$    | $Scen_1^{DOL}$ | $Scen_2^r$    | $Scen_1^{rc}$ |                 | -48,339                            | -48,108                         | -48,339                         | 61,272                         | 60,157                          | 61,272                          |
| $Scen_8^{Contiguous}$    | $Scen_2^{DOL}$ |               |               |                 | 0                                  | 16,465                          | -14,198                         | 0                              | -16,131                         | 14,384                          |
| $Scen_9^{Contiguous}$    | $Scen_3^{DOL}$ |               |               |                 | 172,708                            | 172,708                         | 150,009                         | -169,644                       | -169,644                        | -146,931                        |
| $Scen_{10}^{Contiguous}$ | $Scen_1^{DOL}$ | $Scen_2^r$    | $Scen_2^{rc}$ |                 | -48,413                            | -48,294                         | -48,413                         | 62,045                         | 61,490                          | 62,045                          |
| $Scen_{11}^{Contiguous}$ | $Scen_2^{DOL}$ |               |               |                 | -10,499                            | 4,264                           | -22,717                         | 17,832                         | 4,138                           | 29,535                          |
| $Scen_{12}^{Contiguous}$ | $Scen_3^{DOL}$ |               |               |                 | 156,329                            | 156,329                         | 133,809                         | -140,993                       | -140,993                        | -118,718                        |
| $Scen_{13}^{Contiguous}$ | $Scen_1^{DOL}$ | $Scen_3^r$    | $Scen_1^{rc}$ |                 | -48,312                            | -48,045                         | -48,312                         | 60,977                         | 59,669                          | 60,977                          |
| $Scen_{14}^{Contiguous}$ | $Scen_2^{DOL}$ |               |               |                 | 2,643                              | 19,470                          | -11,995                         | -4,948                         | -21,627                         | 10,066                          |
| $Scen_{15}^{Contiguous}$ | $Scen_3^{DOL}$ |               |               |                 | 176,554                            | 176,554                         | 153,814                         | -176,872                       | -176,872                        | -154,064                        |
| $Scen_{16}^{Contiguous}$ | $Scen_1^{DOL}$ | $Scen_3^r$    | $Scen_2^{rc}$ |                 | -48,400                            | -48,261                         | -48,400                         | 61,902                         | 61,235                          | 61,902                          |
| $Scen_{17}^{Contiguous}$ | $Scen_2^{DOL}$ |               |               |                 | -8,167                             | 7,014                           | -20,859                         | 13,690                         | -644                            | 26,079                          |
| $Scen_{18}^{Contiguous}$ | $Scen_3^{DOL}$ |               |               |                 | 160,146                            | 160,146                         | 137,583                         | -148,098                       | -148,098                        | -125,702                        |

| CONTIGUOUS SCENARIO                             |   |  |  |   | FINANCIAL VARIATION UNDER SCENARIO |                                |                |                     |                   |
|---|---|--|--|---|------------------------------------|--------------------------------|----------------|---------------------|-------------------|
|   |   |  |  |   | POSITION FUTURES-STYLE OPTIONS     |                                |                | POSITION IN FUTURES | TOTAL             |
| <i>DOL</i>                                      | <i>r</i>                                | <i>rc</i>                              | $\sigma_{DOL}$                         | Minimum $T_1$   | Minimum $T_2$                      | Minimum $T_1$<br>Minimum $T_2$ |                |                     |                   |
| <i>Scen</i> <sub>1</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>1</sub> <sup>DOL</sup> | <i>Scen</i> <sub>1</sub> <sup>rc</sup> | <i>Scen</i> <sub>1</sub> <sup>rc</sup> | <i>Scen</i> <sub>1</sub> <sup><math>\sigma</math></sup> | -48,361                            | 60,566                         | <b>12,205</b>  | -34,628,36          | -22,423,36        |
| <i>Scen</i> <sub>2</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>2</sub> <sup>DOL</sup> |  |  |   | -16,299                            | -10,927                        | <b>-27,226</b> | -4,946.91           | <b>-32,172.91</b> |
| <i>Scen</i> <sub>3</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>3</sub> <sup>DOL</sup> |  |  |   | 146,252                            | -162,617                       | <b>-16,365</b> | 29,681.45           | 13,316.45         |
| <i>Scen</i> <sub>4</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>1</sub> <sup>DOL</sup> | <i>Scen</i> <sub>1</sub> <sup>r</sup>  | <i>Scen</i> <sub>2</sub> <sup>rc</sup> |   | -48,424                            | 61,698                         | <b>13,274</b>  | -34,628.36          | <b>-21,354.36</b> |
| <i>Scen</i> <sub>5</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>2</sub> <sup>DOL</sup> |  |  |   | -24,475                            | 8,615                          | <b>-15,860</b> | -4,946.91           | -20,806.91        |
| <i>Scen</i> <sub>6</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>3</sub> <sup>DOL</sup> |  |  |   | 130,084                            | -134,092                       | <b>-4,008</b>  | 29,681.45           | 25,673.45         |
| <i>Scen</i> <sub>7</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>1</sub> <sup>DOL</sup> | <i>Scen</i> <sub>2</sub> <sup>r</sup>  | <i>Scen</i> <sub>1</sub> <sup>rc</sup> |   | -48,339                            | 60,157                         | <b>11,818</b>  | -34,628.36          | -22,810.36        |
| <i>Scen</i> <sub>8</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>2</sub> <sup>DOL</sup> |  |  |   | -14,198                            | -16,131                        | <b>-30,329</b> | -4,946.91           | <b>-35,275.91</b> |
| <i>Scen</i> <sub>9</sub> <sup>Contiguous</sup>  | <i>Scen</i> <sub>3</sub> <sup>DOL</sup> |  |  |   | 150,009                            | -169,644                       | <b>-19,635</b> | 29,681.45           | 10,046.45         |
| <i>Scen</i> <sub>10</sub> <sup>Contiguous</sup> | <i>Scen</i> <sub>1</sub> <sup>DOL</sup> | <i>Scen</i> <sub>2</sub> <sup>r</sup>  | <i>Scen</i> <sub>2</sub> <sup>rc</sup> |   | -48,413                            | 61,490                         | <b>13,077</b>  | -34,628.36          | -21,551.36        |
| <i>Scen</i> <sub>11</sub> <sup>Contiguous</sup> | <i>Scen</i> <sub>2</sub> <sup>DOL</sup> |  |  |   | -22,717                            | 4,138                          | <b>-18,579</b> | -4,946.91           | <b>-23,525.91</b> |
| <i>Scen</i> <sub>12</sub> <sup>Contiguous</sup> | <i>Scen</i> <sub>3</sub> <sup>DOL</sup> |  |  |   | 133,809                            | -140,993                       | <b>-7,184</b>  | 29,681.45           | 22,497.45         |
| <i>Scen</i> <sub>13</sub> <sup>Contiguous</sup> | <i>Scen</i> <sub>1</sub> <sup>DOL</sup> | <i>Scen</i> <sub>3</sub> <sup>r</sup>  | <i>Scen</i> <sub>1</sub> <sup>rc</sup> |   | -48,312                            | 59,669                         | <b>11,357</b>  | -34,628.36          | -23,271.36        |
| <i>Scen</i> <sub>14</sub> <sup>Contiguous</sup> | <i>Scen</i> <sub>2</sub> <sup>DOL</sup> |  |  |   | -11,995                            | -21,627                        | <b>-33,622</b> | -4,946.91           | <b>-38,568.91</b> |
| <i>Scen</i> <sub>15</sub> <sup>Contiguous</sup> | <i>Scen</i> <sub>3</sub> <sup>DOL</sup> |  |  |   | 153,814                            | -176,872                       | <b>-23,058</b> | 29,681.45           | 6,623.45          |
| <i>Scen</i> <sub>16</sub> <sup>Contiguous</sup> | <i>Scen</i> <sub>1</sub> <sup>DOL</sup> | <i>Scen</i> <sub>3</sub> <sup>r</sup>  | <i>Scen</i> <sub>2</sub> <sup>rc</sup> |   | -48,400                            | 61,235                         | <b>12,835</b>  | -34,628.36          | -21,793.36        |
| <i>Scen</i> <sub>17</sub> <sup>Contiguous</sup> | <i>Cen</i> <sub>2</sub> <sup>DOL</sup>  |  |  |   | -20,859                            | -644                           | <b>-21,503</b> | -4,946.91           | <b>-26,449.91</b> |
| <i>Scen</i> <sub>18</sub> <sup>Contiguous</sup> | <i>Cen</i> <sub>3</sub> <sup>DOL</sup>  |  |  |   | 137,583                            | -148,098                       | <b>-10,515</b> | 29,681.45           | 19,166.45         |

The columns under heading **Financial variation under scenario – Position in Futures-Style Options** present the variations associated with each maturity and their sum. The column before last contains the financial variation of the position in futures associated with the FPR, whereas the last column represents the sum of the two previous ones.

In comparison with the portfolio in *Example 5*, the portfolio's risk consolidation matrix in this example has two additional columns, related to the FPRs added by including the position in Ibovespa's futures contract, *CY* and *IBV*.

Since these factors are not of the *rr* type and the variations associated to them derive only from the position in futures, the rows of each new column contain the same value, equal to the minimum variation under scenario. Additionally, the variations associated to factor *r*, which in *Example 5* derived only from the position in the exchange rate futures contract, here include also the variations of the position in Ibovespa's futures contract.

|                                | <i>r</i> | <i>rc</i> | <i>DOL</i> | <i>CY</i> | <i>IBV</i> | TOTAL VARIATION<br>$\Delta CFV^{Total}$ |
|--------------------------------|----------|-----------|------------|-----------|------------|---|
| $[Scen_1^r \quad Scen_1^{rc}]$ | 2,213    | -         | 32,172.91  | -         | -135,171   | -169,557                                |
| $[Scen_1^r \quad Scen_2^{rc}]$ | 2,213    | 3,698.5   | 21,354.36  | -         | -135,171   | -162,437                                |
| $[Scen_2^r \quad Scen_1^{rc}]$ | -        | -         | 35,275.91  | -         | -135,171   | -170,447                                |
| $[Scen_2^r \quad Scen_2^{rc}]$ | -        | 3,698.5   | 23,525.91  | -         | -135,171   | -162,395                                |
| $[Scen_3^r \quad Scen_1^{rc}]$ | 2,308.77 | -         | 38,568.91  | -         | -135,171   | -171,431                                |
| $[Scen_3^r \quad Scen_2^{rc}]$ | 2,308.77 | 3,698.5   | 26,449.91  | -         | -135,171   | -163,011                                |

$$\text{Market Risk} = \min_i \Delta CFV^{Total} \quad i = -171,431$$

Just as it happens in assessing the risk of positions in futures contracts, stress scenarios are grouped in scenarios areas, in order to exclude the results obtained under very unlikely scenarios combinations. Thus, just as in the margin methodology for futures contracts, one calculates the risk of a portfolio involving futures-style options in each scenarios area and takes the highest risk per area as the market risk of such portfolio. When assessing the local risk in area *A*, one considers only the scenarios belonging to *A*, that is, the variation scenarios for FPRs and the contiguous scenarios generated by combining them,  $Scen^{Contiguous}$  and  $Scen^{Contiguous \ rr}$ .

Additionally, the futures-style options are also distributed into subportfolios, and the risk condition between futures and futures-style options takes place between contracts belonging to the same subportfolio. The portfolio's margin is obtained as the sum of the margins of each subportfolio. The subportfolio margin, in turn, is a function of the local risk in each scenarios area.

Therefore, considering the grouping of contracts in subportfolios and the grouping of the scenarios in areas, one applies the rules of risk consolidation, through the *risk consolidation matrix*, to each pair of subportfolio and scenarios area. Assuming that the contracts of a subportfolio – futures and futures-style options– are grouped in  $N_{Subp}$  subportfolios, denoted by  $Subp_s$ , one has

where *Local Risk*  $A, Subp_s$  is given by equation (62), considering only the scenarios of area  $A$  and only the contracts / positions belonging to subportfolio  $Subp_s$ .

### **Subportfolio 2 Procedure**

The Subportfolio 2 Procedure is applied to calculate the margin of future-style options, as presented in the section on margin of futures contracts, that is, given a portfolio, the margin arises from two risk values – one related to the full portfolio,  $Subportfolio_{All}$ , and the other related to the original portfolio excluding the positions in short contracts,  $Subportfolio_{Long}$ . Thus,

$$\begin{aligned} \text{Market Risk } Subp_s &= \\ &= \min_A \min \left[ \text{Local Risk } A, Subportfolio_{s,All} , \text{Local Risk } A, Subportfolio_{s,Long} \right] \end{aligned}$$

where  $Subportfolio_{s,All}$  and  $Subportfolio_{s,Long}$  are those related to the procedure – original and without the short contracts – considering only the contracts belonging to subportfolio  $S$ .

### **Minimum Margin**

There is no charging of minimum margin for positions in future-style options.

#### **2.5.5. Margin Of Options On Futures Contracts**

The margin of an option contract position in a futures contract is determined according to the methodology described herein, until the option is exercised or at its maturity.

The exercise of the option on a futures contract implies the extinction of the position in the option contract and assuming the position in the futures contract. For futures contracts traded in price, if the option is a call (put), the holder assumes a long (short) position and the writer assumes a short (long) position in the futures contract. For rate-based futures contracts, if the option is a call (put), the holder assumes a short (long) position and the writer assumes a long (short) position, price-based, in the futures contract.

Therefore, after the option on the futures contract is exercised, the margin refers to the position in the futures market, calculated according to the corresponding methodology.

## 2.6. Margin Calculation Methodology for After-Hours Trades

The margin, according to the methodologies described in the preceding sections, is a function of the difference between the settlement cost and the portfolio's market risk. As presented previously, (i) the calculation of the portfolio's settlement cost covers only the positions arising from the transactions traded during regular trading hours and (ii) the calculation of the portfolio's market risk applies to the positions resulting from transactions carried out during regular and after-hours trading sessions.

The transactions carried out in after-hours session, on date  $D$ , are considered part of the transfers of regular trading on  $D+1$  and the cash settlement occurs on  $D+2$ . For the purpose of margin requirement, however, such transactions are considered in the calculation of the net closing position of  $D+1$ , with the addition to the portfolio's settlement cost of possible negative financial results arising from the reduction of the regular trading closing position, which is equivalent to a day-trade with negative result.

The part added to the portfolio's settlement cost,  $PSC_{After}$ , is given by

$$PSC_{After} = \max\left(\sum_{c=1}^M PSC_{After,c}, 0\right) \quad (64)$$

with

$$PSC_{After,c} = \min\left(QLP_c + \sum_{j=1}^{NC} QCA_{c,j}, QSP_c + \sum_{j=1}^{NV} QVA_{c,j}\right) \times PMC_c - PMV_c \times M_c \times TC_c \quad (65)$$

$$PMV_c = \frac{PA_c \times QPV_c + \sum_{j=1}^{NV} PVA_{c,j} \times QVA_{c,j}}{QPV_c + \sum_{j=1}^{NV} QVA_{c,j}} \quad e \quad FMC_c = \frac{PA_c \times QPC_c + \sum_{j=1}^{NC} PCA_{c,j} \times QCA_{c,j}}{QPC_c + \sum_{j=1}^{NC} QCA_{c,j}} \quad (66)$$

where

$PSC_{After}$  : settlement cost added to the portfolio, due to transactions carried out in after-hours session, on date  $D$ ;

$PSC_{After,c}$  : part of the settlement cost added to the portfolio, due to transactions carried out in after-hours session, on date  $D$ , related to the transactions involving contract  $C$ ;

$QPC_c$  : quantity of contracts of long position in contract  $C$ , at closing of the regular trading session, on  $D$ ;

$QPV_c$  : quantity of contracts of short position in contract  $C$ , at closing of the regular trading session, on  $D$ ;

$QCA_{c,j}$  : quantity of contracts  $C$  long on the  $j$ -th purchase transaction carried out in after-hours session, on  $D$ ;

$QVA_{c,j}$  : quantity of contracts  $C$  short on the  $j$ -th sale transaction carried out in after-hours session, on  $D$ ;

- $NC$  : quantity of purchase transactions of contract  $C$  carried out in after-hours session, on  $D$ ;
- $NV$  : quantity of sale transactions of contract  $C$  carried out in after-hours session, on  $D$ ;
- $PMC_c$  : average price of purchase transactions of contract  $C$  carried out on  $D$ ;
- $PMV_c$  : average price of sale transactions of contract  $C$  carried out on  $D$ ;
- $PCA_{c,j}$  : price of the  $j$ -th purchase transaction of contract  $C$  carried out in after-hours session, on  $D$ ;
- $PVA_{c,j}$  : price of the  $j$ -th sale transaction of contract  $C$  carried out in after-hours session, on  $D$ ;
- $PA_c$  : daily settlement price of contract  $C$ , on  $D$ , adjusted to the date of the next trading session;
- $M_c$  : contract multiplier  $C$  ; and
- $TC$  : exchange rate, as the case may be.

**Example 1:** Consider that the participant closes the regular trading session with a position long in 100 Ibovespa's futures contracts, of a certain maturity, and that, later on, in the after-hours session, he carries out the transactions described in the following table.

| After-hours sessions – Ibovespa's futures contract |                |                         |        |
|--|----------------|-------------------------|--------|
| Transaction  | Purchase/ Sale | No. of contracts traded | Price  |
| 1  | P              | 25                      | 40,500 |
| 2  | S              | 30                      | 40,000 |
| 3  | S              | 20                      | 41,000 |

Considering that the adjusted settlement price is worth 41,000 index points, the average purchase and sale prices of the transactions carried out in the after-hours session are, respectively,

$$PMV_c = \frac{PA_c \times QPV_c + \sum_{j=1}^{NV} PVA_{c,j} \times QPV_{c,j}}{QPV_c + \sum_{j=1}^{NV} QVA_{c,j}} = \frac{0 + 40,000 \times 30 + 41,000 \times 20}{0 + 50} = 40,400$$

$$PMC_c = \frac{PA_c \times QPC_c + \sum_{j=1}^{NC} PCA_{c,j} \times QCA_{c,j}}{QPC_c + \sum_{j=1}^{NC} QCA_{c,j}} = \frac{41,000 \times 100 + 40,500 \times 25}{100 + 25} = 40,900$$

$$CLC_{After.c} = \min \left( QPC_c + \sum_{j=1}^{NC} QCA_{c,j}, QPV_c + \sum_{j=1}^{NV} QVA_{c,j} \right) \times PMC_c - PMV_c = \min 125, 50 \times 500 = 25,000$$

Having negotiated just one contract in the after-hours session, with the additional settlement cost of this contract being positive, it follows that the total settlement cost to be added is worth

$$CLC_{After} = \max \left( \sum_{c=1}^M CLC_{After,c}, 0 \right) = \max 25,000, 0 = 25,000$$

The margin for the participant's portfolio of futures contracts is calculated according to the stress scenarios test methodology, applied to the portfolio of futures contracts obtained after closing of the after-hours session – his Ibovespa's futures portfolio, for instance, is the long position in 75 contracts.

Supposing that the risk of the positions in the participant's futures contracts is assessed at R\$500,000 according to the stress scenarios methodology, the required margin will be R\$525,000, since

$$Margin = Settlement\ Cost - Market\ Risk = 25,000 + 500,000 = 525,000$$

**Example 2:** Consider the previous example, but with a new price for the sale transaction of 30 contracts carried out in the after-hours sessions, as per the following table.

| After-hours sessions – Ibovespa's futures contract |               |                         |        |
|--|---------------|-------------------------|--------|
| Transacti  | Purchase/Sale | No. of contracts traded | Price  |
| 1  | P             | 25                      | 40,500 |
| 2  | S             | 30                      | 42,000 |
| 3  | S             | 20                      | 41,000 |

Considering that the adjusted settlement price is worth 41,000 index points, the average purchase and sale prices of the transactions carried out in the after-hours session are, respectively,

$$PMV_c = \frac{0 + 42,000 \times 30 + 41,000 \times 20}{0 + 50} = 41,600$$

$$PMC_c = \frac{41,000 \times 100 + 40,500 \times 25}{100 + 25} = 40,900$$

$$CLC_{After,c} = \min 125, 50 \times -700 = -35,000$$

Having negotiated just one contract in the after-hours session, with the additional settlement cost of this contract being negative, it follows that the total settlement cost to be added is null,

$$CLC_{After} = \max \left( \sum_{c=1}^M CLC_{After,c}, 0 \right) = \max -35,000, 0 = 0$$

Since the transactions carried out in the after-hours session do not result in an increase in the settlement cost, the portfolio's required margin is given by the market risk value – R\$500,000, as per the preceding example.

## 2.7. Margin Calculation Methodology for Contracts traded via BM&FBOVESPA webtrading

The margin model for a portfolio of positions arising from trading via BM&FBOVESPA webtrading (WTr) is based on a fixed margin, in Reais, per contract. The model's simplicity, as compared to the other margin methodologies, is due to the fact that the WTr is earmarked for small investors, especially individual Customers.

The margin of a position in a contract where the Customer is classified as an arbitrator follows the margin methodology defined for the standard contract. The Customer authorized by BM&FBOVESPA to operate in WTr as a provider of liquidity to a certain instrument is classified as an Arbitrator. The following description refers to contracts for which the Customer is classified as *Non-arbitrator*.

The fixed margin per contract may be expressed as

$$\text{Margin}_{\text{Contract } m} = F_m \times \text{Abs } q \quad (67)$$

where  $F_m$  is the margin value, fixed in local currency, corresponding to 1 unit of contract  $m$ , and  $q$  is the number of contracts of the position.

A characteristic of managing the risk of such positions is the pre-margin concept, under which a Customer's transactions, from the moment the offer is included, have their risk adequately covered by previously pledged collateral. Therefore, the margin value is periodically updated along the trading session, in order to contemplate the transactions carried out and the offers.

A position's margin concerning futures contract  $m$  is given, in a general manner, by

$$\text{Margin}_{\text{Contract } m} = \max \text{ Margin}_m \text{ Offers P}, \text{ Margin}_m \text{ Offers S} \quad (68)$$

$$\text{Margin}_m \text{ Offers P} = F_m \times \text{Abs } q_P + \text{Result Offers S} \quad (68-P)$$

$$\text{Margin}_m \text{ Offers S} = F_m \times \text{Abs } q_S + \text{Result Ofertas S} \quad (68-S)$$

where

$F_m$  : margin value, fixed in local currency, corresponding to 1 unit of contract  $m$  ;

$q_C$  : number of contracts resulting from the balance of contracts and long offers of the day;

$q_V$  : number of contracts resulting from the balance of contracts and short offers of the day;

Result *P Offers* : result of Marking to Market of long offers; and

Result *S Offers* : result of Marking to Market of short offers.

for spot contracts, the margin is given by two portions of margin, corresponding to the positions with settlement on  $T+0$  and on  $T+1$

$$\text{Margin}_{\text{Contract } m} = \text{Margin}_m^{T+0} + \text{Margin}_m^{T+1} \quad (69)$$

$$\text{Margin}_m^{T+0} = F_m \times \text{Abs } q \quad (70)$$



$$\text{Margin}_m^{T+1} = \max \left( \text{Margin}_m^{T+1} \text{ P Offers}, \text{Margin}_m^{T+1} \text{ S Offers} \right) \quad (71)$$

where

- $q$  : number of contracts with settlement on  $T + 0$ ;
- $\text{Margin}_m^{T+1} \text{ P Offers}$  : calculated according to equation (68-P), with  $q_p$  being the number of contracts of the position resulting from the trades and purchase offers of the day, for settlement on  $T + 1$ ; and
- $\text{Margin}_m^{T+1} \text{ S Offers}$  : calculated according to equation (68-S), with  $q_s$  being the number of contracts of the position resulting from the trades and sale offers of the day, for settlement on  $T + 1$ .

the chapter dealing with risk management presents further details on this subject, as well as details concerning margin calculation.

Finally, the margin of a portfolio with positions arising from trading via WTr is given by

$$\text{Margin Portfolio of WTr Contracts} - \text{Non - Arbitrator} = \text{Margin}_{\text{Contract 1}} + \text{Margin}_{\text{Contract 2}} + \dots \quad (72)$$

## 2.8. Margin of Positions Resulting from Structured Transaction

A structured transaction is a mechanism which allows for implementing a strategy to trade with derivatives contracts. The result from trading a structured transaction is a set of positions in the contracts it defines.

The forward rate agreement and volatility type transactions are structured transactions. The spread rate forward rate agreement type of trading, for example, results in positions on two different maturities of a USD x Real spread rate futures contract. The trading of an underlying asset volatility, in turn, involves futures and options contracts on an underlying asset.

Since there is not position in a strategy, but rather the positions generated from its trading, the margin associated with this trading derives from the methodologies applicable to each contract.

For example, upon trading the purchase of exchange rate volatility, through the Exchange Rate Volatility Structured Transaction (VTC) with call option, series  $X$ , the Customer assumes two positions simultaneously. (1) a short position in the exchange rate futures contract with maturity on the same month of maturity of series  $X$  of the option and (2) a long position in call option series  $X$ . The Customer's margin, after that trade, is calculated on the portfolio resulting from adding positions (1) and (2) to its initial portfolio, that is, from the application of the margin calculation methodologies described in preceding sessions, to each corresponding group of contracts.

## 2.9. Stress Test on Cash flow – Margin Calculation Methodology for Swap Contracts Portfolio

The margin of a swaps portfolio must be enough to cover the futures settlement values of all the positions. The methodology consists in assessing all the set of financial flows foreseen, from the stress scenarios for the futures values of the variables involved in portfolio swaps. Before the description of the methodology, there is a section devoted to some definitions and respective notations.

### 2.9.1. Definitions and Notation

The swap contract defines two sets of parameters, associated with their active (or long) and passive (or short) legs. Each set of parameters contains a variable  $y$ , a percent  $\rho$  applicable to the daily variation of  $y$  and an interest rate  $c$  added to the variation of  $y$ , combined according to contractual rules and used to value one of the swap legs. This set of parameters  $y, \rho, c$  is referred to simply as  $y$ . For example, one may have  $y$  as the Real x USD exchange rate and  $c$  as a USD spread rate value.

The margin of a swap portfolio is determined from the stress scenarios. Whereas in the margin calculation methodologies for standardized futures and options contracts scenarios are defined for the primitive risk factors, in the swap margin methodology stress scenarios are defined for variables  $r$  which adjust the legs of a swap and for interest rate  $y$  used to calculate present value.

#### Future value and present value of swap legs

Denote by  $F_c(t_1, t_2)$  the accumulated factor, in the period between  $t_1$  and  $t_2$ , of interest rate  $c$  and by  $F(y, \rho, t_1, t_2)$  the accumulated variation factor, in the period from  $t_1$  to  $t_2$ , of percentage  $\rho$  of (daily) variation of  $y$ . Function  $F(y, \rho, t_1, t_2)$  represents the factor utilized to "carry" forward in the period between  $t_1$  and  $t_2$  when  $t_1 < t_2$ , and, when  $t_1 > t_2$ , represents the discount factor in the period from  $t_2$  to  $t_1$ , that is,

$$F(y, \rho, t_1, t_2) = \frac{1}{F(y, \rho, t_2, t_1)}.$$

The swap leg indexed to variable  $y$  is worth, at maturity  $T$ ,  $VV^{y,T}$

$$VV^{y,T} = s \times V_0 \times F(y, \rho, T_0, T) \times F_c(T_0, T) \quad (73)$$

where

$$s = \begin{cases} -1 & \text{if } y \text{ is the variable of the passive leg of the swap} \\ +1 & \text{if } y \text{ is the variable of the active leg of the swap} \end{cases}$$

$V_0$  : swap base value;

$T_0$  : swap base date; and

$T$  : swap Expiration date.

On maturity date, the swap with active and passive legs indexed to  $y_{Active}$  and  $y_{Passive}$ , respectively, is worth  $VV^{Swap,T}$

$$VVSwap^T = VV^{y_{Active},T} + VV^{y_{Passive},T} \quad (74)$$

The present value, in  $t$ , of the leg indexed to  $y$  of a swap with maturity at  $T$  is denoted by  $VP^{y,T}$  and obtained by discounting the interest rate from future value  $WV^{y,T}$ , on  $t$ , for the period between  $t$  and  $T$ .

$$VP^{y,T} = \frac{WV^{y,T}}{F_r(t,T)} = \frac{s \times V_0 \times F(y, \rho, T_0, T) \times F_c(T_0, T)}{F_r(t,T)} \quad (75-a)$$

By decomposing factor  $F(y, \rho, T_0, T)$  into two factors – the factor of the accumulated variation in the period from base date  $T_0$  and  $t$  and the factor of the accumulated variation in the period between  $t$  and maturity  $T$ , as in the following equation:

$$F(y, \rho, T_0, T) = F(y, \rho, T_0, t) \times F(y, \rho, t, T)$$

one has the following alternative equation to equation (75-A)

$$VP^{y,T} = [s \times V_0 \times F_c(T_0, T)] \times F(y, \rho, T_0, t) \times \frac{F(y, \rho, t, T)}{F_r(t,T)} \quad (75-b)$$

When calculation a swap after its base date, on  $t > T_0$ , term  $F(y, \rho, T_0, t)$ , in the above equation, represents a "forward" correction factor, between  $t$  and  $T_0$ . When calculating a forward swap on a date  $t$  preceding base date  $T_0$ , term  $F(y, \rho, T_0, t)$  represents the discount factor in the period from  $t$  to  $T_0$ , and equation (75-b) may be rewritten as

$$VP^{y,T} = [s \times V_0 \times F_c(T_0, T)] \times \frac{1}{F(y, \rho, t, T_0)} \times \frac{F(y, \rho, t, T)}{F_r(t,T)} \quad (75-c)$$

**Example 1:** Consider a 3-year swap with a leg indexed to the Real x USD exchange rate, plus a spread rate of 3 % p.a.

Suppose one wants to calculate the value of that swap leg, after 2 years have elapsed from its base date  $T_0$ , that is  $t - T_0 = 2$  years and  $T - t = 1$  year. Suppose the fx variation observed in the period from  $T_0$  to  $t$  is -0.5 % and that, on  $t$ , fx variation and interest rate for 1 year are expected to be +2 % and 12 % p.a., respectively. Under such conditions, the present value associated with the exchange rate variable assumes, on  $t$ ,

$$VP^{y,T} = [s \times V_0 \times 1 + 0.03 \times 3] \times 1 - 0,005 \times \frac{1 + 0.02}{1 + 0.12} = s \times V_0 \times 0.988$$

**Example 2:** Consider a 2-year forward swap for 1 year from the calculation date, and with a leg indexed to the Real x USD exchange rate, plus a spread rate of 3 % p.a.

Suppose the fx rate, on calculation date  $t$ , is expected to devalue by 4.5 % in the period between  $t$  and the base date and by 2 % between  $t$  and its maturity. For the 3-year interest rate, one expects 12 % p.a. Under such conditions, the present value associated with the exchange rate variable assumes, on  $t$ ,

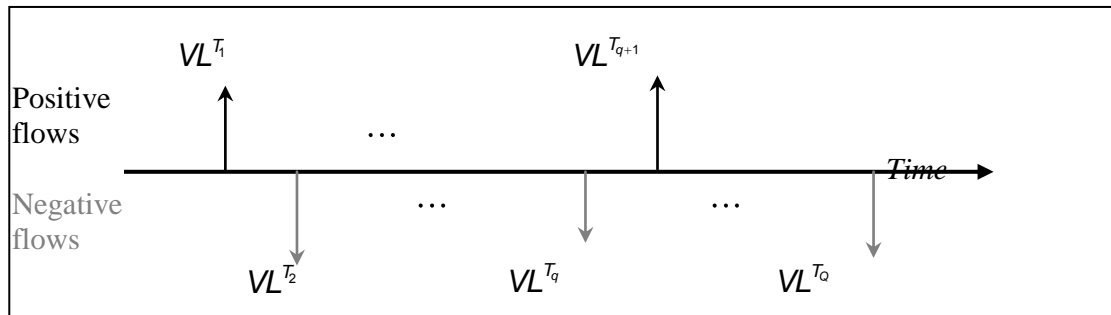
$$VP^{y,T} = \left[ s \times V_0 \times 1 + 0.03 \times 2 \right] \times \frac{1}{1 - 0.045} \times \frac{1 + 0.02}{1 + 0.12}^3 = s \times V_0 \times 0.806$$

### Cash flow of a swap portfolio

A swaps portfolio defines a financial flow, or cash flow, whose value associated with date  $T$ ,  $VL^T$ , represents the net value, at  $T$ , of the swaps with maturity on that date. For a portfolio containing  $G$  swaps with maturity on  $T$ ,  $VL^T$  is given by

$$VL^T = VWSwap_1^T + VWSwap_2^T + \dots + VWSwap_G^T = \sum_{g=1}^G VWSwap_g^T \quad (76)$$

where  $VWSwap_g^T$  is the settlement value of the  $g$ -th swap of maturity  $T$ .



**Figure 2.8-1 – Cash flow, at futures value, of a swap portfolio**

Let  $SVV^{y,T}$  and  $SVP^{y,T}$  be, respectively, the consolidated value at maturity  $T$  and the consolidated present value, of all swap legs indexed to variable  $y$  with maturity at  $T$ . Assuming that the portfolio contains  $G$  positions / contracts with leg indexed to  $y$  and maturity at  $T$ , then

$$SVV^{y,T} = \underbrace{VV_1^{y,T}}_{\substack{\text{Value, at } T, \text{ of the leg} \\ \text{indexed to } y \text{ of the first} \\ \text{swap with maturity } T \text{ and} \\ \text{leg indexed to } y}} + \dots + \underbrace{VV_G^{y,T}}_{\substack{\text{Value, at } T, \text{ of the leg} \\ \text{indexed to } y \text{ of the } G\text{-th} \\ \text{swap with maturity } T \text{ and} \\ \text{leg indexed to } y}} = \sum_{g=1}^G VV_g^{y,T} \quad (77)$$

$$SVP^{y,T} = \underbrace{VP_1^{y,T}}_{\substack{\text{Present value of the leg} \\ \text{indexed to } y \text{ of the first} \\ \text{swap with maturity } T \text{ and} \\ \text{leg indexed to } y}} + \dots + \underbrace{VP_G^{y,T}}_{\substack{\text{Present value of the leg} \\ \text{indexed to } y \text{ of the } G\text{-th} \\ \text{swap with maturity } T \text{ and} \\ \text{leg indexed to } y}} = \sum_{g=1}^G VP_g^{y,T} \quad (78-a)$$

In the case of  $N$  variables  $y_1, y_2, \dots, y_N$  associated with the swap portfolio,  $VL^T$  may be expressed, alternatively to equation (76), as

$$VL^T = SW^{y_1,T} + SW^{y_2,T} + \dots + SW^{y_N,T} = \sum_{j=1}^N SW^{y_j,T} \quad (79)$$

and the present value of  $VL^T$ , denoted  $VLE^T$ , as

$$VLE^T = \frac{VL^T}{F_r t, T} = \underbrace{SVP^{y_1,T}}_{\substack{\text{Present consolidated value} \\ \text{of all legs indexed to} \\ y_1 \text{ and with maturity } T}} + \dots + \underbrace{SVP^{y_N,T}}_{\substack{\text{Present consolidated value} \\ \text{of all legs indexed to} \\ y_N \text{ and with maturity } T}} = \sum_{j=1}^N SVP^{y_j,T} \quad (80)$$

Thus, the portfolio's cash flow can be represented at future value or at present value

$$\underset{\text{Future}}{\text{Cashflow}} = VL^{T_1}, VL^{T_2}, \dots, VL^{T_Q}$$

$$\underset{\text{At present value}}{\text{Cashflow}} = VLE^{T_1}, VLE^{T_2}, \dots, VLE^{T_Q}$$

The portfolio's market risk is calculated from estimates for the settlement values at several portfolio maturities, based on scenarios for the values of the variables involved. It is, therefore, convenient to express terms  $SVP^{y,T}$  in an alternative way to equation (78-a), as described below

- In the case of variable  $y$  which does not admit parameter  $p \neq 100\%$ , all terms  $VP_g^{y,T}$  of equation (78-a) have the  $\frac{F y, 1, t, T}{F_r t, T}$  ratio in common. If there are  $G$  swap legs indexed to  $y$  and with maturity at  $T$ ,  $SVP^{y,T}$  can be expressed as

$$SVP^{y,T} = \frac{F y, 1, t, T}{F_r t, T} \times \sum_{g=1}^G FC_g \times F y, 1, T_{0,g}, t \quad (78-b)$$

$$FC_g = s_g \times V_{0,g} \times F_c T_{0,g}, T$$

- In the case of variable  $y$ , which admits parameter  $p \neq 100\%$ , it is possible to obtain factor  $F y, p_g, t, T$  of future correction as a function of factor  $F y, 1, t, T$ , as follows

$$F_{y, p_m, t, T} = \prod_{j=t}^T (1 + p_g \times yd_j) = \frac{\prod_{j=t}^T (1 + p_g \times yd_j)}{\prod_{j=t}^T (1 + yd_j)} \times \prod_{j=t}^T (1 + yd_j) = Q^*_{y, p_g, t, T} \times F_{y, 1, t, T}$$

where  $Q^*_{y, p, t_1, t_2}$  is the ratio between the correction factors accumulated in the period between  $t_1$  and  $t_2$  of percentage  $p$  of daily rate  $y, yd$ , and of percentage 100% of daily rate  $yd$

$$Q^*_{y, p, t_1, t_2} = \prod_{j=t_1}^{t_2} (1 + p \times yd_j) / \prod_{j=t_1}^{t_2} (1 + yd_j)$$

From approximation  $r \cong \ln(1+r)$ , valid for a sufficiently small  $r$ , we calculate

$$Q^*_{y, p, t_1, t_2}$$

$$Q^*_{y, p, t_1, t_2} \cong \exp \left[ p - 1 \times \sum_{j=t_1}^{t_2} yd_j \right]$$

Replacing the sum of daily rates  $\sum_{j=t_1}^{t_2} yd_j$  by the average daily rates in the  $n$ -day period between  $t_1$  and  $t_2$ ,  $\bar{y}d$ , and adding parameter  $z$ , as a counterparty to the error of such replacement,  $0 \leq z \leq 1$ , it follows

$$Q^*_{y, p, t_1, t_2} \cong \exp \left[ p - 1 \times n \times \bar{y}d \right] (1 + z) \quad (81)$$

It follows that equation (75-b) for present value  $VP_g^{y, T}$  of the  $VP_g^{y, T}$ -th leg indexed to percentage  $g$  of  $p_g$  and equation (78-a) are rewritten, respectively, as

$$VP_g^{y, T} = FC_g \times F_{y, p_g, T_{0, g}, t} \times Q^*_{y, p_g, t, T} \times \frac{F_{y, 1, t, T}}{F_r t, T}$$

e

$$SVP^{y, T} = \frac{F_{y, 1, t, T}}{F_r t, T} \times \sum_{g=1}^G \left[ FC_g \times F_{y, p_g, T_{0, g}, t} \times Q^*_{y, p_g, t, T} \right] \quad (78-c)$$

$$FC_g = s_g \times V_{0, g} \times F_c T_{0, g}, T$$

**Example 3:** Consider the portfolio formed by two swaps of same maturity, as per the following table:

| PORTFOLIO |          |                 |                |            |            |          |          |             |          |          |                                    |     |
|-----------|----------|-----------------|----------------|------------|------------|----------|----------|-------------|----------|----------|------------------------------------|-----|
| Swap      | Matur.   | Total timeframe | Time to elapse | Base value | Active leg |          |          | Passive leg |          |          | Variation occurred since base date |     |
|           |          |                 |                |            | <i>y</i>   | <i>p</i> | <i>c</i> | <i>y</i>    | <i>p</i> | <i>c</i> | DI                                 | DOL |
| 1         | <i>T</i> | 2 years         | <i>1 year</i>  | 1,000.000  | <i>DOL</i> |          | 4%       | <i>DI</i>   | 100      | -        | 12.50%                             | 1%  |
| 2         |          | 3 years         |                | 1,500.000  | <i>DI</i>  | 110      | -        | <i>DOL</i>  | -        | 3%       | 27.35%                             | -   |

Suppose the following expectations on the portfolio variables for the end of the time to elapse – 1 year, from the date of the analysis up to maturity.

- exchange rate, Reais per U.S. Dollar 8%
- accumulated DI rate and pre-fixed interest rate: 12 % p.a., with a daily average of 0.0444 %.

The settlement value at  $T$  is made up of a portion related to variable DOL,  $SVP^{DOL,T}$ , and the other related to variable DI,  $SVP^{DI,T}$ .

$$VLE^T = SVP^{DOL,T} + SVP^{DI,T}$$

According to equation (78-b),

$$FC_1^{DOL,T} = +1 \times 1,000,000 \times 1 + 0.04 \times 2 = 1,080,000$$

$$FC_2^{DOL,T} = -1 \times 1,500,000 \times 1 + 0.03 \times 3 = -1,635,000$$

$$SVP^{DOL,T} = \frac{1+0.08}{1+0.12} \times [1,080,000 \times 1 + 0.01 - 1,635,000 \times 1 - 0.005] = -516,881.25$$

According to equations (78-C) AND (81),

$$FC_1^{DI,T} = -1 \times 1,000,000 \times 1 = -1,000,000, \quad Q^* = 1$$

$$FC_2^{DI,T} = +1 \times 1,500,000 \times 1 = 1,500,000, \quad Q^* \cong \exp[1.1 - 1 \times 252 \times 0.0444\%] = 1.011$$

$$SVP^{DI,T} = \frac{1+0.12}{1+0.12} \times [-1,000,000 \times 1 + 0.125 \times 1 + 1,500,000 \times 1 + 0.2735 \times 1.011] = 806,262.75$$

Finally, the estimated value to settle at  $T$ , at present value, is

$$VLE^T = SVP^{DOL,T} + SVP^{DI,T} = 289,381.50$$

## 2.9.2. Margin

The methodology to calculate the margin for swap portfolios is based on the calculation, under stress scenarios, of the portfolio's cash flow at present value, and the margin value ultimately derives from the scenario resulting in the biggest risk. The portfolio risk, in turn, is measured through the *cash flow accumulated value*.

### Accumulated cash flow value

The cash flow accumulated value at present value

$$\text{Cashflow} = VLE^{T_1}, VLE^{T_2}, \dots, VLE^{T_0}$$

At present value



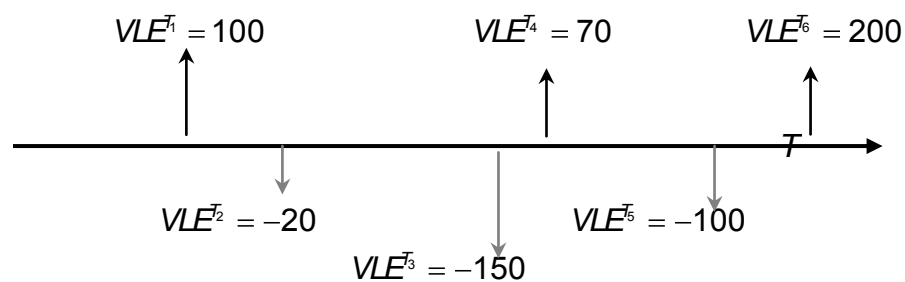
is denoted  $V AFC$  and defined from the partial sums of the estimated settlement values, according to equation (82)

$$V AFC = \min \left[ 0, VLE^{\tau_1}, VLE^{\tau_1} + VLE^{\tau_2}, \dots, VLE^{\tau_1} + VLE^{\tau_2} + \dots + VLE^{\tau_n} \right] \quad (82)$$

The hypothesis that a swap position cannot be settled before its maturity implies the non-offsetting between settlement values on different dates when the negative flow precedes the positive flow.

Let us consider, for example, the default of a participant whose portfolio contains swaps with maturities  $T_1$  and  $T_2$ ,  $T_1 < T_2$ , with estimated settlement values  $VLE^{\tau_1}$  and  $VLE^{\tau_2}$ . In the case when  $VLE^{\tau_1} < 0$  and  $VLE^{\tau_2} > 0$ , one cannot use at  $T_1$  the gain estimated for  $T_2$ , since positive flow  $VLE^{\tau_2}$  is expected to occur only at  $T_2$ . In the opposite case, in which  $VLE^{\tau_1} > 0$  and  $VLE^{\tau_2} < 0$ , the gain at  $T_1$  can be used by the Clearinghouse to cover, at  $T_2$ , the loss foreseen for that maturity (and if the financial flow at  $T_2$  is, indeed, negative).

**Example 4:** Consider a portfolio with the following estimated cash flow:



The accumulated value of that flow, according to equation (82), is

$$V AFC = \min 0, 100, 80, -70, 0, -100, 100 = -100$$

Although the positive value of the flow at  $T_4$  is enough to cover the accumulated value of all previous flows, only the positive flow of  $T_1$  is used to offset the negative flows at  $T_2$  and  $T_3$ . Additionally,  $V AFC$  is determined by the value of the next-to-last flow.

The calculation of the portfolio's market risk consists in calculating, under scenario, the accumulated value of the cash flow, by estimating financial flows  $VLE^{\tau}$  under scenarios for the interest rate and for variables  $y$  associated with the portfolio's swaps. As a risk measure, one takes the minimum value of  $V AFC$ , among the values assumed under the various contiguous scenarios.

The following sessions present the criteria to calculate the estimated settlement values and the accumulate value of the cash flow under scenario, which define the portfolio's market risk. Finally, the margin is determined by a portion of the minimum margin and by the market risk.

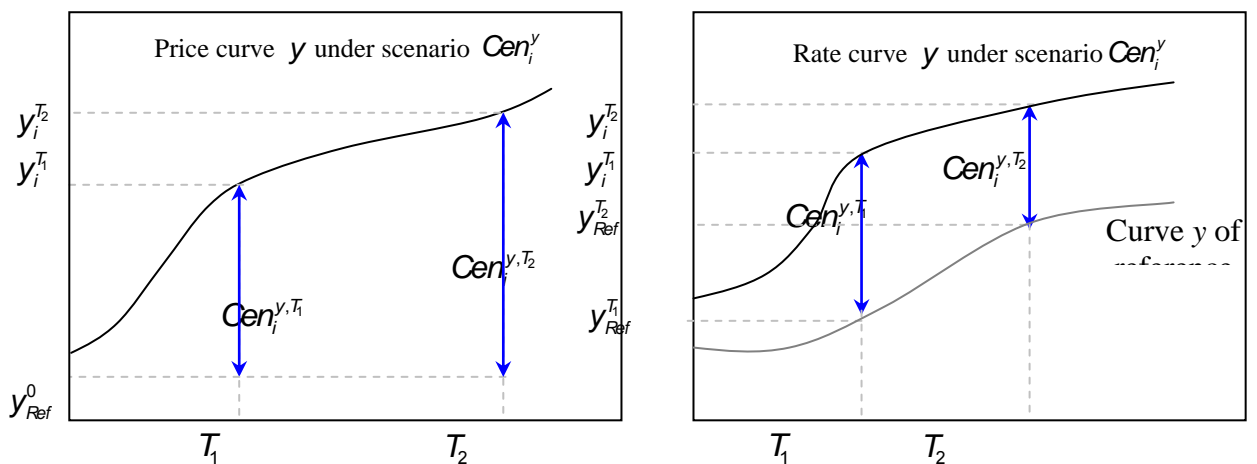
## Scenarios for the swap variables and for the interest rate

The equations for the consolidated present value of all the legs indexed to  $y$  and to the same maturity  $T$ ,  $SVP^{y,T}$ , involve the ratio between  $F y, 1, t, T$  and  $F_r t, T$ . Since these terms are unknown in  $t$ , one estimates  $SVP^{y,T}$  through scenarios defined for variables  $y$  and for interest rate  $r$ . The following notation is used for such scenarios:

$Cen_i^{y,T}$  : represents the  $i$ -th stress scenario for  $y$  on  $T$ , under which it assumes value  $y_i^T$ , with variation  $\Delta_i^{y,T}$  in relation to reference value  $y_{Ref}^0$ , with  $\Delta_i^{y,T} = \frac{y_i^T - y_{Ref}^0}{y_{Ref}^0}$  or  $\Delta_i^{y,T} = y_i^T - y_{Ref}^T$ , in the cases where variable  $y$  is of the price-type or rate-type, respectively;

$Cen_i^y$  : represents the  $i$ -th scenario for curve  $y$ , that is, it is the set of scenarios defined  $y$  on each future date,  $Scen_i^{y,T_q}$ ,  $q = 1, 2, 3, \dots$ .

The following figure illustrates the scenarios for price-type and rate-type variables.



**Figure 2.8-2 – Curve of a variable  $y$  under scenario**

$Scen_j^{r,T}$  : represents the  $j$ -th scenario of interest rate  $r$  for the period from  $t$  to  $T$ , under which the (nominal) rate is worth  $r_j^T$ , that is, the scenario indicates variation  $\Delta_j^{r,T} = r_j^T - r_{Ref}^T$ ;

$Scen_i^r$  : represents the  $j$ -th scenario for the curve of  $r$ , given by the set of scenarios for each timeframe,  $Scen_j^{r,T_q}$ ,  $q = 1, 2, \dots$ .

$Scen_k^{Contiguous}$  : is the  $k$ -th contiguous scenario for all variables  $y$  and for rate  $r$ , on future date  $T$ ; and

$Scen_k^{Contiguous}$  : is the  $k$ -th contiguous scenario for the set of variables  $y$  and rate  $r$ , made up of one scenario for each curve  $y$  and one scenario for interest rate curve  $r$ ,  
 $Scen_k^{Contiguous} = [Scen_{k_r}^r, Scen_{k_1}^{y_1}, Scen_{k_2}^{y_2}, \dots, Scen_{k_N}^{y_N}]$ .

The risk analysis discards the contiguous scenarios resulting from combinations of individual scenarios of variables  $y$  and interest rate, which the Market Risk Committee considers very unlikely from a macroeconomic analysis.

### Estimation under scenario

The calculation of the portfolio risk provides both values for the accumulated value of cash flow and the amount of contiguous scenarios defined to calculate the margin.

Denote by  $V AFC k$  the accumulated value of the cash flow under the  $k$ -th contiguous scenario,  $Scen_k^{Contiguous}$ , and by  $VLE^T k$  the estimated settlement value at  $T$  under the same scenario.

$$V AFC k = \min \left[ 0, VLE^T_1 k, VLE^T_1 k + VLE^T_2 k, \dots, VLE^T_1 k + VLE^T_2 k + \dots + VLE^T_n k \right] \quad (83)$$

$$VLE^T k = SVP^{y_1, T} k + \dots + SVP^{y_n, T} k \quad (84)$$

The calculation of portion  $SVP^{y, T} k$  consists in calculating  $SVP^{y, T}$  under the scenarios for the curve of interest rate  $r$  and for  $y$  belonging to scenario  $Scen_k^{Contiguous}$ . For that purpose, one replaces, in equations (78-b) and (78-c), terms  $F y, 1, t, T$  and  $F_r t, T$  - and term  $F y, 1, T_0, t$  in the cases then  $t < T_0$  (forward swaps calculated before the base date) - by their respective implicit estimates in scenarios  $Scen_i^{y, T}$  and  $Scen_i^{r, T}$ .

Considering the possibility of a portfolio containing forward swap operations, it is advisable to take  $SVP^{y, T}$  as the sum of the present value associated with the forward operations and the present value associated with the non-forward transactions. Thus, the value of  $SVP^{y, T}$  under scenario  $Scen_k^{Contiguous}$  is given by

$$SVP^{y, T} k = SVP_{Non\ forward}^{y, T} k + SVP_{Forward}^{y, T} k$$

Consider that, among the  $G$  transactions with leg indexed to  $y$  and maturity  $T$ ,  $G_1$  are non-forward and  $G_2$  are forward.

$$SVP_{Non\ forward}^{y, T} k = \begin{cases} \frac{1 + \Delta_i^{y, T}}{1 + dr_j^T} \times \sum_{g=1}^{G_1} FC_g \times F y, p_g, T_{0, g}, t & \text{if } y \text{ is a price-type variable} \\ \frac{1 + d_i^{y, T}}{1 + d_j^{r, T}} \times \sum_{g=1}^{G_1} FC_g \times F y, p_g, T_{0, g}, t \times Q^* y_i^T, p_g, t, T & \text{if } y \text{ is a rate-type variable} \end{cases} \quad (85)$$

The average, in the period from  $t$  to  $T$ ,  $\bar{y}d$ , used to calculate  $Q^*$ , according to equation (81), is the daily rate corresponding to  $y_i^T$ , given by scenario  $Scen_i^{y, T}$ .

$$SVP_{Forward}^{y,T} k = \begin{cases} \frac{1 + \Delta_i^{y,T}}{1 + dr_j^T} \times \sum_{g=1}^{G_2} FC_g \times \frac{1}{1 + \Delta_i^{y,T_0,g}} & \text{if } y \text{ is a price-type variable} \\ \frac{1 + d_i^{y,T}}{1 + d_j^{r,T}} \times \sum_{g=1}^{G_2} FC_g \times \frac{1}{1 + d_i^{y,T_0,g}} \times Q^* & \text{if } y \text{ is a rate-type variable} \end{cases} \quad (86)$$

The average rate, in the period from  $t$  to  $T$ ,  $\bar{y}d$ , utilized to calculate  $Q^*$ , according to equation (81), is the daily rate corresponding to the forward rate for the period from  $T_0$  to  $T$ ,  $y_i^*$ , implicit in scenario  $Scen_i^{y,T}$ .

The differentiation between term and non-term transactions is necessary, since, in the case of forward transactions, the factor of accumulated variation of  $y$  between  $t$  and  $T_0$  (term  $F y, 1, T_0, t$  in equation (75-b)) represents future variation and is unknown in  $t$ . For such transactions, this factor is estimated from the scenario for  $y$  belonging to scenario  $Scen_k^{Contiguous}$ .

Once  $NC$  contiguous scenarios are defined, the margin corresponds to the smallest accumulated value of cash flow, if negative, among the values obtained under each contiguous scenario

$$\text{Margin Swaps Portfolio} = -\min[VAFC 1, VAFC 2, \dots, VAFC NC] \quad (87)$$

**Example 5:** Consider the swap portfolio described in the following table, involving three different maturities.

| PORTFOLIO |        |                 |                |            |            |     |     |             |     |      |                                    |       |
|-----------|--------|-----------------|----------------|------------|------------|-----|-----|-------------|-----|------|------------------------------------|-------|
| Swap      | Matur. | Total timeframe | Time to elapse | Base value | ACTIVE LEG |     |     | PASSIVE LEG |     |      | Variation occurred since base date |       |
|           |        |                 |                |            | $y$        | $p$ | $c$ | $y$         | $p$ | $c$  | DI                                 | DO L  |
| 1         | $T_1$  | 2 years         | 1 year         | 1,000,000  | DO L       |     | 4 % | DI          | 100 | -    | 12.50 %                            | 1%    |
| 2         | $T_1$  | 3 years         |                | 1,500,000  | DI         | 110 | -   | DO L        | -   | 3%   | 27.35 %                            | -0.5% |
| 3         | $T_2$  | 2 years         | 1.5 year       | 1,000,000  | DI         | 100 | -   | Pre         | -   | 12 % | 6.0%                               |       |
| 4         | $T_3$  | 2.5 years       | 2 years        | 2,000,000  | DO L       | -   | 3 % | Pre         | -   | 13 % |                                    | -1.5% |

Suppose two contiguous scenarios for the portfolio variables, among which Pre and DI are represented by interest rate  $r$  :

| VARIABLE  | CONTIGUOUS SCENARIO                          |           |           |  |           |           |
|---|--|-----------|-----------|--|-----------|-----------|
|   | <i>Scen<sub>1</sub><sup>Contiguous</sup></i> |           |           | <i>Scen<sub>2</sub><sup>Contiguous</sup></i> |           |           |
|   | $T_1$  | $T_2$     | $T_3$     | $T_1$  | $T_2$     | $T_3$     |
| DOL   | 8%   | 10%       | 11%       | -8%  | -10%      | -15%      |
| DI (aa)   | 12%  | 12,5%     | 12,8%     | 12%  | 10,5%     | 9%        |
| Pre (aa)  | 12%  | 12,5%     | 12,8%     | 12%  | 10,5%     | 9%        |
| <i>Estimated settlement value under contiguous scenario</i> |  |           |           |  |           |           |
| $SVP^{DOL,T}$   | -516.881                                     | -         | 1,847,479 | -  | -         | 1,515,098 |
| $SVP^{DI,T}$  | 806.263                                      | 1.060.000 | -         | 806,263                                      | 1,060,000 | -         |
| $SVP^{Pré,T}$   | -  | -         | -         | -  | -         | -         |
| $VLE^T$   | 289.382                                      | 1.051.253 | 2,082,705 | -  | 1,079,923 | 2,230,452 |
| VAFC  |  | 0         |           |  | -369.320  |           |

$$VAFC\ 1 = \min\left[0, VLE^{T_1\ 1}, VLE^{T_1\ 1} + VLE^{T_2\ 1}, VLE^{T_1\ 1} + VLE^{T_2\ 1} + VLE^{T_3\ 1}\right] =$$

$$= \min\ 0, 289,382, 298,129, 62,903 = 0$$

$$VAFC\ 2 = \min\left[0, VLE^{T_1\ 2}, VLE^{T_1\ 2} + VLE^{T_2\ 2}, VLE^{T_1\ 2} + VLE^{T_2\ 2} + VLE^{T_3\ 2}\right] =$$

$$= \min\ 0, 365,957, 346,034, -369,320 = -369,320$$

Assuming only scenarios  $Scen_1^{Contiguous}$  and  $Scen_2^{Contiguous}$  are used to estimate the financial flows, the margin is worth 369,320 \$:

$$\text{Margin Swaps Portfolio} = -\min\ VAFC\ 1, VAFC\ 2 = 369,320$$

### Safety parameters – expansion of the scenarios set

In order to contemplate the possibility of a shock, or rupture, at the variables levels, in addition to the variations already implicit in the originally-defined scenarios, safety parameters, which, applied to the original scenarios of  $\mathcal{Y}$ , generate new scenarios, are defined. These are the Jump and Volatility parameters, which allow for generating more conservative scenarios than the original ones.

This session defines the criteria for using such parameters under the original scenarios and the use of new scenarios to calculate the margin.

#### Volatility Parameter $\nu$ - scenarios for rate-type variables

This parameter is associated with the variables which represent interest rate. The parameter is defined per variable and contiguous scenario, in a positive percent value  $\nu$ . Assuming, for example, contiguous scenarios,  $Scen_1^{Contiguous}$  and  $Scen_2^{Contiguous}$  with respective volatility parameters  $\nu_1$  and  $\nu_2$  associated with a

variable  $y$ , to the  $y$  scenario belonging to contiguous scenario  $Scen_1^{Contiguous}$  one applies  $v_1$  and to the  $y$  scenario belonging to contiguous scenario  $Scen_2^{Contiguous}$  one applies  $v_2$ , even if the scenarios of  $y$  in each contiguous scenario are the same.

One applies  $v$  to the effective rates given by the original scenario, thus generating scenarios which appear as a range around the variable curve under that original scenario – the lower range results from applying  $-v$  and the upper range results from applying  $+v$ .

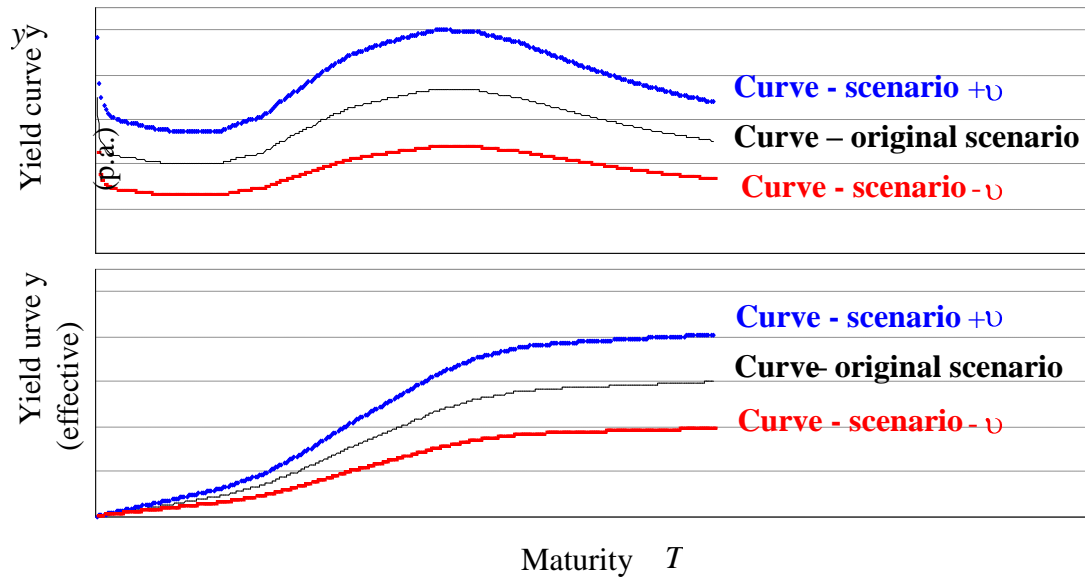


Figure 2.8-3 – Scenarios for the curve of variable  $y$  assuming a shock  $v$  along the curve

Let  $d$  be the effective rate in the period between  $t$  and  $T$ , corresponding to nominal rate  $tx$ ,

$$d = \begin{cases} 1 + tx^R - 1 & \text{if } tx \text{ with exponential capitalization} \\ R \times tx & \text{if } tx \text{ with linear capitalization} \end{cases} \quad (88)$$

where  $R$  is the ratio between the effective interest capitalization period ( $T - t$ ) and the nominal rate reference period.

Denote by  $Scen_{i,v}^y$  the scenario derived from original scenario  $Scen_i^y$  as a function of shock  $v$ . The variations implicit in the new scenario are given by

$$\Delta_{i,v}^{y,T} = y_{i,v}^T - y_{Ref}^T \quad (89)$$

where nominal rates  $y_{i,v}^T$  are worth, respectively when the new scenario results from adding or subtracting  $v$ ,

$$y_{i,v}^T = \begin{cases} \left[ 1 + y_i^T \times 1 + v - v \right]^{1/R} - 1 & \text{if } y \text{ exponential} \\ y_i^T \times 1 + v & \text{if } y \text{ linear} \end{cases} \quad (90)$$

e

$$y_{i,v}^T = \begin{cases} \left[ 1 + y_i^T R \times 1 - \nu + \nu \right]^{1/R} - 1 & \text{if } y \text{ exponential} \\ y_i^T \times 1 - \nu & \text{if } y \text{ linear} \end{cases}$$

The corresponding effective rates are

$$d_{i,v}^{y,T} = d_i^{y,T} \times 1 + \nu = \begin{cases} \left[ 1 + y_i^T R - 1 \right] \times 1 + \nu & \text{if } y \text{ exponential} \\ y_i^T \times R \times 1 + \nu & \text{if } y \text{ linear} \end{cases}$$

and

$$d_{i,v}^{y,T} = d_i^{y,T} \times 1 - \nu = \begin{cases} \left[ 1 + y_i^T R - 1 \right] \times 1 - \nu & \text{if } y \text{ exponential} \\ y_i^T \times R \times 1 - \nu & \text{if } y \text{ linear} \end{cases}$$

The new scenario replaces the original scenario in calculating the risk of the swap portfolio, when estimating financial flows  $VLE^T$ . Correction factor  $F_{y,1,t,T}$ , used to calculate terms  $SVP^{y,T}$ , is worth, under the new scenario,

$$F_{y,1,t,T} = 1 + d_{i,v}^T = 1 + d_i^T \times 1 \pm \nu \quad (92)$$

with  $\nu$  being added or subtracted, depending on the position indexed to  $y$  being either passive or active, respectively.

**Example 6:** Consider the scenario for the curve of the prefixed interest rate variable which indicates a variation of +100 base points in relation to the reference curve, in all maturities. The table presents some points of the interest curve – each cell contains the variation scenario in relation to the reference curve, in base points, and the interest rates, yearly and effective, for the corresponding period. Suppose an exponential rate and parameter  $\nu = 20\%$ .

| SCENARIO FOR PREFIXED RATE                         | TIMEFRAME |     |          |     |           |     |           |
|--|-----------|-----|----------|-----|-----------|-----|-----------|
|  | 1 day     | ... | 3 months | ... | 12 months | ... | 24 months |
| Original scenario                                  | 100       |     | 100      |     | 100       |     | 100       |
|  | 13.70%    |     | 13.50%   |     | 12.50%    |     | 10.00%    |
| Original scenario with addition of $\nu = 20\%$    | 395.66    |     | 385.61   |     | 350.00    |     | 289.28    |
|  | 16.66%    |     | 16.36%   |     | 15.00%    |     | 11.89%    |
| Original scenario with subtraction of $\nu = 20\%$ | -188.19   |     | -180.32  |     | -150.00   |     | -92.60    |
|  | 10.82%    |     | 10.70%   |     | 10.00%    |     | 8.07%     |
|  | 0.051%    |     | 3.10%    |     | 12.50%    |     | 21.00%    |
|  | 0.061%    |     | 3.86%    |     | 15.00%    |     | 25.20%    |
|  | 0.041%    |     | 2.57%    |     | 10.00%    |     | 16.80%    |

In the scenario altered by a positive shock:

$$r_{Scen,v}^{3m} = \left[ 1 + r_{Scen}^{3m} R \times 1 + \nu - \nu \right]^{1/R} - 1 = \left[ 1.135^{1/4} \times 1.2 - 0.2 \right]^4 - 1 = 16.36\%$$

$$d_{Scen,v}^{r,3m} = d_{Scen}^{r,3m} \times 1 + v = \left[ 1 + r_{Scen}^{3m} - 1 \right] \times 1 + v = \left[ 1.135^{1/4} - 1 \right] \times 1.2 = 3.86\%$$

In the scenario altered by a negative shock:

$$y_{Scen,v}^{3m} = \left[ 1.135^{1/4} \times 0.8 + 0.2 \right]^4 - 1 = 10.70\% \quad \text{and} \quad d_{Scen,v}^{r,3m} = \left[ 1.135^{1/4} - 1 \right] \times 0.8 = 2.57\%$$

### Jump Parameter ( $J$ ) – scenarios for price-type variables

Factors of this type are associated with the variables which represent price or value of an index, such as currency exchange rates, inflation indices, stock indices, etc., and are defined for the purpose of capturing the occurrence of a jump, or shock, not foreseen in the originally-defined scenarios.

The Jump parameter is defined per variable and contiguous scenario, just like parameter  $v$ , with two percent values,  $J$  and  $J^*$ , negative and positive, respectively, being defined for each combination of variable and contiguous scenario.

The supposition of occurrence, on a future date  $T^*$ , of a shock of value  $J$  on variable  $y$  corresponds to applying shock  $J$  to the curve of  $y$  under scenario at all dates after  $T^*$ , so that the curve undergoes variation only starting from  $T^*$ . The following figure illustrates the curves under an original scenario and under the scenario derived from it through  $J$ .

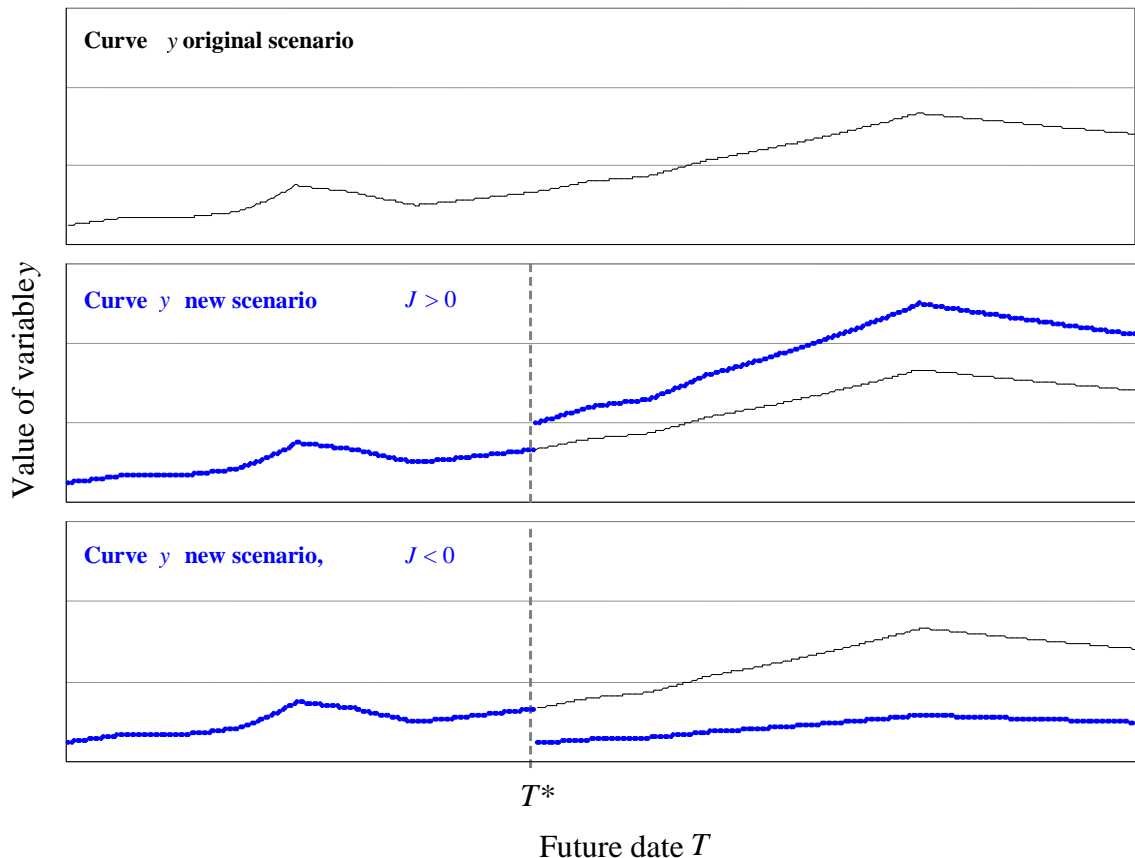


Figure 2.8-4 – Scenarios for the curve of a variable  $y$  assuming the occurrence of a shock  $J$  at  $T^*$



Denote by  $Scen_{i,J,T^*}^y$  the scenario derived from the original scenario  $Scen_i^y$  for the curve of  $y$  as a function of shock  $J$ , at  $T^*$ . The values of  $y$  under this new scenario  $Scen_{i,J,T^*}^y$  and the variations implicit therein are, respectively,

$$y_{i,J}^T = \begin{cases} y_i^T & \text{if } T < T^* \\ y_i^T \times 1+J & \text{if } T \geq T^* \end{cases} \quad \text{and} \quad \Delta_{i,J}^{y,T} = \begin{cases} \Delta_i^{y,T} & \text{if } T < T^* \\ 1+\Delta_i^{y,T} \times 1+J -1 & \text{if } T \geq T^* \end{cases} \quad (93)$$

The jump from the original scenario to the new scenario, that is, the difference between curve  $y$  under scenario  $Scen_{i,J,T^*}^y$  and curve  $y$  under scenario  $Scen_i^y$ , at each  $T$  starting from  $T^*$ , is linear as to the value of  $y$ , since

$$Jump^T = y_{i,J}^T - y_i^T = J \times y_i^T$$

In calculating settlement value  $VLE^T$ , the correction factor  $F_{y,1,t,T}$  utilized to calculate terms  $SVP^{y,T}$  is worth, under the new scenario of  $y$ ,

$$F_{y,1,t,T} = 1+\Delta_{i,J}^{y,T} = 1+\Delta_i^{y,T} \times 1+J \quad (94)$$

**Example 7:** Consider the scenario for the futures curve of the real x USD exchange rate variable, which indicates variations of 6%, 7%, 8%, 10% and 11%, respectively, for timeframes of 1 day, 3, 12, 18 and 24 months. Suppose that parameters  $J$  and  $J$  of this variable are defined at -5% and 5%, respectively, in all contiguous scenarios which contain that scenario. The scenario for the exchange rate curve generated under the hypothesis of a negative shock occurring sometime between the 6th and the 12th months is given by the following variations:

$$\Delta_{Scen,J^-}^{DOL,1d} = \Delta_{Scen}^{DOL,1d} = 6\%$$

$$\Delta_{Scen,J^-}^{DOL,3m} = \Delta_{Scen}^{DOL,3m} = 7\%$$

$$\Delta_{Scen,J^-}^{DOL,12m} = 1+\Delta_{Scen}^{DOL,12m} \times 1+J^- -1 = 1+0.08 \times 1-0.05 -1 = 2.60\%$$

$$\Delta_{Scen,J^-}^{DOL,18m} = 1+\Delta_{Scen}^{DOL,18m} \times 1+J^- -1 = 1+0.1 \times 1-0.05 -1 = 4.50\%$$

$$\Delta_{Scen,J^-}^{DOL,24m} = 1+\Delta_{Scen}^{DOL,24m} \times 1+J^- -1 = 1+0.11 \times 1-0.05 -1 = 5.45\%$$

The following tables the variation and exchange rate value, for the timeframes of 3, 6, 12, 18, and 24 months, under the original scenario and under the scenarios generated under the hypotheses of occurring (i) a negative shock between the 6th and the 12th month and (ii) of a positive shock between the 12th and the 18th month. One assumes the spot exchange rate of R\$ 2 per US\$ on the date of calculation.

| SCENARIO<br>FOR THE REAL X<br>USD EXCHANGE<br>RATE                          | TIMEFRAME |     |             |     |              |     |              |     |              |
|---|-----------|-----|-------------|-----|--------------|-----|--------------|-----|--------------|
|   | 1 day     | ... | 3<br>months | ... | 12<br>months | ... | 18<br>months | ... | 24<br>months |
| Original scenario   | 6%        |     | 7%          |     | 8%           |     | 10%          |     | 11%          |
|   | 2.12      |     | 2.14        |     | 2.16         |     | 2.20         |     | 2.22         |
| <b>Original scenario with</b><br>$J$ between the 5th and<br>the 12th month  | 6%        |     | 7%          |     | 2.60%        |     | 4.50%        |     | 5.45%        |
|   | 2.12      |     | 2.14        |     | 2.052        |     | 2.09         |     | 2.109        |
| <b>Original scenario with</b><br>$J$ between the 12th and<br>the 18th month | 6%        |     | 7%          |     | 8%           |     | 15.50%       |     | 16.55%       |
|   | 2.12      |     | 2.14        |     | 2.16         |     | 2.31         |     | 2.331        |

The incorporation of the safety parameters to the calculation of the portfolio's risk represents an extension of the set of contiguous scenarios, in addition to those originally defined. The criterion for applying shocks and creation of the new contiguous scenarios must allow for calculating their impact on the portfolio's cash flow as a function of the date of occurrence of the shock in the price-type variables. The date of that shock is indeed relevant – given a scenario  $Scen^y$  for variable  $y$  and a portfolio containing a swap leg associated with  $y$ , with maturity at  $T$ , the accumulated value of the portfolio flow assumes different values according to the time of the shock on  $y$  - before  $T$  or after  $T$ . The scenario resulting from the occurrence of the shock before  $T$  has an impact on the settlement value of that leg, in relation to the original scenario, whereas the scenario resulting from a shock on any date after  $T$  generates a new scenario under which the settlement value is equal to the estimated value under the original scenario.

To calculate the margin using the safety parameters, one calculates the accumulated cash flow under the contiguous scenarios derived from situations (i), (ii) and (iii), covering all the maturities present in the portfolio upon simulating (ii) and (iii):

- i. occurrence of shock  $v$  in all rate-type variables and non-occurrence of shock  $J$  in no price-type variable;
- ii. occurrence of shock  $v$  in all rate-type variables and occurrence of positive shock  $J$  immediately and only before a maturity  $T$ , in all price-type variables; and
- iii. occurrence of shock  $v$  in all rate-type variables and occurrence of negative shock  $J$  immediately and only before a maturity  $T$ , in all price-type variables.

Let  $VAFC_{k,v}$  be the accumulated value of the cash flow under the scenario resulting from applying  $v$  on the scenarios of the rate-type variables which make up the original contiguous scenario  $Scen_k^{Contiguous}$ .

Let  $VAFC_{k,v,J,T}$  and  $VAFC_{k,v,\bar{J},T}$  be the accumulated values of the cash flow calculated under original scenario  $Scen_k^{Contiguous}$  altered by  $v$  and by shock, respectively negative and positive, immediately and only before  $T$ , in all price-type variables. The values of  $J$  and  $\bar{J}$  are those corresponding to each variable in scenario  $Scen_k^{Contiguous}$ .

Each original contiguous scenario thus generates  $1 + 2 \times Q$  new contiguous scenarios:

- (0) the original scenario with shock  $\nu$  in rate-type variables and no shock in price-type variables
- (1) the scenario in (0) with a **negative** shock, immediately and only before  $T_1$ , in price-type variables
- (2) the scenario in (0) with a **negative** shock, immediately and only before  $T_2$ , in price-type variables
- ⋮
- (Q) the scenario in (0) with a **negative** shock, immediately and only before  $T_Q$ , in price-type variables
- (Q+1) the scenario in (0) with a **positive** shock, immediately and only before  $T_1$ , in price-type variables
- (Q+2) the scenario in (0) with a **positive** shock, immediately and only before  $T_2$ , in price-type variables
- ⋮
- (2Q) the scenario in (0) with a **positive** shock, immediately and only before  $T_Q$ , in price-type variables

in the case of  $NC$  original contiguous scenarios, a swap portfolio with  $Q$  maturities is calculated under at least  $NC$  at most  $NC \times 1 + 2 \times Q$  different scenarios.

The value of the margin is given by the smallest cash flow value under all the scenarios resulting from the original scenarios as a function of safety parameters  $\nu$  and  $Jump$

$$\text{Margin Swaps Portfolio} = -\min[VAFC_1, VAFC_2, \dots, VAFC_{NC}]$$

where  $VAFC_k$  represents the accumulated cash flow value associated to the scenarios generated from  $Scen_k^{Contiguous}$  and parameters  $\nu$  and  $J$

$$VAFC_k = \min_{1 \leq q \leq Q} [VAFC_{k,\nu}, VAFC_{k,\nu,J,T_q}, VAFC_{k,\nu,J,T_q}] \quad (95)$$

**Example 8:** Consider the portfolio described in the following table.

| PORTFOLIO |        |                 |                |            |            |        |     |             |        |     |                                    |     |     |
|-----------|--------|-----------------|----------------|------------|------------|--------|-----|-------------|--------|-----|------------------------------------|-----|-----|
| Swap      | Matur. | Total timeframe | Time to elapse | Base value | Active leg |        |     | Passive leg |        |     | Variation occurred since base date |     |     |
|           |        |                 |                |            | $\gamma$   | $\rho$ | $c$ | $\gamma$    | $\rho$ | $c$ | DI                                 | DOL | EUR |
| 1         | $T_1$  | 2 years         | 1 year         | 1,000,000  | DOL        |        | 4%  | DI          | 100    | -   | 12,50%                             | 1%  |     |
| 2         | $T_2$  | 2 years         | 1,5 year       | 1,000,000  | DOL        |        | 4%  | DI          | 100    | -   | 6,0%                               | -1% |     |
| 3         |        | 2 years         | year           | 1,000,000  | DI         | 100    | -   | EUR         | -      | 5%  |                                    |     | -1% |

In this example, the margin is calculated taking into account the effect of safety factors on exchange rates and interest rate.

Suppose two contiguous scenarios for the portfolio variables, among which Pre and DI are represented by interest rate  $r$ .

The present value associated with variable DI represents passive and active positions, respectively, at  $T_1$  and at  $T_2$ , so that shock  $\nu$  applied to the interest curve, when correcting the leg value until the maturity is positive in estimating  $VLE^T$  and negative in estimating  $VLE^2$ .

| VARIABLE | SCENARIOS GENERATED FROM $Scen_1^{Contiguous}$ |        |                     |        |                           |        |                     |        |                           |        |
|----------|--|--------|---------------------|--------|---------------------------|--------|---------------------|--------|---------------------------|--------|
|          | $\nu = 20\%$ in $r$                            |        | $\nu = 20\%$ in $r$ |        | $\nu = 20\%$ in $r$       |        | $\nu = 20\%$ in $r$ |        | $\nu = 20\%$ for $r$      |        |
|          | $T_1$  | $T_2$  | $T_1$               | $T_2$  | $T_1$                     | $T_2$  | $T_1$               | $T_2$  | $T_1$                     | $T_2$  |
|          | before $T_1$ :                                 |        | before $T_1$ :      |        | between $T_1$ and $T_2$ : |        | before $T_1$ :      |        | between $T_1$ and $T_2$ : |        |
|          | $J_{DOL} = -5\%$                               |        | $J_{DOL} = -5\%$    |        | $J_{DOL} = -5\%$          |        | $J_{DOL} = 5\%$     |        | $J_{DOL} = 5\%$           |        |
|          | $J_{EUR} = -5\%$                               |        | $J_{EUR} = -5\%$    |        | $J_{EUR} = -5\%$          |        | $J_{EUR} = 3\%$     |        | $J_{EUR} = 3\%$           |        |
| DOL      | 8%   | 10%    | 2.60%               | 4.50%  | 8%                        | 4.50%  | 13.40%              | 15.50% | 8%                        | 15.50% |
| EUR      | 7%   | 12%    | 1.65%               | 6.40%  | 7%                        | 6.40%  | 10.21%              | 15.36% | 7%                        | 15.36% |
| DI (aa)  | 14.40%   | 10.06% | 14.40%              | 10.06% | 14.40%                    | 10.06% | 14.40%              | 10.06% | 14.40%                    | 10.06% |
| Pre (aa) | 12.00%   | 12.50% | 12.00%              | 12.50% | 12.00%                    | 12.50% | 12.00%              | 12.50% | 12.00%                    | 12.50% |
| $VLE^T$  | -95.70   | -37.40 | -148.40             | -35.50 | -95.70                    | -35.50 | -43.00              | -18.70 | -95.70                    | -18.70 |
| VAFC     | -133.10  |        | -183.90             |        | -131.20                   |        | -61.70              |        | -114.40                   |        |

A similar analysis for the scenarios generated from scenario  $Scen_2^{Contiguous}$ , with the values for parameters  $\nu$ ,  $J_{DOL}$ ,  $J_{DOL}$ ,  $J_{EUR}$  and  $J_{EUR}$ , results in the following estimates:

| variable | SCENARIOS GENERATED FROM $Scen_2^{Contiguous}$ |       |                         |       |                     |       |                           |       |                     |       |
|----------|--|-------|-------------------------|-------|---------------------|-------|---------------------------|-------|---------------------|-------|
|          | $\nu = 20\%$ in $r$                            |       | $\nu = 20\%$ in $r$     |       | $\nu = 20\%$ in $r$ |       | $\nu = 20\%$ for $r$      |       | $\nu = 20\%$ in $r$ |       |
|          | $T_1$  | $T_2$ | $T_1$                   | $T_2$ | $T_1$               | $T_2$ | $T_1$                     | $T_2$ | $T_1$               | $T_2$ |
|          | Before $T_1$ :                                 |       | Between $T_1$ and $T_2$ |       | Before $T_1$ :      |       | Between $T_1$ and $T_2$ : |       |                     |       |
|          | $J_{DOL} = -5\%$                               |       | :                       |       | $J_{DOL} = 5\%$     |       | $J_{DOL} = 5\%$           |       |                     |       |
|          | $J_{EUR} = -5\%$                               |       | $J_{DOL} = -5\%$        |       | $J_{EUR} = 3\%$     |       | $J_{EUR} = 3\%$           |       |                     |       |
|          | $J_{EUR} = -5\%$                               |       | $J_{EUR} = -5\%$        |       |                     |       |                           |       |                     |       |

|                        |         |        |         |         |         |         |         |        |         |        |
|------------------------|---------|--------|---------|---------|---------|---------|---------|--------|---------|--------|
| DOL                    | -8%     | -10%   | -12.60% | -14.50% | -8.00%  | -14.50% | -3.40%  | -5.50% | -8.00%  | -5.50% |
| EUR                    | -7%     | -11%   | -11.65% | -15.45% | -7.00%  | -15.45% | -4.21%  | -8.33% | -7.00%  | -8.33% |
| DI (aa)                | 14.40%  | 8.44%  | 14.40%  | 8.44%   | 14.40%  | 8.44%   | 14.40%  | 8.44%  | 14.40%  | 8.44%  |
| Pre (aa)               | 12.00%  | 10.50% | 12.00%  | 10.50%  | 12.00%  | 10.50%  | 12.00%  | 10.50% | 12.00%  | 10.50% |
| <b>VLE<sup>T</sup></b> | -251.77 | -6.64  | -296.63 | -6.30   | -251.77 | -6.30   | -206.90 | 9.76   | -251.77 | 9.76   |
| <b>VAFC</b>            | -258.40 |        | -302.94 |         | -258.07 |         | -206.90 |        | -251.77 |        |

The margin derives from the accumulated values of cash flow under all the scenarios derived from the original contiguous scenarios  $Scen_1^{Contiguous}$  and  $Scen_2^{Contiguous}$ .

$$\text{Margin Swaps Portfolio} = 302.94$$

This result is observed under scenario  $Scen_2^{Contiguous}$ , with a negative shock on the exchange rates before the shorter maturity (swap 1), in addition to the shock on the rate utilized to correct the value of the position indexed to variable DI, from the date of the analysis to maturity.

### Minimum Margin

The swap margin is made up, in addition to the portion obtained from the analysis of stress scenarios, by a portion of the minimum margin, which represents another safety factor, defined as a function of the contract's liquidity.

The minimum margin is calculated per transaction, according to the variables of each swap leg and to the timeframe. The minimum margin for the transaction of base value  $V_0$ , with legs indexed to  $y_a$  and  $y_b$  and maturity at  $T$ , corresponding to a timeframe of  $n$  in calendar days in relation to the date of analysis, is given by

$$MM Op_{y_a, y_b} = V_0 \times \mu_{a,b} n \times \sqrt{\frac{n}{360}} \quad (96)$$

where factor  $\mu_{a,b} n$  is the minimum margin parameter for swaps with legs indexed to  $y_a$  and  $y_b$  and timeframe  $n$ ,  $\mu \geq 0$ .

The minimum margin of a forward transaction is calculated on the period from the date of analysis to the swap maturity.

The minimum margin of the portfolio associated with each pair of indicators  $y_a$  and  $y_b$  is the consolidation of the minimum margins of all the transactions involving both variables.

$$MM_{y_a, y_b} = Abs \left[ \sum_{\substack{Swaps \\ y_a \times y_b}} MM Op_i_{y_a, y_b} - \sum_{\substack{Swaps \\ y_b \times y_a}} MM Op_j_{y_a, y_b} \right] \quad (97)$$

Finally, the minimum margin of the portfolio is the sum of the absolute values of the minimum margin associated with each pair of variables

$$MM = \sum_{Y_a, Y_b} MM_{Y_a, Y_b} \quad (98)$$

The portfolio's margin, after incorporating its minimum margin portion, is thus given by

$$\text{Margin Swaps Portfolio} = -\min[VAFC 1, VAFC 2, \dots, VAFC NC] + MM \quad (99)$$

**Example 9:** Consider the portfolio in *Example 5*. The last column on the following table indicates the values of the minimum margin for each swap, obtained according to equation (96), assuming a minimum margin factor equal to 1 % for any pair of variables and any timeframe.

| PORTFOLIO |        |                 |                |            |            |        |     |             |        |     |                         |
|-----------|--------|-----------------|----------------|------------|------------|--------|-----|-------------|--------|-----|-------------------------|
| Swap      | Matur. | Total timeframe | Time to elapse | Base value | ACTIVE LEG |        |     | PASSIVE LEG |        |     | Minimum Margin eq. (21) |
|           |        |                 |                |            | $\gamma$   | $\rho$ | $c$ | $\gamma$    | $\rho$ | $c$ |                         |
| 1         | $T_1$  | 2 years         | 1 year         | 1,000,000  | DOL        |        | 4%  | DI          | 100    | -   | 10,000.00               |
| 2         | $T_1$  | 3 years         |                | 1,500,000  | DI         | 110    | -   | DOL         | -      | 3%  | 15,000.00               |
| 3         | $T_2$  | 2 years         | 1.5 year       | 1,000,000  | DI         | 100    | -   | Prefixed    | -      | 12% | 12,247.45               |
| 4         | $T_3$  | 2.5 years       | 2 years        | 2,000,000  | DOL        | -      | 3%  | Prefixed    | -      | 13% | 28,284.27               |

The minimum margin of this portfolio is given by

$$MM = MM_{DOL, DI} + MM_{Pre, DI} + MM_{DOL, Pre}$$

The minimum margin corresponding to the swaps involving variables DOL and DI is the difference between the sum of the minimum margins of DOL X DI swaps and the sum of the minimum margins of DI x DOL swaps.

$$MM_{DOL, DI} = Abs \ 10,000 - 15,000 = 5,000$$

Similarly for the other pairs,  $MM_{Pre, DI} = 12,247.45$  and  $MM_{DOL, Pre} = 28,284.27$

The portfolio's total minimum margin is worth

$$MM = MM_{DOL, DI} + MM_{Pre, DI} + MM_{DOL, Pre} = 45,531.72$$

and the portfolio's margin, incorporating the minimum margin portion, is now worth

$$\text{Margin Swaps Portfolio} = -\min VAFC 1, VAFC 2 + MM = 369,320 + 45,531.72 = 414,851.72$$

The margin for positions in forward contracts traded at the Over-The-Counter Market –on currencies and metallic commodities – is calculated according to the methodology to calculate the margin for swap contracts, since one forward contract equals to one or more swap contracts. Such equivalence refers to the result of the forward transaction and of the swap(s).

Consider the simplest form of a forward contract – that which determines the spot purchase / sale of a quantity  $q$  of an underlying asset, for price  $F$ , on future date  $T$ , with  $F$  being denominated in local currency. Let us denote the spot reference prices  $S_0$  e  $S_T$  of the underlying asset, respectively, on the date on which the forward contract was executed and on its maturity date. The result of the transaction for the buyer is given by

$$\pi = q \times S_T - F \quad (100)$$

which can be rewritten as

$$\pi = q \times S_0 \times \left( \frac{S_T}{S_0} - \frac{F}{S_0} \right) = q \times S_0 \times \left( \frac{S_T}{S_0} - 1 + c \right) \quad (101)$$

where  $c$  is the effective rate implicit in the difference between  $S_0$  and  $F$ , known as of the contract trading. Such equation represents the value of a swap with the following characteristics:

- notional value  $q \times S_0$  ;
- maturity at  $T$  ;
- active leg indexed to the spot price of the asset underlying the forward contract; and
- passive leg prefixed in local currency, at effective rate  $c$ .

Assuming that the price of the underlying asset is fixed in foreign currency, the forward purchase is equivalent to a swap with the same characteristics as described above, except for the passive leg, which, in this case, is indexed to the exchange rate between the local currency and the foreign currency plus a prefixed interest rate in the foreign currency.

The characteristics of the swap(s) equivalent to a forward contract depend on the characteristics of the forward contract – the asset underlying the contract, the currencies involved, the type of price used in the definition of  $F$ , etc.

Thus, to calculate the margin of the set of positions in forward contracts, each contract is converted into a swap contract and incorporated to the set of positions in swap, by applying the methodology to calculate margin as defined for a swaps portfolio.

## 2.10. Stress Test for Flexible Options – Methodology to Calculated Margin for a Portfolio of Flexible Option Contracts

The margin required for a portfolio of flexible options must be sufficient to cover the position's settlement value which, for the purpose of calculating the risk of such contract, corresponds to the sum of the settlement values of each position in the portfolio at its respective maturity.

The methodology for margin calculation is based on the calculation of the settlement value of the positions under scenarios for the value of the underlying asset, which scenarios are defined from parameters related to the underlying asset, its volatility and the interest rates. Combined positions can also cause a margin reduction and, due to their reduced liquidity, there is no risk offsetting between positions on options on underlying assets and different maturities.

This section presents the criteria of the methodology in 4 parts

- margin of a holder's position;
- margin of a writer's position;
- margin of combined positions; and
- margin of the flexible options portfolio.

Let  $S$  and  $S^T$  be the values of the underlying object, respectively on the date of portfolio calculation and on future date  $T$ , that of the maturity of an option. The methodology is based on two scenarios for the value of the underlying asset at each maturity – a bullish scenario  $Scen_A^{S,T}$  and a bearish scenario  $Scen_B^{S,T}$ . Under such scenarios,  $S^T$  assumes values  $S_A^T$  and  $S_B^T$ , respectively,

$$S_A^T = S \times 1 + \Delta_A^T, \quad \Delta_A^T = 1 + i \times 1 + F_1 \frac{n}{360} \times \left( 1 + F_2 \times \sqrt{\frac{n}{360}} \right) + F_4 - 1 \quad (102)$$

and

$$S_B^T = S \times 1 + \Delta_B^T, \quad \Delta_B^T = 1 + i \times 1 - F_1 \frac{n}{360} \times \left( 1 - F_2 \times \sqrt{\frac{n}{360}} \right) - F_4 - 1 \quad (103)$$

where  $n$  is the timeframe until maturity  $T$  of the position, in calendar days, and  $i$ ,  $F_1$ ,  $F_2$  and  $F_4$  are parameters of the methodology.

A minimum value is defined for the settlement value at maturity / closing of the position, called minimum margin and denoted as  $MM$

$$MM = F_3 \times S \times Abs Q \quad (104)$$

Holder's and writer's positions are denoted by  $Pos^L$  and  $Pos^S$ , respectively. Indices "C" and "V", added to the other variables, if necessary, refer to the holder's and writer's positions, respectively. Term premium refers to the total value paid / received from the transaction involved in the transaction which originated their position.



Flexible option contracts contain several characteristics which give them the name “flexible”, such as (i) no standardization of maturity dates; (ii) possibility of choosing the premium payment date and the type of exercise; and (iii) possibility of defining the limit for the value of the underlying asset in the exercise (price limiter), and the knock-in barrier, knock-out barrier and rebate premium, paid the holder in case of activation / non activation of knock-out / knock-in barriers.

The contract parameters concerning such characteristics are named according to the following notation:

- $P$  : option premium, determined upon trading;
- $X$  : the strike price of the option;
- $FB$  : limiter for the value of the underlying asset upon the exercise;
- $ID$  : value of the knock-in-and-down type barrier;
- $IU$  : value of the knock-in-and-up type barrier;
- $OD$  : value of the knock-out-and-down type barrier;
- $OU$  : value of the knock-out-and-up type barrier;
- $Reb$  : rebate premium, per unit of the underlying asset;
- $T$  : maturity of the option; and
- $TM$  : the contract size;

$Q$  is defined as the total amount of the underlying asset corresponding to the position in  $q$  units of an option,  $Q = q \times TM$ .

### 2.10.1. Margin of a Holder’s Position

Since only obligation before the Clearinghouse of the holder of a flexible option is to pay the premium, his required margin is null after the premium is settled, that is,

$$\text{Margin } Pos^C = \begin{cases} P & \text{until settlement of premium } P \\ 0 & \text{after settlement of premium } P \end{cases} \quad (105)$$

### 2.10.2. Margin of a Writer’s Position

Differently from the holder of an option, the writer’s obligation extends up to the maturity of the contract, with him being the debtor counterparty. Thus, to calculate the margin required from a writer’s position, stress scenarios are defined for the value of the underlying asset on the option's maturity date.

Regarding the activation of knock-in and knock-out barriers, it is worth noting that

- the option whose knock-in barrier has been attained until the moment of margin calculation is considered an option without knock-in barrier; and
- the position whose knock-out barrier has been activated until the moment of margin calculation is no longer part of the portfolio.

Given the possibility of combining, in the same contract, price limiter ( $FB$ ) and knock-in ( $ID$  or  $IU$ ) and knock-out ( $OD$  or  $OU$ ) barriers, the estimation of the settlement value at maturity / closing of the position

must contemplate the various possibilities of combination between activated and non-activated barriers. Therefore, the margin value is determined through the assessment of a sequence of conditions, as described below.

Consider the upper and lower limits for the value of the underlying asset, on maturity date – the price limiter, if defined, or the value of the underlying asset, otherwise.

$$LimS_A = \begin{cases} S_A^T & \text{if } PB \text{ is not defined} \\ PB & \text{if } PB \text{ is defined} \end{cases} \quad \text{and} \quad LimS_B = \begin{cases} S_B^T & \text{if } PB \text{ is not defined} \\ PB & \text{if } PB \text{ is defined} \end{cases} \quad (106)$$

### Margin of a writer's position in a call option

Consider the following situations concerning the activation / non-activation of knock-in and knock-out barriers, under the scenarios for  $S^T$ .

- (i) The option has barrier  $IU$  and  $S_A^T < IU$
- (ii) The option has barrier  $ID$  and  $S_B^T > ID$
- (iii) The option has barrier  $ID$  and  $S_B^T \leq ID$
- (iv) The option has barrier  $OD$  and  $S_B^T > OD$
- (v) The option has barrier  $OD$  and  $S_B^T \leq OD$
- (vi) The option has barrier  $OU$  and  $S_*^T < OU$

- (vii) The option has barrier  $OU$  and  $S_*^T \geq OU$ , with  $S_*^T = \begin{cases} ID \times 1 + \Delta_A & \text{if (iii)} \\ S \times 1 + \Delta_A & \text{otherwise} \end{cases}$

The position's margin is determined by verifying all the following conditions, in the order they are presented:

- if (i) or (ii),  $\text{Margin Pos}^S = \max MM, \text{Reb}$  (C-1)

- if (i) or (ii),  $\text{Margin Pos}^S = \max MM, \text{Abs } Q \times [\min LimS_A, S_*^T - X]$  (C-2)

- if (v),  $\text{Margin Pos}^L = \max MM, \text{Reb}, \text{Abs } Q \times [\min LimS_A, S_*^T - X]$  (C-3)

- if (vii),  $\text{Margin Pos}^S = \max MM, \text{Reb}, \text{Abs } Q \times [\min LimS_A, OU - X]$  (C-4)

- otherwise,  $\text{Margin Pos}^S = \max MM, \text{Reb}, \text{Abs } Q \times [\min LimS_A, S_*^T - X]$  (C-5)

### Margin of a writer's position in a put option

Consider the following situations concerning the activation / non-activation of knock-in and knock-out barriers, under the scenarios for  $S^T$ .

- (i) The option has barrier  $IU$  and  $S_A^T < IU$
- (ii) The option has barrier  $IU$  and  $S_A^T \geq IU$

- (iii) The option has barrier  $ID$  and  $S_B^T > ID$
- (iv) The option has barrier  $OD$  and  $S_A^T > OD$
- (v) The option has barrier  $OD$  and  $S_A^T \leq OD$
- (vi) The option has barrier  $OU$  and  $S_A^T < OU$
- (vii) The option has barrier  $OU$  and  $S_A^T \geq OU$ , with  $S_*^T = \begin{cases} IU \times 1 + \Delta_B & \text{if (ii)} \\ S \times 1 + \Delta_B & \text{otherwise} \end{cases}$

The position's margin is determined by verifying the following conditions, in the order they are presented:

- if (i) or (iii),  $\text{Margin Pos}^S = \max MM, \text{Reb}$  (V-1)

- if (iv) or (vi),  $\text{Margin Pos}^S = \max MM, \text{Abs } Q \times [X - \max \text{Lim}S_B, S_*^T]$  (V-2)

- if (v),  $\text{Margin Pos}^S = \max MM, \text{Reb}, \text{Abs } Q \times [X - \max \text{Lim}S_B, OD]$  (V-3)

- if (vii),  $\text{Margin Pos}^S = \max MM, \text{Reb}, \text{Abs } Q \times [X - \max \text{Lim}S_B, S_*^T]$  (V-4)

- otherwise  $\text{Margin Pos}^S = \max MM, \text{Reb}, \text{Abs } Q \times [X - \max \text{Lim}S_B, S_*^T]$  (V-5)

### 2.10.3. Margin of Combined Positions

A **combination** is a pair of positions – a long position and a short position – in options of the same type (call option or put option), of European type, and having in common the underlying asset, the maturity, price of underlying object upon exercise, type and value of the barrier.

The size of the combination,  $Q^{\text{Combination}}$ , corresponds to the smallest among the long and short positions which make up the combination, that is,

$$Q^{\text{Combination}} = \min Q^C, -Q^V \quad (107)$$

The balance of a partially combined position can be utilized to form other combinations. In the event that such utilization does not take place, one determines the margin of the remaining position according to the criteria described for a holder's or writer's position, as the case may be. The sequence of formation of combinations follows the sorting of the strike price, by minimizing the differences between the strike prices of holder's and writer's positions – among the options which may form a combination with a strike price option  $X$ , one takes that with the strike price closest to  $X$ .

If there is a premium to settle the holder's position, the premium proportional to the portion of the holder's position in the combination,  $I P$ , makes up the value of the combination's margin

$$I P^L = \begin{cases} P^L \times \frac{Q^{\text{Combination}}}{Q^L} & \text{up to settlement of the deferred premium} \\ 0 & \text{after settlement of the deferred premium} \end{cases} \quad (108)$$

For a combination involving barrier (knock-out),  $Reb^{Combination}$  is defined as the rebate resulting from the combined position, given by

$$Reb^{Combination} = \begin{cases} Reb^S & \text{if purchase knock-out barrier} < \text{sale knock-out barrier} \\ \max(0, Reb^S - Reb^L) & \text{if purchase knock-out barrier} = \text{sale knock-out barrier} \end{cases} \quad (109)$$

The combination rebate is incorporated to the margin when, under scenario, the short position's knock-out barrier is activated. In order to simplify the margin equations, constants  $\delta$  are utilized,

$$\delta_A = \begin{cases} 0 & \text{if } S_A^T < OU^V \\ 1 & \text{if } S_A^T \geq OU^V \end{cases} \quad \text{and} \quad \delta_B = \begin{cases} 0 & \text{if } S_B^T > OD^V \\ 1 & \text{if } S_B^T \leq OD^V \end{cases} \quad (110)$$

The methodology recognizes the combinations listed below, considered only when they imply a margin reduction.

#### Combination with identical options

This is the most trivial combination – the holder's and writer's positions have equal strike prices ( $X^L = X^S$ ), equal strike price limiters ( $PB^L = PB^S$ ), same knock-in barrier values ( $ID^L = ID^S$  or  $IU^L = IU^S$ ), same values of the knock-out barrier ( $OD^L = OD^S$  or  $OU^L = OU^S$ ) and same rebate values ( $Reb^L = Reb^S$ ). The equality of all the characteristics is equivalent to a “reset” position in a same option contract and, therefore, does not require a margin in excess of the value of the premium not yet settled in relation to assuming the holder's position.

$$\text{Margin Combination} = I P^L \quad (111)$$

#### Combination with options with no barriers and no price limiters

This combination corresponds to bullish or bearish spreads, whose pay-offs, are limited between zero and the difference between strike prices. The margin is given by

$$\text{Margin Combination} = \begin{cases} I P^L + Q^{Combination} \times \max(0, X^L - X^S) & \text{if Combination with call options} \\ I P^L + Q^{Combination} \times \max(0, X^S - X^L) & \text{if Combination with put options} \end{cases} \quad (112)$$

#### Combination with call options solely with knock-out-and-down barrier and without price limiters

Margin Combination

$$= \begin{cases} I P^L + \delta_B \times Reb^{Combination} & \text{if } X^L \leq X^S \\ I P^L + \max(MM^S, \delta_B \times Reb^{Combination}, Q^{Combination} \times [\min(X^L, S_A^T) - X^S]) & \text{if } X^L > X^S \end{cases} \quad (113)$$

**Combination with call options solely with knock-out-and-up barrier and without price limiters**

Margin *Combination* =

$$= \begin{cases} I P^L + \delta_A \times \text{Reb}^{\text{Combination}} & \text{if } X^L \leq X^S \\ I P^L + \max MM^S, Q^{\text{Combination}} \times [\min X^L, S_A^T - X^S] & \text{if } X^L > X^S \text{ and } S_A^T < OU^S \\ I P^L + \max (MM^S, \text{Reb}^{\text{Combination}}, Q^{\text{Combination}} \times [\min (X^L, OU^S) - X^S]) & \text{if } X^L > X^S \text{ and } S_A^T \geq OU^S \end{cases} \quad (114)$$

**Combination with put options solely with knock-out-and-down barrier and without price limiters**

Margin *Combination* =

$$= \begin{cases} I P^L + \delta_B \times \text{Reb}^{\text{Combination}} & \text{if } X^L \geq X^S \\ I P^L + \max MM^S, Q^{\text{Combination}} \times [X^S - \max X^L, S_B^T] & \text{if } X^L < X^S \\ I P^L + \max (MM^S, \text{Reb}^{\text{Combination}}, Q^{\text{Combination}} \times [X^S - \max (X^L, OD^S)]) & \text{if } X^L < X^S \end{cases}$$

(115)

**Combination with put options solely with knock-out-and-up barrier and without price limiters**

Margin *Combination* =

$$\begin{cases} I P^L + \delta_A \times \text{Reb}^{\text{Combination}} & \text{if } X^L \geq X^S \\ I P^L + \max MM^S, \delta_A \times \text{Reb}^{\text{Combination}}, Q^{\text{Combination}} \times [X^S - \max X^L, S_B^T] & \text{if } X^L < X^S \end{cases} \quad (116)$$

Combinations are formed by executing an algorithm on each group of positions which meet the combination's definition. In the group of positions on put options, the search follows an ascending order of strike prices; in the group of positions on call options, the search follows a descending order of strike prices.

**2.10.4. Margin of Flexible Options Portfolio**

The margin of a flexible options portfolio is given by the sum of the margins of each position, or of the combination of which the position is a part, if the combination formation represents a decrease of the margin.

Consider that a portfolio's position - long and short positions - are such that, among all possible combinations, only  $N_T$  represent a margin benefit, there being left  $N_L$  long positions and  $N_S$  short positions. The portfolio's margin is then expressed according to the following equation

$$\text{Margin Flexible Options Position} = \sum_{i=1}^{N_L} \text{Margin } Pos_i^L + \sum_{i=1}^{N_S} \text{Margin } Pos_i^S + \sum_{i=1}^{N_T} \text{Margin } Combination_i \quad (117)$$

Where terms  $\text{Margin } Pos_i^L$  are given according to equation (105),  $\text{Margin } Pos_i^S$  according to equations (c-1) to (c-5) and (v-1) to (v-5) and  $\text{Margin } Combination_i$  according to equations (111) to (116).

**Example 1:** Consider a portfolio of Ibovespa's flexible options, as described in the following table, where cells highlighted in dark gray indicate an activated barrier. All positions have the same characteristics regarding the price alternative for settlement. On the date of margin calculation, the index is worth 35,000.

Suppose that a minimum margin parameter,  $F_3$ , is worth 3 %, and that parameters  $i$ ,  $F_1$ ,  $F_2$  and  $F_4$  result in variations  $\Delta_A^{T_1} = 16.9\%$  and  $\Delta_B^{T_1} = -12.3\%$  for maturity  $T_1$  and  $\Delta_A^{T_2} = 37\%$  and  $\Delta_B^{T_2} = -15\%$ ,

- 30,700 and 40,900 at  $T_1$ , respectively, under bearish and bullish scenarios

- 29,757 and 47,943 at  $T_2$ , respectively, under bearish and bullish scenarios

| PORTFOLIO |        |                         |                  |                     |                                    |        |        |        |                      |        |
|-----------|--------|-------------------------|------------------|---------------------|------------------------------------|--------|--------|--------|----------------------|--------|
| Opt       | Matur. | Call/Put<br>P/S<br>qty. | Strike Price $X$ | FB price<br>limiter | KNOCK-IN AND KNOCK-OUT<br>BARRIERS |        |        |        | Premium<br>to settle | Rebate |
|           |        |                         |                  |                     | ID                                 | IU     | OD     | OU     |                      |        |
| 1         | $T_1$  | Put<br>S 20             | 42,000           | 40,000              | -                                  | 40,000 | 38,000 | -      | -                    | 3,000  |
| 2         |        | Put<br>S 30             | 37,000           | -                   | 36,000                             | -      | 34,000 | -      | -                    | 2,000  |
| 3         |        | Call<br>S 12            | 38,000           | -                   | -                                  | -      | -      | -      | 1,200                | -      |
| 4         |        | Call<br>S 10            | 38,500           | -                   | -                                  | -      | -      | -      | -                    | -      |
| 5         |        | Call<br>C 15            | 35,000           | -                   | -                                  | -      | -      | -      | 6,000                | -      |
| 6         | $T_2$  | Put<br>V 10             | 36,000           | -                   | -                                  | -      | -      | -      | 350                  | -      |
| 7         |        | Put<br>V 25             | 38,000           | -                   | -                                  | -      | -      | 40,500 | -                    | 1,000  |
| 8         |        | Put<br>P 10             | 36,500           | -                   | -                                  | 38,000 | -      | -      | -                    | -      |
| 9         |        | Put<br>P 20             | 37,000           | -                   | -                                  | -      | -      | 40,500 | -                    | 3,000  |

**OPT 1:** There is no possibility of forming a combination with this options, since it has a knock-in barrier. Under the bullish and bearish scenarios for the Ibovespa price at  $T_1$ , the option has its knock-in and knock-out barriers activated, since  $S_A^{T_1} = 40,900 > IU$  and  $S_*^{T_1} = IU \times 1 + \Delta_B^{T_1} = 35,080 \leq OD$ . According to equation (V-3),

$$\text{Margin } Pos_1 = \max \{ 21,000, 3,000, 20 \times 42,000 - \max \{ 40,000, 38,000 \} \} = 40,000$$

**OPT 2:** This position could form a combination, since it has only knock-out-and-down barrier and has no price limiter, except for the fact of there not being a similar long put at the same maturity. Its knock-in barrier is ignored, since it has already been activated, and its knock-out barrier, under a bearish scenario, is attained. Therefore, the position's margin is given by equation (V-5)

$$\begin{aligned} \text{Margin Pos}_2 &= \max MM, \text{ Reb, Abs } Q \times \left[ X - \max \text{ Lim}S_B, S_*^T \right] = \\ &= \max 31,500, 2,000, 30 \times 37,000 - \max 30,700, 30,700 = 189,000 \end{aligned}$$

**OPT 3:** The position, calculated in an isolated form, has its margin given by equation (C-5).

$$\begin{aligned} \text{Margin Pos}_3 &= \max MM, \text{ Reb, Abs } Q \times \left[ \min \text{ Lim}S_A, S_*^T - X \right] = \\ &= \max 12,600, 0, 12 \times \min 40,900, 40,900 - 38,000 = 34,800 \end{aligned}$$

However, the position in Opt 3 can form a combination with the position in Opt 4 and the remaining balance with Opt 5, both involving call options with no barriers and no premium limiters.

The combination with Opt 4, of size  $Q^{\text{Combination}} = 10$ , reduces the margin value, since it is worth 5,000 \$, lower than the margin of the writer's position, of 29,000 \$

$$\text{Margin Combination} = I P^P + Q^{\text{Combination}} \times \max 0, X^P - X^S = 0 + 10 \times \max 0, 38,500 - 38,000 = 5,000$$

The combination with Opt 5, of size  $Q^{\text{Combination}} = 2$ , reduces the margin, since it is worth 7.800 \$, lower than the margin of the writer's position, of 5.800 \$ (ten twelfths of the total position's margin)

$$\text{Margin Combination} = I P^P + Q^{\text{Combination}} \times \max 0, X^P - X^S = \frac{6,000 \times 2}{15} + 2 \times \max 0, 38,500 - 35,000 = 7,800$$

Therefore, in calculation the portfolio's margin, part of the position in Opt 3 (10/12) contributes through the combination with Opt 4 and the rest (2/12) contributes in an isolated manner.

**OPT 4:** this position was totally utilized in the combination with Opt 3. If it were not part of any combination, its margin would be null.

**OPT 5:** since the formation of combinations was not utilized, the margin of this positions equals the value of the premium yet not settled. according to equation (105),

$$\text{Margin Pos}_5 = 6,000$$

**OPT 6:** the margin of this position, calculated in an isolated form, is given by equation (V-5) and is worth.

$$\text{Margin Pos}_6 = \max(10,500, 0, 10 \times 36,500 - \max(29,757, 30,700)) = 58,000$$

However, it forms a combination with the position in Opt 8, since the knock-in barrier of Opt 8 has already been activated. The combination margin totally reduces the margin of the position in Opt 6, since

$$\text{Margin Combination} = I P^P + Q^{\text{Combination}} \times \max(0, X^S - X^P) = 10 \times \max(0, 36,500 - 37,000) = 0$$

**OPT 7:** this position's margin, if calculated separately, is given by equation (V-4)

$$\begin{aligned} \text{Margin Pos}_7 &= \max(MM, \text{Reb}, \text{Abs } Q \times [X - \max(LimS_B, S_*^T)]) = \\ &= \max(21,000, 3,000, 20 \times 37,000 - \max(30,700, 30,700)) = 126,000 \end{aligned}$$

The combination of this position with Opt 9, however, represents a margin reduction. This combination involves put options only with similar knock-out-and-up barriers and with no premium limiters, since, with the strike price of the holder's position higher than the writer's position and with  $S_A^T = 40.900 \geq OU^V$  - its margin is then worth

$$\text{Margin Combination} = I P^P + \delta_A + \text{Reb}^{\text{Combination}} \times \max(0, \text{Reb}^S - \text{Reb}^P) = 2,000$$

**OPT 8:** this position was totally utilized in the combination with Opt 6. If it were not part of any combination, its margin would be null.

**OPT 9:** The remaining position of the combination formed with Opt 7 has a null margin, since it is a long position without deferred premium to settle.

Finally, the portfolio's margin is given by

$$\begin{aligned} \text{Margin Portfolio} &= \text{Margin}(Pos_1) + \text{Margin}(Pos_2) + \text{Margin}(Pos_3) + \text{Margin}(\text{Combination}(Pos_3, Pos_4)) + \\ &\quad \text{Margin}(Pos_5) + \text{Margin}(\text{Combination}(Pos_6, Pos_8)) + \text{Margin}(Pos_8) + \\ &\quad \text{Margin}(\text{Combination}(Pos_7, Pos_9)) + \text{Margin}(Pos_9) = \\ &= 40,000 + 189,000 + 34,800 \times \frac{2}{12} + 5,000 + 6,000 + 0 + 0 + 2,000 + 0 = 247,800 \end{aligned}$$

,  
In case the methodology would not allow to reduce the margin due to the formation of combinations, the portfolio's margin value would reach 452,800 \$.



## 2.11. Margin Calculation Methodology for a Portfolio of Forward Gold Contracts

The margin of a position in a forward gold contract is proportional with the difference between the spot prices and the gold forward price

$$\Delta = \begin{cases} PT - S & \text{if a long position} \\ S - PT & \text{if a short position} \end{cases} \quad (118)$$

A position's margin in  $q$  units of a forward contract is given by the following equations, depending on the position being short or long

$$\text{Margin } Pos^L = q \times \max A, \min B, C \quad (119)$$

e

$$\text{Margin } Pos^S = \begin{cases} -q \times A & \text{if } \Delta \leq 0 \\ -q \times \max B, C & \text{if } \Delta > 0 \end{cases} \quad (120)$$

with  $A = 0,1 \times PT$   
 $B = 0,1 \times PT + 0,1 \times \Delta$  and  
 $C = 1,5 \times \Delta$

Term  $A$  defines the minimum margin value, whereas terms  $B$  and  $C$  are proportional with  $\Delta$ , so that (i) the margin decreases linearly as the spot price approaches the traded price and (ii) keeps the same, equal to  $q \times A$  in the case of a long position and spot price higher than the forward price, or equal to  $-q \times A$  in the case of a short position and spot price lower than the traded forward price.

The required margin of the gold forward contracts portfolio made up of  $N_L$  long positions and  $N_S$  short positions is given by the sum of each position's margins.

$$\text{Margin Gold Forward Position} = \sum_{i=1}^{N_L} \text{Margin } Pos_i^L + \sum_{i=1}^{N_S} \text{Margin } Pos_i^S \quad (121)$$

with  $\text{Margin } Pos_i^L$  and  $\text{Margin } Pos_i^S$  according to equations (119), (120) and (10).

### 3. INTRADAY RISK

The Clearinghouse continuously monitors its exposure to participants' credit risk by monitoring the intraday risk, which allows it to carry out early margin calls during the day, that is, to execute a margin call on T+0, thus reducing its risk exposure.

For that follow-up, the Clearinghouse monitors the risk of the transactions of participants who access BM&FBOVESPA's trading systems directly – participants belonging to the category of Brokers (Brokerage Houses, Locals and PAPE holders), and PLDs. In this section, the term Broker also refers to participants in the PLD category.

#### 3.1. Intraday Risk Limit

The Clearinghouse establishes an **intraday risk limit** for each Broker linked to a same Clearing Member, with this Clearing Member having the choice of either accepting or reducing it, according to his own criteria, since he is responsible for the settlement of the operations and for posting the collateral required from the Broker. Monitoring the intraday risk of Participants consists of assessing, as often as possible, the adherence of their overall transaction values to the limits that have been imposed upon them, and to that end, the **operational limit** of each Broker is monitored, under each Clearing Member with whom he has a contractual relationship.

The intraday risk limit establishes the Broker's maximum risk exposure beyond which the Clearinghouse requires the Broker, its customers, or the responsible Clearing Member to promptly pledge additional collateral. The Broker can pledge additional collateral of its ownership with the Clearinghouse, in order to cover the amount of risk exposure which exceeds its intraday risk limit, thus preserving its operational regularity. The Clearing Member responsible for it can also pledge proprietary collateral, in order to increase that Participant's limit.

The value of the intraday risk limit ascribed to a Broker,  $IRL_{Broker}$ , is limited as per the following equation

—

where:

$A$  : the amount of the Clearing Fund;

$B$  : the amount of the Special Clearing Member Fund; and

$N$  : the parameter set up by the Market Risk Committee with a value greater than or equal to 1.

The Clearing Fund and the Special Clearing Member Fund constitute BM&FBOVESPA's safeguards. Information about them is available in BM&FBOVESPA's Rulebook and Operating Procedures Manual.

In order to facilitate understanding the following sections, previous reading of the chapter dealing with the methodologies to calculate collateral margin is recommended.

#### 3.2. Operational Limit

The Participant's operational limit is a function of

- i. its intraday risk limit
- ii. the collateral posted to cover the transactions assigned to it; and
- iii. a risk measurement representing the maximum loss incurred in case the Customers linked to it and holding higher-risk positions simultaneously default.

The Broker's ( $OL_{Broker,CM}$ ) operational limit is denoted by *Trader* in regard to the transactions under a specific Clearing Member's (*CM*) responsibility. The operational limit is given by the difference between (i) the sum of the intraday risk limit attributed to it and the collateral pledged and (ii) the risk of the transactions under its responsibility.

(1)

where

- : Intraday Risk Limit attributed by the Clearinghouse to the Broker and adjusted by the responsible *CM* regarding the transactions under said *CM*'s responsibility;
- : the collateral pledged by the Broker to increase its operational limit, restricted to the transactions under said *CM*'s responsibility;
- : the collateral pledged by Clearing Member *CM* in favor of the Broker to increase its operational limit, restricted to the transactions under said *CM*'s responsibility; and
- : risk of Broker's transactions under the responsibility of Clearing Member *CM*, given by

(2)

The separation of the Broker's transactions between allocated and non-allocated transactions for risk calculation purposes is due to the possibility of specifying the customers of the trades, in the trading and transaction registration systems, only at day closing.

It should be noted that:

- the transactions of a Broker belonging to the Local or Agricultural Commodities Local (OEs) categories, except for give-ups to Brokerage Houses, which overburden the latter's Operational Limit, are considered **allocated** at the time of registration, since the OEs trade only for their own account; thus, during assessment of these participants' transactions, term \_\_\_\_\_ is null; and
- the trades executed through the WTr have their corresponding Customers identified at the time of closing of the trade, so that they are considered **allocated** when calculating the Broker's operational risk.

In general, whereas the only source of uncertainty regarding the allocated transactions is the volatility of market prices, the non allocated ones are added of the uncertainty arising from several possibilities of distribution of trades among Customers linked to the Broker. The following sections present the criteria to calculate the portions of the Broker's risk – the risk portion of allocated transactions and the risk portion of non-allocated transactions. Below is a description of how to calculate the balance of free collateral for transfer and other relevant criteria/characteristics of intraday risk monitoring. Finally, some examples are shown.

### 3.2.1. *Risk of Allocated Trades*

The calculation of the risk of **allocated** transactions is based on the portfolios of Customers linked to the Broker and on the amount of collateral they pledge. Should a Customer default, the Broker's potential loss will be given by the difference, if positive, between the risk of the defaulter's positions and the amount of collateral it pledged.

The risk of allocated transactions is therefore defined as the Broker's maximum potential loss in case, among the Customers under its responsibility, the  $NC^*$  Customers with the higher-risk positions default.

(3)

where  $NC$  is the total number of Customers linked to Broker ( $NC \geq NC^*$ ) and  $Customer\ Deficit_i$  represents the difference, if positive, between the values of the portfolio's risk and the collateral pledged by the  $i$ -th Customer. Sorting the deficits in decreasing order,  $Customer\ Deficit_j$  is the  $j$ -th largest risk<sup>7</sup> for the Clearinghouse.

The Customer's risk, calculated based on the BM&FBOVESPA stress test models, represents the Clearinghouse's exposure to the customer's credit exposure in a thorough manner, that is, by taking into account the customer's position at day opening, the new trades allocated on behalf of the customer up to the time of calculation, the intraday marking to market of the customer's positions and the amount of collateral pledged by the customer with the Clearinghouse.

The deficit of the Customer authorized to trade through the WTr as an *Arbitrator* or the non-WTr user Customer is given by

(4)

where

$MR_{ET}$  : Customer's **required margin** for his positions in BM&FBOVESPA's exchange traded contracts, including those undertaken through the WTr, calculated according to BM&FBOVESPA's stress test model for the relevant contracts, reflecting his closing position on the preceding business day (considering even the transactions carried out in after-hours session) and the transactions allocated to him until the time of such calculation; term  $MR_{ET}$  is updated along the day;  $MR_{ET} \geq 0$ ;

$MR_{OTC}$  : Customer's **required margin** for his positions in OTC Market contracts registered with the Clearinghouse's *guarantee feature* and accepted by it, calculated according to BM&FBOVESPA's stress test model for the relevant contracts, reflecting only its closing position on the preceding business day; term  $MR_{OTC}$  remains constant along the day;  $MR_{OTC} \geq 0$ .

$MR_{Additional}$  : Customer's **required additional margin**;

---

<sup>7</sup> The various accounts held by the same Customer, who is identified by the corresponding Corporate or General Individual Taxpayer Register of the Ministry of Finance (CNPJ or CPF), Brazilian Securities and Exchange Commission (CVM) code, or nonresident agricultural investor code, under the same Participant and the same CM, are treated in a consolidated manner by the SRI.

$VLM_{D+0}$  : Customer's **multilateral settlement value**, to be settled on T+0, assuming a null value after the Clearinghouse's settlement window<sup>8</sup>;  $VLM_{D+0} < 0$  represents debit against the Customer and  $VLM_{D+0} > 0$  represents credit to him;

$MtM$  : **result of marking to market** of the Customer's positions in futures contracts, including the trades carried out during the day up to the time of such calculation;  $MtM$  is calculated on the basis of the latest market reference prices; negative (positive) amounts represent loss (gain) to the Customer;

$Col$  : **collateral volume** pledged by the Customer with the Clearinghouse, with the aim of covering the risk of his positions, up to the time of said calculation, updated along the day according to collateral transfers<sup>9</sup> carried out;  $Col \geq 0$ ;

$p$  : measurement of excess percent risk on the collateral volume

$$p = \begin{cases} \bar{p} & \text{if } Col = 0 \\ \frac{Risk}{Col} & \text{if } Col > 0 \end{cases}$$

, ; and

$\bar{p}$  : minimum excess risk on collateral volume, defined by the Clearinghouse per Broker and/or Customer,  $\bar{p} \geq 1$ .

The deficit of the Customer authorized to trade through the WTr as a *Non-Arbitrator* is given by

(5)

$$\text{with } p = \begin{cases} \bar{p} & \text{if } Col + Col^{WTr} = 0 \\ \frac{Risk}{Col + Col^{WTr}} & \text{if } Col + Col^{WTr} > 0 \end{cases}$$

; and

where terms have the same meanings which were assigned to them in the description of equation (4), however

<sup>8</sup> The procedures for settling and calculating the multilateral settlement value are described in the Clearinghouse's Operating Procedures Manual.

<sup>9</sup> The procedures for collateral transfer are described in the Clearinghouse's Operating Procedures Manual.

- the values of  $MR_{ET}$ ,  $MR_{Additional}$ ,  $VLM_{D+0}$ ,  $MtM$  and  $Col$  are obtained without including the positions and transactions derived from trading via WTr;
- the values of  $MR_{OTC}$ ,  $VLM_{D+0}$ ,  $MtM^{WTr}$  and  $Col^{WTr}$  are restricted to the positions and transactions derived from trading via WTr, from Customer not registered as an *Arbitrator*; and
- 

The way it was defined in (4) or (5), the Customer's deficit assumes a null or positive value. A positive deficit value indicates that the collateral pledged by the Customer is not enough to cover the potential loss derived from his positions and transactions. A null deficit value, on the other hand, indicates exactly the opposite, given the stress scenarios utilized by the risk calculation model adopted by BM&FBOVESPA and its premises.

Furthermore, it should be noted that:

- although term  $MR_{OTC}$  suffers no alteration along the day, it is necessary to consider it when calculating the deficit, since term *Collateral* represents the total volume of collateral pledged, thus making it impossible to differentiate the positions each collateral pledged refers to;
- transactions carried out on T-1 and whose possible collateral margin call has not yet been met overburden the Customer's deficit and, consequently, the responsible Broker's operating limit.
- $\bar{p}$  it operates as a trigger, by determining whether the Customer's risk increment overburdens the responsible Broker's operating limit or not; and
- the collateral margin calculation methodologies are those described in chapter 2 –Margin Calculation, in this Manual; it is also applied to calculate the required margin term of the exchange traded contracts,  $MR_{TrFloor}$ , the Subportfolio 2 Procedure, foreseen for this group of contracts.
- upon the exercise of an American option on a futures contract, the positions of the holder and of the writer of the option are transformed into positions in the underlying futures contract - the holder of the option assumes a long or short position in the futures contract, depending on whether it is a call or put option, with the option writer assuming the opposite position as that of the holder. Such a transformation of positions occurs during the futures contract trading session, and is captured by the intraday risk monitoring system and may cause a significant alteration in the risks of the portfolios of the Customers involved in the exercise and, consequently, of the operating limits of the respective responsible Brokers;
- for the Customer classified as *Non-arbitrator* who trades through the WTr, we have

**Example 1:** Consider a Broker linked to 5 Customers, whose portfolios have the following status as of the calculation of its operational limit, considering  $\bar{p} = 1$  and all Customers as *Arbitrators*.

| Customer | Updated required collateral | VLM to settle on T+0 | MtM     | Risk      | Collateral pledged | Deficit   |
|----------|-----------------------------|----------------------|---------|-----------|--------------------|-----------|
| 1        | 10,000,000                  | 1,000,000            | 500,000 | 9,500,000 | 6,000,000          | 3,500,000 |

|   |            |            |           |            |            |                  |
|---|------------|------------|-----------|------------|------------|------------------|
| 2 | 20,000,000 | -1,000,000 | -300,000  | 21,300,000 | 17,500,000 | <b>3,800,000</b> |
| 3 | 16,000,000 | -          | 2,000,000 | 14,000,000 | 15,000,000 | -                |
| 4 | 5,000,000  | -2,000,000 | -         | 7,000,000  | 8,000,000  | -                |
| 5 | 9,000,000  | -          | -         | 9,000,000  | 9,050,000  | -                |

Assuming the Clearinghouse attributes to this Broker an  $NC^*$  value equal to 3, the risk of the allocated transactions is

$$Risk_{Allocated\ Trades} = Customer\ Deficit_{(1)} + Customer\ Deficit_{(2)} + Customer\ Deficit_{(3)} = 3,800,000 + 3,500,000 + 0 = 7,300,000$$

As one can observe, the Customer who has pledged collateral in an amount enough to cover his risk, that is, whose deficit is null, exerts no impact on the responsible Broker's operational limit.

### 3.2.2. Risk of Non-Allocated Transactions

The risk of **non-allocated** transactions is calculated so as to reflect the Broker's maximum potential loss, given all possibilities to specify such transactions and all combinations of stress scenarios possibilities.

In addition to market price volatility, the calculation of the risk of non-allocated transactions requires special attention, since the uncertainty involved in such transactions arises from the indetermination about transaction distribution among the several customers with whom the Participant maintains a contractual relationship. Whereas it is not possible to attribute a new trade to a specific customer, it is also not possible to assess whether there is enough collateral to cover the corresponding risk. This is because the collateral pledged by a Customer is solely earmarked to cover the risk of the customer's own transactions, which means that this collateral cannot be used in a joint manner. Under an extreme situation, all losing trades carried out on that day are allocated to one or more customers with no collateral pledged with the Clearinghouse, thus increasing a Broker's potential loss.

Given the possibility of specifying several trades to different Customers, a situation in which possible offsets no longer exist, **no risk offsetting is allowed in calculating the risk of non-allocated transactions** – between purchase and sale transactions of the same contract, nor between exposures to risk factors common to positions originating from different trades. It is worth mentioning that trades that have not been allocated to a secondary Clearing Member within the corresponding timeframe are automatically attributed to the Broker's main Clearing Member.

The set of non-allocated operations consists only of the Exchange Market transactions. Just like the calculation of the required collateral margin, in order to calculate the risk of non-allocated transactions the contracts are clustered in contract subportfolios. Consider the following variables, concerning the contracts belonging to a certain subportfolio:

$Op_i$  : the  $i$ -th transaction attributed to the Broker and yet unallocated;

$Scen_k^{Contiguous}$  : the  $k$ -th contiguous stress scenario for the set of FPRs of the contracts belonging to the subportfolio; and

$V_{ki}$  : the variation of the value of transaction  $Op_i$  under scenario  $Scen_k^{Contiguous}$ .

Maintaining the notation used in the chapters on collateral margin calculation, the  $k$ -th contiguous scenario for risk factors  $FPR^1, FPR^2, \dots, FPR^N$  is denoted by  $Scen_k^{Contiguous} = [Scen_{k_1}^1, Scen_{k_2}^2, \dots, Scen_{k_N}^N]$ , where  $Scen_{k_1}^1$  is one of the scenarios defined for factor  $FPR^1$ ,  $Scen_{k_2}^2$  is one of the scenarios defined for factor  $FPR^2$ , and so on.

It should be noted that

- the subportfolios of contracts utilized to monitor intraday risk are not necessarily the same as those defined for calculation of the required collateral margin; and
- the stress scenarios for FPR utilized to monitor intraday risk are not necessarily the same as those defined for calculation of the required collateral margin; and
- the contiguous stress scenarios are not necessarily the same as those along the subportfolios.

### Futures Contracts

For a transaction with futures contract, variation  $V_{ki}$  is given by

- a portion which is a function of the price variation in relation to the negotiated price, taken place up to the time of calculation, and
- a portion which represents the price variation expectation, from the time of calculation, obtained as a linear combination of the variations for the FPRs as defined in the respective stress scenarios.

$$V_{ki} = VF_i \times \left( 1 - \frac{P_{Op_i}}{P_{Ref}} \right) + VF_i \times [s_1 \times \Delta^1 k_1 + s_2 \times \Delta^2 k_2 + \dots + s_N \times \Delta^N k_N] \quad (6)$$

$$VF_i = q_i \times P_{Ref} \times TM$$

where

- $q_i$  : number of contracts traded in transaction  $Op_i$ ,  $q_i < 0$  if a purchase transaction,  $q_i > 0$  if a sale transaction;
- $P_{Ref}$  : reference price (last market price) for the contract traded in transaction  $Op_i$  ;
- $TM$  : size of the contract traded in transaction  $Op_i$  ;
- $P_{Op_i}$  : price traded in transaction  $Op_i$  ;
- $\Delta^j k_j$  : percent variation for factor  $FPR^j$ , under scenario  $k_j$  defined for that factor which is part of contiguous scenario  $Scen_k^{Contiguous}$ ,  $\Delta^j k_j = \frac{FPR_{k_j}^j - FPR_{Ref}^j}{FPR_{Ref}^j}$  ;
- $s_j$  : sign of the financial exposure of the contract traded in transaction  $Op_i$  to factor  $FPR^j$  ( $s_j = \pm 1$ , depending on the contract and factor).

### Options Contracts

Just as in the case of calculating the required margin, pricing function  $f$  is used to obtain the premium of the option under scenario. For a transaction with options contract, variation  $V_{ki}$  is given by



$$V_{ki} = \begin{cases} FV_i k \times \left(1 - \frac{P_{Op_i}}{P k}\right) & \text{if purchase of option} \\ -\max(FV_i k, q_i \times MM) & \text{if sale of option} \end{cases}, \quad FV_i k = q_i \times P k \times TM \quad (7)$$

where

$MM$  : minimum margin of the contract traded in transaction  $Op_i$ ;

$P k$  : the option premium under contiguous scenario  $Scen_k^{Contiguous}$ ; and

the other variables have the same meaning given in the description of  $V_{ki}$  in the case of futures contract.

An option purchase transaction presents a negative variation under scenario if the premium, under such scenario, is lower than traded price  $P_{Op_i}$ . If the buyer Customer does not settle the purchase transaction on T+1, the responsible Broker assumes that settlement and may, later on, sell the option at market price; however, if the defaulting Customer does not have collateral pledged and the market price is lower than  $P_{Op_i}$ , the Broker may incur a loss proportional to the difference between both prices.

Assuming that scenario  $Scen_k^{Contiguous}$  occurs, the Broker's largest potential loss arising from transactions with contracts belonging to the subportfolio takes place when negative-value transactions are allocated to a single customer with no collateral pledged and positive-value transactions are allocated to other customers, that is

$$MaximumTradeLoss(Subp_s, Scen_k) = -\sum_{i=1}^n \min(V_{ki}, 0) \quad (8)$$

where  $n$  is the number of non-allocated transactions with contracts of subportfolio  $s$ .

The risk corresponds to the worst result among the results of such combination of specifications under each scenario

$$Risk_{non-specified\ oper} Subp_s = -\min\left[\sum_{i=1}^n \min(V_{1i}, 0), \dots, \sum_{i=1}^n \min(V_{mi}, 0)\right] \quad (9)$$

The following figure shows the calculation of the risk, for a contract subportfolio, of non-allocated transactions.

| Scenarios             | NON-ALLOCATED TRANSACTIONS |          |     |          | MAXIMUM<br>BROKER LOSS          |
|-----------------------|----------------------------|----------|-----|----------|---------------------------------|
|                       | $Op_1$                     | $Op_2$   | ... | $Op_n$   |                                 |
| $Scen_1^{Contiguous}$ | $V_{11}$                   | $V_{12}$ | ... | $V_{1n}$ | $-\sum_{i=1}^n \min(V_{1i}, 0)$ |
| $Scen_2^{Contiguous}$ | $V_{21}$                   | $V_{22}$ | ... | $V_{2n}$ | $-\sum_{i=1}^n \min(V_{2i}, 0)$ |
| ⋮                     | ⋮                          | ⋮        |     | ⋮        |                                 |



$$Scen_m^{Contiguous} \quad V_{m1} \quad V_{m2} \quad \dots \quad V_{mn} \quad -\sum_{i=1}^n \min V_{mi}, 0$$

$$Risk_{non-specified oper} Subp_s = -\min \left[ \sum_{i=1}^n \min V_{li}, 0, \dots, \sum_{i=1}^n \min V_{mi}, 0 \right]$$

**Table – Risk of non-allocated transactions of a subportfolio**

Notice that, differently from the calculation of required margin, here no consolidation is made of the risk between non-allocated transactions – between maturities of a same contract, nor between futures contracts and contracts of option with daily settlement.

**Example 2:** Let us consider that the Broker of the previous example is responsible for 4 non-allocated transactions up to the time of calculating his operational limit, with the following variations under the contiguous scenarios:

| CONTIGUOUS SCENARIO                     | NON-ALLOCATED TRANSACTIONS |                 |                 |                 | SUM OF NEGATIVE RESULTS |
|---|----------------------------|-----------------|-----------------|-----------------|-------------------------|
|   | Op <sub>1</sub>            | Op <sub>2</sub> | Op <sub>3</sub> | Op <sub>4</sub> |                         |
| Scen <sub>1</sub> <sup>Contiguous</sup> | -500,000                   | 100,000         | -100,000        | -100,000        | <b>-800,000</b>         |
| Scen <sub>2</sub> <sup>Contiguous</sup> | -500,000                   | 150,000         | -800,000        | -400,000        | <b>-1,300,000</b>       |
| Scen <sub>3</sub> <sup>Contiguous</sup> | 350,000                    | -250,000        | +600,000        | -100,000        | <b>-350,000</b>         |

Each scenario represents a combination of the scenarios defined for the risk factors. In case scenario 1 occurs and all operations with a negative value under that scenario are allocated to the same Customer without collateral pledged, the broker's potential loss is 800,000 \$. The same calculation, under the other scenarios, results in the values on the last column of the above table. Finally, the risk of non-allocated transactions corresponds to the Broker's worst potential loss, that is,

$$Risk_{non-allocated trades} = -\min(-800,000, -1,300,000, -350,000) = 1,300,000$$

Considering the risk of the allocated transactions under his responsibility, as calculated in the previous example, the risk of the Broker's transactions is given by

$$Risk_{Broker, CM} = Risk_{allocated trades} + Risk_{non-allocated trades} = 7,300,000 + 1,300,000 = 8,600,000$$

The risk of all the Broker's non-allocated transactions is given by accumulating the risks of non-allocated transactions calculated in each subportfolio.

(10)

**3.2.3. Operational Limit Monitoring – Operational Limit Percent Utilization**

As the Broker performs allocations in the Clearinghouse's systems, the allocated trades are excluded from the calculation of risk of his transactions and included in the calculation of risk of allocated transactions, in the risk portions of the respective Customers responsible for them. Therefore, the Broker's Operational Limit is unburdened when transactions are allocated to Customers who have enough collateral or to customers who have opposite positions in relation to the trades carried out on the day, thus providing a reduction of the risk in their portfolios.

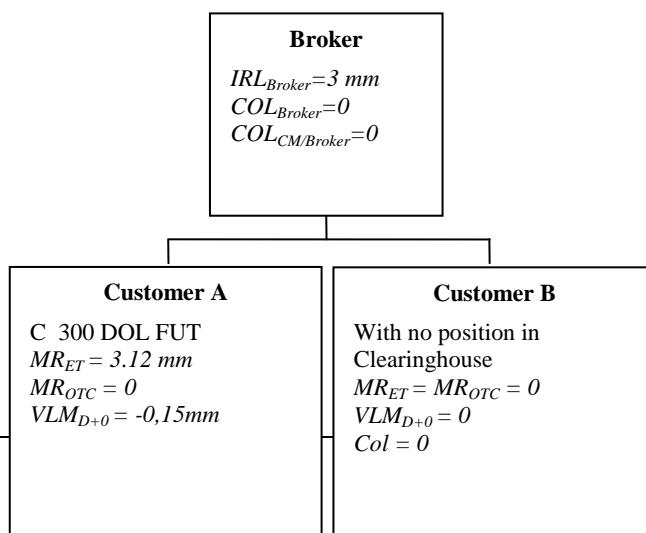
The Broker's adherence to the intraday risk limit which is assigned to him by the Clearinghouse (and possibly reduced by the responsible Clearing Member) is monitored through the respective **Operational Limit Percent Utilization**, given by the ratio between the risk and the intraday limit added of the collateral:

(11)

A negative operational limit is equivalent to an operational limit percent utilization lower than 100 %. The Brokers are required to anticipate the transactions they intend to perform, for their own or their customers' portfolios, by taking the necessary measures to prevent the respective operational limit percent utilization from exceeding 100 %. The Clearinghouse's Operating Procedures Manual describes such steps, as well as the procedures foreseen for situations in which the Broker's Operational Limit percent utilization exceeds the value of 100 % and for the cases of unjustified recurrence of violation of the Operational Limit within a short period of time.

**Example 3: Let us consider the participants and their respective positions on opening of T+0 as per the following figure, with the Broker being linked to only one main Clearing Member. Consider that**

- **the Customers do not trade via WTr;**
- $\bar{p} = 1$ ;
- the calculation of the Broker's operational limit includes the deficits of all Customers linked to him  $NC^* = NC$  ; and
- **the required collateral margin for 1 unit of the USD futures contract is worth R\$10,400.00 for either a long or short position.**



- At trading session opening, the Broker's operational limit assumes the same value of his intraday risk limit. Indeed, at day opening there are no unallocated transactions, so that  $Risk_{Broker,CM} = Risk_{allocated\ trades}$ . The risk of allocated transactions derives from the deficits of Customers A and B, and they are both zero.

$Customer\ Deficit_A = 0$  since

$$p = \frac{Risk}{Col} = \frac{3.27}{4} = 0.82 < \bar{p}, \quad Risk = 3.12 + 0 - \min(0, -0.15) - 0 = 3.27$$

$Customer\ Deficit_B = 0$  since, as this Customer has no collateral,  $\rho = \bar{\rho}$  and

---


$$OL_{Broker,CM} = 3 + 0 + 0 - 0 = 3mm$$

At this moment the Broker is at a regular condition in relation to the utilization of his operational limit, since his operational limit is zero or, similarly, his percent utilization of his operational limit is lower than 100 %.

- 
- Consider that Broker sells 100 US Dollar futures contracts at market price, and keeps it non-allocated. Under this situation, his operational limit is reduced to 1.96 mm. In fact, the Broker's risk in relation to the allocated transactions undergoes no change, since the positions of Customers A and B have not changed. On the other hand, the risk portion of the non allocated transactions assumes the value of 1.04mm and

$$OL_{Broker,CM} = 3 + 0 + 0 - 1.04 = 1.96mm > 0$$

- Consider that Broker sells an additional 200 US Dollar futures contracts at market price and the corresponding trade remains unallocated, just like the previous sale transaction. His operational limit undergoes a new reduction, down to -0.12mm. The risk of the allocated transactions is not changed, and the risk of non-allocated trades totals 3.12mm and

$$OL_{Broker,CM} = 3 + 0 + 0 - 3.12 = -0.12mm < 0$$

With a negative operational limit, with percent utilization at 104 %, the Broker must take action, that is, arrange for it to return to a positive value. The specification of customers to the trades carried out on the day may result in such adherence.

- In case he specifies both trades to Customer B, his operational limit does not change, since that Customer's deficit, after the specification, assumes the value of 3.12mm. Indeed, as this Customer has no collateral pledged,  $p = \bar{p}$  and, therefore

$$Customer\ Deficit_B = \max(3.12 + 0 + 0 - 0 - 0, 0) = 3.12$$

$$Risk_{allocated} = Customer\ Deficit_A + Customer\ Deficit_B = 0 + 3.12 = 3.12$$

$$OL_{Broker,CM} = 3 + 0 + 0 - 3.12 = -0.12mm$$

- In case he specifies both trades to Customer A, his operational limit returns to the value of 3mm, since the risk of the non-allocated transactions goes back to null, as well as Customer A's deficit, whose position is "reset" with the specification.
- In case he specifies the first trade to Customer A and the second to Customer B, then

$$Customer\ Deficit_A = 0, \text{ since } p = \frac{Risk}{Col} = \frac{2.23}{4} = 0.56 < \bar{p}$$

$$Customer\ Deficit_B = \max(2.08 + 0 + 0 - 0 - 0, 0) = 2.08$$

$$Risk_{allocated} = Customer\ Deficit_A + Customer\ Deficit_B = 0 + 2.08 = 2.08$$

$$OL_{Broker,CM} = 3 + 0 + 0 - 2.08 = 0.92mm$$

- In case he specifies the first trade to Customer B and the second to Customer A, then

$$Customer\ Deficit_A = 0, \text{ since } p = \frac{Risk}{Col} = \frac{1.19}{4} = 0.3 < \bar{p}$$

$$Customer\ Deficit_B = \max(1.04 + 0 + 0 - 0 - 0, 0) = 1.04$$

$$Risk_{allocated} = Customer\ Deficit_A + Customer\ Deficit_B = 0 + 1.04 = 1.04$$

$$OL_{Broker,CM} = 3 + 0 + 0 - 1.04 = 1.96mm$$

Therefore, except for the first allocation alternative, the others unburden the Broker's operational limit and place him in a regular condition.

### 3.3. Collateral Balance Free for Transfer

At each Customer's risk updating, the new transactions allocated to him until then are included in the calculation. Possible excess collateral pledged by the Customer is automatically blocked by the Clearinghouse's systems, in the same proportion as the risk increase, if any.

The collateral balance free for transfer represents the amount which can be transferred by the Customer and the responsible Broker. Such balance is denoted as *FB* and determined as follows:

(12)

Where the Customer's required collateral margin concerning his position in exchange traded contracts, at the closing of the preceding business day; the definitions of the other variables given previously keep unchanged.

According to the above expression, reductions in variable  $MR_{ET}$  cannot increase the collateral balance free for withdrawal on D+0, but only for withdrawal on D+1. The release of the Customer's free balance under a certain Broker is conditional to the Customer previously meeting the margin calls under the other Brokers with whom he has a contractual relationship.

**Example 4:** Consider Customer A from the preceding example at day's opening.

|   |
|---|
| <p><b>Customer A</b></p> <p>C 300 DOL FUT</p> <p><math>MR_{ET} = 3.12mm</math></p> <p><math>MR_{orc} = 0</math></p> <p><math>VLM_{D+0} = -0.15mm</math></p> <p><math>Col = 4mm</math></p> |
|---|

The collateral balance he can withdraw, according to equation (12), is worth

$$FB = \max(4 - \max(3.12, 3.12 - 0 - 0) + \min(0, -0.15) + 0) = 0.73$$

Suppose the trades carried out by the Broker, as described in the previous example, are allocated to this Customer. Due to the allocation of trades, Customer A has no open position and, nevertheless, his free collateral balance remains unchanged.

$$FB = \max(4 - \max(3.12, 0 - 0 - 0) + \min(0, -0.15) + 0) = 0.73$$

## ***APPENDIX 1 – RULES FOR MAPPING FUTURES CONTRACTS IN PRIMITIVE RISK FACTORS***

This appendix describes the rules for mapping futures contracts in primitive risk factors. With these rules we determine the values of financial exposure of a position on a futures contract to the corresponding primitive risk factors.

As mentioned in the chapter dealing with the methodologies to calculate collateral margin, the variation of the value of a futures contract is approximated by the linear combination of the variations of its primitive risk factors, which is called *linear decomposition of futures contracts*. The value  $FV$  of a position in  $q$  units of a futures contract undergoes, along a time period, a variation  $\Delta FV$  given by

$$\Delta FV \cong s_1 \times FV \times \tilde{R}_{FPR_1} + s_2 \times FV \times \tilde{R}_{FPR_2} + \dots + s_N \times FV \times \tilde{R}_{FPR_N}$$

where  $\tilde{R}_{FPR_k}$  is the variation, along the period, of the value of primitive risk factor  $FPR_k$  and  $s_k = \pm 1$ ,  $k = 1, 2, \dots, N$ , according to the factor.

In the above equation, term  $s_k \times FV$  represents the position's financial exposure to risk factor  $FPR_k$ .

Due to the existence of primitive risk factors representing timeframe-associated variables, such as interest rates and future prices of agricultural commodities, a reduced number of timeframes, called factor vertices, is adopted. As a consequence, the financial exposure to an FPR of this type associated with a timeframe  $T$  is split into two exposures: an exposure to the FPR for the vertex immediately inferior to the original timeframe  $T$ ,  $v_{inf}$ , and an exposure to the FPR for the vertex immediately superior to the original timeframe  $T$ ,  $v_{sup}$ .

The  $s_k \times FV \times \tilde{R}_{FPR_k}$  portion is replaced, in the  $\Delta FV$  equation, by the sum of parts

$$\alpha \times s \times FV \times \tilde{R}_{FPR, v_{inf}} \quad \text{and} \quad 1 - \alpha \times s \times FV \times \tilde{R}_{FPR, v_{sup}}$$

with  $\alpha = 1 - \frac{T - v_{inf}}{v_{sup} - v_{inf}}$

The following table presents the financial exposures of BM&FBOVESPA's derivatives contracts to the respective FPRs. The following notation is adopted:

- $PA$  : contract settlement price;
- $q$  : number of contracts of the position, with  $q > 0$  representing price-based purchase;
- $TM$  : the contract size;
- $TC$  : the contract's exchange rate, if applicable; and
- $Taxa_{Ref DI}$  : BM&FBOVESPA's ID reference rate for the calculation date.

The financial exposure indicated on the following table equals the financial exposure of the hedger's position.

### MAPPING OF FUTURES CONTRACTS

#### FUT DI1 - Average One-Day Interbank Deposit Rate Futures Contract (DI)

$$FV = q \times PA \times TM$$

$$P = 100,000 \times (1 + r)^{-1} = 100,000 \times PU_r$$

$r$  : Pre-fixed interest rate in local currency

$PU_r$  : present value of 1 unit of local currency, at the rate  $r$

| FPR  | FINANCIAL EXPOSURE  |
|--|---|
| Pre-fixed interest rate – vertex $v_i$     | $FV \times \alpha^{v_i}$                                    |
| Pre-fixed interest rate – vertex $v_{i+1}$ | $FV \times \alpha^{v_{i+1}} = FV \times (1 - \alpha^{v_i})$ |

#### FUT DOL – Futures Contract of Real x Commercial USD Exchange Rate FUT WDL – Mini Futures Contract of Real x Commercial USD Exchange Rate

$$FV = q \times PA \times TM$$

$$P = S_{BRLxUSD} \times \frac{1+r}{1+rc} = S_{BRLxUSD} \times PU_{rc} \times PU_r^{-1}$$

$S_{BRLxUSD}$  : exchange rate, Reais per dollar

$r$  : Pre-fixed interest rate in local currency

$PU_r$  : present value of 1 unit of local currency, at the rate  $r$

$rc$  : pre-fixed interest rate in foreign currency

$PU_{rc}$  : present value of 1 unit of foreign currency, at the rate  $rc$

| FPR  | FINANCIAL EXPOSURE  |
|--|---|
| Spot R\$ x US\$ exchange rate              | $FV$  |
| Spread rate – vertex $V_j$                 | $FV \times \alpha^{V_j}$                                    |
| Spread rate – vertex $V_j$                 | $FV \times \alpha^{V_{j+1}} = FV \times 1 - \alpha^{V_j}$   |
| Pre-fixed interest rate – vertex $V_j$     | $-FV \times \alpha^{V_j}$                                   |
| Pre-fixed interest rate – vertex $V_{i+1}$ | $-FV \times \alpha^{V_{i+1}} = -FV \times 1 - \alpha^{V_i}$ |

### FUT DDI - ID x U.S. Dollar Spread Futures Contract

$$FV = q \times PA \times TM \times TC \times 1 + Rate_{Ref DI}^{1/252}, TC = Prate \text{ of reference for the calculation date}$$

$$P = 100,000 \times 1 + rc^{-1} \times S_{BRLxUSD} = 100,000 \times PU_{rc} \times S_{BRLxUSD}$$

$S_{BRLxUSD}$  : exchange rate, Reais per dollar

$rc$  : pre-fixed interest rate in foreign currency

$PU_{rc}$  : present value of 1 unit of foreign currency, at the rate  $rc$

| FPR                           | FINANCIAL EXPOSURE  |
|-------------------------------|---|
| Spot R\$ x US\$ exchange rate | $FV$  |
| Spread rate – vertex $V_j$    | $FV \times \alpha^{V_j}$                                  |
| Spread rate – vertex $V_j$    | $FV \times \alpha^{V_{j+1}} = FV \times 1 - \alpha^{V_j}$ |

### FUT EUR – Futures Contract of Real x Euro Exchange Rate

$$FV = q \times PA \times TM7$$

$$P = S_{BRLxEUR} \times \frac{1+r}{1+rc_{EUR}} = S_{BRLxUSD} \times S_{USDxEUR} \times \frac{1+r}{1+rc_{USD} \times 1+spr} =$$

$$= S_{BRLxUSD} \times S_{USDxEUR} \times PU_{rc_{USD}} \times PU_{spr} \times PU_r^{-1}$$

$S_{BRLxUSD}$  : exchange rate, Reais per dollar

$S_{USDxEUR}$  : exchange rate, Reais per euro

$r$  : pre-fixed interest rate in local currency

$PU_r$  : present value of 1 unit of local currency, at the rate  $r$

$rc_{USD}$  : Pre-fixed interest rate in USD

$PU_{rc_{USD}}$  : present value of 1 US dollar, at the rate  $rc_{USD}$

$spr$  : spread between the USD and Euro exchange rates



$FU_{spr}$  : spread, expressed in price

| FPR  | FINANCIAL EXPOSURE  |
|--|---|
| Spot R\$ x US\$ exchange rate              | $FV$  |
| US\$ x EUR spot exchange rate              | $FV$  |
| Spread rate (US\$) – vertex $V_j$          | $FV \times \alpha^{V_j}$                                    |
| Spread rate (US\$) – vertex $V_{j+1}$      | $FV \times \alpha^{V_{j+1}} = FV \times 1 - \alpha^{V_j}$   |
| US\$ x EUR spread – vertex $V_j$           | $-FV \times \alpha^{V_j}$                                   |
| US\$ x EUR spread – vertex $V_{j+1}$       | $-FV \times \alpha^{V_{j+1}} = -FV \times 1 - \alpha^{V_j}$ |
| Pre-fixed interest rate – vertex $V_i$     | $-FV \times \alpha^{V_i}$                                   |
| Pre-fixed interest rate – vertex $V_{i+1}$ | $-FV \times \alpha^{V_{i+1}} = -FV \times 1 - \alpha^{V_i}$ |

**FUT IND - Ibovespa Futures Contract and  
FUT WIN - Ibovespa Mini Futures Contract**

$$FV = q \times PA \times TM$$

$$P = S_{Ibovespa} \times 1 + r \times 1 + cy = S_{Ibovespa} \times PU_r^{-1} \times PU_{cy}^{-1}$$

$S_{Ibovespa}$  : the Bovespa Index cash price

$r$  : pre-fixed interest rate in Reais

$PU_r$  : present value of 1 unit of local currency, at the rate  $r$

$cy$  : convenience yield

| FPR  | FINANCIAL EXPOSURE  |
|--|---|
| the Bovespa Index cash price               | $FV$  |
| Pre-fixed interest rate – vertex $V_i$     | $-FV \times \alpha^{V_i}$                                   |
| Pre-fixed interest rate – vertex $V_{i+1}$ | $-FV \times \alpha^{V_{i+1}} = -FV \times 1 - \alpha^{V_i}$ |
| Convenience Yield – vertex $V_j$           | $-FV \times \alpha^{V_j}$                                   |
| Convenience Yield – vertex $V_{j+1}$       | $-FV \times \alpha^{V_{j+1}} = -FV \times 1 - \alpha^{V_j}$ |

**FUT BRI – Brasil 50 Index Futures Contract**

$$FV = q \times PA \times TM$$

$$P = S_{IbrX-50} \times 1 + r \times 1 + cy = S \times PU_r^{-1} \times PU_{cy}^{-1}$$

$S_{IbrX-50}$  : the IbrX-50 Index cash price

$r$  : pre-fixed interest rate in Reais

$PU_r$  : present value of 1 unit of local currency, at the rate  $r$

$cy$  : convenience yield

| FPR  | FINANCIAL EXPOSURE  |
|--|---|
| the IbrX-50 Index cash price               | $FV$  |
| Pre-fixed interest rate – vertex $V_i$     | $-FV \times \alpha^{V_i}$                                   |
| Pre-fixed interest rate – vertex $V_{i+1}$ | $-FV \times \alpha^{V_{i+1}} = -FV \times 1 - \alpha^{V_i}$ |
| Convenience Yield – vertex $V_j$           | $-FV \times \alpha^{V_j}$                                   |

|                                      |   |
|--------------------------------------|---|
| Convenience Yield – vertex $V_{j+1}$ | $-FV \times \alpha^{V_{j+1}} = -FV \times 1 - \alpha^{V_j}$ |
|--------------------------------------|---|

### FUT OZ1 – Gold 250 gram Futures Contract

$$FV = q \times PA \times TM$$

$$P = S \times 1 + r = S \times PU_r^{-1}$$

$S$  : Gold cash price

$r$  : pre-fixed interest rate in Reais

$PU_r$  : present value of 1 unit of local currency, at the rate  $r$

| FPR  | FINANCIAL EXPOSURE  |
|--|---|
| Gold cash price                            | $FV$  |
| Pre-fixed interest rate – vertex $V_j$     | $-FV \times \alpha^{V_j}$                                   |
| Pre-fixed interest rate – vertex $V_{j+1}$ | $-FV \times \alpha^{V_{j+1}} = -FV \times 1 - \alpha^{V_j}$ |

### FUT Baa – Futures Contract of Federative Republic of Brazil US Dollar Denominated Global Bond Due aaaa

$$FV = q \times PA \times TM \times TC, \quad TC: \text{BM\&FBOVESPA reference R\$ / US\$ exchange rate}$$

$$P = S \times 1 + rc = S \times PU_{rc}^{-1}$$

$S$  : underlying Global Bond cash price, in USD

$rc$  : pre-fixed interest rate in USD

$PU_{rc}$  : present value of 1 US dollar, at the rate  $r$

| FPR                                   | FINANCIAL EXPOSURE   |
|---------------------------------------|--|
| the Global Bond cash price;           | $FV$   |
| Spread rate (US\$) – vertex $V_j$     | $-FV \times \alpha^{V_j}$                                  |
| Spread rate (US\$) – vertex $V_{j+1}$ | $-FV \times \alpha^{V_{j+1}} = FV \times 1 - \alpha^{V_j}$ |

### FUT T10 – Futures contract of 10-Year US Treasury Note

$$FV = q \times PA \times TM \times TC, \quad TC: \text{BM\&FBOVESPA reference R\$ / US\$ exchange rate}$$

$$P = S \times 1 + rc = S \times PU_{rc}^{-1}$$

$S$  : underlying US T-Note 10Y cash price, in USD

$rc$  : pre-fixed interest rate in USD

$PU_{rc}$  : present value of 1 US dollar, at the rate  $r$

|                                       |  |
|---------------------------------------|--|
| US T- Note 10Y cash price             | $FV$   |
| Spread rate (US\$) – vertex $V_j$     | $-FV \times \alpha^{V_j}$                                  |
| Spread rate (US\$) – vertex $V_{j+1}$ | $-FV \times \alpha^{V_{j+1}} = FV \times 1 - \alpha^{V_j}$ |

### FUT IGM – Futures Contract of General Market Price Index (IGP-M)

$$FV = q \times PA \times TM$$

$$P = S_{IGP-M} \times \frac{1+r}{1+rc} = S \times PU_{rc} \times PU_r^{-1} \text{ (in index points)}$$

$S$  : IGP-M index price  
 $rc$  : IGP-M spread rate  
 $P_{U_r}$  : present value of 1 index point, at the rate  $rc$   
 $r$  : pre-fixed interest rate in Reais  
 $P_{U_r}$  : present value of 1 unit of local currency, at the rate  $r$

| FPR  | FINANCIAL EXPOSURE   |
|--|--|
| IGP-M index price                                    | $FV$   |
| IGP-M spread rate (DIxIGP-M rate) – vertex $V_i$     | $FV \times \alpha^{V_i}$                                   |
| IGP-M spread rate (DIxIGP-M rate) – vertex $V_{i+1}$ | $FV \times \alpha^{V_{i+1}} = FV \times 1 - \alpha^{V_i}$  |
| Premium on IGP-M spread rate – vertex $V_i$          | $FV \times \alpha^{V_i}$                                   |
| Premium on IGP-M spread rate – vertex $V_{i+1}$      | $FV \times \alpha^{V_{i+1}} = FV \times 1 - \alpha^{V_i}$  |
| Pre-fixed interest rate – vertex $V_i$               | $-FV \times \alpha^{V_i}$                                  |
| Pre-fixed interest rate – vertex $V_{i+1}$           | $-FV \times \alpha^{V_{i+1}} = FV \times 1 - \alpha^{V_i}$ |

### FUT IAP – Futures Contract of National Consumer Price Index (IPCA)

$$FV = q \times PA \times TM$$

$$P = S_{IPCA} \times \frac{1+r}{1+rc_{IPCA}} = S \times P_{U_{rc_{IPCA}}} \times P_{U_r}^{-1}$$

$S_{IPCA}$  : IPCA index price  
 $rc$  : IPCA spread rate  
 $P_{U_{rc}}$  : present value of 1 index point, at the rate  $rc$   
 $r$  : pre-fixed interest rate in Reais  
 $P_{U_r}$  : present value of 1 unit of local currency, at the rate  $r$

| FPR  | FINANCIAL EXPOSURE   |
|--|--|
| IPCA index price                                     | $FV$   |
| IPC-A spread rate (DIxIPC-A rate) – vertex $V_i$     | $FV \times \alpha^{V_i}$                                   |
| IPC-A spread rate (DIxIPC-A rate) – vertex $V_{i+1}$ | $FV \times \alpha^{V_{i+1}} = FV \times 1 - \alpha^{V_i}$  |
| Pre-fixed interest rate – vertex $V_i$               | $-FV \times \alpha^{V_i}$                                  |
| Pre-fixed interest rate – vertex $V_{i+1}$           | $-FV \times \alpha^{V_{i+1}} = FV \times 1 - \alpha^{V_i}$ |

### FUT DAP - IPCA Spread Rate Futures Contract

$$FV = q \times PA \times TM$$

$$P = S_{IPCA} \times 1 + rc = S \times P_{U_{rc}}$$

$S_{IPCA}$  : IPCA index price  
 $rc$  : IPCA spread rate  
 $P_{U_{rc}}$  : present value of 1 index point, at the rate  $rc$

| FPR  | FINANCIAL EXPOSURE       |
|--|--------------------------|
| IPCA index price                                 | $FV$                     |
| IPC-A spread rate (DIxIPC-A rate) – vertex $V_i$ | $FV \times \alpha^{V_i}$ |

|  |   |
|--|---|
| IPC-A spread rate (DIxIPC-A rate) – vertex $V_{i+1}$ | $FV \times \alpha^{V_{i+1}} = FV \times 1 - \alpha^{V_i}$ |
|--|---|

### FUT DDM – DI X IGP-M Spread Rate Futures Contract

$$FV = q \times PA \times TM$$

$$P = S_{IGP-M} \times 1 + rc = S \times PU_{rc}$$

$S_{IGP-M}$  : IPCA index price

$rc$  : IPCA spread rate

$PU_{rc}$  : present value of 1 index point, at the rate  $rc$

| FPR  | FINANCIAL EXPOSURE  |
|--|---|
| IGP-M index price                                    | $FV$  |
| IGP-M spread rate (DIxIGP-M rate) – vertex $V_i$     | $FV \times \alpha^{V_i}$                                  |
| IGP-M spread rate (DIxIGP-M rate) – vertex $V_{i+1}$ | $FV \times \alpha^{V_{i+1}} = FV \times 1 - \alpha^{V_i}$ |

### SCC – Exchange Swap with Reset SC3 – Mini Exchange Swap with Reset

$$FV = q \times PA \times TM \times TC \times 1 + Rate_{Ref DI}^{2/252}, \quad TC = P_{tax} \text{ of reference for the calculation date}$$

$$P = 100,000 \times 1 + rc^{-1} \times S_{BRLxUSD} = 100,000 \times PU_{rc} \times S_{BRLxUSD}$$

| FPR                           | FINANCIAL EXPOSURE  |
|-------------------------------|---|
| Spot R\$ x US\$ exchange rate | $FV$  |
| Spread rate – vertex $V_j$    | $FV \times \alpha^{V_j}$                                  |
| Spread rate – vertex $V_j$    | $FV \times \alpha^{V_{j+1}} = FV \times 1 - \alpha^{V_j}$ |

### Futures Contracts of Agricultural Commodities

$$FV = q \times PA \times TM \times TC, \quad TC: \text{BM\&FBOVESPA reference R\$ / US\$ exchange rate}$$

| FPR   | FINANCIAL EXPOSURE   |
|---|--|
| Futures price of commodity – vertex $V_i$     | $-FV \times \alpha^{V_i}$                                  |
| Futures price of commodity – vertex $V_{i+1}$ | $-FV \times \alpha^{V_{i+1}} = FV \times 1 - \alpha^{V_i}$ |

## APPENDIX 2 – PRICING MODELS OF OPTIONS CONTRACTS

This annex describes the models adopted by BM&FBOVESPA to assess risk and collateral margin, for pricing of options contracts.

Function  $N(\cdot)$  represents the normal cumulative probability density function.

### A2 – 1. Pricing of Options

#### Black–Scholes Model

The Black–Scholes model is employed in pricing the option on actuals, according to the following formula:

$$P_{BS} = f_{BS}(S, K, r, \sigma, t)$$

$$P_{BS,Call} = S \times N(d_1) - K \times e^{-rt} \times N(d_2) \quad d_1 = \frac{\ln(S/K) + (r + \sigma^2/2) \times t}{\sigma \times \sqrt{t}}$$

$$P_{BS,Put} = K \times e^{-rt} \times N(-d_2) - S \times N(-d_1) \quad d_2 = d_1 - \sigma \times \sqrt{t}$$

where

- $S$  : price of the underlying asset of the option;
- $K$  : the strike price of the option;
- $r$  : the risk-free interest rate per annum with continuous compounding;
- $\sigma$  : the underlying asset volatility per annum;
- $t$  : the time to maturity in years (based on 252 days);
- $P_{BS,Call}$  : the call option price; and
- $P_{BS,Put}$  : the put option price.

#### Pricing under a Stress Scenario

To assess the option under a stress scenario, the above equations are used, with the values of  $S$ ,  $r$  and  $\sigma$  being given by scenarios  $S_c$ ,  $r_c$ , and  $\sigma_c$ , respectively.

## Black's Model for Options on Futures

Black's model is employed in pricing options on futures, according to the following formula:

$$P_{Black} = f_{Black}(F, K, r, \sigma, t)$$

$$P_{Black, Call} = e^{-rt} \times F \times N(d_1) - K \times N(d_2) \quad d_1 = \frac{\ln(F/K) + \sigma^2/2 \times t}{\sigma \times \sqrt{t}}$$

$$P_{Black, Put} = e^{-rt} \times K \times N(-d_2) - F \times N(-d_1) \quad d_2 = d_1 - \sigma \times \sqrt{t}$$

where

- $F$  : price of the underlying futures contract;
- $K$  : the strike price of the option;
- $r$  : the risk-free interest rate per annum with continuous compounding;
- $\sigma$  : the market volatility of the underlying futures contract per annum;
- $t$  : the time to maturity in years (based on 252 days);
- $P_{Black, Call}$  : the call option price; and
- $P_{Black, Put}$  : the put option price.

### Pricing under a Stress Scenario

- When the risk of the underlying futures contract is represented by a curve of futures prices (for example, agricultural futures), the price of the option under scenario is obtained from the above equations, by using the values of  $F$ ,  $r$  and  $\sigma$  given by the respective scenarios,  $F_c$ ,  $r_c$  and  $\sigma_c$ .
- When the risk of the underlying futures contracts is assessed from the decomposition into primitive risk factors (for example, financial futures), the price of the option under scenarios is obtained from the above equations, using the values of  $F$ ,  $r$  and  $\sigma$  under scenario, with the value of  $F$  under scenario ( $F_c$ ) deriving from the scenarios defined for primitive factors  $S$ ,  $r$  and  $rc$ :

$$F_c = F \times \frac{S_c}{S} \times e^{r_c - r \times t} \times e^{rc - rc_c \times t}$$

where

- $F$  : the reference price of the underlying futures contract;
- $S$  : the reference price of the asset underlying the futures contract;
- $S_c$  : the price under the stress scenario of the asset underlying the futures contract;
- $r$  : the risk-free reference interest rate per annum with continuous compounding;
- $r_c$  : the risk-free interest rate under the stress scenario per annum with continuous compounding;
- $rc$  : the reference opportunity cost of the underlying futures contract per annum with continuous compounding;
- $rc_c$  : the opportunity cost under the stress scenario of the underlying futures contract per annum with continuous compounding.

## Modified Black's Model for Options on ID Futures

The modified Black's model is employed in pricing options on ID futures, according to the following formula:

$$P_{Black,DI} = f_{Black,DI} \left( PU_{Short}, PU_{Long}, K, \sigma, t_{Short,bd}, t_{Short,cd}, t_{Long,bd}, t_{Long,cd} \right)$$

$$P_{Black,DI,Call} = \delta \times S^* \times N(d_1) - K^* \times N(d_2)$$

$$P_{Black,DI,Put} = \delta \times K^* \times N(-d_2) - S^* \times N(-d_1)$$

$$K^* = \left( 1 + K \times e^{t_{Long,bd} - t_{Short,bd}} - 1 \times e^{t_{Long,cd} - t_{Short,cd}} \right)^{-1}$$

$$d_1 = \frac{\ln(S^*/K^*) + \sigma^2/2 \times t_{Short,cd}}{\sigma \times \sqrt{t_{Short,cd}}}$$

$$S^* = \left( \frac{PU_{Short}}{PU_{Long}} - 1 \right) \times e^{t_{Short,cd} - t_{Short,cd}}^{-1}$$

$$d_2 = d_1 - \sigma \times \sqrt{t_{Short,cd}}$$

$$\delta = \frac{PU_{Long} \times e^{t_{Long,cd} - t_{Short,cd}}}{1 + K^* \times e^{t_{Long,cd} - t_{Short,cd}}}$$

where

$PU_{Short}$  : the price (PU) of ID futures contract with the same maturity as that of the option;

$PU_{Long}$  : the price (PU) of the underlying ID futures;

$K$  : the strike price of the option (forward rate based on 252 days);

$\sigma$  : the market volatility of the underlying forward rate per annum;

$t_{Short,bd}$  : the time to maturity of the option in years (based on 252 days);

$t_{Short,cd}$  : the time to maturity of the option in years (based on 365 days);

$t_{Long,bd}$  : the time to maturity of the underlying futures contract in years (based on 252 days);

$t_{Long,cd}$  : the time to maturity of the underlying futures contract in years (based on 365 days);

$P_{Black,DI,Call}$  : the call option price; and

$P_{Black,DI,Put}$  : the put option price.

### Pricing under a Stress Scenario

Considering a set of stress scenarios for the relevant risk factors of the modified Black's model for options on ID futures, pricing under each scenario is given by:

$$P_{Black,DI,c} = f_{Black,DI,c} \left( PU_{Short}, PU_{Long}, r_{Short}, r_{Short,c}, r_{Long}, r_{Long,c}, K, \sigma_c, t_{Short,bd}, t_{Short,cd}, t_{Long,bd}, t_{Long,cd} \right)$$

$$P_{Black,DI,Call,c} = \delta_c \times S_c^* \times N(d_1) - K^* \times N(d_2)$$

$$P_{Black,DI,Put,c} = \delta_c \times K^* \times N(-d_2) - S_c^* \times N(-d_1)$$

$$K^* = \left( 1 + K \times e^{t_{Long,bd} - t_{Short,bd}} - 1 \times e^{t_{Long,cd} - t_{Short,cd}} \right)^{-1}$$

$$S_c^* = \left( \frac{PU_{Short} \times e^{r_{Short} - r_{Short,c} \times t_{Short,bd}}}{PU_{Long} \times e^{r_{Long} - r_{Long,c} \times t_{Long,bd}}} - 1 \right) \times t_{Long,cd} - t_{Short,cd}^{-1}$$

$$d_1 = \frac{\ln S_c^*/K^* + \sigma_c^2/2 \times t_{Short,cd}}{\sigma_c \times \sqrt{t_{Short,cd}}}$$

$$d_2 = d_1 - \sigma_c \times \sqrt{t_{Short,cd}}$$

$$\delta_c = \frac{PU_{Long} \times e^{r_{Long} - r_{Long,c} \times t_{Long,bd}} \times t_{Long,cd} - t_{Short,cd}}{1 + K^* \times t_{Long,cd} - t_{Short,cd}}$$

where

- $r_{Short}$  : the fixed interest rate for the time to maturity of the option per annum with continuous compounding;
- $r_{Short,c}$  : the fixed interest rate under the stress scenario for the time to maturity of option per annum with continuous compounding;
- $r_{Long}$  : the fixed interest rate for the time to maturity of the underlying futures contract per annum with continuous compounding;
- $r_{Long,c}$  : the fixed interest rate under the stress scenario for the time to maturity of the underlying futures contract maturity per annum with continuous compounding;
- $\sigma_c$  : the underlying forward rate volatility under the stress scenario per annum;
- $P_{Black,DI,Call,c}$  : the call option price under the stress scenario; and
- $P_{Black,DI,Put,c}$  : the put option price under the stress scenario.

### Garman–Kohlhagen Model

The Garman–Kohlhagen model is employed in pricing options on exchange rate, according to the following formula:

$$P_{GK} = f_{GK} S, K, r, rc, \sigma, t$$

$$P_{GK,Call} = e^{-rc \times t} \times S \times N d_1 - K \times e^{-r \times t} \times N d_2$$

$$P_{GK,Put} = K \times e^{-r \times t} \times N -d_2 - e^{-rc \times t} \times S \times N -d_1$$

$$d_1 = \frac{\ln S/K + r - rc + \sigma^2/2 \times t}{\sigma \times \sqrt{t}}$$

$$d_2 = d_1 - \sigma \times \sqrt{t}$$

where

- $S$  : price of the underlying asset of the option;
- $K$  : the strike price of the option;
- $r$  : the risk-free internal interest rate per annum with continuous compounding;
- $rc$  : the risk-free external interest rate per annum with continuous compounding;
- $\sigma$  : the underlying asset market volatility per annum;
- $t$  : the time to maturity in years (based on 252 days);
- $P_{GK,Call}$  : the call option price;



$P_{GK,Put}$  : the put option price.

### Pricing under a Stress Scenario

The price of the option under scenario is obtained from the above equations, with the values of risk factors  $S$ ,  $r$ ,  $r_C$  and  $r_C$  being given by the respective scenarios,  $S_c$ ,  $r_c$ ,  $r_{C_c}$  and  $\sigma_c$ .

## **A2 – 2. Pricing of Futures-style options**

In order to determine the price of a futures-style option we use the relationship between the prices of the futures-style options and conventional options of same characteristics, that is

$$\text{Premium}_{\text{futures-style option}} = e^{rt} \times \text{Premium}_{\text{conventional option}}$$

where  $t$  represents the time for maturity of the option and  $r$  represents the risk-free interest rate.

*This is a free translation offered only as a convenience for English language readers.  
Any questions arising from the text should be clarified by consulting the original in Portuguese.*

# **OPERATING PROCEDURE MANUAL OF THE BM&FBOVESPA DERIVATIVES CLEARINGHOUSE**

This document is a revised, expanded version of the Operating Procedure Manual of the BM&FBOVESPA Derivatives Clearinghouse and is in the process of being approved by the Central Bank of Brazil.

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## I. GENERAL INTRODUCTION

This Manual describes the processes and operating procedures related to the systems run by the BM&FBOVESPA Derivatives Clearinghouse, as well as its risk management and control mechanisms.

This Manual has been submitted to Central Bank of Brazil's evaluation and is approved by the latter, being an integral part of the BM&FBOVESPA Derivatives Clearinghouse Rulebook.

### 1. Acronyms and Definitions

Listed below are the definitions, acronyms and mathematical functions used throughout this document, with some terms bearing the same meaning assigned to them by the Clearinghouse Rulebook.

|                             |  |
|-----------------------------|--|
| <b>Bacen</b>                | Central Bank of Brazil                                   |
| <b>BM&amp;FBOVESPA Bank</b> | BM&FBOVESPA Settlement and Custody Services Bank         |
| <b>BM&amp;FBOVESPA</b>      | Brazilian Mercantile & Futures Exchange-BM&FBOVESPA S.A. |
| <b>CETIP</b>                | Central of Custody and Cash Settlement of Securities     |
| <b>CBLC</b>                 | Brazilian Clearing and Depository Corporation            |
| <b>CMB</b>                  | Brazil Mint  |
| <b>CMN</b>                  | Brazilian National Monetary Council                      |
| <b>COAF</b>                 | Council for Financial Activities Control                 |
| <b>CONAB</b>                | Brazilian Supply Company                                 |
| <b>CVM</b>                  | Securities and Exchange Commission of Brazil             |
| <b>NMB</b>                  | Nonstandardized Derivatives                              |
| <b>IPT</b>                  | São Paulo State Institute for Technological Research     |
| <b>SELIC</b>                | Brazilian Special System for Settlement and Custody      |
| <b>SFN</b>                  | Brazilian National Financial System                      |
| <b>SPB</b>                  | Brazilian Payment System                                 |
| <b>SRCA</b>                 | Registration System for Agribusiness Securities Custody  |
| <b>STR</b>                  | Reserves Transfer System, run by Bacen                   |
| <b>BM&amp;FBOVESPA WTr</b>  | WebTrading BM&FBOVESPA <sup>1</sup>                      |

|                                 |   |
|---------------------------------|---|
| <b>Settlement Bank</b>          | A financial institution that provides funds transfer services between Clearing Members and the Clearinghouse. |
| <b>Participant Registration</b> | The procedure for the admission of Participants to the Clearinghouse systems.                                 |
| <b>Clearinghouse</b> or         | The BM&FBOVESPA Derivatives Clearinghouse.  |

<sup>1</sup> WTr BM&FBOVESPA is the Internet-based trading platform earmarked for small investors.

|  |                    |  |
|--|--------------------|--|
| <b>Derivatives Clearinghouse</b>         |                    |  |
| <b>Ethics Code</b>                       |                    | The Brazilian Mercantile & Futures Exchange – BM&FBOVESPA S.A. Market Participants’ Ethics Code.   |
| <b>Customer</b>                          |                    | The Participant who holds the positions resulting from the derivatives and commodities transactions carried out and/or registered for the account and on behalf of the Participant on the BM&FBOVESPA markets.                       |
| <b>2687 investor</b>                     | <b>Nonresident</b> | The investor as defined in CMN 2687 Resolution, of January 26, 2000.   |
| <b>2689 investor</b>                     | <b>Nonresident</b> | The investor as defined in CMN 2689 Resolution, of January 26, 2000.   |
| <b>Clearing</b>                          |                    | The calculation of the participants’ net positions and of their respective amounts to be settled by cash settlement and physical delivery.   |
| <b>Economic / financial conglomerate</b> |                    | A group of institutions that maintain corporate colligation or control links, or a contractual and/or an administrative relationship.  |
| <b>Settlement Account</b>                |                    | An account held by the Clearinghouse with Bacen, operated through the STR and utilized for the funds transfer related to the settlement of Participants’ obligations.  |
| <b>Bank Reserves Account</b>             |                    | An account held by a banking institution with Bacen, operated through the STR and utilized for the institutions’ funds transfer and to comply with mandatory deposits.   |
| <b>Brokerage (SRCA)</b>                  | <b>House</b>       | An SRCA participant authorized to transfer, for their own account or for the accounts of third parties, the securities registered with SRCA.   |
| <b>Custodian (SRCA)</b>                  |                    | An institution that provides securities custody and registration services (with the terms <i>registration</i> and <i>securities</i> having their respective meanings assigned to them in the SRCA Rulebook).                         |
| <b>Physical Delivery</b>                 |                    | The Settlement of the obligations resulting from a Transaction settled by the physical delivery of the traded assets or commodities either by the Clearinghouse or the selling Customer, as the case may be.                         |
| <b>Allocation</b>                        |                    | The procedure which indicates the Customer in a Transaction and the Clearing Member responsible for its registration and settlement.   |
| <b>Specification (SRCA)</b>              |                    | The procedure which indicates the data required for agribusiness securities registration and transfer (with the terms <i>registration</i> and <i>transfer</i> having the respective meanings assigned to them in the SRCA Rulebook). |
| <b>Default</b>                           |                    | The failure of a Clearing Member, Settlement Bank, Broker, Intermediary, or Participant to fulfill an obligation to the Clearinghouse or the other Participants.   |
| <b>Intermediary</b>                      |                    | The Participant that trades for the account and on behalf of third parties, by relaying orders to a Broker.  |
| <b>Settlement</b>                        |                    | The fulfillment of obligations to the Clearinghouse or to Clearing Members   |

|                           |   |
|---------------------------|---|
|                           | and to other participants resulting from one or more Transactions;  |
| <b>Collateral</b>         | The amount of Collateral required taking into account each Transaction and each Position or group of Transactions and Positions held by or under the responsibility of one or more Participants.                                |
| <b>Broker</b>             | The Participant that holds a Trading Right, with direct access to the BM&FBOVESPA trading and registration systems, who receives orders and fills them on the auction system and/or registers them in the registration systems. |
| <b>Transaction</b>        | A trade executed on any of the BM&FBOVESPA auction or trading systems, and/or registered in its systems, whose settlement of which takes place by means of the Clearinghouse settlement service.                                |
| <b>Participant</b>        | The individual or legal entity that is bound to the Clearinghouse and is subject to its rules and regulations.  |
| <b>Participant (SRCA)</b> | The institution that is authorized by BM&FBOVESPA to access SRCA either directly or indirectly.   |
| <b>Position</b>           | The balance of contracts resulting from a Customer's Transactions.  |
| <b>Rules of Access</b>    | The BM&FBOVESPA Rules of Access which govern the access to the trading and settlement systems and to the markets managed by BM&FBOVESPA.  |
| <b>Operating Rules</b>    | The Operating Rulebook of the BM&FBOVESPA Auction Systems – open outcry and electronic trading.   |
| <b>Registration</b>       | The registration of a Transaction in the Clearinghouse systems.   |

|                                |  |
|--------------------------------|--|
| <b>Minimum value function</b>  | $\min x, y = \begin{cases} x & \text{if } x \leq y \\ y & \text{if } x > y \end{cases}$ $\min a_1, a_2, \dots, a_n \text{ is the lowest value among the values of } a_1, a_2, \dots, a_n$  |
| <b>Maximum value function</b>  | $\max x, y = \begin{cases} y & \text{if } x \leq y \\ x & \text{if } x > y \end{cases}$ $\max a_1, a_2, \dots, a_n \text{ is the highest value among the values of } a_1, a_2, \dots, a_n$ |
| <b>Sign function</b>           | $\text{sgn } x = \begin{cases} -1 & \text{if } x \leq 0 \\ +1 & \text{if } x > 0 \end{cases}$  |
| <b>Absolute value function</b> | $\text{abs } x =  x  = \begin{cases} -x & \text{if } x \leq 0 \\ x & \text{if } x > 0 \end{cases}$   |
| <b>Sum</b>                     | $\sum_{i=1}^n a_i = a_1 + a_2 + \dots + a_{n-1} + a_n$   |



$$\prod_{i=1}^n a_i = a_1 \times a_2 \times \dots \times a_{n-1} \times a_n$$

---

## 2. General Aspects

BM&FBOVESPA is a company that provides for the functioning of, and organizes the development of markets for the trading of any kind of securities and/or contracts, for prompt and future delivery, that are based on or have as underlying assets financial instruments, indices, rates, commodities and foreign currencies.

An essential condition for the perfect functioning of certain markets is that the accepted transactions will be effectively settled, pursuant to the established terms and time frames. BM&FBOVESPA's Clearinghouses provide their relevant markets with this condition by exercising the role of central counterparty (CCP). For settlement purposes, a clearinghouse acting as a central counterparty becomes the buyer to the seller and the seller to the buyer.

The BM&FBOVESPA Derivatives Clearinghouse acts as a central counterparty for all transactions with derivatives contracts executed on Exchange-traded Markets and also on the OTC (Over the Counter) Market and registered *with the guarantee feature*.

For the purposes of this Manual, an Exchange-traded Market is part of the array of markets managed by BM&FBOVESPA where derivatives transactions are executed on the open outcry or electronic systems; and OTC Market is the set of swap, forward and flexible-options markets where transactions are registered with the Derivatives Clearinghouse and for which it may act as a CCP.

In order to ensure the market's integrity and the participants' rights, the Derivatives Clearinghouse has risk-management mechanisms, safeguards and loss-sharing rules – measures required by the applicable legislation and by applicable regulations. The Clearinghouse, as far as the principles and rules of the Brazilian Payment System are concerned, is qualified as a *systemically important* clearinghouse subject to Bacen's regulation and supervision, from which it receives its operating authorization. A *systemically-important* clearinghouse is one that clears and settles transactions in such a volume and/or of such a nature that is capable of posing risk to the soundness and regular operation of the Brazilian Financial System.

The services provided by the Derivatives Clearinghouse are:

- I. **Registration, netting and multilateral settlement** of Exchange-traded and OTC Market transactions with the Clearinghouse acting as a CCP<sup>2</sup>;

---

<sup>2</sup> The Clearinghouse allows the registration of OTC Market transactions (swap, forward, and flexible-option contracts) in the *no guarantee* mode, which are not included in the multilateral settlement values.

- II. Operating as a CCP for the transactions referred to in item I, by carrying out the **risk management**;
- III. **Bilateral registration, clearing, and settlement** of the BM&FBOVESPA Non-standardized Derivatives market transactions;
- IV. **Gross settlement** of transactions with agribusiness securities and commodities executed and/or registered on the Brazilian Commodities Exchange, as well as of special transactions carried out on other environments; and
- V. **Custody** of assets in general, especially the Gold Fungible Custody and the Agribusiness Securities Custody.

In providing its services, some of the Clearinghouse's activities are integrated with those of the BM&FBOVESPA Bank, set up under BM&FBOVESPA control, in order to act as an operating support provider for BM&FBOVESPA participants.

## **2.1. Registration, Clearing and Settlement, Risk Management and Custody Services**

The **registration** service comprises managing the registration systems whose transactions are expected to be settled through the Derivatives Clearinghouse and which are carried out

- i. On the Exchange-traded Market;
- ii. On the OTC Market;
- iii. On the Non-standardized Derivatives Market – NMB; and
- iv. On other markets that may be managed by BM&FBOVESPA or to which it may provide services.

As a result of trading rules, the self-regulating function undertaken by BM&FBOVESPA, and the Clearinghouse risk management mechanisms, the acceptance of transactions may be subject to restrictions and/or analysis and approval by the Clearinghouse.

The **clearing** service consists of calculation of participants' net positions and of their respective amounts to be settled by cash settlement and physical delivery. **Bilateral netting** is the procedure designed to calculate the result of the transactions between two participants – the bilateral result. **Multilateral netting** is the procedure designed to calculate the sum of bilateral debt and credit results of each participant vis-à-vis the others, with the result of such netting corresponding to the multilateral result. In any event, the netting procedure generates a single net result between the parties, settled as set forth by BM&FBOVESPA.

The **settlement** service consists of the process to extinguish obligations. It is called **deferred settlement** when carried after the time of acceptance of the transactions which give rise to the corresponding obligations, and **real-time settlement** in the opposite situation. When the settlement amount is determined by netting, settlement is said to be a **net bilateral settlement** or a **net multilateral settlement**, respectively, as the case may be; if there is no netting, the obligations are settled one by one, and the settlement is called **gross settlement**.

The figure below illustrates the funds transferred between market agents under gross, bilateral, and multilateral settlement. The amount indicated next to each arrow represents the financial amount to be transferred. In the gross and bilateral settlement models, transfers between agents may or may not take place through a clearinghouse.

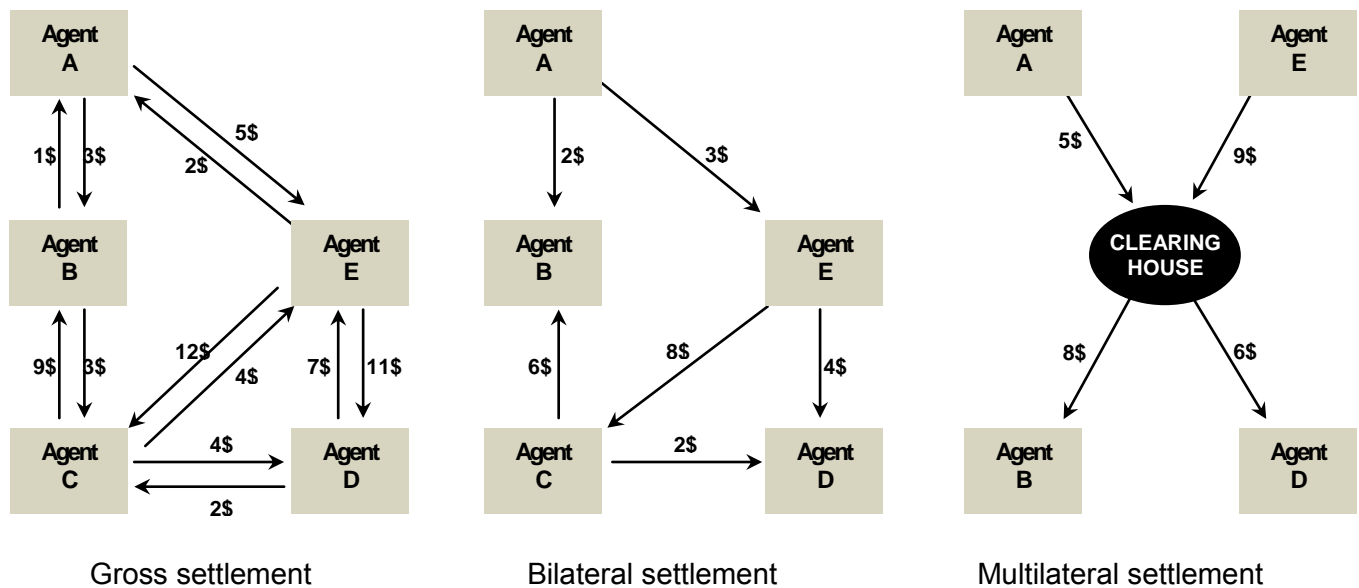


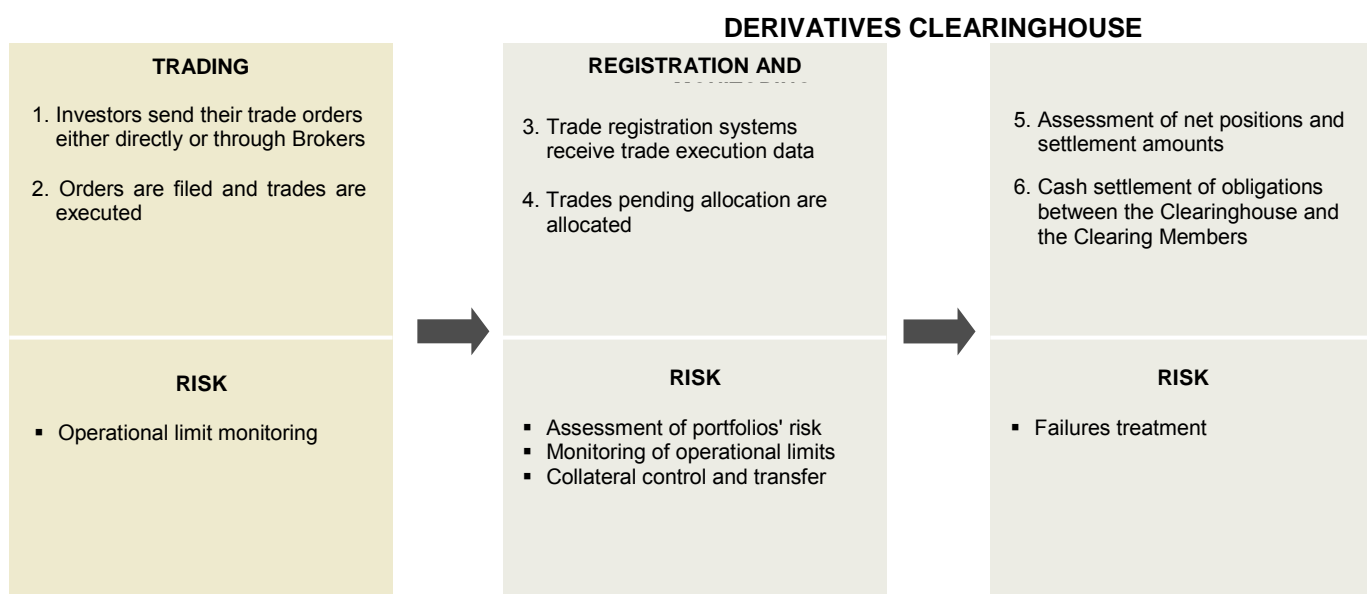
Figure 1 – Clearing and cash settlement models

The Clearinghouse adopts the **net multilateral deferred settlement** model for transactions in Exchange-traded and OTC Market transactions where it acts as a CCP. In addition to cash settlement, the Clearinghouse also supervises delivery procedures for contract settled by physical delivery.

For the NMB Market, the Clearinghouse provides the **net bilateral deferred settlement**, but does not act as a central counterparty. For that market, the BM&FBOVESPA only acts as a Calculation Agent, sets up limits for transaction registration and monitors the adherence of transactions to such limits.

For the Brazilian Commodities Exchange and for special transactions, the Clearinghouse provides **gross settlement** services, also not acting as a CCP.

The Clearinghouse's main source of risk, therefore, is the possibility of default or delay by the participants to whom the transactions are guaranteed by the Clearinghouse are allocated: the Clearing Members. To the extent that it acts as a central counterparty for the registered transactions, the Clearinghouse becomes responsible to the non-defaulting members for the defaulting members' positions. In order to mitigate the counterparty risk, the Clearinghouse adopts a risk model, implemented by means of **risk management** mechanisms, which comprises collateral requirements, an additional safeguard structure, limits to the size of open positions and to price fluctuation, among others.



**Figure 2 – Registration, Clearing and Settlement, and Risk Management Services**

Custody consists of safekeeping, which includes conserving and managing financial instruments on behalf of third parties. The custody of an asset may be fungible or non-fungible. When fungible assets are withdrawn they may not necessarily be the same as those that were originally deposited, although they will have the same quantity, quality and type. On the other hand, when non-fungible assets are withdrawn they will be exactly those that were originally deposited.

BM&FBOVESPA's **custody** service encompasses the Gold Fungible Custody and the (non-fungible) Agribusiness Securities Custody, whose systems are managed by the Clearinghouse.

In the Gold Fungible Custody, BM&FBOVESPA controls customer positions by entering them into individual accounts. Gold is kept by the custodians, where gold bars are entered into BM&FBOVESPA's name. The system is used for controlling the gold available both for physical delivery for gold contracts and to meet margin requirements for Transactions in general.

The Agribusiness Securities Custody system was developed to host the registration of custody of the securities and contracts traded between rural sector agents and the other agents - exporters, industries, investors, and the government. The SCRA serves the trading systems linked to BM&FBOVESPA and to other exchanges, as well as to the Clearinghouse collateral system.

Trade registration and acceptance are described in chapter III, whereas chapter IV addresses clearing and settlement procedures. Risk management aspects are included in chapter V, and assets custody services are discussed in chapter VI.

## 2.2. Applicable Legislation and Rules

The Clearinghouse activities are governed and regulated by the legislation and by the rules set forth by the relevant agencies.

**Law 10214**, enacted on March 27, 2001, is the federal law which regulates the operation of clearinghouses, within the scope of the Brazilian Payment System, formed by entities, systems and procedures related to the transfer of funds and financial assets, as well as to the processing, clearing, and settlement of payments. That law authorizes the multilateral netting of obligations within the same clearinghouse and requires the definition of mechanisms and safeguards, such as safety devices and risk control rules, which ensure the settlement of the transactions cleared and settled by the clearinghouse.

Following the enactment of that law, Bacen published **Resolution 2882** on August 30, 2001, which sets forth CMN resolutions regarding the payment system and the clearinghouses integrate it. Among its resolutions, CMN assigned to Bacen and CVM, regarding the payment system and securities transactions, respectively, (i) the regulation of clearinghouse activities, (ii) the operating authorization for clearinghouse systems, and (iii) the supervision of their activities and the application of penalties. In addition, it determined that the clearinghouses should abide by the provisions of Bacen **Resolution 2554**, of September 24, 1998, concerning the implementation of internal control systems.

Then, on August 31, 2001, Bacen **Circular 3057** was published approving the regulations which govern the functioning of the systems operated by the clearinghouses which integrate the payment system. That circular contains, among other provisions: (i) the definition of settlement by a clearinghouse as a definitive event, that is, on an irrevocable, unconditional basis; (ii) the criterion for qualifying a settlement system as *systemically important*; and (iii) the procedures for the segregation of capital, as required by Law 10214, as an exclusive guarantee for the fulfillment of the obligations in the systems where they operate.

As a STR and Selic participant, the Clearinghouse is also subject to the provisions of Bacen **Circular 3100**, of March 27, 2002 and **Circular 3316**, of March 9, 2006. Circular 3100 created the STR and approved its rulebook, whereas Circular 3316 approved the Selic rulebook.

Furthermore, the Clearinghouse is subject to Bacen **Resolution 3198**, of May 27, 2004, which deals with the regulation of independent auditor services. Pursuant to that resolution, the clearinghouses must be audited by independent auditors registered with CVM and meet the minimum requirements set forth by Bacen. The resolution also governs the clearinghouse management's responsibility concerning

independent auditors, the need to appoint a qualified officer to respond to Bacen, and the requirement to include in its bylaws the need to set up an audit committee.

Bacen's authorization for the BM&FBOVESPA's Derivatives Clearinghouse to operate was announced on April 18, 2002, by means of **Communication 9419**.

Although the aforementioned statutes are the ones which determine, in a more direct manner, the Clearinghouses' operating regime, others may be referred to, since they also affect said regime.

This is the case of CMN **Resolution 2687** and **Resolution 2689** by CMN, published by Bacen on January 26, 2000, which deal with non-resident investors. While Resolution 2689 addresses the investment of foreign investor funds entering the country, Resolution 2687, among other provisions, (i) authorizes non-resident investors to carry out transactions at commodities and futures exchanges involving spot, futures and options contracts based on agricultural products, vetoing operating strategies which may result in a predetermined yield; (ii) authorizes the exchanges to open up an offshore custody account collateral transfers, and a checking account, for financial transfers related to the transactions referred to in item (i); and (iii) assigns to the exchanges the responsibility for the foreign exchange operations concerning said transactions.

The CMN **Resolution 3263**, published by Bacen on February 24, 2005, involves the agreements for netting and settlement of obligations in the SFN environment. This resolution allows the financial institutions and other institutions authorized to operate by Bacen to carry out those agreements with individuals or legal entities and sets forth the relevant rules.

**CVM Instruction no. 461**, of October 23, 2007, governs the regulated securities markets and addresses the creation, organization, operation, and closing of securities, commodities and futures exchanges, and organized OTC markets. Although this statute does not deal directly with clearing and settlement systems, it is mentioned herein because it defines the operating regime for BM&FBOVESPA as an exchange and as an OTC market manager.

Internally, the Clearinghouse and its participants are subject to the resolutions adopted by the BM&FBOVESPA Board of Directors and Chief Executive Officer, the provisions set forth in the Ethics Code, the BM&FBOVESPA Operating Rules and Rules of Access, the Derivatives Clearinghouse Rulebook and Risk Management Manual, this Manual, the BM&FBOVESPA WebTrading Rulebook, the SRCA Rulebook, as well as in other norms, rules and procedures set forth or which may be set forth by BM&FBOVESPA. The Clearinghouse, its participants and the transactions are also inspected and supervised by the Self-Regulation Board, by the Self-Regulation Department and the Audit Committee, within the powers and duties of each body.

### **2.3. Internal Administrative Structure**

The Clearinghouse is made up as an in-house body, as per the BM&FBOVESPA Bylaws.

The Chief Clearinghouse, Depository and Risk Management Officer reports to the Chief Clearinghouse Officer, who in turn reports to the CEO (DG), who reports to the Board of Directors (CA). Its powers and duties include the coordination of the Clearinghouse activities – transaction registration, clearing and

settlement process management, central counterparty and risk management, as well as custody services.

The Clearinghouse includes the following offices: Risk Management, Settlement, and Central Depository. The Clearinghouse offices have complementary functions and act in an integrated manner in many of their activities.

The Market Risk Committee provides technical assistance to the CEO and to BM&FBOVESPA's executive body in terms of risk management. It is the Market Risk Committee's responsibility to review the Clearinghouse risk management policies and mechanisms, such as those concerning the methodology and relevant parameters for measuring and controlling risks, the systems, the definition and establishment of operational limits, the definition of criteria for accepting transactions and collateral and for collateral valuation, among others.

#### **2.4. Official Communication Systems between the BM&FBOVESPA and its Participants**

The official communication systems between BM&FBOVESPA and its participants are categorized as follows: Self-regulatory, operational and informative.

**Self-regulatory** are those that inform about the decisions made by BM&FBOVESPA under its jurisdiction as provided for in its Bylaws, the Clearinghouses Rulebooks and Manuals, and in the legislation applicable to the SPB. BM&FBOVESPA publishes its self-regulatory communications both physically and electronically through Circular Letters; all other information is published through External Communications. The Circular Letters, issued solely by the CEO, set up the rights and obligations of the BM&FBOVESPA participants arising from the resolutions adopted by the Board of Directors and the executive body. Communications may be issued by any BM&FBOVESPA Department and are used to inform the market about facts, actions or measures adopted by BM&FBOVESPA, for participants in general or for participant categories. Despite their informative function, Communications are, for the purposes of this Manual, characterized among the self-regulatory communications.

**Operational communications** are those transmitted by means of letters, telephone calls, the World Wide Web, private computer networks, electronic mail, messaging systems, and others.

**Informative communications** are those that disclose information of public interest concerning trades carried out within the scope of the Clearinghouse. Examples of informative communications are BM&FBOVESPA's Daily Bulletin and the information available on the BM&FBOVESPA's Website ([www.bmfbovespa.com.br](http://www.bmfbovespa.com.br)).

All BM&FBOVESPA communication systems are backed up by contingency systems which have an official status when used in that capacity.



## II. PARTICIPANT STRUCTURE

The Clearinghouse participant categories are grouped as follows:

1. Participants directly involved in the settlement process with BM&FBOVESPA;
2. Participants involved in the trading process;
3. Ancillary service providers;
4. Collateral issuing banks;
5. Non-standardized Derivatives market participants;
6. Participants in custody and gross settlement services for the Brazilian Commodities Exchange transactions; and
7. Other participants.

Groups 1, 2, 3, and 4 encompass the participants involved with the **registration, clearing and settlement** services for transactions carried out on Exchange-traded and OTC Markets where the Clearinghouse acts as a CCP. They are:

| <b>Participants directly involved in the settlement process with BM&amp;FBOVESPA</b>   |
|--|
| Settlement Bank<br>Clearing Member<br>Direct Settlement Participant (PLD)<br>Special Settlement Participant (PLE)  |
| <b>Participants involved in the trading process</b>  |
| Broker<br>Commodities Brokerage House<br>Special Brokerage House<br>Holder of a Trading Permit for Specific Products (PAPE)<br>Agricultural Commodities Special Local<br>Local<br>Intermediary<br>Customer |
| <b>Ancillary service providers</b>   |
| Depository Establishment<br>Commodity Quality Supervisor   |

Group 5 is the group of participants involved with the **registration, clearing and bilateral settlement** for NMB market transactions.

### **NMB Market Participants**

OTC Market Participant (PMB)  
Carrying Agent  
Customer

Group 6 includes the participants involved with **custody** and the **gross settlement** services for transactions executed on the Brazilian Commodities Exchange.

### **Participants in the custody and gross settlement services for Brazilian Commodities Exchange transactions**

#### Gold Fungible Custody Service Participants

Gold Custodian Bank  
Gold Refiner  
Gold Supplier

#### SRCA and Brazilian Commodities Exchange Gross Settlement Service Participants

Custodian  
Registration Agent  
Brokerage House  
Trading System  
Guarantor  
Warehouse  
Collateralized Participant

At its sole discretion and whenever it deems necessary and within the limits of current legislation and the regulations, the Clearinghouse may consult governmental agencies or private credit protection services to verify the authenticity of the information provided by its participants.

The following sections present the characteristics, functions and conditions for Clearinghouse participant authorization.

## **1. Participants Directly Involved in the Settlement Process with BM&FBOVESPA**

### **1.1. Settlement Bank**

Settlement Bank is the banking institution that holds a Bank Reserves account whose services are contracted by a Clearing Member to carry out funds transfers between the Clearing Member and the Clearinghouse, via the STR, concerning the settlement of obligations.

## **1.2. Clearing Member**

The Clearing Member is the participant that holds a Derivatives Clearinghouse Settlement Right (DL). This is the participant liable for the settlement of the transactions assigned to the Clearing Member for registration, clearing and settlement in the Clearinghouse, and responsible for their proper settlement as well as for the delivery, reception, authenticity, and legitimacy of any and all assets, documents, securities, and amounts relating to such transactions, in the established time frames and manners.

The clearing and settlement services provided by the Clearing Member encompass the transactions where the Clearinghouse acts as CCP and comprise:

- the payment and delivery of the assets underlying contracts settled by physical delivery and traded on the spot and futures markets;
- the payment of the debit balance corresponding to cash settled transactions on the futures markets;
- the pledge of collateral required by the Clearinghouse; and
- the delivery and receipt of any and all documents, assets, amounts and collateral concerning the transactions, assuming the responsibility for the authenticity and legitimacy thereof.

The Clearing Member is allowed to charge for the services it provides.

To perform their activities with BM&FBOVESPA, the Clearing Members that do not hold a Bank Reserves account must contract the services of a Settlement Bank which will provide funds transfers between the Clearing Members and the Clearinghouse.

When a participant under a Clearing Member's responsibility and services fails to pay or to deliver assets or commodities within the established time frame, the settlement of the relevant obligation to the Clearinghouse is incumbent on the Clearing Member. The default by the participant under a Clearing Member's responsibility and services must be formalized by the Clearing Member to BM&FBOVESPA, by means of a communication to the Derivatives Clearinghouse requesting the adoption of the applicable measures pursuant to the provisions of the Clearinghouse Rulebook and other BM&FBOVESPA rules.

BM&FBOVESPA requires the Clearing Member to pledge collateral in the Operational Performance Fund and, on a joint and mutualized basis, in the Clearing Fund, which consist of BM&FBOVESPA safeguards that ensure the proper settlement of transactions in the event of default by Clearing Members.

## **1.3. Direct Settlement Participant (PLD)**

The Direct Settlement Participant (PLD) is an institution which, by acting directly as a customer or by holding certain portfolios, which act as customers, under the institution's control, holds concomitantly a Derivatives Clearinghouse Settlement Right (DL) and is duly registered and authorized to act as a Clearing Member. In this capacity it is subject to the same conditions and assumes the same responsibilities as those that apply to said participant category.

The institution which qualifies to act as a PLD is allowed to:

- send orders directly to the executing broker through the trading desk of the Broker whose services it has contracted. Depending on the case, this direct communication is allowed to the managers responsible for the portfolios which are under the PLD's responsibility; and
- register and settle the transactions earmarked for:
  - i. its proprietary portfolios;
  - ii. the portfolios held by nonresident investors pursuant to CMN Resolution 2689;
  - iii. the portfolios held by a mutual fund;
  - iv. the portfolios held by an investment club; and
  - v. a managed portfolio,

provided, however, that they are managed and/or controlled by the PLD or by an institution belonging to the same economic/financial group to which the PLD belongs.

The PLD must keep the documentation evidencing the nature, form of operation, and legal relationship it maintains with the holder of the transactions referred to in terms (i) through (v). Those holders are the Customers that operate under the PLD's responsibility, that is, that settle their obligations via the PLD.

The Customers that settle their obligations via a PLD send their orders to buy or sell directly to the executing broker of the Broker of their choice, manage their positions and collateral, and settle their obligations without the need to provide any funds transfers between them and the Broker.

The information on transactions performed, positions, settlement values, fees charged, required collateral, among others, is made available directly to the PLD by means of the BM&FBOVESPA systems.

The commission to be charged for the PLD's transactions must be paid to the Broker who executed the corresponding orders and with whom the relevant intermediation contracts will be maintained.

#### **1.4. Special Settlement Participant (PLE)**

The Special Settlement Participant (PLE) is an institution which holds a Derivatives Clearinghouse Settlement Right (DL) and is duly registered and authorized to act as a Clearing Member. In this capacity it is subject to the same conditions and assumes the same responsibilities as those that apply to said participant category. The companies whose main area of activity is agribusiness or the management of third parties' funds, including nonresident funds, are those that may qualify to act as PLEs. All trades must be allocated to their proprietary position/portfolio or to the mutual funds managed by the PLEs, as the case may be.

The PLEs are granted the same facilities as the PLDs, so that, operationally speaking, they have an identical function to that of the PLD as far as settlement, risk, access to systems, etc. are concerned.

## **2. Participants Involved in the Trading Process**

### **2.1. Broker**

A Broker is the participant that holds a Trading Right (DN), with direct access to trading and/or registration systems, to execute and/or register trades on the markets managed by BM&FBOVESPA.

As far as the ways of accessing BM&FBOVESPA's systems are concerned, Brokers are characterized as holders of either restricted or full access, depending on the markets where they are authorized to operate, which does not affect their obligations and responsibilities in the settlement chain.

Commodities Brokerage Houses, PAPE holders and Locals are Brokers.

After BM&FBOVESPA demutualized, the enrollment of participants in the Special Brokerage House and Agricultural Commodities Special Local categories was no longer accepted. Such denominations currently apply only to those participants that were already authorized prior to the Exchange demutualization, such as a Special Brokerage House and an Agricultural Commodities Special Local.

It is still possible to operate according to the extinct Special Brokerage House category. In order to do so the interested party has to apply to obtain the relevant restricted Trading Right and authorization to operate in the Commodities Brokerage House category.

The individual interested in operating according to the extinct Agricultural Commodities Special Local category can do so by being granted the relevant Trading Right restricted to the agribusiness markets of the applicant's interest and authorization in the Local category.

To perform their activities with BM&FBOVESPA, the Brokers must contract the services of a Clearing Member.

BM&FBOVESPA requires that certain Broker categories post collateral in the Operational Performance Fund.

#### *Commodities Brokerage House*

The Commodities Brokerage House acts as an intermediary, carrying out the transaction orders, either proprietary or those sent by its customers, pursuant to the rules set forth by BM&FBOVESPA and CVM, and must provide trade allocation within the time frame and in accordance with the established rules.

The Commodities Brokerage House may have a full or restricted access to trading systems, according to the characteristics of the Trading Rights it is entitled to hold.

#### *Special Brokerage House*

The Special Brokerage House can only register OTC Market transactions - swaps, flexible options and forwards – and is forbidden to operate on the Exchange-traded Markets.

#### *PAPE Holders*

The Trading Permit for Specific Product holder, for the purposes of current regulation, is characterized as a Commodities Brokerage House, therefore subject to the obligations and controls in effect for this category.

PAPEs grant their holders the right to perform transactions, either proprietary or for third parties, on a *single BM&FBOVESPA-managed market*, based on stock indices or agricultural products. For this

purpose, by *single BM&FBOVESPA-managed market* we mean the spot, futures, forward, and swap and options markets based on the same underlying asset or commodity, which may encompass different contract sizes and commodity types, quality or categories. For example, a PAPE held on the coffee market includes both Arabica and Robusta-Conillon coffee varieties, as well as both commodities traded on the BM&FBOVESPA futures and options markets.

PAPE were created as a part of a broad program to restructure the intermediation sector which involved, as one of its measures, the implementation of a Program for Repurchasing Commodities Brokerage House Equity Memberships. They were solely granted to entities characterized, pursuant to the regulations, as Commodities Brokerage Houses, subject to the limit of two permits per entity, which opted, by March 31, 2005, to no longer act broadly on the markets managed by BM&FBOVESPA, by means of adhering to said program.

These permits cannot be traded or transferred to third parties and their validity expires on December 31, 2009, when their holders' operating rights are extinguished, with residual responsibilities before them and the Clearinghouse remaining in force.

PAPE holders cannot perform or receive give-ups, except as expressly authorized by BM&FBOVESPA, in which case the entity with which they maintain an operational relationship must also be involved.

The rules, terms and conditions for using PAPEs are described in the rules adopted by the Board of Directors, attached to the resolution of its 491<sup>st</sup> meeting and disclosed through Circular Letters 007/2005-DG, of January 18, 2005, and 064/2005-DG, of May 27, 2005.

#### *Local*

The Local is the a natural person or an individual entrepreneur that carries out transactions on BM&FBOVESPA's markets for his/her own account or for the account and on behalf of a Commodities Brokerage House, in which case he/she may charge for the intermediation service.

#### *Agricultural Commodities Special Local*

The Agricultural Commodities Special Local is a natural person or an individual entrepreneur that carries out transactions on BM&FBOVESPA's agribusiness commodity markets, for his/her own account or for the account and on behalf of a Commodities Brokerage House, in which case he/she may charge for the intermediation service.

## **2.2. Intermediary**

An Intermediary is the participant who sends, for execution through a Broker, orders for the account and on behalf of its clients, without its clients necessarily being identified before the Broker, although they have to be identified before BM&FBOVESPA.

The Intermediary must maintain a contractual intermediation relationship with a Commodities Brokerage House and, in order to the registration of the *Trading on behalf* account be effective, must request a specific authorization from BM&FBOVESPA, by means of a *Request Letter for Trading on Behalf Registration*.

The investor on whose behalf the Intermediary trades must be the Intermediary's client, and as such is a participant who acts in the Customer category before the Clearinghouse. The investor's identification with BM&FBOVESPA is the responsibility of the Intermediary, which is responsible for keeping the investor's registration up-to-date (pursuant to CVM Instruction 387). It is worth mentioning that the Intermediaries themselves, in view of their position, already appear as Customers in their relationship with the Broker they use.

### **2.3. Customer**

Customers are investors who hold the transactions executed and/or registered for their accounts and on their behalf on the BM&FBOVESPA markets by Brokers, as well as those who hold positions under a PLD or a PLE responsibility.

The Customers must maintain an intermediation agreement with the Brokers that trade on their behalf. In the case of investors who trade through an Intermediary, the agreement must be signed with the latter. In view of the facts above, the Intermediaries themselves must maintain a relationship, under the same terms, with the Brokers they use.

Vis-à-vis the Brokers with whom they maintain an operational relationship or the Intermediaries that trade on their behalf, or vis-à-vis the PLDs or PLEs with which they maintain an operational relationship, as the case may be, Customers are responsible for the obligations undertaken in their names, as well as for the truthfulness of the information provided and for the regularity of the documents, assets, securities and amounts delivered.

The registration of Customers with the BM&FBOVESPA is carried out (i) by the Brokers of whom they are clients; or (ii) by the Intermediaries that trade on their behalf; or (iii) by the PLD or PLE under which they operate, as the case may be.

The participant responsible for a Customer's registration must (i) zealously manage the authenticity of the provided data; (ii) notify BM&FBOVESPA of any irregularity; and (iii) maintain updated records of the documentation evidencing the registration data, making them available to the regulatory agencies as well as to BM&FBOVESPA, as per current regulations.

BM&FBOVESPA, the Clearinghouse, the Clearing Members, and the Brokers can establish rules, criteria, norms and operational limits for Customers or groups of Customers.

The Clearinghouse provides the information required for the Customers to meet their obligations to the Brokers, and in turn for the Brokers to meet their obligations to the Clearing Members in the settlement process.

## **3. Ancillary Service Providers**

### **3.1 Depository Establishment**

A Depository Establishment provides services concerning the storage, loading, unloading, and delivery of the commodities underlying the agricultural commodity, energy, and metal contracts to be settled by physical delivery.

General warehouses, warehouses, sugar mills and silos are Depository Establishments. At general warehouses coffee, cotton and corn are stored, whereas sugar mills store ethanol and sugar in their tanks. Soybean warehouses, given the characteristics of the BM&FBOVESPA soybean futures contract, consist of port terminals. A silo is the place for storing unpackaged/unbagged products. The Gold Custodian Bank is also a Depository Establishment, whose role is to safekeep the metal in its facilities.

Admission of a Depository Establishment is conditional on BM&FBOVESPA's approval, after a technical inspection of its facilities is carried out by Exchange technicians to ascertain the eligibility of the applicant to process and store the relevant product(s). BM&FBOVESPA can also perform inspections, in order to check the commodity lots validated for physical delivery.

The Depository Establishment is subject to losing its license if any irregularity is found, in which case the products stored therein and previously classified and arbitrated by BM&FBOVESPA will have their respective Certificates of Classification invalidated. If the product's quality maintenance is ascertained in spite of irregularities, BM&FBOVESPA may, at its sole discretion, authorize removal of the product to another depository unit, at the choice of the commodity's depositor, among those accredited by the Exchange, maintaining the validity of the corresponding Certificate of Classification. The costs of this removal will be borne by the depositor.

Failure by the warehouse to fulfill any of its obligations does not exempt from responsibility the participant that selected it.

### **3.2 Commodity Quality Supervisor**

The Commodity Quality Supervisor is an entity that provides services of an instrumental nature concerning the Clearinghouse activities, namely the analysis of commodities and certification of conformity vis-à-vis the characteristics specified in the relevant contracts.

Such analysis may be requested from BM&FBOVESPA by the selling counterparty — which is required to tender the Certificate of Classification in order to proceed with the settlement by physical delivery — and by the buyer who disagrees with the quality of the commodity received.

The Commodity Quality Supervisor's actions do not exempt from responsibility the participant that selected it.

## **4. Collateral Issuing Bank**

The Collateral Issuing Bank is the bank which issues, to third parties' benefit, collateral subject to the Clearinghouse acceptance.

Collateral Issuing Banks issue letters of credit and certificates of deposit (CDs) and/or guarantee Rural Product Notes (CPRs) accepted by the Clearinghouse as collateral.

The bank issuing a letter of credit acts as a guarantor, by guaranteeing the fulfillment of obligations undertaken by the Clearinghouse (guaranteed) participant to the BM&FBOVESPA (beneficiary).



The bank issuing a CD and the CPR guarantor ensure the redeeming of said securities in favor of the beneficiary on their due dates.

The Collateral Issuing Bank is subject to operational limits being imposed on the use of the collateral it issues.

*The reader who is solely interested in the Clearinghouse procedures concerning its operation as a central counterparty may skip sections 5 and 6 below, which deal with the participants involved with the services related to the NMB market, securities custody and the Brazilian Commodities Exchange, respectively.*

## **5. Non-standardized Derivatives Market Participants**

The NMB market participants are characterized as OTC Market Participants, Customers, and Carrying Agents. BM&FBOVESPA may admit other NMB market participants to fulfill specific activities related to this market, pursuant to the established rules.

### **5.1. OTC Market Participant (PMB)**

PMBs are the participants authorized to effect registrations in the NMB market system.

- On their own behalf (PMB2 only); or
- On their own behalf and on behalf of their clients (PMB1).

In the capacity of a Commodities Brokerage House, or when they belong to the same economic/financial conglomerate of a Commodities Brokerage House, or yet when they are authorized to carry out registrations directly in the BM&FBOVESPA registration systems, PMBs have a direct access to these systems. Otherwise, they may access said systems by means of a Carrying Agent who they choose to act on their behalf at BM&FBOVESPA.

### **5.2. Customer**

Customer is the person or legal entity, either financial or nonfinancial that holds the transactions registered by a PMB. The Customers do not carry out registrations nor have a direct access to the BM&FBOVESPA systems, and are therefore represented by a PMB before the Exchange.

### **5.3 Carrying Agent**

The Carrying Agent is an institution authorized by BM&FBOVESPA in the Commodities Brokerage House category in charge of performing the functionalities of the NMB market system, namely: Carry out registrations and events on behalf of PMBs, provide custody and/or carry the corresponding positions, and represent PMBs before BM&FBOVESPA.

## **6. Participants of Custody Services and Gross Settlement Services for Brazilian Commodities Exchange Transactions**

## **6.1. Gold Custody Service Participants**

### **6.1.1. Gold Custodian Bank**

The Gold Custodian Bank is a banking institution duly accredited by BM&FBOVESPA and responsible for receiving, safekeeping and preserving the gold bars under BM&FBOVESPA's custody which serve as an underlying asset to BM&FBOVESPA contracts.

Its accreditation is conditional on BM&FBOVESPA's approval, after a technical inspection of its facilities, carried out by Exchange technicians to ascertain its eligibility for the custody of the metal. Additionally, BM&FBOVESPA appoints an accredited technical institution to carry out an inspection to ascertain the conformity of the gold bars with the required specifications and may, at any time, inspect the registration and documentation kept by the Gold Custodian Bank for the gold bars under the Exchange custody.

The Gold Custodian Bank must accept for BM&FBOVESPA's custody only gold bars sent by BM&FBOVESPA – accredited Gold Refiners and Suppliers, bearing responsibility for the weight of the deposited bars.

### **6.1.2. Gold Refiner and Supplier**

The Gold Refiner and the Gold Supplier are the companies that certify and guarantee the metal's fineness before it is delivered to a Gold Custodian Bank. While the Refiner directly handles the bars, the Supplier buys them directly from the refiner, which represents an additional guarantee regarding the gold's fineness.

BM&FBOVESPA accepts under its custody only gold bars from BM&FBOVESPA accredited Refiners and Suppliers, which are responsible for their conformity with BM&FBOVESPA's requirements in terms of weight and purity content.

The Refiner must issue a *Certificate of Fineness and Weight* for each gold bar, or a *Letter of Guarantee* when a set of bars has been cast for the account and on behalf of Suppliers. Pursuant to these documents, the Refiner guarantees the quality of the bar it produces to settle the contracts traded at BM&FBOVESPA. The Supplier, in turn, issues a *Guarantee Certificate* for each bar and is jointly liable with the Refiner that produced the bars for the Supplier's account for the obligations the latter has assumed with the BM&FBOVESPA.

BM&FBOVESPA appoints a qualified technical institution to carry out an inspection to ascertain the conformity of the gold bars with the required specifications and may, at any time, inspect the registration and documentation kept by the Refiner/Supplier concerning the gold bars under BM&FBOVESPA's custody. The Refiner must, when so required by BM&FBOVESPA, submit to inspection its production and quality control processes, as well as the weight and purity content of the bars it produces.

### **6.1.3. Other participants**

The participants of the Clearinghouse registration, netting and multilateral settlement take part in the BM&FBOVESPA Gold Fungible Custody service when they meet margin requirements with gold, since the Clearinghouse only accepts as collateral the gold bars that are under its custody. The Gold Fungible

Custody service adopts the same account structure as that of the Clearinghouse Registration, Clearing and Settlement service.

## **6.2. SRCA and Brazilian Commodities Exchange Gross Settlement Service Participants**

SRCA participants are the institutions authorized by BM&FBOVESPA to access it, either directly or indirectly, and characterized as Custodians, Registration Agents, Brokerage Houses, Trading Systems, Guarantors, Warehouses, Collateralized Participants and other institutions, at BM&FBOVESPA's discretion.

Participants in this system are subject to SRCA's Rulebook and Operating Manual.

### **6.2.1. Custodian**

A Custodian is the participant responsible, before BM&FBOVESPA and before any third parties, for the existence, safekeeping and physical regularity of the securities it registers and/or which are under its custody, or which are registered by a registering entity with which it maintains a specific securities custody arrangement, as well as for the maintenance of the documentation evidencing the securities and proving the granting of powers for its operation. The Custodian, upon performing its activities, is subject to the commands issued by the Registration Agent, through the SRCA, and by the SRCA, having to take the necessary actions for their prompt satisfaction. In view of the securities under custody and the obligations arising there from, the Custodian's obligations and responsibilities may encompass other actions, as set forth in the relevant regulations.

### **6.2.2. Registration Agent**

The Registration Agent is the participant authorized to carry out the registration of securities custody in the SRCA which is responsible for all the actions required for the accomplishment of this task, as well as for the regularity of the securities taken to registration, for the truthfulness, regularity, and updating of the information provided to the SRCA, for maintaining the documentation supporting the securities and evidencing the powers granted to him. The Registration Agent may contract duly authorized Custodians to provide securities physical custody services. In view of the securities under custody and the obligations arising there from, the Registration Agent's obligations and responsibilities may encompass other actions, as set forth in the relevant regulations.

The same participant may concurrently act as a Registration Agent and as a Custodian.

### **6.2.3. Brokerage House**

A Brokerage House is the institution connected to a trading system which is authorized to trade the securities, for its own account or for the accounts of third parties, and is responsible for the regularity of such transactions, for the correct trade allocation, and for the information provided to BM&FBOVESPA.

### **6.2.4. Trading System**

A system through which securities are traded and/or registered on exchange-traded or OTC markets connected to the SRCA. The resulting transactions are directly registered by the relevant trading system, which is also responsible for the correct trade allocation.

### **6.2.5. Guarantor**

A Guarantor is the legal entity (bank or insurance company) which guarantees the fulfillment of the obligations contained in securities.

#### **6.2.6. Warehouse**

A Warehouse is the legal entity authorized to provide, pursuant to current legislation, services for storing and preserving agricultural products, their derivatives, by-products and residues of economic value.

#### **6.2.7. Collateralized Participant**

A Collateralized participant is the beneficiary of the collateral made up by securities registered with the SRCA.

### **7. Requirements for Registering and Authorizing Participants**

Regardless of the relevant category, registration of participants with BM&FBOVESPA takes place through the Participant Registration Center and/or the Broker and precedes the exercise of their activities. The Clearinghouse participants are admitted and excluded pursuant to the provisions of the Clearinghouse Rulebook and the other BM&FBOVESPA rules.

Participants must fulfill their obligations in terms of technical and operating qualification of employees and representatives, as well as to maintain the adequacy of technological and communication systems, besides meeting the compliance requirements defined by BM&FBOVESPA for each category.

The following obligations concern solely the situation of the participants when acting in their capacity and their recognition by the BM&FBOVESPA systems, and do not cover their technical and operating responsibilities.

#### Settlement Bank

The Settlement Bank must:

- be a banking institution holding a Bank Reserves account;
- be capable of providing fund transfer services to customers, pursuant to current legislation;
- designate one of its officers as the party legally responsible before BM&FBOVESPA for the Settlement Bank's actions and/or transactions;
- sign a Settlement Bank Adhesion Term, stating it abides by BM&FBOVESPA's rules, the Clearinghouse Rulebook and this Manual; and
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

The Clearinghouse may, at its own discretion, establish rules and conditions for Settlement Bank registration by taking into account minimum equity and capitalization levels, evidence of managerial, organizational and operating capability to run the Settlement Bank's activities, as well as other operating conditions.

#### Clearing Member

The Clearing Member must:

- be a financial institution duly authorized to operate as a multiple bank, commercial bank, investment bank, securities broker or dealer, when providing clearing and settlement services to third parties not belonging to its economic group;
- hold a Derivatives Clearinghouse Settlement Rights (DL) and meet the conditions and requirements set forth in the Rules of Access and other BM&FBOVESPA regulations addressed to DL holders;
- post collateral in the Operational Performance Fund as required by BM&FBOVESPA for this participant category;
- post the collateral required for the Clearing Fund and any other funds which may be created by BM&FBOVESPA;
- satisfy the operational limits set forth by BM&FBOVESPA/Clearinghouse;
- designate one of its officers as the party legally responsible before BM&FBOVESPA for Clearing Member's actions and/or transactions;
- maintain its headquarters or an office in the city of São Paulo;
- designate the Privileged Employee who will be responsible for managing the access to the BM&FBOVESPA systems;
- produce the documents required by the Participant Registration Center and other registration requirements which may be set forth; and
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

The Clearinghouse, at its own discretion, establishes rules and conditions for Clearing Member registration by taking into account minimum equity and capitalization levels, evidence of managerial, organizational and operating capability to run the Clearing Member's activities, as well as other operating conditions.

#### PLD and PLE

The PLD and PLE must:

- be regularly authorized to operate in the Clearing Member category, being therefore responsible to meet the requirements applicable to this category;
- not operate as a Commodities Brokerage House or a Special Brokerage House under the same legal entity;
- execute an adhesion term concerning its PLD or PLE condition, as the case may be;
- produce the documents and provide for the designation of employees and representatives as required by the BM&FBOVESPA Participants Registration Center;
- comply with the financial and equity requirements as well as those concerning minimum trading volume set forth by BM&FBOVESPA; and
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

#### Commodities Brokerage House

The Commodities Brokerage House must:

- be a legal entity and include in its articles of incorporation or bylaws the purpose of trading commodities or financial assets for its proprietary account or for the accounts of third parties;
- hold a Trading Right (DN) in the relevant derivatives market categories and comply with the relevant conditions and requirements set forth in the Rules of Access and other BM&FBOVESPA regulations;

- maintain, as per current regulation, the corresponding registration with CVM, should it is not a Bacen authorized financial company;
- post collateral in the Operational Performance Fund as required by BM&FBOVESPA for this participant category;
- comply with the financial and equity requirements set forth by BM&FBOVESPA;
- designate one of its officers as the party legally responsible before BM&FBOVESPA for the Commodities Brokerage House's actions and/or transactions;
- designate the statutory officer responsible for complying with CVM Instruction no. 387, of April 28, 2003, and CVM Instruction no. 402, of January 27, 2004;
- designate the professionals responsible, before BM&FBOVESPA, for the administrative, human resources, integrity, telecommunications, compliance and information technology functions;
- designate the Privileged Employee who will be responsible for managing the access to the BM&FBOVESPA systems; and
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

#### Special Brokerage House

The Special Brokerage House must:

- be a legal entity and include in its articles of incorporation or bylaws the purpose of trading commodities or financial assets for its proprietary account or for the accounts of third parties, and be authorized, pursuant to current regulation, to develop such activities;
- hold a restricted Trading Right (DN) in the OTC derivatives category and comply with the relevant conditions and requirements set forth in the Rules of Access and other BM&FBOVESPA regulations for this participant category ;
- designate one of its officers as the party legally responsible before BM&FBOVESPA for the Special Brokerage House's actions and/or transactions;
- designate the statutory director responsible for complying with CVM Instruction 387, of April 28, 2003;
- designate the Privileged Employee who will be responsible for managing the access to the BM&FBOVESPA systems;
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

#### Local

The Local must:

- be a natural person or an individual entrepreneur;
- hold a full Trading Right (DN) or a restricted DN in the relevant derivatives categories and comply with the relevant conditions and requirements set forth in the Rules of Access Rulebook and other BM&FBOVESPA regulation addressed to DN holders in this participant category;
- post collateral in the Operational Performance Fund as required by BM&FBOVESPA for this participant category;
- be of legal age;
- have a proven moral character and financial suitability;
- pass the technical sufficiency examination given by BM&FBOVESPA;
- maintain his/her office or residence, if a natural person, in the city of São Paulo; and

- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

#### Agricultural Commodities Special Local

The Agricultural Commodities Special Local has to comply with the same requirements as those set forth for the Local, provided that:

- The Trading Rights are held in restricted agricultural derivatives categories; and
- Collateral is not required for the Operational Performance Fund.

#### Intermediary

The Intermediary must:

- be authorized, pursuant to current legislation/regulations, to intermediate transactions on behalf of third parties – securities broker (CVTM), securities dealer (DVTM) or investment bank;
- obtain authorization from BM&FBOVESPA to carry out the registration of *Trading on behalf* accounts;
- be contractually bound to a Commodities Brokerage House; and
- comply with other requirements set forth or which may be set forth by BM&FBOVESPA.

#### Customer

The Customer must:

- fill out and sign the Registration Form, supplying the corresponding supporting documentation to meet the provisions set forth in current regulations; the investor's record must be kept on file by the Broker to whom it is connected, who in turn registers the investor in the BM&FBOVESPA systems.
- execute an Intermediation Agreement with the Broker or Intermediary responsible for executing the Customer's orders, pursuant to current legislation;
- comply with the rules issued by CVM; and
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

Customers who are non-resident investors, pursuant to CMN Resolution 2687, are subject to specific BM&FBOVESPA registration and authorization procedures. Such investors, both legal entities and individuals, must execute the relevant adhesion term.

#### Depository Establishment

The Depository Establishment must:

- be an entity with proven expertise and technical and operating suitability;
- have a proven financial capacity;
- have a proven storage capacity under proper technical conditions, as well as the specific equipment and machinery for the product intended to be stored;
- prove additional collateral in the form of insurance;
- be located in a strategic place vis-à-vis producing, consuming and exporting regions;
- in the case of a General Warehouse
  - i. Be duly registered with the State Board of Trade as a general warehousing company; and
  - ii. Designate the person acting as a fiduciary trustee;
- comply with BM&FBOVESPA's licensing rules;

- in the case of a coffee warehouse, designate the Privileged Employee who will be responsible for managing the access to the BM&FBOVESPA systems; and
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

#### Commodity Quality Supervisor

The Agricultural Commodity Quality Supervisor must:

- be a company with proven technical and operating capacity in the analysis of agricultural commodities and similar products;
- have a proven financial capacity;
- have a proper technical structure;
- comply with BM&FBOVESPA's licensing rules; and
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

#### Gold Custodian Bank

The Gold Custodian Bank must:

- have an adequate physical structure for gold custody;
- have a high-precision weighing scale;
- have security systems;
- insure the metal kept under custody;
- execute the adhesion term to the licensing rules.
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the corresponding adaptation time frames.

#### Gold Refiner and Supplier

The Gold Refiner and Supplier must:

- be a company with a net worth compatible with the minimum amount set forth by BM&FBOVESPA (equivalent to 50 kilograms of gold);
- pledge a non-operating collateral (equivalent to 50 kilograms of gold, to be reduced by 10 kilograms per year until it reaches the level of 10 kilograms);
- provide proof of technical capacity by means of a gold purity report issued by an independent body (the Technology Research Institute or the Brazil Mint), based on a technical inspection to be paid by the interested refiner/supplier and monitored by a BM&FBOVESPA representative; and
- comply with other requirements defined by BM&FBOVESPA, which may set forth new criteria, with the relevant time frames for adaptation.

## **8. Relationship between Participants**

To perform their activities at BM&FBOVESPA, participants must create the following contractual relationships.

### **8.1. Relationship between Clearing Member and Settlement Bank**



The Clearing Members that does not hold a Bank Reserves account shall enter into an agreement with a Settlement Bank, called **primary**, to transfer funds between itself and the Clearinghouse, via the STR. The Clearinghouse may designate, based on prudent criteria, a **secondary** Settlement Bank with which the Clearing Member must also maintain a contractual relationship.

The relationship is created by the execution of the *Settlement Bank Appointment Form* by the Clearing Member and the Settlement Bank. This document follows the standard defined by BM&FBOVESPA and may include provisions that the contracting parties must agree upon by mutual agreement and according to their own criteria, such as the application of limits and penalties, among others. Notwithstanding the possibility of the parties defining their own criteria, under no circumstances can such criteria alter the parties' responsibilities to the Clearinghouse, pursuant to its Rulebook.

Changes in the relationship between the Clearing Member and the Settlement Bank, whatever their nature, must be notified to BM&FBOVESPA at least five business days in advance.

## **8.2. Relationship between PLD / PLE and Commodities Brokerage House**

The PLDs/PLEs or, as the case may be, whoever operates under their responsibility must maintain an intermediation agreement with the Broker of their choice to carry out their orders.

Additionally, Broker and PLD / PLE must set forth the so-called *relationship for PLD/PLE assignment*, through which the trades carried out by the Broker on behalf of the PLD/PLE are automatically given-up to the PLD/PLE. A *relationship for PLD/PLE assignment* is created upon the PLD/PLE's request to BM&FBOVESPA to link, in the Exchange system, its account with the Broker to the PLD/PLE's account in BM&FBOVESPA's participant registration system.

## **8.3. Relationship between Broker and Clearing Member**

The Broker that does not operate as a Clearing Member must enter into an agreement with at least one Clearing Member, in order to contract the latter's clearing and settlement services.

The relationship is created when the Broker, except for Special Brokerage Houses, and the Clearing Member sign the *Trade Registration Agreement*. The link between a Special Brokerage House and a Clearing Member is created after they execute an *OTC Market Registration Agreement*. These agreements follow the standard established by BM&FBOVESPA and may include additional provisions defined by the contracting parties by mutual agreement and according to their own criteria, such as the application of operational limits and penalties, among others. Without prejudice to the possibility of the parties defining their own criteria, under no circumstances can such criteria alter the parties' responsibilities to the Clearinghouse, pursuant to its Rulebook.

Pursuant to the Clearinghouse Rulebook, after a relationship is created, the Broker becomes a client using the clearing and settlement services provided by the Clearing Member, through whom the former performs payments and receives funds resulting from the transactions executed on the BM&FBOVESPA markets and before whom the Broker undertakes duties and obligations.

Changes in the relationship between the Broker and the Clearing Member, whatever their nature, must be notified to BM&FBOVESPA at least five business days in advance.

#### **8.4. Relationship between PAPE Holder, Clearing Member and Commodities Brokerage House**

The PAPE holder must maintain a relationship, by means of an operating agreement, containing minimum provisions as set forth by BM&FBOVESPA, with:

- i. an institution which is both a Commodities Brokerage House and a Clearing Member; or
- ii. two institutions – a Commodities Brokerage House and a Clearing Member – belonging to the same economic group or conglomerate.

The institutions referred to in items (i) and (ii) are directly responsible to BM&FBOVESPA for the proper settlement of the transactions carried by the PAPE holder, for pledging the collateral required by such transactions, for performing back-office activities, for complying with current rules, and for other obligations, at the parties' discretion. Should the PAPE become extinguished, said institutions remain responsible, pursuant to current rules, for all obligations they have undertaken.

Changes in the relationship between the PAPE holder and the Clearing Member, and between the PAPE holder and the Commodities Brokerage House, whatever their nature, must be notified to BM&FBOVESPA at least five business days in advance.

#### **8.5. Relationship between Customer and Broker**

The Customers must maintain a contractual relationship with the Broker of their choice to execute their orders by entering into an *Intermediation Agreement* for the markets managed by BM&FBOVESPA, which, among other conditions, defines:

- that the Broker must keep current account records in the Customer's name to register credits and debits related to the proceeds from trade settlement, daily marking to the market, cash margin requirements, and expenses from trade execution, among others;
- the Broker's actions regarding risk management, as well as in the event of a Customer's default or financial incapacity, such as requiring collateral to be executed by BM&FBOVESPA; and
- that the Customer knows and accepts the legal and regulatory rules issued by BM&FBOVESPA and of the relevant regulatory authorities, as well as the obligations and risks associated with the performed trades; and
- the parties' submission to BM&FBOVESPA's Arbitration Panel.

Without prejudice to the possibility of the parties defining their own criteria on their agreement, under no circumstances can these criteria alter their responsibilities to the Clearinghouse or defined as mandatory by the BM&FBOVESPA, pursuant to its rules and regulations.

The relationship between Customer and Broker is not required when the Customer trades via an Intermediary. Under this circumstance:

- i. the Intermediary must maintain a relationship with the Broker that executes the orders the Intermediary issues on behalf of the Customer; and
- ii. the Customers must maintain a relationship with the Intermediary that trades on their behalf. This relationship is subject to the provisions set forth in current regulations and to those referred to above for the Customer-Broker relationship.

### 8.6. Relationship between Intermediary and Broker

The Intermediaries must maintain a contractual relationship with the Brokers of their choice to carry out their orders, issued on behalf of third parties, by entering into an *Intermediation Agreement* for the markets managed by BM&FBOVESPA.

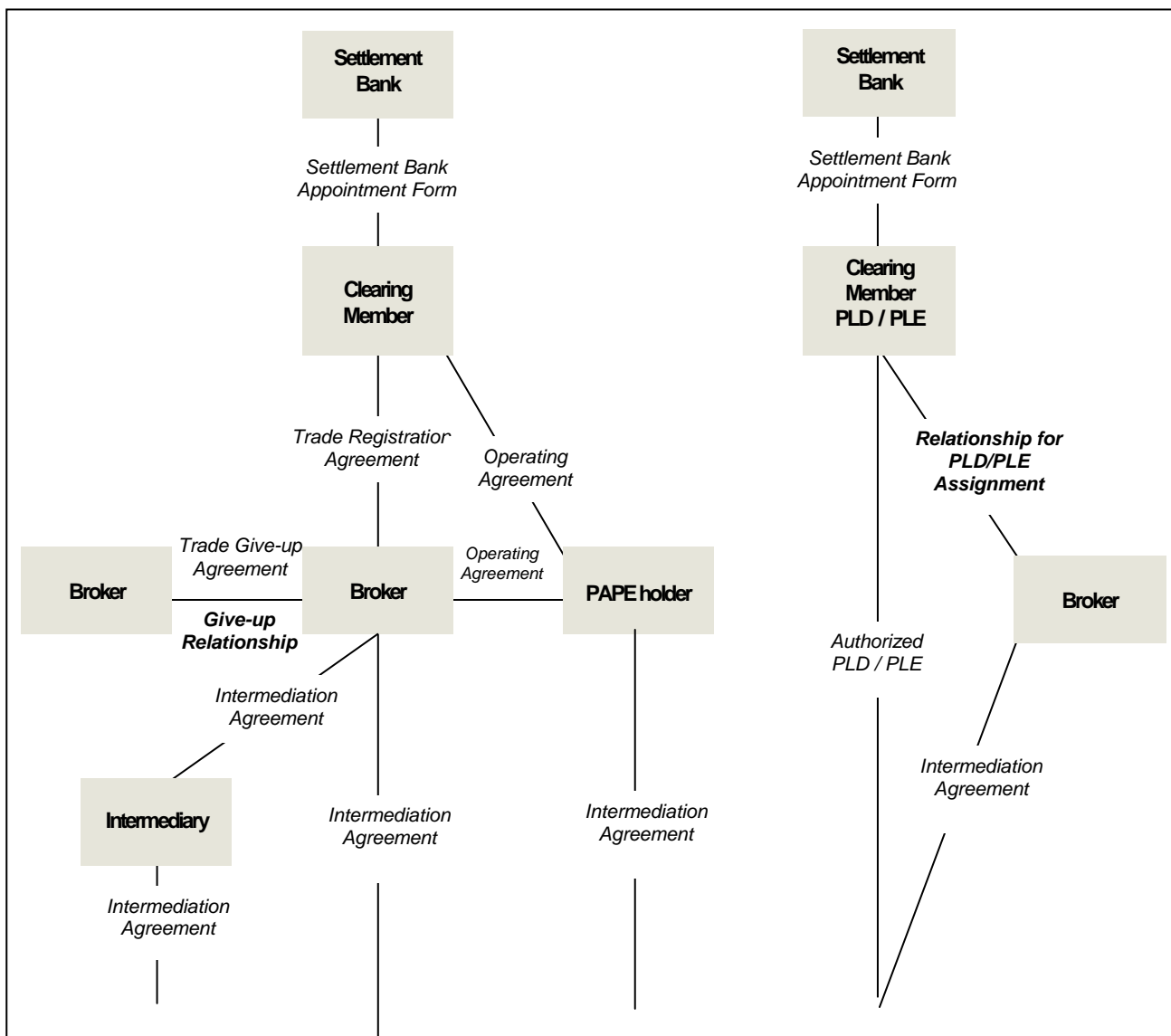
### 8.7. Give-up Relationship between Brokers

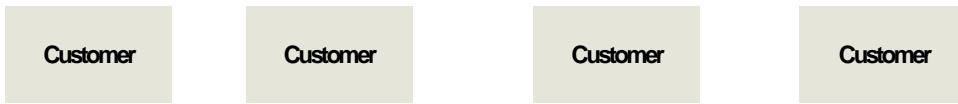
The Brokers who agree to execute trade give-ups create a *trade give-up relationship*, by entering into a specific contract – *Trade Give-up Agreement* – and providing for the registration of their relationship with BM&FBOVESPA in the relevant system.

The registered relationship is represented by a *give-up link code*, to be use by the Broker executing the trade to identify the Broker to whom the trade will be given-up. There is no restriction as to the number of relationships between two Brokers.

PAPE holders are not allowed to create a *trade give-up relationship* with any Broker.

The following diagram illustrates the relationships between the participants.





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**Figure 3 - Relationship between participants**

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### III. TRADE REGISTRATION AND ACCEPTANCE

**Acceptance** of a transaction by the Clearinghouse, except when it is registered *without the guarantee feature*, represents the confirmation that the Clearinghouse has assumed the counterparty position for settlement purposes, in accordance with the terms of the traded contract and to the BM&FBOVESPA's rules and regulations.

For a transaction carried out on the OTC Market, *without the guarantee feature* or on the NMB Market, the acceptance is merely a registration confirmation, which does not entail any responsibility or obligation to the Clearinghouse.

Subject to the operating characteristics of each trading environment – Floor Trading, Electronic Trading, OTC Market and NMB Market – the transactions carried out pursuant to the practices, rules and trading and registration limits established by BM&FBOVESPA are accepted.

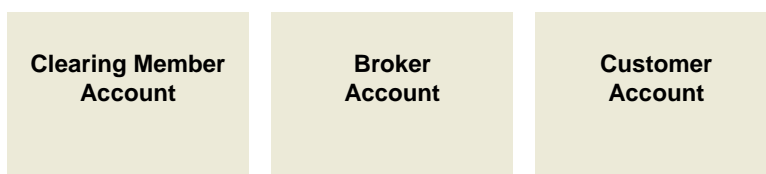
- When the trade is carried out on the BM&FBOVESPA floor, it is considered *accepted* by the Clearinghouse at the time of its execution in the corresponding pit by the floor brokers.
- When carried out on the BM&FBOVESPA electronic system, it is considered *accepted* when the trading engine matches the bid and the offer which have originated it.
- When carried out on the OTC Market, *with the guarantee feature*, the transaction whose registration has been authorized by the Clearinghouse according to its criteria is accepted after the pledge of the collateral required from the contracting parties.
- When carried out on the OTC Market, *without the guarantee feature*, or in the NMB Market, the transaction registration is accepted by the system if it complies with the limits defined by BM&FBOVESPA.

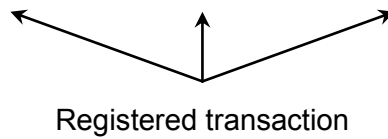
BM&FBOVESPA may decide to cancel an already-accepted transaction whenever it verifies any violation to the provisions of this Manual, the Clearinghouse Rulebook, the Rules of Access, other BM&FBOVESPA regulations or current legal and regulatory rules. It may also create special procedures for any trades executed and/or registered, or even their total or partial close-out.

#### 1. Trade Registration and Acceptance – Exchange and OTC Markets

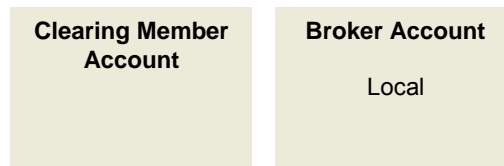
##### 1.1. Account Structure

Leaving aside for a while the operating modes involving participants in the Intermediary, PLD, and PLE categories, the account structure associated with a transaction registered in the Clearinghouse's system has 3 levels, corresponding to the Customer, Broker, and Clearing Member categories.



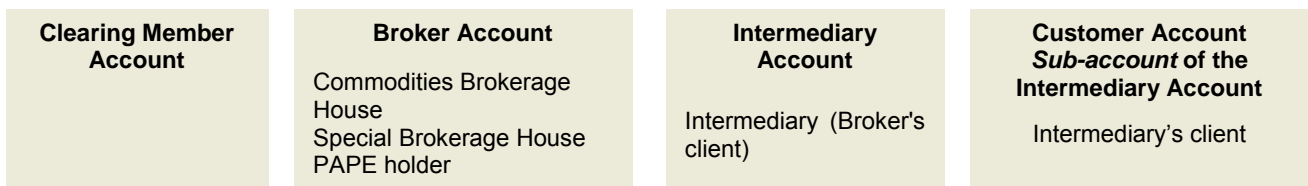


When the Broker is a Local or Agricultural Commodities Special Local, who is allowed to maintain an open position only for its own account, the account structure of its transactions does not include the Customer's account.



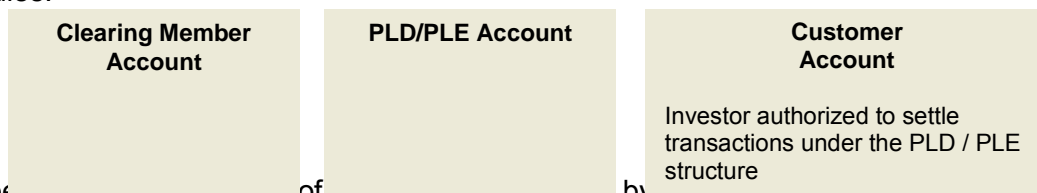
The account structure associated with the transaction sent to a Broker by an Intermediary acting on behalf of another investor's account has 4 levels, as shown in the following figure.

The transaction's Customer, for whose account the Intermediary trades, is the holder of a *sub-account* of the Intermediary's account, who receives the account identification *on behalf*.



The Customer of this transaction maintains no contractual intermediation relationship with the Broker carrying out the respective order, who in turn has no access to the information that allow for his identification. The Clearinghouse, however, has the Customer's identification in its systems.

The account structure for the transaction occurring in the mode defined for the participant in the PLD or PLE category assumes the following configuration, and the Customer of the transaction must belong to the categories authorized to carry out transactions through the PLD or PLE, respectively, according to current rules.



In this operation, the orders are carried out by the Broker, who carries out the orders transmitted by the PLD / PLE, with later indication of the transactions for the account structure of the PLD / PLE proper.

## **1.2. Registration and Acceptance of Transactions Carried out on BM&FBOVESPA's Trading Floor**

The trade carried out at a BM&FBOVESPA floor session is considered *accepted* by the Clearinghouse at the time of transaction execution, by the floor brokers, in the open outcry. Its registration with the Clearinghouse's Registration System occurs at a later time, when the trading card is read, and the characteristics of the transaction are listed by the trading card receiving system.

## **1.3. Registration and Acceptance of Transactions Carried out on BM&FBOVESPA's Electronic Trading System**

The trade carried out on BM&FBOVESPA's Electronic Trading is *accepted* by the Clearinghouse when the electronic trading system matches the bid and offer which originate the transaction, with its concurrent, automatic registration in the Clearinghouse's registration system. The trades carried out via WTr are executed through the same electronic trading system, with the acceptance of an offer transmitted via WTr being conditional on its adherence to the limits defined by BM&FBOVESPA.

## **1.4. Registration and Acceptance of Transactions Carried Out on OTC Markets**

The OTC Market trades occur directly between Customers, with no placement of bid and offer in the trading system. After the trading, the registration of the transaction in the registration system made available by the Clearinghouse for that purpose is carried out by the Brokers related to the counterparties of the trade. In the case of a transaction associated to PLD / PLE, registration must be carried out by the Broker by using the *relationship code to designate* the PLD / PLE, so that the transaction can be automatically transferred to its account.

The transaction registration is accepted in the registration system after the verification, regardless of the guarantee feature, of the adherence of the transaction characteristics to the limits and conditions set forth by the Clearinghouse – concerning prices, rates, deadlines, notional value, among others – according to contractual specifications and BM&FBOVESPA's rules, or by presenting the pertinent justifications.

Three types of guarantee are allowed for the OTC Market transactions

- i. *total guarantee*;
- ii. *partial guarantee* (available only for swap contracts); and
- iii. *without guarantee*.

The contracting parties in the transaction jointly define the guarantee feature under which it will be registered. In the transaction with BM&FBOVESPA's *total guarantee*, both parties are guaranteed, that is, the Clearinghouse undertakes the position of counterparty to both parties; in the *partial guarantee* feature, the Clearinghouse is a counterparty to only one of them; in the transaction *without guarantee*, the Clearinghouse does not undertake the position of counterparty to any of the parties to the transaction.

The transaction with BM&FBOVESPA's *guarantee* feature, either total or partial, whose registration has been accepted in the system is considered as accepted by the Clearinghouse only after the parties have met the required margin requirement. In the case of a transaction with the *total guarantee* feature, both

parties are subject to margin requirement, whereas in the *partial guarantee* case, only the party that did not request the Clearinghouse's guarantee is subject to margin requirement.

The following sections describe the procedures resulting in alteration of the registration characteristics of a transaction in the registration systems designed for BM&FBOVESPA's Exchange and OTC Markets. Such registrations may undergo alterations due to the trade allocation procedures, inclusion and cancellation of trade allocation, PLD / PLE assignment, trade breakdown, trade give-up, transaction transfer and assignment and those procedures defined in case of splitting-up, merging or incorporation of participants.

## 1.5. Trade Allocation

**Trade allocation** is the identification procedure, with respect to the Clearinghouse, through which the Customer who is the final holder of the transaction carried out on the exchange market is identified.

Trade allocation is a procedure for which the participants of the Broker category are responsible. Trade allocation is done in a system suitable for that purpose.

The allocation of both parties of a cross trade<sup>3</sup> to the same Customer is forbidden. In like manner, BM&FBOVESPA's systems reject the allocation of trades executed by two different Brokers for the same customer.

As mentioned in the section on relationships between participants, the Clearinghouse requires the Broker to maintain a relationship with at least one Clearing Member. In case a relationship is set forth with more than one Clearing Member, one of them will be called ***principal*** and the others, ***secondary***. If there is no designation of a *secondary* Clearing Member, BM&FBOVESPA's system automatically associate the trade to the *principal* Clearing Member designated by the Broker who executed it. It is the Broker's responsibility to specify the Clearing Member when the trade is allocated.

In case of lacking, insufficient or incorrect data when a trade is allocated, the trade is attributed to the Broker responsible for its execution and is registered in the 999999 account, called *error account*, of the responsible Broker.

The amounts resulting from the transactions so registered are regularly cleared, by means of the corresponding Clearing Member, as those of an ordinary Customer, including operating costs. The transaction registered in the *error account* is subjected to BM&FBOVESPA's analysis and monitoring, and the Broker must arrange for the balance of that account to be "reset" on T+1, by executing a transaction of a kind opposite to that of the original transaction, which does not release him from meeting the margin requirement, in the form and time frame as set forth by the Clearinghouse. Notwithstanding such "resetting", BM&FBOVESPA keeps control of the results and transactions of the error account.

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<sup>3</sup> A cross trade is the transaction, carried out on the Exchange market, in which the Broker acts as a representative of buyer and seller at the same time, with both distinct Customers being his clients.



*Allocation Time Frame*

BM&FBOVESPA sets up time frames and conditions for allocation and may, upon its own discretion, change times as well as define allocation in advance or immediately. The allocation of a trade must be carried out on the date the trade is executed (T+0), regardless of the trading session.

The allocation of trades arising from orders issued by PLD, PLE, institutional investor, non-resident 2689 investor, financial legal entity and portfolio or mutual fund manager must be executed by 7:30 pm on their execution date.

The following table presents the schedule for executing allocation procedures, valid for trades other than those mentioned in the preceding paragraph.

| TRADE REGISTRATION TIME*        | DEADLINE FOR ALLOCATION  |
|---------------------------------|--|
| Until 11:30:59                  | 12:30:00   |
| from 11:31:00<br>to<br>13:00:59 | 14:00:00   |
| from 13:01:00<br>to<br>15:30:59 | 16:30:00   |
| from 15:31:00<br>to<br>17:00:59 | 18:00:00   |
| after 17:01:00                  | 17:30:00 If allocation of non-resident 2.687 investor  |
|                                 | 18:00:00 If allocation of Customer other than non-resident 2.687 investor, with contracts with physical-delivery clearing during allocation period of Delivery Notice. |
|                                 | 19:30:00 If allocation of Customer other than non-resident 2.687 investor, with the other types of contracts.  |

\* Reading of Trading card, if open outcry

Transaction execution in trading system, if electronic trading

**Table 1 – Schedule for allocation**

*Allocation Cancellation*

The **cancellation of trade allocation** makes the trade *non-allocated*, that is, its Customer is undetermined and the Clearing Member responsible for the trade is the *principal* Clearing Member of the Broker, PLE, or PLD, as the case may be.

In the event of a trade being unduly attributed to a certain Customer and/or Clearing Member, the allocation must be cancelled and the new allocation entered in the system. Such procedure causes an allocation alteration and is commonly referred to as a *re-allocation*.

The cancellation of allocation and inclusion of a substitute allocation must be executed by the Broker or PLD/PLE responsible for the trade, on the same day (T+0) the trade is executed, at the respective defined times, by means of a request to the Clearinghouse, presenting the proper justification, authorization from the Risk Management Office and, if the allocation deadline has expired, from the Settlement Office.

Only in certain cases of operational error in the allocation, duly documented and proven, can the Clearinghouse authorize the correction on a date equal to or later than T+1, at BM&FBOVESPA's sole discretion. Such correction occurs by transfer of the incorrectly-generated position to the due Customer.

Operationally speaking, allocation and allocation cancellation is executed through the BM&FBOVESPA Services system, by entering it directly into the system. The allocation can also be executed by downloading a text-formatted text or sending an *xml*-formatted message.

## 1.6. Trade Give-up

**Give-up** is the procedure to transfer a transaction, on the same day it is executed, between an *execution*-Broker and a *carrying*-Broker, provided the *give-up relationship* between them has been duly set forth.

An *execution*-Broker is the Broker who executes the trade, in the trading floor or in BM&FBOVESPA's trading systems, for the account and order of the Customer or another Broker's.

The *carrying*-Broker is the Broker who receives, via give-up, the transaction executed by the *execution*-Broker.

The give-up is executed by the *execution*-Broker, with the *carrying*-Broker being responsible for confirming or rejecting it, within the time frame and conditions set forth by BM&FBOVESPA.

Possible give-up restrictions, as defined by means of operating limits set forth between *execution*- and *carrying*-Brokers, are monitored and managed by them, with BM&FBOVESPA and the Clearinghouse not being responsible for controlling or monitoring the adherence to such restrictions of the trades given-up.

A transaction give-up can occur

- i. upon the *carrying*-Broker's request, who issues a trade order directly to the *execution*-Broker, such transaction mode being called *brokerage*; or

- ii. by order of the Customer – the *execution*-Broker and the *carrying*-Broker's client – who issues the trade order directly to the *execution*-Broker, for further give-up to the *carrying*-Broker.

In *brokerage*, the *carrying*-Broker gives up to the *execution*-Broker the order received from the former's client, for execution and subsequent return of the transactions. For this situation, the contractual relationship between the *execution*- and the *carrying*-Brokers makes the *carrying*-Broker responsible for maintaining the client informed that his orders may be executed by another Broker, with whom he does not necessarily maintain an intermediation contract.

Once a trade give-up is ordered, the *execution*-Broker becomes responsible

- for the registration of the *carrying*-Broker, if under situation (i), or the client's, if under situation (ii), indicating it is a give-up of the corresponding transaction. It is worth stressing that, under situation (ii), the client must be regularly registered as such in the *execution*-Broker, maintaining with him the corresponding intermediation contract and meeting all the provisions of current regulations;
- for executing the order;
- for registering the transaction executed;
- for the executed transaction give-up within the time frame set forth by BM&FBOVESPA; and
- for settling the transaction and for posting the margin requirement, in case the give-up is rejected.

and the *carrying*-Broker becomes responsible

- under situation (i), for the registration of the client's order (who, solely in this case, does not maintain any direct or indirect relationship with the *execution*-Broker), indicating it is associated with the corresponding transaction give-up;
- for identifying the Customer and the Clearing Member, within the time frame and conditions set forth by BM&FBOVESPA, if give-up is executed;
- for settling the transaction and for posting the margin requirement, in case the give-up is executed and not rejected; and
- for the custody and utilization of any assets and amounts, if the give-up is confirmed and executed.

The trade give-up occurs pursuant to the following operating procedure:

In open outcry, the *execution*-Broker indicates the *give-up intention* and the *give-up link code* to the *carrying*-Broker

- in the trading card; or
- through the BM&FBOVESPA Service Network screen, within the time frame set forth by BM&FBOVESPA, starting the moment the trading card is registered.

In electronic trading, the BM&FBOVESPA determines a specific time frame, starting the moment the transaction is registered, for the *execution*-Broker to indicate the *give-up intention* and the *give-up link code* to the *carrying*-Broker

- on the electronic trading system screen; or
- through BM&FBOVESPA's Service Network.

If the indications are not carried out as mentioned above, the give-up may be executed only if authorized by BM&FBOVESPA, through a formal request by the parties and by producing the pertinent justification.

Give-up execution is conditional on the existence of a *give-up relationship* between the *execution*- and the *carrying*-Brokers.

In case there is no *give-up relationship*, the trade is registered for the *execution*-Broker and the give-up is not executed.

If there is a *relationship*, the give-up is executed, and the *carrying*-Broker must either confirm or reject it, through the BM&FBOVESPA's Service Network, within the time frame set forth by the Exchange and pursuant to the conditions the latter defines; if this is not done by the end of such time frame, then the give-up is considered confirmed and the system attributes the transaction to the *carrying*-Broker;

The Brokers must maintain proper control of the trades which they give up or given up to them, allowing them to monitor the acceptance/rejection process.

The trade which is not rejected within the established time frame is considered confirmed.

The give-up procedure must also meet the following provisions:

- It is the *execution*-Broker's responsibility to observe the time frames defined for the give-up to be executed;
- It is the *carrying*-Broker's responsibility to observe the time frames defined for confirming / rejecting the give-up;
- It is forbidden to give up trades
  - executed via WTr;
  - executed in the OTC Market;
  - resulting from any other give-up (which characterizes a "give-up of a give-up").
  - which has a participant of the PAPE holder category as the *execution*-Broker or *carrying*-Broker; and
  - which has a participant of the Local category as the *carrying*-Broker.

- It is forbidden to cancel the give-up of a transaction already allocated by the *carrying*-Broker; and
- In case of need of give-up for a fraction of a trade, the unilateral breakdown of such trade must be previously arranged, according to the procedures established by BM&FBOVESPA (item 1.8 below) and then executed the give-up of the trade fraction.

## 1.7. PLD or PLE Assignment

The procedure called **PLD / PLE assignment** is equivalent to an automatic give-up, to the PLD / PLE, of the trade ordered by him to the Broker and executed and registered by the latter, provided the *Relationship for PLD / PLE Assignment* between them is duly established.

The PLD / PLE assignment takes place according to the following procedure:

The Broker that executes the trade resulting from the order issued by the PLD / PLE informs the *assignment link code* for the indication of the PLD / PLE, and the transaction is automatically transferred to the latter by the BM&FBOVESPA's system. Such indication must be registered

- in the trading card, in case the PLD / PLE transmits the order, via the Broker's desk, directly to the open outcry broker;
- in the trading card or via the BM&FBOVESPA's Service Network, within the time frame set forth by BM&FBOVESPA, in case the PLD / PLE transmits the order to the Broker's desk to be executed in open outcry;
- on the electronic trading system screen or via the BM&FBOVESPA's Service Network, within the time frame set forth by BM&FBOVESPA, in case the PLD/PLE transmits the order to the Broker's desk to be executed through electronic trading.

The effective PLD / PLE assignment is conditional on the existence of a *relationship for PLD / PLE Assignment* between the Broker and the *PLD / PLE*.

In case there is no such *relationship*, the trade is registered for the Broker, rather than be attributed to the PLD / PLE.

In case there is such *relationship*, the trade is attributed to the PLD / PLE.

Each trade attributed to the PLD / PLE must be confirmed or rejected by the latter, via BM&FBOVESPA's Service Network and, in case of a trade registered with an exchange market, within the time frame set forth by BM&FBOVESPA. There is no time frame for rejecting trades registered with the OTC Market.

The trade rejected by the PLD / PLE returns to the Broker who registered it, the latter, as well as the corresponding Clearing Member, being responsible for settling such trade.

The trade which is attributed to a PLD / PLE and not rejected within the established time frame is considered confirmed by the PLD / PLE.

(3) The trade attributed to the PLD / PLE and confirmed must be allocated, with such allocation being the responsibility of the PLD / PLE, depending on the allocation type, defined at the time of registration of the *relationship for PLD / PLE Assignment*, to the account to which the trade is attributed, namely:

- automatic allocation to the related account with no possibility of being altered;
- automatic allocation to the related account with a possibility of being altered; and
- non-automatic allocation, when the transaction must be later re-allocate to the customer' accounts.

## 1.8. Unilateral Trade Breakdown

**Unilateral trade breakdown** is the procedure through which a trade is divided into trades with the same characteristics of the original trade, except for the quantities, which are smaller than the quantity of the original trade and whose sum results in the quantity of the original trade.

The use of the breakdown procedure is restricted to the cases when a give-up or indication for PLD / PLE involving a fraction of the original trade is necessary, with the execution of the breakdown being the responsibility of the Broker in charge of the give-up or of the indication for PLD / PLE, without involving either BM&FBOVESPA or the trade's counterparty. The following rules apply to the breakdown procedure:

- only non-allocated trades can be broken;
- the give-up or PLD / PLE assignment of at least one of the trades resulting from the breakdown is mandatory;
- the breakdown-derived trades are assigned the same registration time as the original trade, so that the time frames concerning give-up, PLD / PLE assignment and allocation procedures to them appertaining remain unchanged;
- the breakdown of a trade must be carried out within the maximum deadline set forth by BM&FBOVESPA starting from the transaction registration and under the conditions set forth by BM&FBOVESPA; after such deadline, a breakdown can only be done through BM&FBOVESPA's authorization; and
- It is forbidden to breakdown trades
  - received in give-up;
  - registered by Locals or Agricultural Commodities Special Locals;
  - generated by the exercise of an option;

- generated due to purchases to block the exercise of an option;
- with structured transactions;
- executed via WTr;
- executed on (D-1), in after-hours trading session; and
- resulting from breakdown of any other trades (which characterizes a “breakdown of an breakdown”).

### 1.9. Indication of a Master Account

A **master account** is a group of accounts of Customers who have a specific relationship among them, such as, for example, mutual funds accounts managed by the same institution, or yet accounts from companies belonging to the same economic conglomerate. The indication of trades to a master account allows for the identification of the group of Customers responsible for them, isolating them from the other trades executed by the Broker.

The registration of a master account occurs upon a request from a Broker to BM&FBOVESPA's Participants Registration Center, which executes it after the Clearinghouse approves of the requests. During registration, the relationship between the master account and the Customers to be grouped under such account is created, with the Broker assuming total responsibility for the information provided, as well as for their permanent and prompt updating, whenever necessary.

Master account(s) must be registered by Brokers who have clients such as mutual funds, managed portfolio or non-resident investor with an outsourced management.

A trade attributed to a master account is a trade yet not allocated, which must be allocated to one or more Customers with a due contractual relationship with such account.

The master account admits no open position at day closing, so that every trade indicated to a master account is mandatorily allocated to a Customer. The trade indicated by the master account and *not allocated* within due time is registered in the *error account* of the participant responsible for the trade.

In case of an operating error involving the indication to the master account, cancellation of the indication must be requested to the Clearinghouse, by sending a letter containing the pertinent justification. The alteration or cancellation of the allocation of trades indicated to the master account is also done through a request to and approval by the Clearinghouse.

BM&FBOVESPA sets forth time frames for the execution of an indication of a trade to the master account, as well for the allocation of the transaction indicated to the master account. After time frames are expired, the indication and/or allocation may be executed through the Clearinghouse's authorization, requested by the responsible Broker. BM&FBOVESPA may, at any moment and at its discretion, postpone the master account indication, as well as the allocation of the indicated trade.

## 1.10. Other Procedures Related to Transaction Registration

### 1.10.1. Position Transfers

**Position transfer** is the procedure through which the rights and obligations related thereto to another Customer and/or Intermediary, if any, and/or the Broker and/or Clearing Member.

Position transfers involving alteration of the Customer participant are admitted in cases of split-up, merging, winding-up or taking over and, at BM&FBOVESPA's discretion, in case of need to correct an undue registration resulting from an incorrect allocation.

**Position transfer with no ownership alteration** is the procedure through which the ownership position of a same Customer, under a same Intermediary, if any, is transferred from a Broker to other Trades or from a Broker to a PLD or PLE, and vice-versa, but maintaining the Customer.

The *Addressees* of the transfer are the Brokers or PLD/ PLE receiving the transferred positions, and the *Originator* is the Broker or PLD / PLE responsible for the position to be transferred who requested the transfer.

Upon the request by the Customer or Intermediary of the positions being transferred, the *Addressees*, the *Originator* and the *Addressees'* Clearing Members undertake the transfer without a change of ownership

- directly, via access to the services network, in case of transfer of positions executed in Exchange Markets; and
- by means of a specific request sent to the Clearinghouse, which will be in charge of the registration with its systems, in case of transfer of positions executed in the OTC Market.

In any case, the following conditions must be observed:

- The Customer's or the Intermediary's registration data must be identical with those contained in the *Addressees'* and *Originator's* registration; if there is an Intermediary, the sub-account must have been previously identified in BM&FBOVESPA's systems;
- the effective transfer is conditional on the consent by the *Addressees'* Clearing Members; the new Clearing Members, upon accepting the transfer, take on all responsibilities for the positions attributed to them by the transfer, pursuant to the provisions of the Clearinghouse Rulebook and of this Manual; and
- the times set forth by the Clearinghouse for transfer procedures must be followed, that is:
  - in the case of a resident investor's positions assumed in the Exchange Market
    - the transfer request must be registered by the *Originator* by 18:00 h and



- the receipt by the *Addressees* and the approvals of the respective Clearing Members must be registered until the deadline defined for allocation; such restriction implies the 18:00 h deadline for the request, receipt and approval of the positions transfer involving contracts with physical delivery settlement which are in their delivery period.
- for transfer of positions of non-resident 2.687 investors, the deadline for trade allocation as defined for that category of Customer must be followed, implying the 17:30 h deadline for the request, receipt and approval of the positions transfer involving contracts with physical delivery settlement which are in their delivery period.
- in the case of positions assumed in the OTC Market, the documentation required must be received by the Clearinghouse within due time to proceed with the analysis of the request and the transfer registration, if so authorized, in the respective registration system until the time defined for its closing.

If there is no inconsistency or unresolved matter, the transfer is processed overnight in the Clearinghouse's systems, with the positions transferred to the new *Addressees* being registered in their names on the opening of the next business day. The transfer of positions does not imply any financial transfer.

The Clearinghouse monitors on a daily basis the transfers executed and provides the relevant information to the Brokers, PLD / PLE and Clearing Members involved.

Collateral transfer must be provided through a collateral transfer request to the Risk Management Office. The Clearinghouse may, at its sole discretion, block the withdrawal of collateral and/or require additional margin to be posted by the participants involved.

### 1.10.2. Swap Contract Ownership Transfer

A **swap ownership transfer** consists of an ownership transfer arising from negotiation between the parties, in the market.

The transfer of ownership of the swap transactions registered with the *guarantee* feature occurs by means of a specific transfer request submitted to the Clearinghouse, according to the model defined by the latter, subscribed by the *Assignor*, by the *Assignee* and the respective Intermediaries, Brokers or PLD / PLE and Clearing Members. An *Assignor* is the Customer who assigns his ownership in the transaction to another, and an *Assignee* is the Customer receiving the ownership.

The ownership transfer request submitted to the Clearinghouse must contain

- the identification of the underlying contracts of the assignment;
- the amounts to be transferred through the assignment; and
- an express acceptance statement from all undersigned, of the terms and conditions set forth by BM&FBOVESPA to execute the assignment, as well as the rules applicable to the contracts.

The required documentation must be received by the Clearinghouse by 12:00 h of the day when the ownership assignment is requested, or at another times, upon the Clearinghouse's discretion.

For the assignment of ownership of the swap transactions registered without the *guarantee* feature, it is necessary, in addition to the abovementioned measures, to obtain the express consent, in the transfer request submitted to the Clearinghouse, of the counterparty who originally contracted with the *Assignee*. The same applies to the assignment of ownership of the transactions registered with the *guarantee* feature, with the express consent of the counterparty that originally contracted with the *Assignee* being required, in case it is mentioned as the non-guaranteed party.

After analyzing the transfer request, upon checking

- the adherence of the transaction to the various limits, including prices, set forth pursuant to the criteria defined for acceptance of transactions registration in the OTC Market; and
- sufficiency of the collateral posted by the *Assignor* and the *Assignee*; and
- other conditions which the Clearinghouse deems necessary,
- the Clearinghouse decides on its acceptance, on the need to block collaterals and/or require additional margin to be posted by the participants involved and on other measures which, upon its discretion, are deemed necessary.

Once the collateral due by the parties is posted and the other measures set forth by the Clearinghouse are met, the transfer is approved and the Clearinghouse executes the registration of the ownership transfer in the relevant registration system, until the time defined for its closing. The underlying positions of the assignment are recorded, for the *Assignor*, in the opening position of the next business day following the day of the assignment registration.

The operating costs, assessed only on the position ownership assignment, are the current operating costs of the initial registration of the transactions. In the case of assignment of positions registered with the *guarantee* feature, the amounts due by virtue of the assignment are transferred through the Clearinghouse settlement service, on the next business day following the transfer date. Otherwise, the amounts are transferred directly between the parties involved.

### **1.10.3. Procedures in the Event of Splitting-up, Winding-up, Incorporation or Merging of Participants**

The open positions under the responsibility of participants involved in splitting-up, winding-up, incorporation or merging procedures must be transferred.

In case the participant involved in the event is an Intermediary or Customer, the Broker or PLD responsible for the positions to be transferred must express himself about the event by requesting to the Clearinghouse, through correspondence / communication, the transfer of positions. In case the participant involved in the event is a Clearing Member, Broker or PLD/PLE, he himself requests the transfer to the Clearinghouse.

After receiving and analyzing of the required documentation, the Clearinghouse ascertains the sufficiency of the collateral posted and may require the posting of additional margin, upon its discretion, as well as other measures it deems necessary. If there are no pending matters, it proceeds with the transfer of positions and/or ownership, as the case may be.

## **2. Registration and Acceptance of Transactions – Non-Standardized Derivatives Market**

Similarly to what occurs in the OTC Market, the NMB Market trades are executed directly between the counterparties. After trading, the transaction is registered in the system specific to that market - NMB Market System – through messaging, file download or entering directly onto the system screen, by the participants responsible for executing the registration - PMBs, Intermediaries, and Preferred Agents.

The transaction must be covered by a Bilateral Agreement<sup>4</sup> and be registered in one of the system modules, according to the characteristics and operating features adopted, pursuant to the specific procedures of the respective module.

The transaction registration is accepted by the system after verification of the adherence of the transaction characteristics to the limits and conditions set forth by the Clearinghouse. In addition to such restrictions, a registration may be rejected by the Clearinghouse whenever the transaction shows signs of irregularities or non-conformity with current rules.

The mechanisms to register the transactions of the NMB Market are different from other contracts and/or registration systems, including those of the OTC Market.

## **3. Registration and Acceptance of Transactions – Other Trading Environments**

The transactions executed in other trading environments are registered in the registration systems and accepted by the Clearinghouse according to the rules and procedures defined by BM&FBOVESPA.

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<sup>4</sup> A Bilateral Agreement is a bilateral clearing agreement executed between the parties, which define the transactions covered by it, the credit events and the conditions for acceleration of contract maturity.

## IV. CLEARING AND SETTLEMENT

This chapter is divided into 4 sections – section 1 deals with the multilateral cash settlement for the Exchange and OTC Markets, whereas sections 2, 3, and 4 deal with the settlement services for the Non-Standardized Derivatives Market, for the Brazilian Commodities Exchange and for special transactions, for which markets the Clearinghouse is not CCP.

BM&FBOVESPA may decide to suspend settlement of a transaction if it verifies any breach of the provisions of this Manual, the Clearinghouse Rulebook, the Rules of Access, other BM&FBOVESPA regulations or current legal and regulatory rules. It may also establish special procedures or conditions for the settlement.

### 1. Multilateral Clearing and Settlement

The Clearinghouse operates as counterparty, before the Clearing Members, for the purpose of settling the transactions registered in its systems, occurring in the Exchange Markets and OTC Market with the *guarantee* feature. The obligations resulting from such transactions are settled through the Net Deferred Multilateral Settlement service, simply called Multilateral Settlement.

The clearing and settlement services rendered by the Clearinghouse include

- multilateral clearing of the debtor and creditor amounts which are under each Clearing Member and the corresponding cash settlement;
- supervision of the physical delivery procedures, from the ascertainment of buyers to the execution of the actual delivery, pursuant to the DVP (Delivery versus Payment) criterion; and
- handling of failures in settlement.

The multilateral clearing is processed by the Clearinghouse systems overnight, after daily closing of the transactions registration systems, that is, after the registration and allocation of the trades executed on the day, T+0, with the reports concerning the settlement on T+1 being issued and made available to the participants, such reports containing the updated open positions and the composition of the provisional settlement amounts.

For that purpose, the positions and transactions attributed to a same account structure are consolidated per market, commodity, maturity and series, if in the Exchange Market, with off-setting of opposite positions in the same contract, provided that

- the transactions executed on date T+0, in open outcry and in before-hours and regular-hours sessions of the electronic trading, affect the opening position on T+1, the settlement amount to be settled on T+1 and the margin requirement to be met on T+1;
- the transactions executed on date T+0, in the after-hours trading session, are considered as open position only in the opening of T+2, and the corresponding margin requirement must be met on T+1. The result of the trades makes up the settlement amount to be settled on T+2, provided that, if it is a debtor result, it will be calculated as margin requirement, to be met on T+1; and

- the OTC Market transactions with no Clearinghouse guarantee are not included in the clearing and, therefore, only the fees arising from such transactions affect the settlement amounts.

The multilateral settlement processing follows the positions consolidation, with the calculation, for each participant, of the settlement amount, either payable or receivable, called **Multilateral Settlement Amount**.

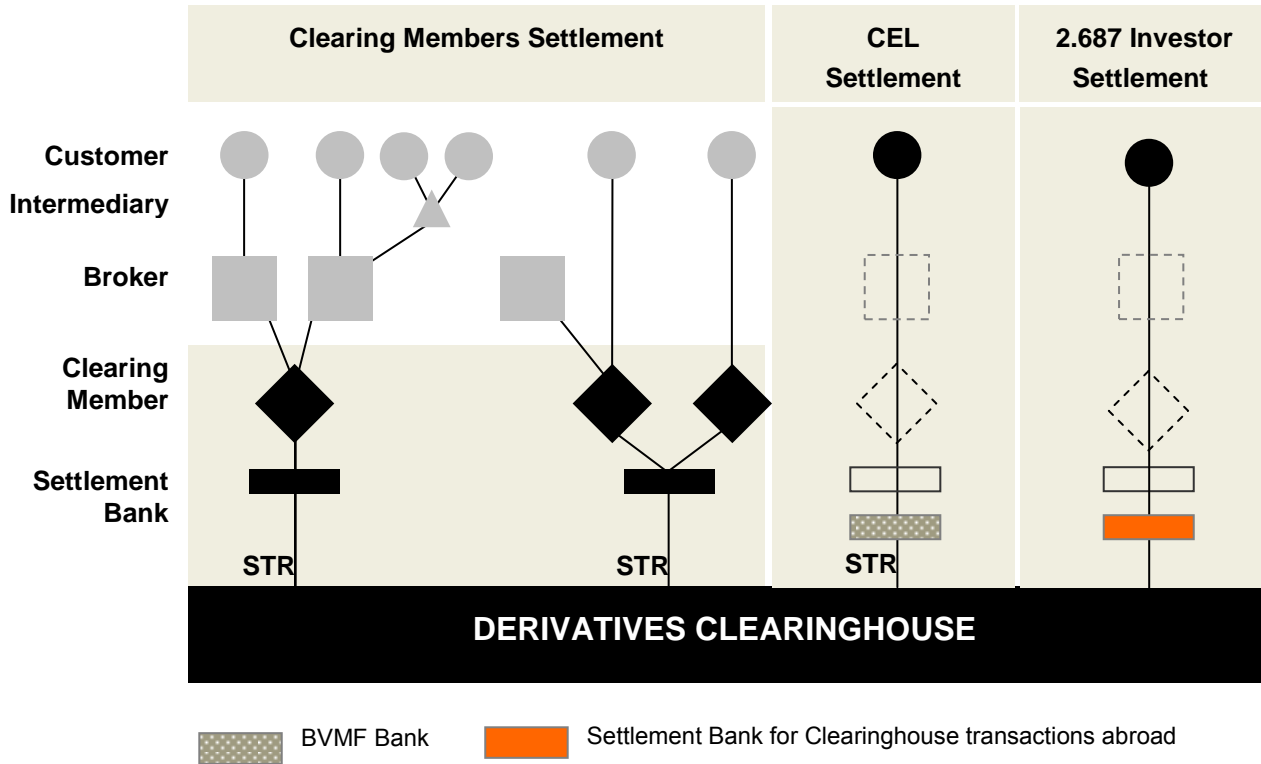
The Clearinghouse multilateral cash settlement comprises the following modes:

- Settlement of Clearing Members, via the STR's LDL (Clearinghouses Multilateral Settlement) services;
- Settlement through the Special Settlement Account at BM&FBOVESPA Bank (CEL), via the STR's LDL services; and
- Settlement of Non-resident 2.687 Investors, via the Settlement Bank in charge of BM&FBOVESPA's transactions abroad (New York).

The procedures for each mode of multilateral cash settlement are detailed in section 1.3.

The following figure shows the multilateral settlement modes. The participants indicated in black are those directly involved in the settlement with the Clearinghouse – Clearing Members, Customers using the CEL, Non-resident 2.687 Investors, and the settlement banks. In the settlement modes via CEL and for non-resident 2.687 Investors, the participants identified with a dotted outline remain responsible and undertake the obligations corresponding to the settlement in case of payment default via the chosen settlement mode, with settlement then occurring in accordance to the Clearing Member Settlement mode.

## NET DEFERRED MULTILATERAL CASH SETTLEMENT

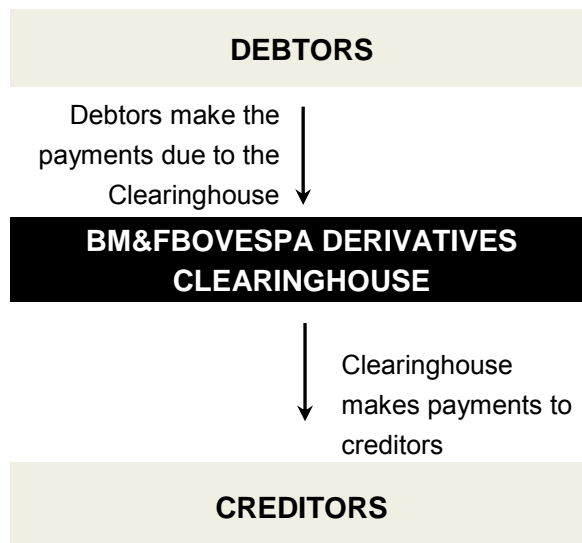


**Figure 4 – Net Multilateral Deferred Cash Settlement**

The Clearinghouse provides the information needed for the Clearing Member to perform the functions attributed to it for settlement of the transactions in regard to the users of its clearing services and to BM&FBOVESPA.

The Settlement Banks are only entered as service providers to the Clearing Members, executing the reserves transfer in the STR. Although only Clearing Members and Settlement Banks participate directly in the settlement with the Clearinghouse, in the Clearing Members Settlement mode, all participants are responsible for the respective payments, in the vertical order indicated in the figure below.

The daily cycle of each settlement mode has two stages – the stage of debtors’ payment to the Clearinghouse and the stage of the Clearinghouse’s payment to the creditors.



Cash settlement between the Clearinghouse and its Clearing Members occurs on a daily basis, in case of a **business day**, as defined below, according to the specific timeframe and

- the delivery of assets refers to the net amount traded; and
- the margin is required to be posted in cash, which, upon BM&FBOVESPA's discretion, may be replaced by other assets.

For the purpose of cash settlement resulting from non-agricultural derivatives contracts, a **business day** is the day when there is trading session at BM&FBOVESPA for trades with derivatives and commodities contracts registered with the Clearinghouse. Non-business days are those when there is no trading session at BM&FBOVESPA, namely: Saturdays, Sundays, national holidays, bank holidays in São Paulo and others that may be created in the future.

For the purpose of cash settlement resulting from agricultural derivatives contracts, a **business day** is the day when (i) there is trading session at BM&FBOVESPA for trades with derivatives and commodities contracts registered with the Clearinghouse, and (ii) it is not a bank holiday in New York nor in São Paulo. The first cash settlement after the occurrence of consecutive holidays – in São Paulo and/or New York – involves the results of all trading sessions occurred since the last date with cash settlement in the Clearinghouse.

### 1.1. Multilateral Settlement Value

The **Multilateral Settlement Value – VLM** of a participant is the cash amount to be settled, resulting from his positions and/or transactions undertaken, through the Clearinghouse's net multilateral deferred cash settlement service.

Given the opening positions of the day, the trades executed and the financial parameters, the calculation of the participants' VLMs is automatically processed by BM&FBOVESPA's systems. The financial parameters are made up of the updated values of economic indicators – inflation indices, exchange rates, assets prices, agricultural indices, among others – and the reference prices of the Exchange Market contracts, supplied by the Pricing Department.

The settlement values thus calculated are provisional. In case of any divergence regarding the correct settlement value, the due adjustment is made at a specific stage of the settlement cycle, through inclusion/exclusion of the shortfall in the Settlement Complementary Map.

Below is the description of the make-up of the Multilateral Settlement Value of each category of participant.

#### **Customer's Multilateral Settlement Value**

The Customer participant is attributed as many VLMs as the number of Brokers-Clearing Members pairs, under which his positions are registered, with each value covering the positions and transactions under the responsibility of a same Broker-Clearing Member pair.

The following portions make up the Customer's VLM:

- Variation margins from positions in the Exchange Market contracts;
- Premiums of option contracts, traded in Exchange Market or OTC Market with the Clearinghouse's *guarantee* feature;
- The result from the exercise of option contracts, traded in Exchange Market or OTC Market with the Clearinghouse's *guarantee* feature;
- Payments concerning spot market transactions;
- Payments concerning settlement by physical delivery;
- Swap and forward contracts settlement value, upon maturity or by acceleration,
  - whenever it refers to a trade (i) in the Exchange Market or (ii) in the OTC Market with the Clearinghouse's *guarantee feature*; and
  - in the case of an OTC Market transaction with the Clearinghouse's *partial guarantee feature*, if it represents a creditor value for the party that requested the guarantee; otherwise, that is, if it represents a creditor value for the party which did not request the guarantee, the cash settlement occurs directly between the parties, with the Clearinghouse being exempted from any responsibility;
- Operating costs (fees), including those resulting from transactions in the OTC Market with the *partial guarantee* and *no-guarantee* feature;
- Collateral margin call;
- Values concerning assets posted as collateral – resulting from stock proceeds and payment of interest and principal on government bonds;
- Transfer of costs associated with the custody fee for assets posted as collateral (shares of stock, federal government bonds etc.); and
- BM&FBOVESPA's custody service fees.

The value corresponding to the collateral margin call represents a debtor value, being excluded from the VLM in case an equivalent value is posted, to meet margin requirements, in other assets, at BM&FBOVESPA's sole discretion.

At the discretion of the Clearinghouse, the VLM may include other amounts that are not discriminated in the partial settlement processes, but which belong to the settlement process.

The values corresponding to foreign currency-denominated contracts and which make up the VLM to be settled in local currency are converted into the local currency at BM&FBOVESPA's Reference Exchange Rate or at Ptax, concerning the specific date, pursuant to each contract's provisions.

In spite of the Intermediary having a contractual relationship with a Broker and operating on behalf of third parties, the Clearinghouse does not calculate a VLM for that participant.

### **Broker's Multilateral Settlement Value**



The VLM of the Local or Agricultural Commodities Special Local has the same make-up as that of a Customer's VLM, since such Brokers only operate for their proprietary account.

The VLM of a Broker of the other categories – Commodities Brokerage House, Special Brokerage House and PAPE Holder - is the sum of all VLMs

- i. of its proprietary portfolio;
- ii. of the Customers who settle through him; and
- iii. of the Intermediaries' clients, who settle through him (Customers on behalf of whom the Intermediaries trade) provided they are linked to (have a contractual relationship with) the same Clearing Member. Therefore, the Broker is attributed as many VLMs as the number of Clearing Members with whom he has a contractual relationship.

### **Clearing Member's Multilateral Settlement Value**

The VLM of a Clearing Member is the sum of the VLMs of the Brokers and VLMs of the Customers who operate under the PLD / PLE structure, who have a contractual relationship with him and use his settlement services. The Clearing Member whose VLM is positive is Clearinghouse's creditor, and that who has a negative VLM is Clearinghouse's debtor.

The settlement value of non-resident 2687 Customer is included in the Multilateral Settlement Value of the Clearing Member responsible for the Broker who made the intermediation for that investor's trades, until the moment the payment he owes the Clearinghouse is confirmed, by means of the specific settlement mode for this type of participant – Settlement of Non-resident Investors. If there is no such confirmation, settlement occurs through multilateral settlement between the Clearing Member and the Clearinghouse, via STR.

The same procedure applies to the Customer holder of CEL - the settlement value of this participant is included in the Multilateral Settlement Value of the Clearing Member responsible for the Broker who made the intermediation for that investor's transactions, until the moment the payment he owes the Clearinghouse is confirmed, by means of the BM&FBOVESPA Bank. If there is no such confirmation, settlement occurs through multilateral settlement between the Clearing Member and the Clearinghouse, via STR.

The Multilateral Settlement Values of Clearing Members are the object of the Clearing Member's settlement with the Clearinghouse.

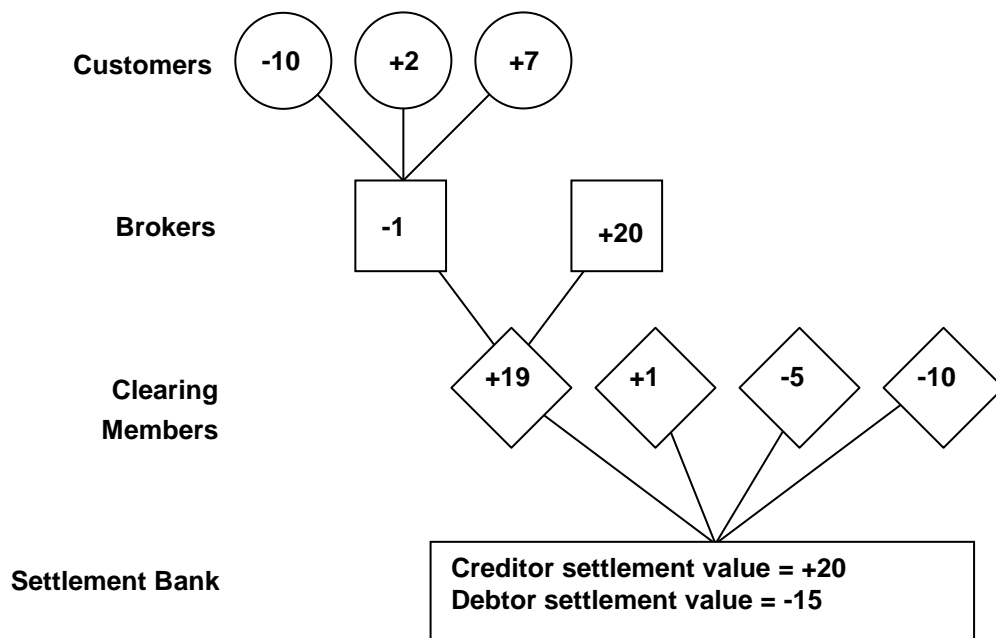
### **Settlement Bank's Settlement Value**

Differently from the Clearing Members and Brokers, the Settlement Bank is forbidden to off-set the VLMs of the participants using his services, the Clearing Members. Thus, to each Settlement Bank corresponds a Debtor Settlement Value and a Creditor Settlement Value.

The **Debtor Settlement Value** of a Settlement Bank is the sum of the VLMs of the Clearing Members with whom it has a contractual relationship and who are Clearinghouse's debtors.

The **Creditor Settlement Value** of a Settlement Bank is the sum of the VLMs of the Clearing Members with whom it has a contractual relationship and who are Clearinghouse's creditors.

**Example 1:** The following figure shows how to calculate the VLMs of the Brokers and Clearing Members and the Settlement Bank's settlement values, from the Customer's VLMs. The participant's VLM is indicated inside each figure.



## 1.2. Liabilities in the Settlement Chain

### Derivatives Clearinghouse's Liability

Pursuant to the provisions set forth in article 4 of Federal Law No. 10214, the Clearinghouse assumes the contracting party position solely to the Clearing Members for the purpose of settling the obligations resulting from the transactions **accepted** by the Clearinghouse for clearing and settlement. As far as the other participants are concerned, the Clearinghouse is not responsible for defaults between each other, regardless of the reason for the default.

In a cash settlement, Clearinghouse liability to the Clearing Member terminates when the Clearinghouse sends a transfer instruction to debit its Settlement Account and credit the Banking Reserves account of the Settlement Bank indicated by the Clearing Member; in a physical delivery, Clearinghouse liability to the Clearing Member terminates when the asset / commodity delivery is made, under the terms and conditions specified in the contracts and in this Manual.

The Clearinghouse cannot be held liable for settlement of OTC Market transactions registered as *without guarantee* trades. The Clearinghouse is also exempted from any settlement liability in the case of transactions registered with the *partial guarantee* feature and with the debtor being the party requesting the guarantee. Such transactions are directly settled between the parties, with the Clearinghouse only having to inform the respective settlement values.

### **Settlement Bank's Liability**

The Settlement Bank is responsible, before the Clearinghouse, for the transfer of funds whose availability it has confirmed, earmarked to meet the obligations of the participants contracting its service.

Within the established time frame, the Settlement Bank must confirm to the Clearinghouse, via the specific message (LDL0003), whether they have total or partial availability of funds in order to meet the Clearing Members' obligations. In the lack of such confirmation, the Settlement Bank must send the LDL0003 message with a zero value. The confirmation of the funds availability made by the Settlement Bank makes it responsible for the corresponding transfer and does not exempt the Clearing Members from their liability for their total obligations towards the Clearinghouse.

In case of a VLM of a Clearing Member who is controlled by the Settlement Bank, the liability for meeting the obligations does not depend on the confirmation.

It is the Settlement Bank's responsibility:

- to maintain the security standards defined by Bacen in regard to the exchange of messages for the transfer of funds and assets corresponding to transaction settlement and related activities.
- to promptly inform BM&FBOVESPA and the Clearing Member that uses its clearing services, in a timely manner, of any force majeure or any credit, operational or technological problem, or any event that may prevent the Settlement Bank from making the total or partial funds transfer, under the terms and conditions defined in this Manual.
- to promptly communicate to BM&FBOVESPA any evidence or fact that may indicate the possibility of a Clearing Member not meeting its settlement obligations.

The Settlement Bank's liability to the Clearinghouse is independent of the direct or indirect participation of other institutions in the settlement process.

### **Clearing Member's Liability, including PLD and PLE**

The Clearing Member is liable to the Clearinghouse for the proper settlement of any and all transactions attributed to him – not taking into account those registered as *without guarantee* of the Clearinghouse – as well as for the delivery, reception, authenticity, and legitimacy of any and all assets, documents, securities, and amounts relating to such transactions.

The Clearing Member's liability to the Clearinghouse is independent of the direct or indirect participation of other institutions in the settlement process.

The responsibility of the debtor Clearing Member with the Clearinghouse, in case of cash settlement, when the Clearinghouse receives confirmation of the credit of the debtor value in its Settlement Account, via STR's specific message, in the form and time frame established herein; in case of physical delivery, upon the execution of the underlying asset delivery, in the form and time frame set forth in contractual specifications and herein; in case of settlement in U.S. dollars by non-resident 2.687 investors, when BM&FBOVESPA receives the corresponding funds in its settlement account with the bank settling the Clearinghouse's transactions abroad.

The Clearing Member is liable for the fulfillment of any and all obligations due to the Clearinghouse, as well as to the participants using its services, regardless of any failure or problem its Settlement Banks may have for the transfer of funds with the Clearinghouse.

### **Broker's Liabilities, including the Local and Agricultural Commodities Special Local**

The Broker is liable to the Clearing Members who have been attributed the transactions he has executed and/or registered, for their proper, effective settlement, for meeting the obligations resulting there from, as well as for the delivery, reception, authenticity and legitimacy of any and all securities, documents, amounts and collateral related to those transactions. The Broker's liability to the Clearing Member is independent of the direct or indirect participation of other institutions in the settlement process.

As far as its clients are concerned, the Broker is liable for the transfer of the positive results from their trades.

Brokers are liable for all the information they provide, especially those necessary for the execution of clearing and settlement procedures.

### **Intermediary's Liabilities**

The Intermediary is liable to the Broker with whom it has an *intermediation agreement* for meeting the obligations resulting from transactions of the investors on behalf of whom it trades. As far as its clients are concerned, the Intermediary is liable for the transfer of the positive results from their trades.

### **Customer's Liability**

The Customer is liable to the Brokers, or PLD / PLE, or to the Intermediary with whom he/she has a contract, for settling his/her obligations with the Clearinghouse.

The investors who settle their obligations directly with the Clearinghouse, through the Settlement Bank responsible for BM&FBOVESPA's trades abroad (non-resident, pursuant to CMN Resolution 2.687), in U.S. dollars, undertake the responsibility to the Clearinghouse for meeting their obligations, as well as to the Broker with whom they have a contractual relationship.

## **1.3. Net Multilateral Deferred Cash Settlement Procedure**

### **Clearing Members Settlement – via STR**

The cash settlement between the Clearinghouse and its Clearing Members occurs through the transfer of reserves between the Clearinghouse Settlement Account and the Settlement Bank's Bank Reserves accounts, via STR. Communication about such transfers between the Clearinghouse, the Settlement Banks and Bacen takes place through STR's LDL (Clearinghouses Multilateral Settlement) messaging system. Further details about the LDL messaging service may be found in the Brazilian Payments System Messaging Catalog.

The stage of payments to the Clearinghouse extends from the beginning of the trading session to the end of the credits settlement window in favor of the Clearinghouse; in this stage, the Clearing Members must meet the margin call and provide, before the Settlement Banks, the funds corresponding to their debtor balances; the Settlement Banks, in turn, send the corresponding credit orders in favor of the Clearinghouse.

The stage of payments by the Clearinghouse extends from the end of the credits window in favor of the Clearinghouse to the offsetting of the Clearinghouse's Settlement Account in STR; in this stage, pending matters are verified and, through the STR, the Clearinghouse sends credit orders in favor of the Settlement Banks with creditor balance vis-à-vis the Clearinghouse, definitely closing the day's cash settlement process.

The values sent – in favor of the Clearinghouse or the participants – above the required value, due to an operational error, are considered **undue credits**. The party which received undue credit is responsible for promptly returning the surplus to the originating participant, according to the time frame and form set forth by BM&FBOVESPA.

The stages for Clearing Member's cash settlement obey the schedule listed below.

| PERIOD      |       | EVENT  | STR MESSAGE |
|-------------|-------|--|-------------|
| Start       | End   |  |             |
| 06h30       | 06h45 | Clearinghouse informs opening for settlement procedures.   | LDL0028     |
| 07h00       | 07h30 | Clearinghouse notifies Settlement Banks of the provisional values of Debtor and Creditor Settlement Values and of the VLMs of the Clearing Members who originated them.  | LDL0001     |
| 07h30       | 13h00 | Clearing Members and users of their services indicate/post collateral to meet margin call. Posting of the portion of the margin to be met in cash occurs in the debit settlement window ( <b>Settlement of Debtor Clearing Members</b> ) or via Clearinghouse's <i>margin account</i> with BM&FBOVESPA Bank. |             |
| 14h10       | 14h15 | Clearinghouse notifies Settlement Banks of the definitive values of Debtor and Creditor Settlement Values and of the VLMs of the Clearing Members who originated them.   | LDL0001     |
| 14h15       | 14h30 | Settlement Banks confirm availability of Clearing Members' funds to settle the obligations, listing the available portions of the VLMs of each Clearing Member.  | LDL0003     |
| Until 14h50 |       | <p style="text-align: center;"><b>Settlement of Debtor Clearing Members – credits in favor of the Clearinghouse</b></p> Settlement Banks send funds transfer request from their Bank Reserves accounts to the Clearinghouse's Settlement Account, settling the VLMs of debtor Clearing Members.              | LDL0004     |
| 14h50       | 15h25 | Verification of pending matters and execution of procedures to solve such matters  |             |

|       |       | <b>Settlement of Creditor Clearing Members – debits against the Clearinghouse</b>  |         |
|-------|-------|--|---------|
| 15h25 |       | Clearinghouse sends request to transfer funds from its Settlement Account to the Settlement Banks' Bank Reserves accounts, settling the VLMs of creditor Clearing Members. | LDL0005 |
| 15h30 | 17h00 | Return of undue credits.   | LDL0006 |
|       | 17h00 | Clearinghouse informs closing for settlement procedures.   | LDL0029 |

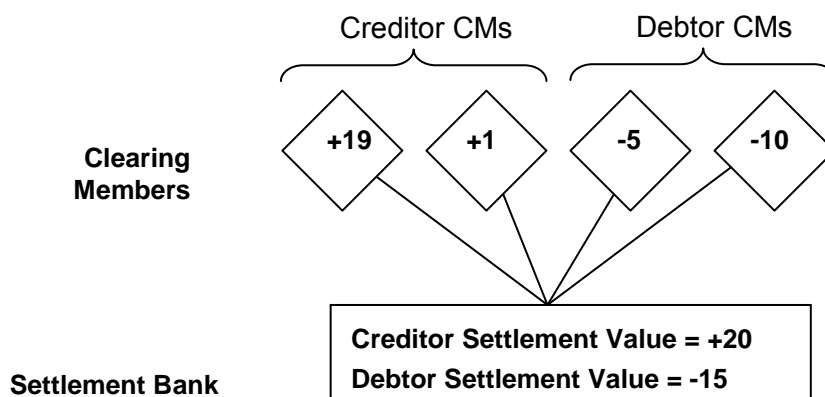
**Table 2 – Time Schedule for Clearing Members' Settlement**

The Clearing Members and their clients (users of their settlement services) have access to the respective VLMs via the Clearinghouse's systems.

Brokers' cash settlement occurs directly between them and their respective Clearing Members; cash settlement of Intermediaries occurs directly between them and the respective Brokers and, finally, Customer's settlement occurs directly between them and the respective Brokers or Intermediaries, if any.

Failure to follow the deadlines set forth for Clearing Members' Settlement procedures, or the lack of cash settlement may subject the participant to penalty assessment, upon BM&FBOVESPA's discretion, and to notification of the occurrence to the Self-Regulation Department.

**Example 2** – Let us consider the Multilateral Settlement Values of the Clearing Members from *Example 1*.



In the settlement chain, the Settlement Bank transfers to the Clearinghouse the debtor settlement value (-15), having received from the debtor Clearing Members the respective VLMs which originated it (-10 and -5). Later, the Clearinghouse transfers the creditor settlement value (+20) to the Settlement Bank, which in turn transfers the corresponding VLMs (+19 and +1) to the creditor Clearing Members.

### **Clearing Members' Settlement via SPB's Contingency Mechanisms**

The SPB's contingency mode for settlement via STR may be actuated by the Clearinghouse in case of difficulties to send the messages from SPB's LDL service used for cash settlement of creditor balances, that is, for transferring reserves debited from the Clearinghouse's Settlement Account to the Settlement Banks' Bank Reserves accounts. Under the contingency mode, such transfers can be either advanced or postponed, in terms of the times set forth in the Clearing Members' Settlement time schedule.

The Clearinghouse programs the periodical execution of Clearing Member Settlement procedures in the SPB's contingency mode, for training purposes, and the participants involved are advised in advance.

### **Cash Settlement through the Special Settlement Account (CEL)**

Settlement via CEL is a type of direct multilateral cash settlement between the Customer and the Clearinghouse.

CEL is an account at the BM&FBOVESPA Bank, held by the Customer, through which the cash settlement of its obligations with the Clearinghouse take place, separately from the responsible Broker's and Clearing Member's cash flows. Such account must be solely used to transfer funds inherent in such settlement and in posting of cash collateral.

The use of this type of settlement represents, for the Customer, absence of exposure to a possible credit risk from the other participants involved in other types of settlement.

The following may be authorized to settlement via CEL

- financial institutions not holding a Bank Reserves account;
- mutual funds;
- Non-resident 2.689 investors, and
- others, at BM&FBOVESPA's discretion.

The granting of the condition of CEL user to the Customer must be requested to BM&FBOVESPA by the Broker responsible for the Customer, which will assess its adherence to the minimum levels of trading volume it has determined. Once the granting is approved, opening of the CEL at the BM&FBOVESPA Bank must be requested by the Broker to BM&FBOVESPA's Participants Registration Center.

The authorization for settlement via CEL granted to the Customer can be canceled and, therefore, the CEL can be terminated under the following situations

- if the CEL is not operated for more than 90 days;
- if there is evidence of the Customer or relevant Broker not having met the requirements for the granting, as well as the conditions and procedures set forth in the Clearinghouse Rulebook, in this Manual and in the other BM&FBOVESPA's rules.



- upon request from the relevant Broker, through correspondence sent BM&FBOVESPA at least five business days in advance;
- if the commercial relationship between Customer and Broker is terminated; and
- in other situations, at BM&FBOVESPA's discretion.

In spite of the separation between the Customer's settlement value and the Broker's and Clearing Member's cash flows, the use of CEL does not change the principle of chain of responsibility of the multilateral settlement via the Clearinghouse. In that chain, the Broker is responsible before the Clearing Members for settling his own and his clients' transactions, and the Clearing Members are responsible for all payments to the Clearinghouse. In this sense, if the Customer holds, for any reason, an insufficient balance in the CEL account, the amounts due must be paid by the responsible Broker to his Clearing Member, and by the latter to the Clearinghouse.

Regarding the chain of responsibility described above, the time schedule for settlement via CEL is contained in the Multilateral Settlement window of the Clearing Members via STR, since if the participant does not settle via CEL, the participant's obligations are transferred to the responsible Clearing Members and Brokers, for settlement in the Clearing Members settlement mode.

Settlement via CEL is executed by transfer of funds between the Clearinghouse's Settlement Account and the BM&FBOVESPA Bank's Bank Reserves account. The Broker, based on the financial reports issued by the Clearinghouse, informs the Customer of the value to be settled on the day, including the operating costs of the debtor Customer with the Clearinghouse and deducting those of the creditor Customer.

In the case of a **debtor Customer** with the Clearinghouse:

- he transfers to his CEL, until 12:00 h, the VLM due, which is automatically blocked by the BM&FBOVESPA Bank and informed to the Clearinghouse;
- once the blocking is confirmed, the value effectively credited in the CEL is excluded from the provisional VLMs of the corresponding Broker and Clearing Member; and
- the BM&FBOVESPA Bank debits the CEL, until 12:30 h, of the value available due to the Clearinghouse and credits it to the Clearinghouse's Settlement Account, via STR.

In the case of a **creditor Customer** with the Clearinghouse:

- the Customer's VLM is excluded from the provisional VLMs of the corresponding Broker and Clearing Member; and
- at 15:25 h, the Clearinghouse orders, via STR, the transfer of funds from its Settlement Account to the BM&FBOVESPA Bank's Bank Reserves account, which transfers it, until 15:30 h, to the CEL.

Below is the time schedule for Cash Settlement via CEL.

| PERIOD |     | EVENT        | STR MESSAGE |
|--------|-----|--------------|-------------|
| Start  | End |              |             |
| 12h00  |     | Deadline for |             |

|  |       |   |          |
|--|-------|---|----------|
|  |       | <ul style="list-style-type: none"> <li>▪ transfer to CEL of the value owed by the debtor Customer who chose the settlement via CEL mode; and</li> <li>▪ the Broker responsible for the creditor Customer using the CEL to determine non-payment via CEL.</li> </ul> <p>The Clearinghouse excludes from the provisional VLMs of the respective Brokers and Clearing Members</p> <ul style="list-style-type: none"> <li>▪ the debtor values deposited in CEL accounts; and</li> <li>▪ the creditor values authorized for settlement via CEL.</li> </ul> |          |
| 12h30  |       | <p><b>Settlement of Debtor Customers – credits in favor of the Clearinghouse</b></p> <p>Deadline for the BM&amp;FBOVESPA Bank to transfer the debtor values deposited in CEL accounts to the Clearinghouse’s Settlement Account, via STR.</p>   | LDL 0004 |
| 13h00  |       | Deadline for Clearing Members and their clients to post collateral to meet margin requirements. The margin requirement to be met in cash can be deposited with CEL until 12:00 h.   |          |
| <p>The amounts due and not deposited with CEL are incorporated to the definite VLMs of the corresponding Brokers and Clearing Members and settled, on the same day, by means of the Multilateral Settlement of Clearing Members.</p> |       |   |          |
| 14h10  | 14h15 | The Clearinghouse communicates to the Settlement Banks the definitive amounts of the Debtor and Creditor Settlement Values and the Clearing Members’ VLMs - such values do not take into consideration the debtor values settled via CEL and the posting of assets to meet margin requirement that may have been executed.  | LDL0001  |
| 14h15  | 14h30 | Settlement Banks confirm availability of funds of Clearing Members to settle the obligations, listing the available portions of the VLMs of each Clearing Member.   | LDL0003  |
| Until 14h50  |       | <p><b>Settlement of Debtor Clearing Members – credits in favor of the Clearinghouse</b></p> <p>Settlement Banks send funds transfer request from their Bank Reserves accounts to the Clearinghouse’s Settlement Account, settling the VLMs of debtor Clearing Members.</p>  | LDL0004  |
| 14h51  | 15h24 | Verification of pending matters and execution of procedures to solve such matters.  |          |
| 15h25  |       | <p><b>Settlement of Creditor CEL Customers – debits against the Clearinghouse</b></p> <p>Clearinghouse sends request funds transfer from its Settlement Account to the BM&amp;FBOVESPA Bank’s Bank Reserves account, settling the VLMs of</p>   | LDL0005  |

|       |       |  |         |
|-------|-------|--|---------|
|       |       | creditor customers using settlement via CEL.   |         |
| 15h30 |       | Deadline for the BM&FBOVESPA Bank to transfer the funds received from the Clearinghouse to the pertinent CEL accounts. |         |
| 15h30 | 17h00 | Return of undue credits.   | LDL0006 |
| 17h00 |       | Clearinghouse informs closing for settlement procedures.   | LDL0029 |

**Table 3 – Time Schedule for Cash Settlement through CEL**

Failure to follow the deadlines set forth for procedures involving Cash Settlement via CEL, or the lack of cash settlement may subject the participant to penalty assessment, at BM&FBOVESPA’s discretion, and to notification of the occurrence to the Self-Regulation Department.

**Settlement of Non-resident Investors – Agricultural Markets**

The non-resident investor object of this section is that defined in CMN Resolution 2.687, who operates in BM&FBOVESPA’s agricultural commodity markets.

His obligations and rights are settled in US dollars, directly with the Clearinghouse, in New York, USA, through the Settlement Bank appointed by BM&FBOVESPA to provide such service. For the purpose of currency conversion it is used the BM&FBOVESPA Referential Exchange Rate, published in BM&FBOVESPA Daily Bulletin.

In the event that the non-resident investor participant does not honor the settlement of his obligations with the Clearinghouse, the Clearing Member of the Broker which made the intermediation the transaction assumes the debtor value, incorporated into his VLM and settled, on the same day, in local currency, according to the Clearing Members’ Settlement cycle. Thus, the time frame for settlement of the non-resident 2.687 investor is contained in the Clearing Members’ Settlement window.

The following table shows the schedule for cash settlement of non-resident investors – the stages after the deadline for transfer of funds owed to the Clearinghouse’s account at the Settlement Bank for BM&FBOVESPA’s transactions abroad are those of the Clearing Members’ settlement cycle.

| PERIOD |       | EVENT   | STR MESSAGE |
|--------|-------|---|-------------|
| Start  | End   |   |             |
| 09h00  | 09h30 | Brokers sent instructions to the Clearinghouse for cash settlement and meeting of margin requirements by non-resident 2.687 investors.                                |             |
| 13h00  |       | Deadline for transfer of debtor values from non-resident 2.687 investors to the Clearinghouse’s account at the Settlement Bank for BM&FBOVESPA’s transactions abroad. |             |

|  |       |   |         |
|--|-------|---|---------|
|  |       |   |         |
| From 13h30   |       | The Clearinghouse executes the payments due to creditor non-resident 2.687 investors.   |         |
| The amounts due and not deposited are incorporated to the definitive VLM of the responsible Clearing Member and settled, on the same day, by means of the Multilateral Settlement of Clearing Members. |       |   |         |
| 14h10  | 14h15 | The Clearinghouse notifies Settlement Banks of the definitive values of Debtor and Creditor Settlement Values and of the VLMs of the Clearing Members who originated them.  | LDL0001 |
| 14h15  | 14h30 | Settlement Banks confirm availability of funds of Clearing Members to settle the obligations, listing the available portions of the VLMs of each Clearing Member.   | LDL0003 |
| Until 14h50  |       | <p style="text-align: center;"><b>Settlement of Debtor Clearing Members – credits in favor of the Clearinghouse</b></p> Settlement Banks send funds transfer request from their Bank Reserves accounts to the Clearinghouse's Settlement Account, settling the VLMs of debtor Clearing Members. | LDL0004 |
| 15h30  | 17h00 | Return of undue credits.  | LDL0006 |
| 17h00  |       | Clearinghouse informs closing for settlement procedures.  | LDL0029 |

**Table 4 – Time Schedule for Cash Settlement of Non-resident 2.687 Investors**

As a substitute for the incorporation to the responsible Clearing Member's definitive VLM of the value not posted until the deadline in the Clearinghouse's account at the Settlement Bank for BM&FBOVESPA's transactions abroad, the Clearinghouse may, at its sole discretion, (i) block the corresponding Broker's collateral available, in an amount at least equivalent to the amount due, and (ii) extend the time for making the payment of the amount due until 16:00 h of the same day. If such payment does not occur by 16:00 h of the same day, the Clearinghouse will require the responsible Clearing Member to make the payment in the same day and, upon its confirmation, it will release the Broker's collateral.

Failure to follow the deadlines set forth for Non-resident 2.687 Investors' Settlement procedures, or the lack of cash settlement may subject the participant to penalty assessment, upon BM&FBOVESPA's discretion, and to notification of the occurrence to the Self-Regulation Department.

The Clearinghouse provides contingency for cash settlement. In the event that the activities related to the Clearinghouse's cash settlement procedures are transferred to the *Contingency Site*, the Settlement Banks are informed by the Clearinghouse of such situation, through the SPB, except when such change involves the programmed exercise of a contingency simulation.

The following figure shows the schedule for the Clearinghouse's multilateral cash settlement procedures.

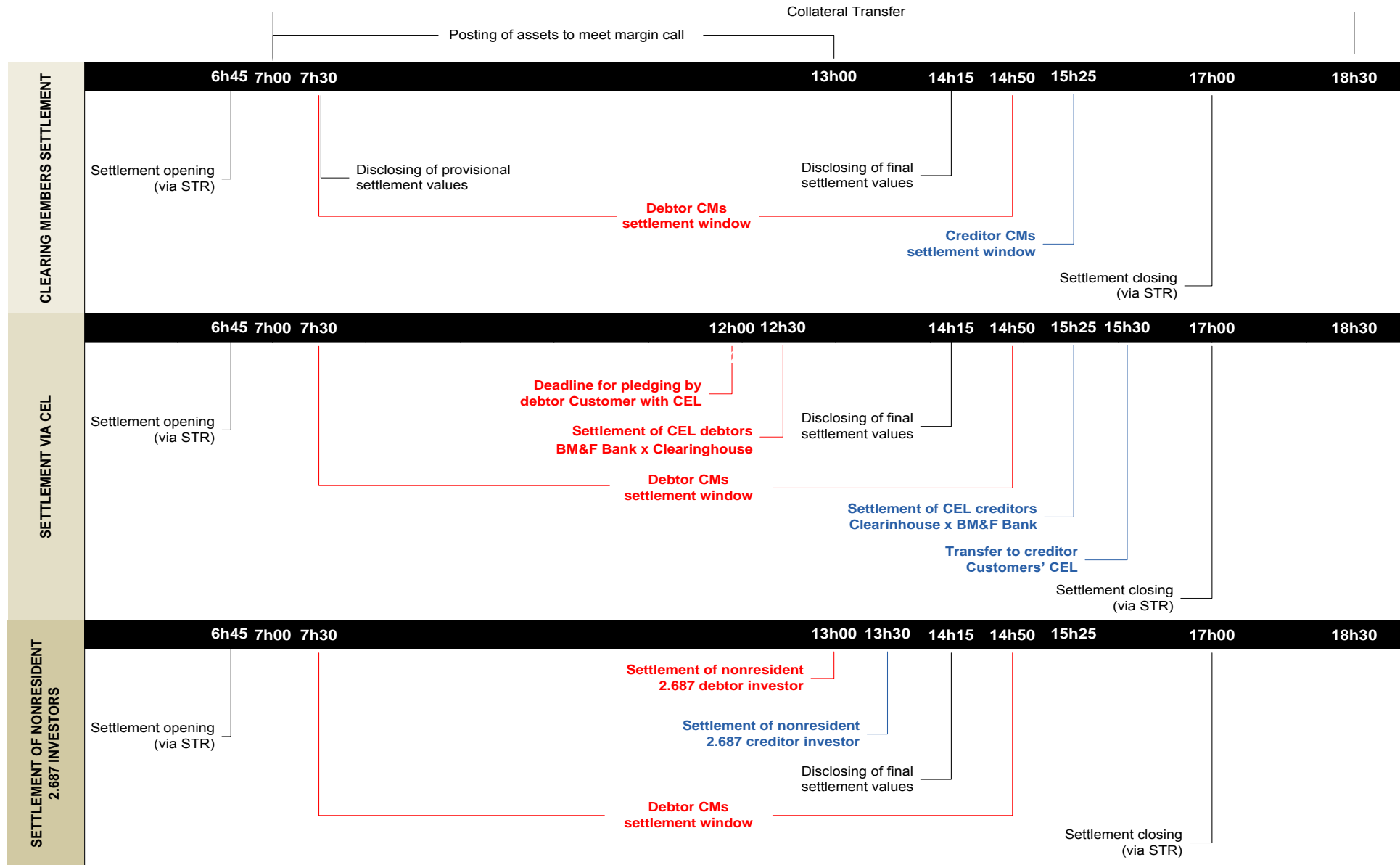
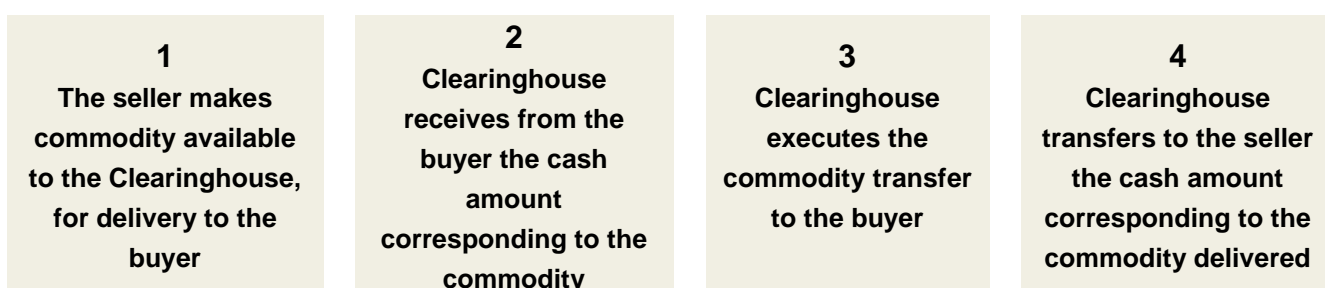


Figure 5 – Net Multilateral Deferred Cash Settlement

## 1.4. Physical Delivery Procedure

The settlement upon maturity of the physical delivery contract takes place through the delivery of the commodity by the selling party and the payment of the settlement value by the buying party, according to the Delivery versus Payment (DvP) principle, under which the delivery of the underlying asset occurs if payment is made.

The delivery and receipt of the commodity are coordinated with the corresponding cash settlement – the payment due by the buyer to the seller of the commodity received. Such cash settlement occurs via the Clearinghouse's Multilateral Cash Settlement. The physical delivery can be represented, in general, in 4 stages, as shown in the following figure, of which stages 2 and 4 correspond to the cash settlement.



Some of the exchange traded contracts based on metal, agricultural, and energy commodities are subject to physical delivery upon maturity, according to the time frames and specific conditions of each contract. Excluded from that rule are the so-called *mini*<sup>5</sup> contracts, based on agricultural commodities, traded via WTr, the settlement of which upon maturity is solely in cash.

Below, a seller's (buyer's) Broker is the Broker responsible for the selling (buying) Customer, or for the corresponding indicated substitute, and a non-resident investor is that defined pursuant to CMN Resolution 2.687.

In physical delivery,

- a commodity lot is considered eligible for delivery when it is in conformity with the standards set forth in the respective contract being settled, duly classified by an accredited company or by BM&FBOVESPA, depending on the commodity; and
- in order to be eligible to make delivery, the seller must provide specific documentation to evidence that he is the legal owner of the lots of the commodity to be delivered.

Resident in Brazil buyer and seller Customers are allowed to **assign third parties** to respectively make or take a commodity delivery.

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<sup>5</sup> The size of a *mini* contract is smaller than that of the equivalent standard contract.

Non-resident buyer and seller Customers are required to **assign third parties** to respectively make and take a commodity delivery, provided that

- the non-resident seller must assign a resident in Brazil to whom delivery rights and obligations will be transferred; and
- the non-resident buyer must assign a third party, residing in Brazil, as his legal representative to provide commodity transportation and shipment for export and to meet the existing requirements of the competent public agencies.

The assigned party must provide all information needed for invoice purposes, and become liable for any and all obligations of a financial, commercial, or tributary nature, among others, arising out of or relating to the corresponding contract up until its final settlement. Depending on the contract, the indicated party must be duly registered as a client of the Broker intermediating the delivery.

A substitute must be indicated, in the case of the seller, upon the registration of the Delivery Notice, and in the case of the buyer, up until the invoicing information is sent.

The original buyer and seller Customers remain responsible for all obligations of the third parties they assign up until the contract's final settlement.

Described below are the procedures for physical delivery for the contracts based on agricultural and energy commodities and for gold-based contracts.

#### **1.4.1. Settlement by Physical Delivery of Agricultural Commodities-based Contracts**

In order to describe the settlement procedures for physical delivery of agricultural and energy commodities contracts, it is necessary to define the following:

|  |  |
|--|--|
| <b>Delivery Notice (AE)</b>                  | Means through which the seller, via Broker, expresses his decision to proceed with the delivery of the commodity; it is the sending of the required documentation and registration, in the Grading and Physical Delivery System, of the delivery decision. |
| <b>Notice of Intention to Deliver (AILE)</b> | A document through which the seller of the live cattle futures contract or feeder cattle futures contract expresses, via Broker, his intention to proceed with delivery of the commodity.  |
| <b>Intention to Delivery Notice (IAE)</b>    | Means through which the seller of the Ethanol futures contract expresses, via Broker, his intention to proceed with delivery of the commodity.   |
| <b>Allocation date</b>                       | Date on which the buyer Customers who will receive the commodity corresponding to the Delivery Notices issued by the seller Customers are determined. Such buyers are defined (i) upon sellers' choice; or (ii) upon BM&FBOVESPA's determination.          |
| <b>Delivery date</b>                         | Date of the effective payment by the buyer of the financial amount of the settlement.  |
| <b>Exit date</b>                             | Date of the effective receipt by the seller of the financial amount of the settlement.   |



|  |   |
|--|---|
| <b>Commodity delivery period</b>                 | Period during which the seller Customer may express, by issuing an AE, or through an AILE, or IAE, depending on the contract, his decision, or intention, depending on the contract, to proceed with the delivery of the contracted underlying commodity, thus starting the procedures for settling his position by physical delivery; beginning and extension of the delivery period are defined according to the commodity and contract due date. |
| <b>Declaration of Quality and Delivery (TQR)</b> | Statement by the buyer to the Clearinghouse that the commodity he received is in perfect conservation conditions and complying with contracted specifications.  |

The physical delivery, at maturity, starts with presentation of the Delivery Notice to BM&FBOVESPA by the Broker responsible for the seller Customer, or for his designated substitute, who decided to settle his position, or part of it, by delivering the underlying commodity.

Closing of the position through physical delivery occurs according to the sequence of procedures described below. Such procedures do not entirely apply to contracts based on Live Cattle, Feeder Cattle, and Ethanol.

- **On  $T_0$ ,  $T_0$**  belonging to the contracted **delivery period**, the seller's Broker issues the Delivery Notice until 18:00 h, by
  - sending the documentation required for issuing the Delivery Notice, as set forth in the contract; and
  - electronic registration of the Delivery Notice in the Grading and Physical Delivery System.

The documentation mentioned in (i) contains the **Provisional Delivery Order** (or **Non-negotiable Delivery Order**), the **Commodity Ownership Declaration** and the **Grading Certificate** (or **Analysis Report**).

The **Provisional Delivery Order** is the document, to BM&FBOVESPA's order, certifying that storage and insurance expenses related to the commodity's regular risks for a specific time have been paid for. This document guarantees the commodity is blocked for settlement by physical delivery of the BM&FBOVESPA contract and authorizes the latter to make the final release of the commodity in favor of the buyer.

The **Commodity Ownership Declaration** attests to the ownership of the commodity, as well as to absence of a lien of any kind whatsoever associated to it, including fiscal matters, and that the commodity packaging is new and in perfect conservation conditions.

The **Grading Certificate** attests to the compliance by the commodity to be delivered with the characteristics of the trade object set forth in the contract.

The documentation mentioned in (i) must be send by the Broker and may, depending on the contract, be done by the Depository Institution where the commodity is stored.

On the same date, the Clearinghouse approves or rejects the Delivery Notice issued, after checking the documentation received and the information registered in the system.

**On  $T_1$** , the Clearinghouse releases the access to the approved Delivery Notice to the buyer Customers' Brokers, making it available at the trading floor. At that moment, the buyer Customers, through their Brokers, choose the commodity to be received, among all Delivery Notices available and according to the position age ranking, that is, on a first in, first out basis for the positions. If there are no parties interested in receiving the commodity, either in whole or partially, BM&FBOVESPA determines the buyers for the commodity lots designated in the Delivery Notices available, in an automatic manner and according to the ranking.

**On  $T_2$**

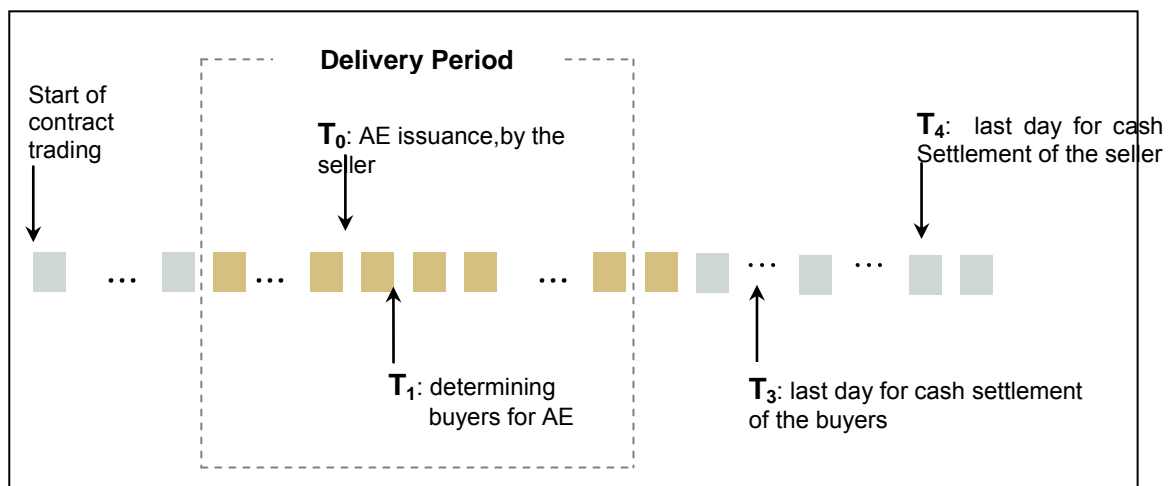
- The buyer's Broker – who has selected the Notice or has been designated by BM&FBOVESPA to receive the commodity – executes the registration of the data for invoicing the commodity in the Grading and Physical Delivery System; and
- the seller's Broker must send the sales bill (copy or original, depending on the contract) to the Clearinghouse, which will then send it to the buyer's Broker; in general, the time period for sending the sales bill to the Clearinghouse is set forth in contract; for those which do not have it, the Clearinghouse will determine it.

**Up to  $T_3$**  payment to the Clearinghouse of the financial value of the settlement due by the buyer Customer must be made through the Clearinghouse's Multilateral Cash Settlement service.

After the cash settlement, the Clearinghouse sends, among other documents, printed forms of the **Physical Settlement Delivery Order** to the buyer's Broker and to the Depository Institution where the commodity is stored. The Physical Settlement Delivery Order attests to the transfer of commodity ownership to the buyer Customer. After that the buyer Customer can withdraw the commodity at the Depository Institution indicated by the seller.

**Up to  $T_4$**  the Clearinghouse pays the financial value of the settlement due to the seller Customer through the Clearinghouse's Multilateral Cash Settlement service.

The time periods between  **$T_0$  and  $T_3$**  and between  **$T_0$  and  $T_4$**  to make payments are set forth by BM&FBOVESPA per contract.



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## Figure 6 – Schedule for Settlement by Physical Delivery of Agricultural Derivatives Contracts

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For contracts that include TQR, BM&FBOVESPA considers as delivered the lots

- i. referred to in the TQR sent to the Clearinghouse by the buyer Customer, or by his substitute, attesting to compliance of the commodity received; or
- ii. after the deadline set forth for sending the TQR, which deadline is defined by the contract.

Certain contracts include commodity delivery / receipt according to a rate contained in the schedule defined by the buyer Customer. To that end, such schedule must be notified to the Clearinghouse by sending the **Delivery Schedule**.

Certain contracts set forth specific procedures for **commodities for export**, such as the requirement of documentation stating and evidencing such destination, for the due proceedings, especially concerning taxes.

Feeder cattle and live cattle futures contracts are settled through a delivery procedure only when the seller wants to make the delivery and there is a buyer interested in receiving his commodity.

Settlement procedures with physical delivery involving the same Customer may be executed as many times as possible during a same **delivery period**, as the Customer assumes positions in contract and schedules the respective settlements.

The seller Customer who decides not to deliver the commodity must close his position, before the end of the deadline set forth for expressing intention to deliver.

The **freight cost** is deducted from the financial value of the physical delivery, both from seller and buyer, whenever the delivery of the commodity occurs at a location different from that specified in the contract as **point of delivery**.

In the event of force majeure, BM&FBOVESPA may determine the cancellation of the physical delivery of one or more contracts, upon its discretion. In such a situation, the contracts can be cash settled, by price difference, or settled by another alternative mechanism, pursuant to criteria defined by BM&FBOVESPA and/or the Clearinghouse.

### 1.4.2. Physical Delivery of Gold-based Contracts

Exchange traded contracts based on Gold – contract on actuals and futures, forward and options contracts – are settled upon maturity, or in case of exercise of options, through delivery of the metal. Similarly to physical delivery of agricultural contracts, physical delivery of gold-based contracts follows the Delivery versus Payment (DvP) principle.

Cash settlement resulting from physical delivery – the payment due to the Clearinghouse by the Customer receiving the gold and the payment due to the Customer delivering the gold – occurs during the Clearinghouse’s Multilateral Settlement cycle, on the same day of the delivery, according to the schedule of such cycle, as described in the following table:

| MARKET                    | GOLD DELIVERY TO BUYER        |          |
|---------------------------|-------------------------------|----------|
|                           | DATE                          | DEADLINE |
| <b>Spot (on actuals)</b>  | T+1 of trade execution date   | 12:00 h  |
| <b>Futures</b>            | T+1 of contract maturity date |          |
| <b>Forward</b>            | T+0 of contract maturity date |          |
| <b>Options on actuals</b> | T+1 of contract maturity date |          |

**Table 5 - Physical Delivery of Gold-based Contracts**

If the gold to be delivered is deposited at BM&FBOVESPA’s Gold Fungible Custody up until 1 day prior to the scheduled delivery date, physical delivery is automatic.

The gold to be used in physical delivery must be deposited in the custody account linked to the Broker responsible for the trade being settled. Otherwise, that is, if there is gold deposited in the account of the Customer delivering the gold linked to another Broker, **transfer of the balance** must be made to the account of the same Customer under the Broker responsible for the transaction.

Failure to follow the deadlines set forth for procedures involving physical delivery, or the lack of physical delivery may subject the participant to penalty assessment, upon BM&FBOVESPA’s discretion, and to notification of the occurrence to the Self-Regulation Department.

Settlement failures – failure by the participants to fulfill their roles in the multilateral settlement chain, whether it is Clearing Members’ Settlement, Settlement via CEL or Settlement of Non-resident 2687 Investors or yet Settlement by physical delivery – are the object of a specific section of the chapter on risk management.

### 1.5. Fees

The term "Fees" refers to the fees and costs charged by BM&FBOVESPA which represent the operating costs incurred by the Clearinghouse’s participants, as a result of trading of contracts or the use of BM&FBOVESPA’s assets custody services whose systems are managed by the Clearinghouse.

Such fees and costs are as follows:

- exchange fee;
- registration fee;
- permanence fee; and
- delivery fee.

Fees and costs are set forth per contract or group of contracts, in a parametric manner, making it possible to make adjustments so that, in case of changes in the market's structural conditions, there may be immediate adaptation of the fee policy, in a transparent, predictable manner for participants.

The **exchange fee** is charged when a generating factor occurs. The following may represent a generating factor:

- the trading of any contract in the Exchange and OTC Markets and in auctions of contracts carried out through systems authorized by BM&FBOVESPA, or the physical delivery resulting from an option exercise, or for a futures contract delivery upon expiration;
- the closing out of a position by automatic cash settlement at expiration;
- the closing out of the contract by an offsetting transaction (an opposite transaction in the OTC Market);
- the exercise of rights in the options market; and
- the assignment procedures.

The rules for calculating the fees are defined per group of products with similar characteristics and purposes or based on the same underlying asset.

BM&FBOVESPA may, upon its discretion and at any moment, differentiate such cost for transactions characterized as day trade, rolling over and brokerage (OTC Market), as well as restrict the generating factors for groups of specific products.

The **registration fee** is charged whenever a contract is registered by the Clearinghouse, as a proportion of the exchange fee, usually charged on the same date and conditional on the occurrence of the same generating factors which determine charging of the exchange fee.

The **permanence fee** is based on the size of open interest every day. Due to the nature of the contracts, different criteria are established for exchange-traded and OTC market contracts, both to ascertain the value and the frequency of charging the permanence fee.

The **delivery fee** is the cost generated from a settlement by physical delivery, whether a delivery resulting from a transaction in spot or futures agricultural markets. The delivery fee is paid by the buyer on the same date as the corresponding delivery cash settlement.

Upon its discretion, BM&FBOVESPA may grant discounts in fees charging to some categories of participants.

The OTC Market transactions with no *guarantee* feature, although not settled through the Clearinghouse's settlement services, are subject to BM&FBOVESPA's fees.

## **2. Clearing and Bilateral Settlement of Transactions in the Non-Standardized Derivatives Market**

The NMB Market transactions are settled directly between the parties or through the Derivatives Clearinghouse, by means of Net Bilateral Settlement, in modes defined for each module of that market.

When providing this settlement service, the Clearinghouse does not operate as a guaranteeing counterparty for settlement purposes and is not responsible for meeting the obligations assumed by the parties. The collateral, funds, and safeguards given to the other markets managed by BM&FBOVESPA do not apply to the NMB Market.

**Net Bilateral Value** is defined as the value resulting from clearing a participant's debtor and creditor balances, due to transactions executed with a same counterparty, to be paid to or received from the participant.

Net Bilateral Values are calculated by BM&FBOVESPA – the Calculation Agent of the NMB Market – according to consistent methodology and specifications or as provided in the NMB Market Formula Book. The cash settlement of the Net Bilateral Value is executed

- directly between the parties, in the case of a transaction in the NMB system's "Clients" module; and
- in the case of a transaction in the "Interfinancial" module, by means of the STR's LTR (Gross or Net Bilateral Settlement) messages, when one may use messages LTR0003, LTR0004 or LTR0007, as described below.

#### **Net Bilateral Settlement – via LTR0003 message**

- The Clearinghouse informs the debtor participant's Settlement Bank of the cash settlement value through message LTR0001.
- The debtor participant's Settlement Bank confirms the cash settlement value through message LTR0002; and
- The debtor participant's Settlement Bank requests BACEN, via LTR0003 message, to transfer the funds from its Bank Reserves account to the Bank Reserves account of the creditor participant's Settlement Bank; the transfer is confirmed by Bacen to the debtor participant's Settlement Bank, to the creditor participant's Settlement Bank, and to Clearinghouse, via receipt of LTR0003R1, LTR0003R2, and LTR0003R3, respectively.

#### **Net Bilateral Settlement – via LTR0004 message**

- the Clearinghouse informs the debtor participant's Settlement Bank of the cash settlement value through message LTR0001.
- the debtor participant's Settlement Bank confirms the cash settlement value through message LTR0002;
- the debtor participant's Settlement Bank requests Bacen, via LTR0004 message, to transfer the funds from its Bank Reserves account to the Clearinghouse's Settlement Account; the transfer is confirmed by Bacen to the debtor participant's Settlement Bank, and to the Clearinghouse, via receipt of LTR0004R1 and LTR0004R2 messages, respectively; and

- after the confirmation mentioned in (3) is received, the Clearinghouse requests Bacen to transfer the funds, via LTR0005 message, from its Settlement Account to the Bank Reserves account of the creditor participant's Settlement Bank; messages LTR0005R1 and LTR0005R2 represent the confirmation of the transfer to the Clearinghouse and the creditor participant's Settlement Bank, respectively.

### **Net Bilateral Settlement – via LTR0007 message**

- (1) the Clearinghouse informs the Settlement Bank of the cash settlement value through message LTR0007; and
- (2) the Settlement Bank informs the Clearinghouse, via message LTR0008, of the confirmation or rejection of the cash settlement value.

This transaction mode is designed to settle transactions through the same Settlement Bank for debtor and creditor parties.

The Clearinghouse considers the transaction as settled when it receives the LTR0008 message confirming the cash settlement value.

The deadlines concerning settlement of NMB Market transactions are described in Circular Letters and in the Non-standardized Derivatives Market Rulebook.

### **3. Gross Settlement – Delivery versus Payment Criteria for Settlement of Transactions Executed in the Brazilian Commodities Exchange**

|   |
|---|
| <p><b>Gross Value</b> is defined as the non-cleared value concerning the settlement of a transaction considered individually, to be paid to or received from the participant.</p> |
|---|

The settlement of certain transactions carried out on the Brazilian Commodities Exchange is executed by the Clearinghouse through an operating agreement set up to offer the agribusiness participants a structured, secure settlement service. Transactions are settled individually by gross values, that is, without clearing.

The Clearinghouse Gross Settlement service covers the transactions occurred in the Brazilian Commodities Exchange – in the *Trading for Unspecified Time* and *Dynamic Trading* and those in the OTC Trade Registration System. Such services do not include CONAB's or Bank of Brazil's auction, nor public or private bidding processes.

The Clearinghouse does not act as CCP for the settlement but ensures the application of the Delivery Versus Payment principle. The collateral, funds, and safeguards given to the other markets managed by BM&FBOVESPA do not apply to the transactions occurred in the Brazilian Commodities Exchange.

The obligations are settled directly between the Clearinghouse and the counterparties involved, by means of gross settlement, through transfer of assets and funds between banking accounts – the buyer

counterparty transfers the funds due to Brazilian Commodities Exchange's banking account, and the Clearinghouse transfers them to the seller counterparty's banking account. Payments can be made by the Brokerage Houses representing the buyer and the seller, in case they are associated with BM&FBOVESPA. If the buyer does not deliver the funds due, the transaction is canceled and the ownership transfer is not processed.

In trades involving physical delivery, the funds transferred by the buyer are retained in the Brazilian Commodities Exchange's banking account until the buyer's Brokerage House confirms, in the Brazilian Commodities Exchange's system, the receipt of the commodity. The Clearinghouse then transfer the funds until then retained to the seller.

In transactions involving securities, their ownership is altered at SRCA following the remittance of payments.

Transfers must meet the deadlines defined by the Brazilian Commodities Exchange and by the Clearinghouse.

#### **4. Gross Settlement – Delivery versus Payment Criteria for Settlement of Special Transactions with Securities**

This Gross Settlement service is designed to settle special transactions, with the Clearinghouse not acting as CCP, but only as a transaction facilitator, by supplying the infra-structure and coordinating the settlement. The collateral, funds, and safeguards given to the other markets managed by BM&FBOVESPA do not apply to the special transactions referred to herein.

Transactions, as well as settlement rules, are set forth by the Board of Governors. Assets eligible for settlement via the gross settlement service are disclosed by BM&FBOVESPA. Both buyer and seller must fulfill the time frame established by the Clearinghouse for each type of transaction, in accordance with the notices and rules defined by BM&FBOVESPA.

The module is operationalized by coordinating the transfer of

- i. assets, in the custody service provided by the Clearinghouse or another depository institution; and
- ii. funds, via the STR's LTR (Gross or Net Bilateral Settlement) services.

The values involved in such transfers do not affect the Multilateral Settlement Values (VLMs) transacted in the Clearinghouse's Multilateral Cash Settlement cycle.



## V. RISK MANAGEMENT

This chapter presents, in a general, but comprehensive manner, the Clearinghouse's risk management procedures.

Such management consists of rules and controls adopted to mitigate the risks to its operating continuity, in a safe, effective manner, even in the event of failure of one or more participants. For the adequate mitigation of the risks assumed – credit, market, liquidity, legal, and operating risks - the Clearinghouse possesses its own risk management system and safeguard structure. Such system and the safeguard structure are the object of continuous testing by BACEN, as per CMN Resolution 2.882 and BACEN Circular Letter 3.057.

In the event that a participant does not meet the payment due or the delivery of the assets and/or commodities due, it is the Clearinghouse's responsibility to actuate its safeguarding mechanisms to ensure the proper settlement of the registered transactions, in the established manner and time frames.

The Clearinghouse's operation as a CCP exposes it to participants' **credit risk**, that is, the risk of losses related to funds that will no longer be received as originally defined, due to default of the users of its clearing and settlement services (the counterparty's credit risk) and/or of the issuers of collateral posted with the Clearinghouse (the issuer's credit risk).

For coverage of the credit risk, the Clearinghouse requires participants to post collateral for the transactions assigned to them, with restrictions as to forms of constitution and using such collateral, and continuously monitors throughout the day the risk that their positions pose to the Clearinghouse.

In case no default event occurs, the Clearinghouse does not have a direct exposure to **market risk** or **liquidity risk**, since it does not have liquidly short or liquidly long positions in the contracts admitted for registration in its systems. However, increase in price volatility may affect the magnitude of the values to be settled by the market participants, which can also reduce the liquidity conditions of the market and increase the likelihood of default by such participants. Therefore, in spite of the non-existence of direct exposure to market and liquidity risks, the latter can impact and potentialize the assumed credit risk.

Nevertheless, in the event of a participant's default, the Clearinghouse assumes exposure to the **market risk** as well as to the **liquidity risk**. In such an event, the market risk is given by the risk of losses resulting from the price variation of the positions in an amount higher than that of the available collateral, equally susceptible to price volatility. The liquidity risk is related to the non-existence of adequate conditions for monetization of the collateral in due time – the time frame of the settlement window.

Among the procedures defined for a default situation are the **closing of positions** of the defaulting participant and the **execution of collateral**.

When the defaulting participant's positions are closed, the Clearinghouse remains exposed to market and liquidity risks, during the time period necessary for the defaulting participant's portfolio offsetting, since the positions to be offset have their values susceptible to price, rates, and financial indicators' fluctuations and the trading conditions. As a result, when closing long (short) positions, it is likely that the Clearinghouse will be able to sell (buy) only at a price lower (higher) than the purchase (sale) reference price, thus liable to suffer an unfavorable variation.

Upon the execution of collateral, the Clearinghouse's exposure to the liquidity risk arises from the fact that its financial safeguards – the participants' collateral, the guaranteeing funds, and BM&FBOVESPA's equity – are made up mostly of assets other than cash, such as government and private securities, stock of exchange-traded companies, letters of credit, among others, and even without immediate liquidity. Thus, if the sale or execution of such collateral requires a time longer than that the Clearinghouse has to make payments to creditors, its capability to make them in the expected time frame of settlement cycles is compromised.

The Clearinghouse implements risk-mitigation mechanisms by imposing operating limits to its participants' operation.

The assignment of **position limits** and **price fluctuation limits** is designed to mitigate liquidity risks and the risk of price distortion, including that resulting from corner situation for contracts settled by physical delivery, as well as to avoid market manipulation and losses to market participants in general.

The definition of **limits to posting collateral** and **limits to using collateral** aims to mitigate the liquidity risk during execution of collateral and the issuer's credit risk.

In order to mitigate the market and liquidity risks inherent in the assets sale transactions during the execution of collateral, **haircuts**, or discounts, are applied on the market values of the collateral, which discounts are defined by the Market Risk Committee for each category of assets. The imposition of such restrictions allows the Clearinghouse to limit the volume of collateral per type of financial asset and per issuer.

The Clearinghouse has additional mechanisms, defined to provide it with the necessary liquidity to meet its obligations, under the defined terms and conditions. They are

- the Special Clearing Member Fund - FEMC
- the guaranteed account contracts;
- the access to BACEN discount window, via the BM&FBOVESPA Bank;
- the access to previously approved credit facilities;
- the contracts opening limits for US dollar purchase and sale; and
- the agreements to grant liquidity to specific products.

The **guaranteed account contract** is the contract executed between BM&FBOVESPA and one or more banks, through which the banks offer BM&FBOVESPA the possibility of drawing funds forthwith and unconditionally, according to contracted limits, such loan being based on BM&FBOVESPA's own funds. In case of settlement default by a participant whose transactions are being covered by illiquid collateral, the funds of the *guaranteed account* may be used to meet the payments due by the Clearinghouse in the settlement window, with the drawn funds being returned after the collateral execution process is completed.

The **BACEN Discount Window** is the last-resort loan given by the Central Bank, under the purchase with resale commitment mode, of securities, credits and credit rights from the assets of multiple banks with commercial portfolio, commercial banks, and savings banks. The Clearinghouse has access to such mechanism via the BM&FBOVESPA Bank.

The **credit facilities** are facilities pre-approved by financial institutions and backed by collateral being executed. After such execution, the funds thus obtained are earmarked to pay for the credit granted. Similarly to the guaranteed account contract, the credit facility is contracted by BM&FBOVESPA due to the possibility of the collateral execution period exceeding the time frame for settlement of obligations.

The **contracts opening limits for US dollar purchase and sale**, executed between BM&FBOVESPA and domestic banks, allow for exchanging US dollars into local currency, when collateral based on US dollars or assets issued abroad are executed. In order to secure the fulfillment of the time frame of the Clearinghouse's settlement window, such agreements may contain a specific clause of settlement on T+0 and within the established deadline.

An **agreement to grant liquidity to a specific product**, executed between BM&FBOVESPA and a financial institution, sets up the commitment by the latter to operate as a final purchaser of collateral made up by the specific product to which the contract refers, upon its execution being determined. Such an agreement provides the Clearinghouse with the timely liquidity necessary to meet its obligations within the settlement window. The Clearinghouse maintains a contract to grant liquidity to fixed-rate financial CPRs.

The liquidity available through such mechanisms must be enough to cover the Clearinghouse's potential cash needs, a function (i) of the risks borne by its participants, and (ii) of the possibility of the assets posted as collateral being immediately monetized or not.

The **legal risk** is associated with uncertainties, absence or shortfall of legislation and regulation to support the Clearinghouse's activities, especially regarding the provision of multilateral clearing and settlement, the procedures for collateral execution and the Clearinghouse's rights thereto and the Clearinghouse's rights to close positions in case of default. The Clearinghouse mitigates such risk by means of a legal and institutional framework defined by the SPB, as of the approval of Federal Law 10.214, of CMN Resolution 2.882, and BACEN Circular Letter 3.057, in addition to the approval of its Rulebook by BACEN.

The **operational risk** is related to losses resulting from human failures, systems failures, inadequacy of controls and procedures, discontinuity of processes, frauds, disclosing of incorrect documentation, among others, both internal and external to the Clearinghouse or to BM&FBOVESPA. Worth special attention are the systems failures which affect the Clearinghouse's ability to assess, monitor, and manage risks, as well as to satisfactorily carry out the settlement of its obligations.

In order to prevent the risk of discontinuity or interruption of the Clearinghouse's activities as a result of events which cause physical damage to its facilities and installations, making them and its systems inaccessible, the BM&FBOVESPA has a contingency location (*Contingency Site*) and periodically performs contingency testing at this location.

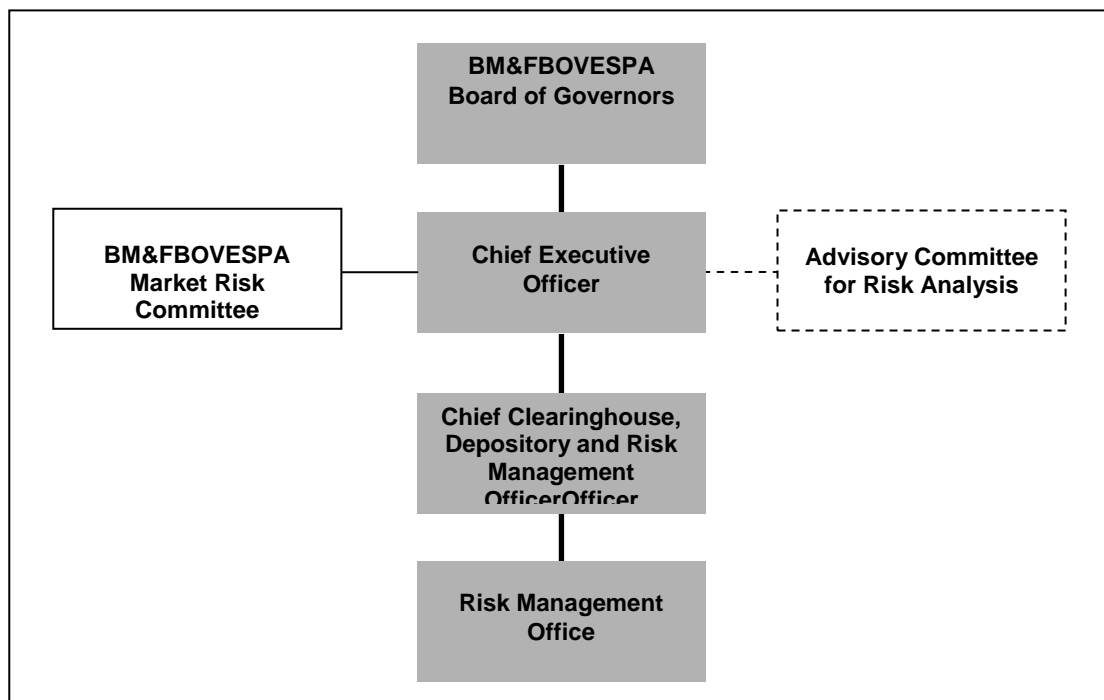
BM&FBOVESPA also relies on the Business Audit Department, which periodically assesses the processes carried out by the Clearinghouse, with the most critical ones being submitted to an assessment by independent external auditors.

The Clearinghouse has NBR ISO 9001:2000 Quality Certification, first issued in 1996 and since then renewed every three years. The Derivatives Clearinghouse's Internal Controls and Processes Manual describes, under a standardized, specific methodology, the various processes and sub-processes executed by the Clearinghouse, its major risks, and the existing controls. In January 2007, the Clearinghouse began to build up an operational troubleshooting database, where all the events involving operational faults, processing errors, human errors, etc. are recorded, as well as their consequences.

## 1. Risk Management Decision-Making Structure

The Clearinghouse's risk management is internally subordinated to the decisions

- i. of the Board of Governors (CA), in charge of setting up the general policies of the BM&FBOVESPA and to foster their proper execution;
- ii. of the Chief Executive Office, coordinating BM&FBOVESPA's executive body and assisted by the Market Risk Committee; and
- iii. the Clearinghouses' Executive Board of Directors.



**Figure 7 - Risk Management Decision-Making Structure**

The BM&FBOVESPA Market Risk Committee's role is to provide risk-related technical assistance to the Chief Executive Officer and BM&FBOVESPA's executive body. Among its duties are: (i) assess the effects of the political and economic scenarios on the markets where BM&FBOVESPA operates; (ii) propose policies, methodologies, criteria, and parameters for managing the risks incurred by BM&FBOVESPA; (iii) propose enhancements to risk systems; (iv) analyze the system's leverage level; and (v) perform the analyses deemed necessary for the proper execution of its activities.

The Market Risk Committee is formed by the Chief Executive Officer, the Chief Clearinghouse, Depository and Risk Management Officer, the Risk Management Director, the Chief Operations and IT Officer and other BM&FBOVESPA Directors indicated by the Chief Executive Officer.

The Market Risk Committee meets on a weekly basis or, under special circumstances, when called on by any of its members, recording in minutes, under any event, the assessments and discussions carried out. In order to guarantee the confidentiality of participants' positions, no member of the Market Risk Committee — except for those directly connected, in their respective areas, with the Clearinghouse — is allowed to access information concerning the positions held by any Clearinghouse participant.

Finally, the Clearinghouse risk management further receives proposals from the Advisory Committee for Risk Analysis approved by the Board of Governors. The Advisory Committee for Risk Analysis is composed of representatives from financial institutions and/or bodies concerned with risk matters, as well as of individuals with renowned capability and reputation in this area. It is the Advisory Committee's role to study risk-related issues and propose the adoption or modification of methodologies or procedures.

## 2. Safeguards

**Safeguards** are the resources, criteria, and mechanisms which make up the Clearinghouse's security structure, which it uses to cover losses related to settlement failure by one or more participants, to ensure the fulfillment of its role as CCP.

The risk coverage model adopted by the Clearinghouse is based on a combination of the so-called *defaulters pay*, *survivors pay* and *CCP capital* models. Under the first one, the Clearinghouse's risk regarding the participants is covered by individual collateral given by the defaulting participant. Under the second one, the risk is covered by collateral posted by the participants and used in a mutualized manner. Under the third model, the Clearinghouse's risk is covered by BM&FBOVESPA's funds. Such combination results in a risk coverage model in which loss is shared between the non-defaulting participants and BM&FBOVESPA after the defaulters' collateral is depleted.

The Clearinghouse's financial safeguards are the collateral posted by the participants, the funds created specifically to cover losses resulting from settlement failures and the BM&FBOVESPA's own equity. The individual collateral provided by defaulting participants is liable for the *defaulters pay* risk coverage model, whereas the funds made up by joint collateral from participants are liable for the *survivors pay* model, and finally, the funds made up by BM&FBOVESPA own funds, as well as its equity, are liable for the *CCP capital* model.

The funds made up by BM&FBOVESPA's own funds, BM&FBOVESPA's equity and the funds made up by collateral provided by Brokers and Clearing Members represent safeguards supplementary to the collateral posted by Customers to meet margin requirements. Such supplementary collateral is created due to the likelihood of insufficient funds being brought in as margin, whether due to unpredicted market volatility or to insufficient time and/or proper conditions to execute the collateral

The following are the funds created as Clearinghouse safeguard:

- Agricultural Market Trading Fund - FOMA;
- Special Clearing Member Fund – FEMC;
- Operational Performance Fund – FDO; and
- Clearing Fund – FLO.

## **2.1. Collateral Requirement**

In spite of the combination of the three risk coverage models, the majority of the risk taken by the Clearinghouse is covered by margin requirement, a mechanism through which is created the part of the safeguard structure made up by the participants' own collateral. This part is determined as a function of each Customer's portfolio risk. The margin requirement mechanism is dealt with in the section covering risk mitigation and control mechanisms.

## **2.2. Operational Performance Fund – FDO**

The Operational Performance Fund – FDO – is made up of funds deposited by Brokers and Clearing Members (holders of Trading Right and Settlement Right), earmarked to severally guarantee the proper settlement of the Clearinghouse-guaranteed transactions. BM&FBOVESPA determines the values of the collateral required for the fund, as well as the assets accepted, which can be altered at any moment, upon its discretion. The assets to make up the fund are those normally accepted by the Clearinghouse as collateral.

The FDO was created due to the Exchange's demutualization, completed in 2007, when the BM&FBOVESPA's equity memberships, then pledged in favor of the Exchange, ceased to exist. In this respect, the FDO is intended to basically cover the same needs that used to be covered by pledging the equity memberships.

The FDO funds must be used to secure the fulfillment of the obligations assumed, either directly or indirectly, also due to the provision of services by third parties, by the participant who deposited them, observing the following preference order:

- with the BM&FBOVESPA;
- with the Clearing Members;
- with the Brokers; and
- with the other BM&FBOVESPA participants.

## **2.3. Agricultural Market Trading Fund - FOMA**

The Agricultural Market Trading Fund – FOMA – is composed by deposits of BM&FBOVESPA's funds to secure the proper settlement of the transactions with contracts based on agricultural commodities for which the Clearinghouse operates as CCP, in case one of more Clearing Members remain in default with the Clearinghouse by virtue of such transactions.

Therefore, FOMA funds have a specific destination.

The fund was created to encourage the development of liquidity in the markets referred above and provide greater competitiveness vis-à-vis foreign exchanges which offer derivatives contracts based on the same commodities. Due to their settlement cycles, such foreign exchanges are able to require margins with a lower protection level as to that adopted by BM&FBOVESPA. Traditionally, the Market Risk Committee establishes collateral amounts based on stress scenarios and on the economic analysis of each market (e.g. harvest and off-season periods, weather risks, etc.). In presence of the FOMA, the Market Risk Committee can establish collateral amounts for the contracts that provide them with a lower level of protection than that which is ordinarily adopted. Therefore, the fund allows BM&FBOVESPA to reduce margin requirement of the contracts, thus preserving the stability and proper functioning of the Clearinghouse's settlement service.

The volume of FOMA capital is determined so as to preserve guarantee of settlement for transactions under default. The criterion defined by the Market Risk Committee, and approved by BACEN, establishes that the fund's minimum capital must be large enough to cover the sum of the  $N$  largest *margin deficits* of groups of Customers, with parameter  $N$  being defined by the Market Risk Committee at an amount not smaller than three (3). Thus, guarantee of settlement of all transactions is preserved, even in case of simultaneous default by the  $N$  major participants of the market in question. It is worth mentioning that, in spite of this criterion for fund capital calculation, its utilization is restricted to the cases of default by one or more Clearing Members.

A *margin deficit* of a Customer with an open position in derivatives contracts based on agricultural commodities is defined as:

$$\text{Margin deficit} = \text{Desirable margin} - \text{Required margin}$$

where

- Desirable margin* : the collateral amount that would be required for the Customer's position if the Market Risk Committee utilized the margin calculation methodology based on stress scenarios and conjectural analysis;
- Required margin* : the collateral amount effectively required for the Customer's positions in agricultural derivatives contracts, in order to offer a statistical level of protection no lower than ninety-five percent (95%).

In order to control the adequacy of the fund's capital, margin deficits of Customers with open positions in commodities contracts are daily consolidated per economic group and in ascending order, therefore the criterion for calculation of FOMA capital is

$$\text{Capital FOMA} \geq \text{Margin deficit}_1 + \text{Margin deficit}_2 + \dots + \text{Margin deficit}_N$$

$$\text{Margin deficit}_1 \geq \text{Margin deficit}_2 \geq \text{Margin deficit}_3 \geq \dots$$

where  $\text{Margin deficit}_i$  is the collateral deficit of the  $i$ -th economic group, given by the sum of the margin deficits of participants belonging to the group and with open interest in agricultural contracts.

BM&FBOVESPA can, at any time, establish equal or differentiated limits for the margin deficits of market participants. In order to reduce existing margin deficits, BM&FBOVESPA can also, at any time, require from the participants the pledge of additional margin, at its sole discretion.

In like manner, Brokers can, at their own discretion, define limits for the margin deficits of their customers. In any case, the Brokers and the Clearing Members remain wholly responsible for the settlement of the transactions registered under their responsibility, with FOMA's resources being allocated to safeguard BM&FBOVESPA.

#### **2.4. Special Clearing Member Fund – FEMC**

BM&FBOVESPA shall maintain the Special Clearing Member Fund – FEMC - for the Derivatives Clearinghouse to guarantee the proper settlement of the transactions executed in its trading systems and/or registered in its registration, clearing and settlement systems, in case of the default of one or more Clearing Members.

The fund is composed by part of BM&FBOVESPA's equity allocated for that purpose, in an amount proposed by the Chief Executive Officer and approved by the Board of Governors.

As with FOMA, the FEMC has no legal status of its own, being part of BM&FBOVESPA's assets, and is separated accounting wise.

The use of its resources is exclusively connected to its purposes, in observance of the established collateral execution rules and, in any situation, following the preliminary use of the portion allocated to FOMA, whenever feasible.

#### **2.5. Clearing Fund – FLO**

BM&FBOVESPA shall maintain the Clearing Fund – FLO – made up of funds or collateral deposited by Clearing Members to guarantee the proper settlement of the transactions guaranteed by the Clearinghouse, executed in its trading systems and/or registered in its registration, clearing and settlement systems, in case of default of one or more Clearing Members.

The amount of the fund shall be proposed by the Chief Executive Officer and approved by the Board of Governors. The share of each Clearing Member is limited to ten million Reais (R\$ 10,000,000.00). The contribution may be differentiated among the Clearing Members, according to the type of Settlement Right they hold. Upon its discretion the Exchange can alter the value of the contribution of each Clearing Member.

Should the amount of the fund need to be increased, and in observance of the limit for individual participation established in the previous paragraph, the new deposit shall be required no sooner than thirty (30) days from the date of the Board of Governors' decision.

The assets which make up the fund are those normally accepted by the Clearinghouse as collateral.



Each Clearing Member's responsibility with the fund is jointly and limited, on an individual basis, to the amount of the initial deposit, added of a new fund deposit, in an amount equal to that of the initial deposit, when so required by BM&FBOVESPA. In any circumstance, the total amount deposited, equivalent to the initial and the new deposit, must not exceed the limit of ten million Reais (R\$ 10,000,000.00).

The Clearing Member that fails to meet any of its obligations will have the corresponding amount debited to its accounts with the fund, which must be replaced within the time frame established by the Board of Governors. The balance due by the Clearing Member to the fund that is not settled within the time frame established by the Board of Governors will be assigned in equal allowances among the remaining Clearing Members by debiting the corresponding amount to their respective accounts, in observance of the limit equivalent to 2 times the original contribution of each member. This allowance shall be assigned by dividing the balance due by the number of non-defaulting Clearing Members, with the debited amounts having to be replaced by them in the fund within the time frame established by the Board of Governors.

It is the Board of Governor's responsibility to establish the other rules governing the fund.

The use of FLO's resources is exclusively connected to its purposes, in observance of the established collateral execution rules.

## **2.6. Sequence of Use of Financial Safeguards**

The use of safeguards to cover losses resulting from a participant's default observes the order shown below.

- (1) collateral posted in favor of the Clearinghouse, used/executed in this order:
  - i. the debtor's own;
  - ii. those presented by third parties to the debtor;
  - iii. those presented by Brokers or other intervening parties responsible for the debtor's transactions, including those deposited in FDO; and
  - iv. those presented by the Clearing Members responsible for the debtor's transactions, including those deposited in FDO.

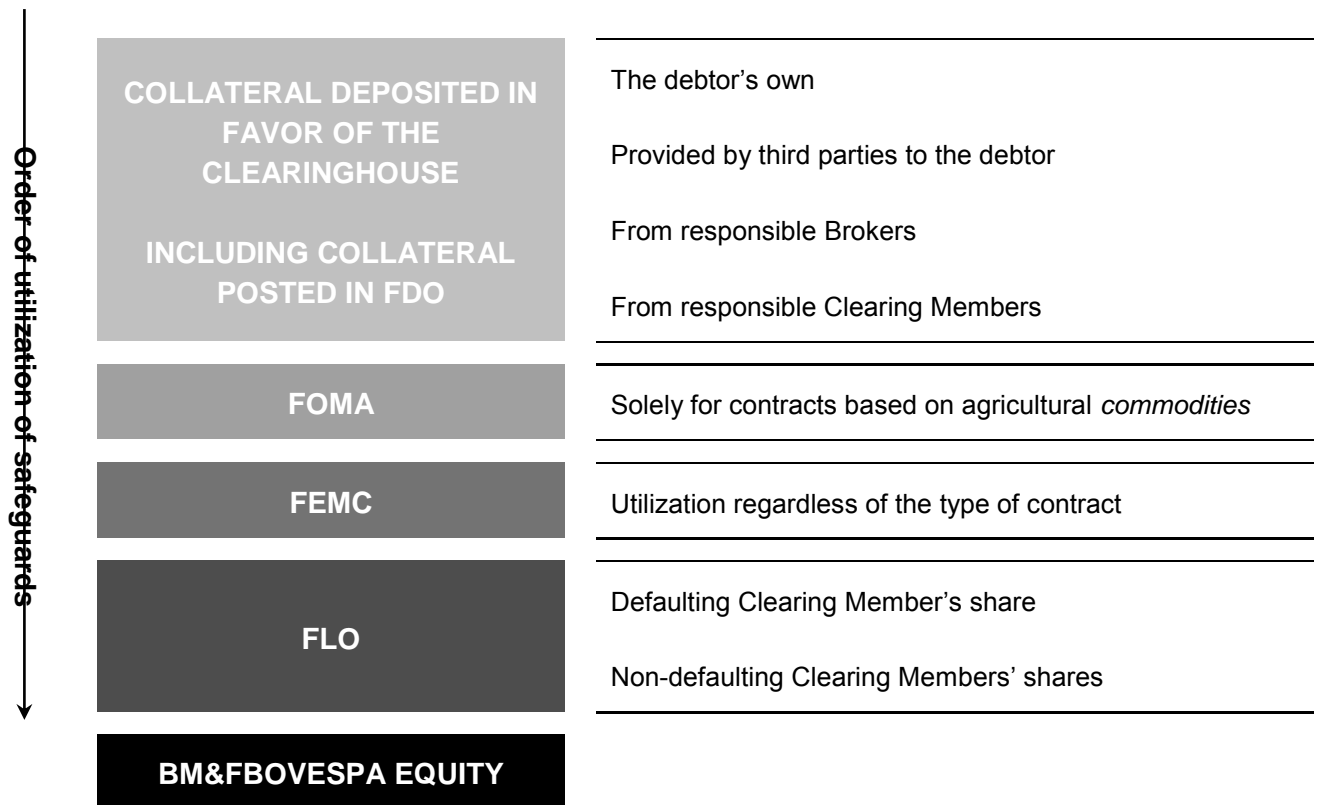
Depending on the liquidity status of the assets posted as collateral, BM&FBOVESPA may alter the execution order of the collateral mentioned in items (i) and (ii) above.

A possible balance remaining from the use of such collateral is returned to its respective holder.

- (2) FOMA's equity, earmarked solely for default of transactions with contracts based on agricultural commodities and in the case of default of a Clearing Member;
- (3) FEMC's equity, in case of default by a Clearing Member, regardless of the type of contract;
- (4) the defaulting Clearing Member's share of the Clearing Fund (FLO);
- (5) the non-defaulting Clearing Members' shares of the Clearing Fund (FLO), including the new deposits that BM&FBOVESPA may require, for immediate use;

- (6) Other safeguard mechanisms created for this purpose; and
- (7) BM&FBOVESPA's Equity

In case the execution of a defaulting Customer's collateral is not enough to cover his debts, his additional collateral with other Brokers and/or Clearing Members can be executed, at the Clearinghouse's discretion.



**Figure 8 – Utilization of safeguards in case of default**

### 3. Risk Mitigation and Control Mechanisms

This section describes the main mechanisms for risk mitigation and control adopted by the Clearinghouse to ensure its CCP function.

Since it is considered *systemically important* by BACEN, the Clearinghouse is required to adopt such mechanisms, which, in addition to guaranteeing its obligations are met, are aimed to provide for the proper operation of the markets and of payment systems, as well as financial stability.

Such procedures enable the Clearinghouse do manage the risk to which it is exposed, reducing the likelihood of occurrence of defaults, limiting potential losses and liquidity pressure in case of default, as well as providing enough funds for loss coverage and meeting its settlement obligations in their due time.

Financial and operational requirements for authorizing an institution or individual as a Clearinghouse participant, as well as the frequent monitoring of participant's adherence to the minimum required standards, also constitute risk mitigation and control measures, especially the counterparty credit risk, allowing the Clearinghouse to control / limit the likelihood of default occurrence. Such requirements are described in chapter II of this Manual.

The following sections describe, in a conceptual manner, the main risk mitigation and control mechanisms. The technical description, including the mathematical models adopted and their corresponding calculation formulas, is found in the Derivatives Clearinghouse's Risk Management Manual.

### **3.1. Marking to Market**

Marking to market is the method to reassess assets and financial instruments by using current market prices and quotations.

The effectiveness of the Clearinghouse's risk management depends on their ability to measure and manage the exposure accumulation.

The Clearinghouse's exposure to a participant's credit risk varies according to the transactions he carries out, to the open positions resulting thereto and to price variations. Therefore, in order to correctly measure the Clearinghouse's exposition, it is necessary for the updated positions to be marked to market at least on a daily basis. For the same reason, the corresponding posted collateral must also be marked to market just as often.

### **3.2. Collateral**

The margin requirement is the main counterparty credit risk management mechanism adopted by the Clearinghouse. In spite of the joint responsibility of non-defaulting participants of certain categories in case of default, most of the Clearinghouse's exposure is covered by the individual collateral posted by participants in favor or on behalf of the Clearinghouse, in order to meet the margin requirement.

The Clearinghouse requires posting of collateral by Customers, Brokers and Clearing Members. In any circumstance, the Clearing Member is liable for the delivery, reception, authenticity, and legitimacy of all collateral sent to the Clearinghouse; the Brokers are liable towards the Clearing Members; and the Customers are liable towards the Brokers. If there is an Intermediary in this responsibility chain, he will act between the Broker and the Customer for whom he operates.

Terms **collateral margin posted**, **collateral margin required** and **collateral margin call** have the following meanings:

**Collateral margin posted** is the amount the participant maintains deposited with the Clearinghouse, or in its name, to guarantee the settlement of the obligations resulting from the transactions assigned to him.

**Collateral margin required** is the minimum amount the participant must maintain deposited with the Clearinghouse to guarantee the settlement of the obligations resulting from the transactions assigned to him.

**Collateral margin call** is the negative difference between the collateral margin required and the collateral margin posted, that is, the amount which the participant must deposit with the Clearinghouse in order to meet the Clearinghouse's margin requirement.

The collateral margin is applied to the positions to which the Clearinghouse acts as CCP, that is, the positions assumed in the Exchange Market and in the OTC Market with the *BM&FBOVESPA guarantee* feature, and is required from each Customer.

The collateral margin required from the Customer must assume a value sufficient to cover the total settlement, or closing, cost of his positions – selling of long positions and buying of short positions. Since prices fluctuate and modify the portfolio's settlement cost value, throughout the period up until positions are finally closed, the value of the collateral margin must be sufficient to cover the settlement cost at market value and the potential increase of such cost - the market risk.

Therefore, the methodologies utilized by the Clearinghouse to calculate the required margin are risk calculation methodologies, which provide estimates for the cost of offsetting the Customer's positions. The market variations along the period expected for offsetting which are expected to be covered are those typical of the occurrence of extreme events.

Such methodologies are based on Stress Scenarios Testing models, as defined by the Market Risk Committee and submitted to BACEN evaluation and approval. In addition to defining the methodologies, the Committee has to define the values of all its parameters and ensure that they are frequently revised, and it may alter them at any moment upon its own discretion.

The Market Risk Committee and BACEN periodically monitor the adequacy of the models utilized for margin calculation through back-test reports which are periodically sent by the Clearinghouse. Back-test is a model evaluation technique which consists in the *ex post* comparison between observed and expected results. In order to evaluate the risk methodology, back-testing is performed of risk factors, settled values, liquidity credit facilities and of FOMA. Risk factors back-testing compares the variations observed in primitive risk factors and those implicit in the stress scenarios adopted. In back-testing settled values, a comparison is made between the Clearing Members' Multilateral Settlement Values and the corresponding collateral margins required. Liquidity lines back-testing consists in comparing the sum of the two largest debits (negative Multilateral Settlement Values) and the total volume of funds provided by contracted liquidity assistance credit facilities. FOMA back-testing consists in comparing the fund's equity and the difference between the collateral margins required and the collateral margins desired.

The Stress Scenarios Test methodologies consist in analyzing the portfolio closing cost under stress scenarios defined for the variables relevant for calculation of its market value. Such variables are called

Primitive Risk Factors (FPRs). In this evaluation, it is of fundamental importance to calculate the time frame necessary to settle the portfolio, called *holding period*. A scenario for an FPR represents a hypothetical variation of the value of such factor, to occur along the holding period of the position in question. For most contracts, the value required as collateral is calculated to cover the market risk of the transaction during a two-day holding period.

Stress scenarios, holding periods and the other parameters of margin calculation models are defined by the Market Risk Committee, based on an array of instruments, such as statistical evaluations of FPRs' behavior, evaluation of economic and political situation, evaluation of likelihood of occurrence of extreme events and their impact, among others.

A derivatives portfolio margin is calculated from different methodologies, basically differing in terms of the features of each derivative contract (e.g., daily marking to market, linearity of variations etc.). The risk factors stress scenarios are defined for contracts with different holding periods, due to differences of liquidity between markets.

For margin calculation and methodology definition purposes, the following groups of derivatives contracts is considered:

- Futures contracts: includes financial, agricultural, and energy futures contracts, as well as exchange swaps with adjustment;
- Standardized Options Contracts: includes options contracts on actuals and futures, plain vanilla or futures-style, traded in the Exchange Market;
- WTr Contracts – Non-arbitrator: includes contracts liable to trading via WTr, when traded by Customers classified as Non-arbitrators<sup>6</sup>;
- Swap contracts: includes swap and forward contracts registered with the *BM&FBOVESPA's guarantee* feature;
- Flexible Options Contracts: includes flexible options contracts registered with the *BM&FBOVESPA's guarantee* feature; and
- Other contracts: includes the Gold Forward Contract.

Considering this groups, the portfolio of a Clearinghouse's Customer is expressed as

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<sup>6</sup> The Customer who is authorized to trade through WTr as a liquidity provider is classified as Arbitrator; otherwise, the Customer is classified as Non-arbitrator.

The application of different methodologies to a portfolio occurs along the clusters of contracts covered by each one, so that the portfolio's collateral margin required may be thus broken down

The following figure illustrates the methodologies for calculating the required margin, according to this cluster.

| <b>DERIVATIVES CLEARINGHOUSE RISK SYSTEM</b>  |  |
|---|--|
| <b>RISK METHODOLOGIES FOR EXCHANGE MARKET CONTRACTS</b>                                     |  |
| Stress Test on Present Value (Futures Contracts)  |  |
| Stress Test on Present Value – <i>Full Valuation</i> (Options Contracts)                    |  |
| Fixed Margin in Local Currency (Contracts traded via WTr by <i>Non-arbitrator</i> Investor) |  |
| Margin for Gold Forward Contracts   |  |
| <b>RISK METHODOLOGY FOR OTC MARKET CONTRACTS</b>  |  |
| Stress Test on Cashflow – Swap and Forward  |  |
| Stress Test for Flexible Options  |  |

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**Figure 9 – Methodologies for collateral margin calculation**

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BM&FBOVESPA provides the Broker with access to margin calculation systems, through which it is possible to make queries and simulate the value of the margin required for the portfolios of Customers under its responsibility.

The margin calculation methodologies are described in detail in the Derivatives Clearinghouse's Risk Management Manual.

To calculate the margin, the portfolios of a same Customer assigned to different Brokers and/or Clearing Members are generally considered in an independent manner, so that the total collateral margin required from such Customer is given by the sum of the margins corresponding to each one of his portfolios. Upon its discretion, the Clearinghouse may allow, for margin calculation purposes, for consolidation of the several portfolios of a same Customer. The margin call is executed individually, on a gross basis, that is, per Customer.

The Clearinghouse, at its sole discretion, may require additional collateral from any participant. Requirement of additional margin results from the identification of factors which imply a potential risk increase for the Clearinghouse, such as increased volatility, concentration of open positions and participant's financial capability, market liquidity condition, specific settlement rules, among others. Positions in contracts with physical delivery are subject to the requirement of additional margin from the beginning of the delivery period – the respective criteria are described in the Clearinghouse's Risk Management Manual.

### 3.2.1. Margin Call Procedure

Margin requirement calls occur on a daily basis, after allocation of the trades executed the day before. By monitoring the intraday risk, the Clearinghouse can, along the day and as many times as needed, advance the margin call, based on the participants' updated open positions.

Margin call must be met within the time frames defined by the Clearinghouse for collateral posting. The period for posting collateral goes from 07:30 h to 18:30 h, with 13:00 h as a limit for deposits to meet the required margin.

| TIME  | EVENT   |
|-------|---|
| 07:30 | Start of period for collateral posting.   |
| 13:00 | Deadline for posting the required collateral.   |
| 14:50 | The amount of the part of the margin call not met with collateral posting until 13:00 h is kept in the VLM composition of the margin-owing participant, therefore being included in the definitive VLM of the responsible Clearing Member and settled via Settlement of Clearing Members until that time. |
| 18:30 | Closing of period for collateral posting.   |

**Table 6 – Schedule for posting required collateral**

These deadlines do not refer to meeting the margin called in advance – margin call on T+0 – due to the increased Clearinghouse exposure to the participant, identified through monitoring of intraday risk. Coverage of the margin call on T+0 follows the specific rules, criteria and deadlines for such procedure, as presented in the next section.

The deadlines for the transfer are also restricted to the own schedules of the institutions external to the Clearinghouse involved in collateral transfer - Cetip, CBLC, BM&FBOVESPA Bank, etc.

### 3.3. Intraday Risk Monitoring

The Clearinghouse continuously monitors its exposure to participants' credit risk by monitoring the intraday risk, which allows it to carry out early margin calls during the day, that is, execute a margin call on T+0, thus reducing its risk exposure.

For that follow-up, the Intraday Risk System (SRI) is used, which monitors the risk of the transactions of participants who access BM&FBOVESPA's trading systems directly, i.e. Brokers (Brokerage Houses, Locals and PAPE holders) and PLDs. In this context, differently from the meaning ascribed thereto up to this section, the term Broker also includes the participants of the PLD category.

The Clearinghouse establishes an **intraday risk limit** for each Broker linked to a same Clearing Member, with this Clearing Member having the choice of either accepting or reducing it, according to his own criteria, since he is responsible for the settlement of the operations and for posting the collateral required from the Broker. Monitoring the intraday risk of Participants consists of assessing, as often as possible; the adherence of their overall transaction values to the limits that have been imposed upon them, and to that end, the **operational limit** of each Broker is monitored, under each Clearing Member to whom he is linked.

The intraday risk limit establishes the Broker's maximum risk exposure beyond which the Clearinghouse requires the Broker, its customers, or the responsible Clearing Member to promptly pledge additional collateral. The value of the intraday risk limit ascribed to a Broker,  $LR_{Broker}$ , is limited as per the following equation

$$LR_{Broker} \leq \frac{A+B}{N}$$

where

$A$  : the amount of the Clearing Fund;

$B$  : the amount of the Special Clearing Member Fund; and

$N$  : the parameter set up by the Market Risk Committee with a value greater than or equal to 1.

The Broker can pledge additional collateral of its ownership with the Clearinghouse, in order to cover the amount of risk exposure which exceeds its intraday risk limit, thus preserving its operational regularity. The Clearing Member responsible for it can also pledge proprietary collateral, in order to increase that Participant's limit.

The Broker's Operational Limit is a function (i) of its intraday risk limit, (ii) of the collateral posted for covering the transactions assigned to it, and (iii) of a risk measure representing the maximum loss incurred in case the Customers linked to it that holds higher risk positions concurrently default. The Broker's Operational Limit is denoted by  $LO_{Broker,CM}$  in regard to the transactions under a specific Clearing Member's ( $CM$ ) responsibility. The operational limit is given by the difference between (i) the sum of the



intraday risk limit attributed to it and the collateral pledged and (ii) the risk of the transactions under its responsibility.

$$LO_{Broker,CM} = LR_{Broker,CM} + Collateral_{Broker,CM} + Collateral_{CM/Broker} - Risk_{Broker,CM} \quad (1)$$

where

- $LR_{Broker,CM}$  : Intraday Risk Limit attributed by the Clearinghouse to the Broker and adjusted by the responsible *CM* regarding the transactions under such *CM*'s responsibility;
- $Collateral_{Broker,CM}$  : the collateral pledged by the Broker to increase its Operational Limit, restricted to the transactions under such *CM*'s responsibility;
- $Collateral_{CM/Broker}$  : the collateral pledged by Clearing Member *CM* in favor of the Broker to increase its Operational Limit, restricted to the transactions under such *CM*'s responsibility; and
- $Risk_{Broker,CM}$  : Broker's risk, resulting from its transactions under the responsibility of Clearing Member *CM*, given by

$$Risk_{Broker,CM} = Risk_{Allocated\ trades} + Risk_{Non-allocated\ trades} \quad (2)$$

Upon convention,  $Risk_{Allocated\ trades}$ ,  $Risk_{Non-allocated\ trades}$  and  $Risk_{Broker,CM} \geq 0$ .

Since the transaction trading and registration systems allow the allocation of certain trades to occur only at day closing, calculation of Broker's risk requires grouping of the transactions attributed to it into **allocated** and **non-allocated** transactions, with the allocation concerning such grouping being the Customer's allocation.

In general, whereas the only source of uncertainty regarding the allocated transactions is the volatility of market prices and rates, the non-allocated ones are added of the uncertainty arising from several possibilities of distribution of trades among Customers.

In the case of the Broker belonging to the Local or Agricultural Commodities Special Local (OEs) categories, its transactions, except for give-ups to Brokerage Houses, which overburden the latter's Operational Limit, are considered allocated at the time or registration, since the OEs trade only for their own account. Thus, for such participants, term  $Risk_{Non-allocated\ trades}$  in the previous equation is null.

Since the trades executed through the WTr have their corresponding Customers identified at the time of closing of the trade, there are considered allocated in calculating the Broker's risk.

The calculation of the risk of **allocated** transactions is based on the portfolios of customers linked to the Broker and on the amount of collateral they pledge. Should a customer default, the Broker's potential loss will be given by the difference, if positive, between the risk of the defaulter's positions and the amount of collateral it pledged. The risk of allocated transactions is therefore defined as the Broker's maximum potential loss in case, among the customers under its responsibility, the customer *NC\** with the higher-risk positions default.

$$Risk_{Allocated\ trades} = \sum_{j=1}^{NC} Customer\ Deficit_j \quad (3)$$

$$Customer\ Deficit_{(1)} \geq Customer\ Deficit_{(2)} \geq \dots \geq Customer\ Deficit_{(NC)}$$

where  $NC$  is the number of Customers linked to the Broker and  $Customer\ Deficit_{(j)}$  represents the risk of the Customer whose position corresponds to the  $j$ -th highest risk<sup>7</sup>.

The Customer's risk, calculated based on the BM&FBOVESPA stress test models, represents the Clearinghouse's exposure to the customer's credit exposure in a thorough manner, that is, by taking into account the customer's position at the opening of the day, the new trades allocated on behalf of the customer up to the time of calculation, the intraday marking to market of the customer's positions and the amount of collateral pledged by the customer with the Clearinghouse. Greater details are provided in the Risk Management Manual of the Derivatives Clearinghouse.

The risk of **non-allocated** transactions reflects the Broker's maximum potential loss, given all the allocation possibilities and all combinations of stress scenarios possibilities taken into consideration. In addition to market price volatility, the calculation of the risk of non-allocated transactions requires special attention, since the uncertainty involved in such transactions arises from the indetermination about transaction distribution among the several customers with whom the Participant maintains a contractual relationship. Whereas it is not possible to attribute a new trade to a specific customer, it is also not possible to assess whether there is enough collateral to cover the risk of the transactions. This is because the collateral pledged by a customer is solely earmarked to cover the risk of the customer's own transactions, which means that this collateral cannot be used in a joint and mutualized manner. Under an extreme situation, all trades carried out on a certain day are allocated to one or more customers with no collateral pledged with the Clearinghouse, thus increasing a Broker's potential loss. Therefore, since non-allocated transactions remain entirely under the responsibility of the Broker who executed them or received them in give-ups, when the risk of non-allocated transactions is estimated, **risk offsetting is not allowed** between non-allocated trades. It is worth mentioning that trades that have not been allocated to a secondary Clearing Member within the corresponding time frame are attributed to the Broker's main Clearing Member.

In order to define the criteria for calculation of the risk of non-allocated transactions, the following variables are to be considered:

$n$  : total of non-allocated trades under the Broker;

$Op_i$  :  $i$ -th transaction attributed to the Broker and yet unallocated;

$Scen_k$  :  $k$ -th contiguous stress scenario for a set of FPRs; a contiguous scenario for a set of  $x$  FPRs is a combination of  $x$  scenarios, one for each separate FPR<sup>8</sup>; and

$m$  : total number of contiguous stress scenarios the for FPRs; and

<sup>7</sup> The various accounts held by the same customer, who is identified by the corresponding Corporate or General Individual Taxpayer Register of the Ministry of Finance (CNPJ or CPF), Brazilian Securities and Exchange Commission (CVM) code, or nonresident agricultural investor code, under the same Trader and the same Clearing Member, can be treated in a consolidated manner by the SRI, provided duly authorized by BM&FBOVESPA.

<sup>8</sup> The reader finds the definition of contiguous scenario in the Risk Management Manual.

$V_{ki}$  : the value of transaction  $Op_i$  under stress scenario  $Scen_k$ ; in the case of futures contracts,  $V_{ki}$  denotes the price variation (settlement price) of the transaction under  $Scen_k$ ; in the case of option contracts,  $V_{ki}$  denotes the contract premium under  $Scen_k$ .

Assuming that scenario  $Scen_k$  occurs, the Broker's largest potential loss will correspond to the case where all the negative value transactions are allocated to a single customer with no collateral pledged with the Clearinghouse and all positive value transactions to other customers. Finally, the risk corresponds to the worst result among the results of such combination of allocations under each scenario

$$Maximum\ Broker\ Loss(Scen_k) = -\sum_{i=1}^n \min V_{ki}, 0$$

$$Risk_{Non-allocated\ trades} = -\min \left[ \sum_{i=1}^n \min V_{1i}, 0, \dots, \sum_{i=1}^n \min V_{mi}, 0 \right] \quad (4)$$

As the Broker carries out the allocations in the Clearinghouse's systems, the allocated trades are excluded from the calculation of risk of non-allocated transactions under the Broker's responsibility and included in the calculation of risk of allocated transactions, in the risk portions of the respective Customers responsible for them.

Therefore, the Broker's Operational Limit is unburdened when transactions are allocated to customers who have enough collateral or to customers who have opposite positions in relation to the trades carried out on the day, thus providing a reduction of the risk in their portfolios.

Through its service network, BM&FBOVESPA makes available to Clearing Members and Brokers specific applications to monitor their respective Operational Limit, parameters and other information utilized in its calculation. It is the obligation of the Clearing Members and the Brokers to know how the system functions and to know its calculation criteria. In addition, they must continually follow the evolution of the information generated throughout the day. The Broker's adherence to the respective intraday risk limit is monitored through the respective **Operational Limit Percent utilization**, given by the ratio between the risk and the intraday limit added of the collateral:

$$LO\ Percentage\ utilization = \frac{Risk_{Broker,CM}}{LRI_{Broker,CM} + Collateral_{Broker,CM} + Collateral_{CM/Broker}} \quad (5)$$

A negative operational limit is equivalent to an operational limit percent utilization higher than 100 %. The Brokers are required to anticipate the transactions they intend to perform, for their own or their customers' portfolios, by taking the necessary measures to prevent the respective operational limit percent utilization from exceeding 100 %. Among such measures the following stand out:

- i. use of the application supplied by BM&FBOVESPA to simulate the impact of new transactions, whether allocated or not, on the operational limit percent utilization; and/or
- ii. advancement of the pledge of additional proprietary collateral with the Clearinghouse to increase their respective operational limits; and/or

- iii. in the case of transactions that increase one or more customers' exposure risk, requirement of advanced pledging of additional collateral in the Clearinghouse, whenever the volume of transactions may cause violation of the operational limit, and prompt allocation of such customers in BM&FBOVESPA systems; and/or
- iv. in the case of transactions requiring reduction of one or more customers' risk exposure, their prompt allocation in the BM&FBOVESPA systems, whenever the volume of transactions may cause an Operational Limit violation; and/or
- v. prompt identification of the transactions performed in GTS that will be passed on to another Brokerage House or PLD (give-ups).

In the event that the Broker's operational limit percent utilization exceeds 100 %, the following procedures are adopted:

- i. the Clearinghouse contacts the Broker and the Clearing Member, by means of recorded phone calls, informing them of the operational limit violation;
- ii. within the time frame set up by the Clearinghouse, the Broker must take all necessary measures to comply with its operational limit, having the following alternatives to choose from:
  - to pledge additional collateral with the Clearinghouse; and/or
  - to specify the customers responsible for the transactions with higher impact on the Operational Limit, followed by the prompt pledge of additional proprietary collateral from those customers, if needed; and/or
  - identify the transactions performed in GTS that will be passed on to another Brokerage House or PLD (give-ups); and/or
  - reversal to market of the transactions with higher impact on the Operational Limit, followed by the prompt allocation of responsible clients;
- iii. in the event that the Broker does not provide the compliance of its Operational Limit within the time frame established by the Clearinghouse, the latter may, upon its own discretion:
  - Require the Clearing Member to pledge the additional collateral in favor of the Broker, granting the latter a specified additional time period; or
  - debit the Clearing Member in the Clearing Members' Settlement in the amount corresponding to the required collateral; or
  - at its sole discretion, grant the Broker an additional time period if it ascertains that the delay observed in the compliance of its limit derives from operational problems outside the Broker's control;

- iv. in the event that the Broker does not provide the compliance of its Operational Limit within the time frame established by the Clearinghouse, the BM&FBOVESPA Chief Executive Officer may, in addition to the measures referred to in item (iii):
  - temporarily suspend the Broker's access to the trading and registration systems; and/or
  - temporarily suspend the possibility of transactions performed by other Brokers from being passed on to the Broker (give-ups), by notifying the other participants – holders of Trading and Settlement Rights - of such decision; and/or
  - Determine that the whole or part of the transactions under the Broker's responsibility be offset, by taking the necessary measures to that end;
- vi. in the event of adoption of any of the measures referred to in the previous items, possible costs or losses arising from the suspension of the Broker's access to the trading and registration systems, as well as those resulting from an offsetting transaction, will be the sole responsibility of the Broker and the Clearing Member.

The Clearinghouse provides the Brokers and Clearing Members involved, as well as BM&FBOVESPA's Chief Executive Officer, with a report on the cases of violation of Broker Operational Limit occurred in the previous period. In the event that the report points out an unjustified recurrence of Operational Limit violation within a short period of time, the following procedure is adopted:

- i. the Clearinghouse can formally alert the Broker and the Clearing Member about the occurrence; and
- ii. besides the measure referred to in the previous item, the Chief Executive Officer can:
  - assess a fine to the Broker and/or Clearing Member; and/or
  - require the Broker and/or the Clearing Member to maintain, during the time frame established by BM&FBOVESPA, the pledge of additional collateral with the Clearinghouse in an amount sufficient to minimize the possibility of occurrence of future operational limit violations; and/or
  - temporarily suspend the activities of the Broker and/or Clearing Member, by notifying the other BM&FBOVESPA participants – holders of Trading and Settlement Rights - of such decision.

As mentioned in the chapter on Transaction Registration Service, **alteration** and **cancellation of a trade's allocation** are not freely admitted, being conditional on the risk analysis and, depending on the case, on the Clearinghouse's approval. Such restriction is due to the possibility of an allocation alteration causing a violation of the Broker's Operational limit, thus making the effort to monitor the intraday risk performed until then ineffective. This is the case, for example, of altering the allocation of customers who have enough collateral volume to other who do not have it, or yet of customers whose portfolios produce

risk offsetting to others who do not. In case of an operational error, the allocation alterations occur pursuant to the following procedure:

- i. the Broker indicates to the Clearinghouse systems the transactions that will have their allocation altered and provides those systems with all the data necessary for the new allocation;
- ii. The SRI simulates the value of the Broker's Operational Limit by assuming the acceptance of the proposed allocation alterations — this simulation will even reflect the updating of the risk calculation for the customers involved; let  $LO$  and  $LO'$  be the values obtained for the Operational Limit, respectively, without and with the allocation alterations;
- iii. if  $LO' \geq 0$  or  $LO' - LO \geq 0$ , the allocation alterations are automatically accepted by the Clearinghouse systems; or
- iv. if  $LO' < 0$  and  $LO' - LO < 0$ , then the allocation alterations are classified by the Clearinghouse's systems as *pending – under analysis*, thus preserving the original set of allocations; the Clearinghouse may then authorize the allocation alterations by means of a Broker's formal request containing the due justification for the allocation errors made.

In any circumstance, the authorization for allocation alteration may be conditional on the prompt pledging of additional collateral with the Clearinghouse, as the case may be.

Another procedure connected to monitoring of the intraday risk is the **withdrawal** of pledged collateral. At each updating of the Operational Limit calculation, the new allocated trades are incorporated into the respective customers' portfolios and the risks of such portfolios are recalculated. In the event that a customer presents a free balance of collateral pledged with the Clearinghouse and, after updating of the risk calculation, presents an increased risk, this excess collateral is automatically retained by the intraday risk and collateral systems, in the same proportion as that of the risk increase. Besides verification of the free balance, the Clearinghouse systems check whether the same customer has debtor balance of collateral under other Brokers and debtor balance in the settlement window. The release of the free balance under a specific Broker is conditional on the previous fulfillment of the margin call by the same customer, or on the existence of available collateral, under all remaining Brokers. The composition of the free balance of collateral is presented in the Clearinghouse's Risk Management Manual.

The withdrawal of collateral owned by the Broker or Clearing Member, deposited in the Clearinghouse in favor of the Broker with the aim of extending his Operational Limit, complies with the following procedure:

- i. the Broker or Clearing Member, as the case may be, requests the withdrawal to the Clearinghouse;
- ii. the SRI simulates the value of the involved Broker's Operational Limit, supposing the withdrawal of collateral; let  $LO'$  be the simulated value of the Operational Limit;

- iii. if  $LO \geq 0$ , the collateral withdrawal is automatically accepted by the Clearinghouse systems; and
- iv. if  $LO < 0$ , the collateral withdrawal is rejected by the Clearinghouse systems.

Technical details can be found in the Risk Management Manual of the Derivatives Clearinghouse.

### **3.4. Posting and Transferring Collateral**

Collateral posting must be done in cash –in US dollars, for non-resident 2.687 investors, and in local currency for the other participants – and can be replaced by depositing other assets/instruments, upon the Clearinghouse’s discretion. The list of assets that can be accepted as substitute for currency is as follows:

- Domestic federal government bonds;
- Domestic private securities;
- Gold;
- Stock from BM&FBOVESPA listed companies and in the Central Depository custody;
- Selected mutual funds shares;
- Bank letters of credit;
- U.S. Treasury securities; and
- Other financial assets or instruments.

Only non-resident, 2.687 investors are authorized to post collateral in foreign currency and U.S. Treasury securities, these being the only forms available to such investors. The margin requirement to be posted in US dollars is converted by the BM&FBOVESPA Referential Exchange Rate, published in its Daily Bulletin.

The assets posted as collateral for a participant’s transactions must be of its own, that is, assets belonging to participant A cannot serve as collateral for participant B’s transactions, with the Brokers and Clearing Members being responsible for complying with this provision. An exception to this condition is the utilization of a bank letter of credit as collateral for the transactions of a participant that is not the letter’s beneficiary, but with whom he has a contractual relationship. This is the case of utilizing part of the funds represented by a bank letter of credit - the beneficiary of which is a Commodities Brokerage House, issued in favor of the Clearinghouse - to cover margin of one or more of its clients (the so-called master letter of credit, whose use is allowed for Clearing Members and Brokers for covering their clients’ risk).

The acceptance of each type of financial asset/instrument is conditional on criteria related to the application of haircuts, imposition of utilization and issuance limits, or any other condition which the

Clearinghouse deems necessary to be defined. Such criteria are established and defined mainly in view of the liquidity condition of the assets/instruments.

Liquid collateral is that whose time frame for conversion into banking reserve (monetization) at the time it is executed is compatible with the Clearinghouse's settlement window. Conversely, illiquid collateral is that whose time frame for monetization exceeds the time frame available up until the time for settlement.

In addition to the deposit in local currency, also considered as liquid collateral is that made up of federal government bonds, selected mutual funds shares and bank letters of credit with a settlement clause on T+0, issued according to the models defined by BM&FBOVESPA.

It should be stressed that

- the collateral-related limits may be altered at any time by BM&FBOVESPA, with the new limits becoming promptly applicable;
- at its sole discretion, the Clearinghouse reserves the right to refuse any asset/instrument presented as collateral; and
- regardless of the fact of the Clearinghouse accepting an asset as collateral for a Customer's positions and transactions, the Broker and the Clearing Member linked to them are responsible for their issuance and authenticity, as well as for their immediate replacement, upon the Clearinghouse's determination. Such responsibility holds even for the cases when the Clearinghouse understands that a certain collateral had its integrity or executability impaired. In such cases, the Broker and/or the Clearing Member may even be called to post the corresponding value in cash.

The collateral values are ascertained daily at market price, in local currency, and are subject to reduction because of the discounting of execution costs and the application of haircuts. Execution costs include relevant transaction costs and possible taxes. Haircuts are determined as a function of

- the market risk associated with the asset/instrument offered as collateral, including foreign exchange risk for those assets denominated in foreign currencies;
- for cross-border assets, the credit risk of their issuing institution, including country risk;
- the liquidity risk associated with the time frame needed to execute collateral; and
- other risks, including event risk.

The collateral issued/deposited abroad has its value converted into local currency at the proper exchange rate.

**Collateral transfer** – deposit, withdrawal and distribution – generally occurs in three stages, namely:

- i. transfer request to the Clearinghouse;
- ii. transfer assessment by the Clearinghouse; and
- iii. execution of the transfer, if authorized by the Clearinghouse, under the conditions the latter determines.



Collateral may be transferred, or replaced, only upon the pledging participant's request, by means of a specific authorization from the Clearinghouse.

The participant responsible for transferring the collateral utilizes, for such procedure, the Collateral Management System, through which it requests the transfer, by identifying the collateral to be transferred, and monitors the transfer status, considering that:

- the transfer of a Customer's collateral is requested to the Clearinghouse by the Broker or PLD, as the case may be, responsible for the transactions and positions covered by such collateral, including in the event that there is an Intermediary between the Customer and the Broker;
- Clearing Members and PLDs have access to the Collateral Management System to transfer their own collateral and to distribute collateral to participants who are directly under its responsibility; and
- participants belonging to the Local, Agricultural Commodities Special Local, Gold Refiner and Supplier categories have no access to the Collateral Management System, with their collateral being transferred with the help of the Clearinghouse, upon the participant's request by letter.

Upon assessment of a request for collateral transfer, in order to decide to accept it or not, the characteristics of the asset to be transferred are analyzed, as well as the impact of the transfer on the Clearinghouse's exposure to the involved participants' risks, be they the collateral holder, those responsible for the positions covered, or to be covered, by the collateral, or its issuers. The transfer request is rejected if the collateral transfer results in some non-adherence of participants to the respective limits and restrictions defined by the Clearinghouse.

**Collateral pledge** is the procedure to constitute collateral in favor of the Clearinghouse. Having accepted such constitution, the Clearinghouse determines the respective *acceptance price*, according to its own criteria. Except for the funds deposited in local currency, any asset is subject to

- the application of haircuts;
- restrictions as to the volume maintained as collateral in the form of a same asset or group of assets *vis-à-vis* the risk of the portfolio for which the collateral is earmarked and its issuer's risk; and
- other conditions which the Clearinghouse deems necessary to impose.

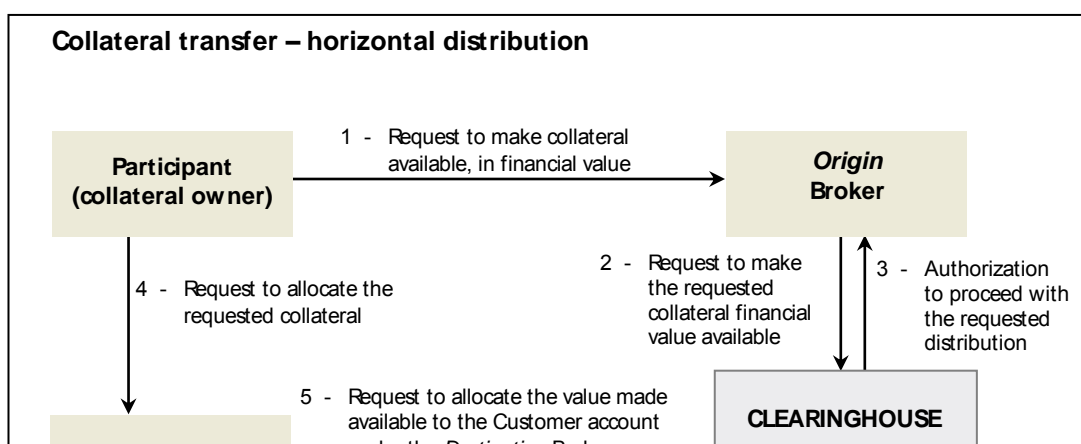
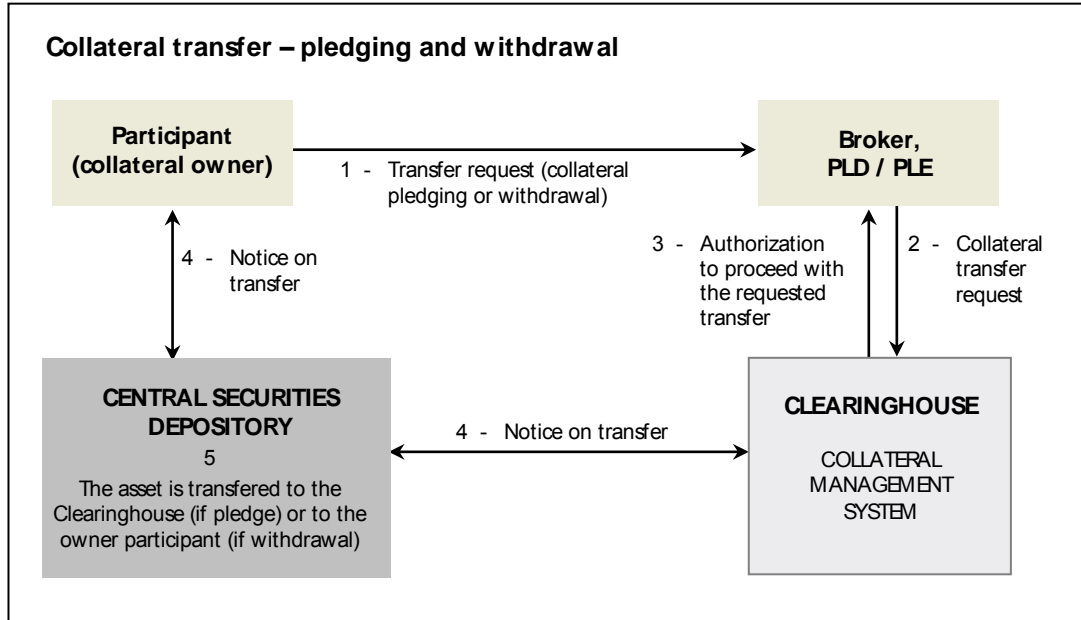
The **horizontal distribution** of collateral is the procedure through which the collateral no longer covers the risk of the position owned by a Customer, under the responsibility of a Broker and a Clearing Member, since it is intended to cover the risk of the position owned by the same Customer, but attributed to another Broker and/or Clearing Member.

The **vertical distribution** of collateral is the procedure through which the participant (Clearing Member or Broker) holder of the collateral transfers a part or the whole of its value to a participant with whom he has a contractual relationship (Broker or Customer, respectively), according to the rules, restrictions, and conditions established by the Clearinghouse.

The **withdrawal** of collateral is the procedure opposite to the pledging, that is, the procedure through which a certain asset is no longer characterized as collateral. The procedure to withdraw a Customer's collateral must be executed with the Clearinghouse by the Broker who pledged it, even if its financial value has been distributed, along the time, to cover the Customer's positions under (an)other Broker(s).

When assessing a withdrawal request, the Clearinghouse verifies the sufficiency of remaining collateral after withdrawal *vis-à-vis* its exposure to the participant involved, considering, to that end, debtor Multilateral Settlement Values due and the risk of the participant's positions, updated with the transactions executed on the day up until the time of assessment, according to the intraday risk monitoring criteria. For such assessment, the positions of the Customer under the responsibility of other Brokers and/or Clearing Members is taken into account.

The following figure illustrates, in a schematic, very general way, the stages of the procedures of collateral pledge, withdrawal, and distribution. The figure does not contain the operational specificities of each asset/instrument.



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**Figure 10 – Collateral pledging, withdrawal, and distribution**

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The Central Depository figure, in the diagram describing the collateral pledging and withdrawal procedures, represents the entity where pledging, registration, and custody of the underlying asset of the transaction is made. In the case of federal government bonds and Bank CDs, for example, it is SELIC and Cetip, respectively.

Every pledged collateral is associated with a **purpose**. The purpose of a collateral indicates its destination and must be defined when the pledging or transfer of the financial asset/instrument is requested. Collateral may have as its purpose to cover the margin of transactions other than those executed via WTr, cover the margin of transactions executed via WTr, constitute the contribution to mutualized funds that composes the Clearinghouse's financial safeguards, and increase operational limits, among others. The alteration of the purpose of a collateral must follow the criteria established by the Clearinghouse but must not result in the participants involved not adhering to the limits the Clearinghouse attributes them.

Shown next are the relevant aspects of the operational procedures for collateral transfer. Fulfillment of the margin call or advance of margin call must comply with the schedules and time frames mentioned in sections 3.2 and 3.3 preceding this section.

- **Local Currency**

There are two operational alternatives for cash collateral transfer, namely, via Clearing Member and via BM&FBOVESPA Bank.

**Via Clearing Member**, the funds are transferred between the Clearinghouse and the Clearing Member through the Multilateral Settlement of Clearing Members, with the corresponding value being incorporated to the Clearing Member's VLM – added to or subtracted from, if a cash collateral withdrawal or pledging, respectively.

**Via BM&FBOVESPA Bank**, upon pledging of the funds, they are transferred by the participant (Broker, PLD or Clearing Member, as the case may be) to the Clearinghouse's specific current account with the BM&FBOVESPA Bank, called *margin account*. Pledging information is transmitted to the Collateral Management System, after which the participant must, through the Collateral Management System, allocate the funds to the respective clients, by indicating the proper purposes. Only after allocation of the funds is the coverage of the margin for such funds considered executed.

Fund withdrawal is requested by the participant through the Collateral Management System. When the request is accepted, after the Customer's risk is assessed, the BM&FBOVESPA Bank, upon the Clearinghouse's instruction, transfer the funds from the Clearinghouse's margin account to the current account indicated by the participant, when the transfer is requested.

- **Federal Government Bond**

The constitution of collateral under the form of a government bond is processed by transferring the bonds in Selic, with their linking in favor of the Clearinghouse via financial system's messages – messages from the STR of SEL groups – Selic Transactions Control and LDL for Collateral Department, or Bond Transfer, with those from the second group only being utilized for collateral withdrawal.

High-liquidity bonds are those which can be utilized for Bacen discount window. Such bonds are automatically accepted and assessed on a daily basis for the respective discount window values disclosed by Bacen, liable to be reduced through the application of haircuts, upon the Clearinghouse's discretion. The acceptance of the other bonds depends on the Clearinghouse's previous assessment, which includes market risk, credit risk, liquidity and maturity aspects.

Bonds pledged as collateral must be replaced prior to their respective maturities, with the advance period as established by the Clearinghouse.

- **Stock of BM&FBOVESPA listed company**

The Clearinghouse can accept stock from BM&FBOVESPA listed companies for pledging as collateral, with stock ownership having to be proved upon pledging, as well as stock custody in BM&FBOVESPA, including ETFs<sup>9</sup>. Their constitution as collateral is processed by transfer to BM&FBOVESPA, which acts as a custody agent, after pledging request via Collateral Management System.

The acceptance of a stock not belonging to Ibovespa's theoretical portfolio is conditioned on the Clearinghouse's assessment concerning market and liquidity risks.

Stock is assessed by its lowest quotation between the average and closing prices on the immediately preceding business day, with application of haircuts according to the stock's participation in Ibovespa's theoretical portfolio. When such price quotation is not representative, the Clearinghouse can arbitrate the price to be used.

- **Private Securities**

The constitution of private securities as collateral is processed by transferring the securities to the Clearinghouse's account with the depository or custody institution where the securities are registered, according to the schedule of the respective institution.

Bonds pledged as collateral must be replaced prior to their respective maturities, with the advance period as established by the Clearinghouse.

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<sup>9</sup> ETF stands for Exchange Traded Fund. ETFs are traded in Bovespa's secondary market, so that they undergo the same criteria and procedures defined for collateral composed of BM&FBOVESPA listed stock.

### **Banking Deposit Certificate (CD)**

Banking Deposit Certificates (CDs) registered at Cetip and issued by banks authorized by BM&FBOVESPA, previously and duly registered as issuers, are accepted as collateral. The deposit is processed by transferring the certificate to BM&FBOVESPA's account with Cetip, linking it in favor of the Clearinghouse. Such transfer is executed through a double order – from the Clearinghouse and from the institution which has the CD under its custody.

CDs are evaluated by their respective market value by considering the interest rates that apply to instruments of similar maturity and risks, in addition to haircuts. When it is not possible to observe interest rates for transactions of similar maturity and risks, CDs are assessed by their respective issuing value (principal amount) to which haircut may be applied, at the discretion of the Clearinghouse.

BM&FBOVESPA establishes limits to CD issuance and utilization together with bank letters of credit. The criteria concerning such limits are presented below.

### **Rural Product Note (CPR)**

CPRs registered with the SRCA are accepted, as long as duly guaranteed by financial institutions authorized by BM&FBOVESPA.

The criteria for acceptance and utilization of CPRs as collateral, as well as the rules for assessing the securities pledged, are established according to the type of security – financial CPR, physical CPR, etc.

Fixed-rate financial CPRs are accepted regardless of the underlying product. Financial CPRs indexed to the price of the underlying product and physical CPRs are accepted upon the Clearinghouse's prior assessment and authorization, except for those whose underlying product is Coffee Arabica. The acceptance is also conditional on the security's time to maturity.

The limits for utilization of CPRs are defined in a variable manner, in order to allow for their higher utilization during the period of agricultural contracts delivery, solely to meet the additional margin call, during the delivery period. Haircuts also vary at the time of alteration of limits under such circumstances.

CPRs are evaluated by their respective market value by considering the interest rates that apply to instruments of similar maturity and the futures prices of the underlying product, in addition to haircuts.

#### **▪ Bank Letter of Credit**

Letters of credit can be admitted as collateral provided they are issued by banks duly registered as issuers, according to the models and standards established by BM&FBOVESPA.

Once a bank letter of credit is authorized as collateral, its pledging occurs by sending a letter to the Collateral Department, which then proceeds with verification of the adherence of the document to the standard defined by BM&FBOVESPA and of the information contained therein.

Bank letters of credit pledged as collateral must be replaced prior to their respective maturities, in due advance as established by the Clearinghouse.

Limits to the issuance and utilization of CD and Bank Letters of Credit are jointly defined by BM&FBOVESPA. The criteria concerning such limits are presented below.

- **Mutual Fund Shares**

Mutual fund shares previously authorized by the Clearinghouse, solely constituted for that purpose, are accepted as collateral. The resulting shares are automatically tied up as a pledge with the Clearinghouse, and only the Clearinghouse can authorize their release for withdraw, with each fund's manager being responsible for controlling the applications carried out. The funds applied in the fund are linked to the coverage of margin with the Clearinghouse through the Credit Rights Assignment Contract. Such contract can be contained in the fund's rulebook or can be executed between the Broker or Clearing Member, as the case may be, BM&FBOVESPA, the fund's manager and the institution, if any, through which application and redemption of shares is executed.

The value of the fund shares pledged as collateral is automatically corrected, according to each fund's updating frequency.

Fund shares transfer must comply with the operational procedures established by the Clearinghouse and each fund's manager, especially as concerns schedules, flow of authorizations and confirmations, among others.

Depending on the fund, it will be allowed (i) to use the shares available – not blocked by the Clearinghouse for margin coverage – for settlement of debts with the Clearinghouse; and/or (ii) to transfer funds resulting from redemption of fund shares to the responsible Clearing Member, through the Clearing Members Settlement; and/or transfer funds resulting from fund shares redemption to the Broker through the BM&FBOVESPA Bank.

- **Gold**

The utilization of gold to cover margin takes place by pledging certificates representing gold deposited in BM&FBOVESPA's Gold Fungible Custody System. Valuation is given by the lowest between the average and closing prices at BM&FBOVESPA's trading floor on the immediately preceding business day, with possible application of haircuts.

- **Foreign Currency – U.S. Dollars**

The Clearinghouse accepts the deposit of U.S. dollars as collateral of participants operating under the terms of CMN Resolution no. 2.687.

In any circumstance, the constitution of collateral in U.S. dollars depends on previous consultation with the Clearinghouse, which may set up limits for the utilization of such type of collateral.

The deposit is processed by transferring the dollars to BM&FBOVESPA's deposit account with banks abroad.

The amount of the dollars pledged as collateral is converted on a daily basis into Reais based on the Real-dollar exchange rate in effect on that day, as defined by BM&FBOVESPA.

Haircut on the dollar value reflects the risk of exchange rate variation and, upon the Clearinghouse's discretion, other risks and/or costs related to the execution of dollars pledged as collateral.

- **United States Treasury Securities (*Treasuries*)**

*Treasuries* are accepted as collateral of the participants operating under the terms of CMN Resolution 2.687.

The constitution of *treasuries* as collateral depends on previous consultation with the Clearinghouse, which may set up limits for the utilization of such type of collateral.

Their pledge is made through the transfer of the corresponding bonds to an account held by the Clearinghouse with depository institutions located abroad.

The amount of the dollars pledged as collateral is converted on a daily basis into Reais based on the Real-dollar exchange rate in effect on that day, as defined by BM&FBOVESPA. Haircut on the value of *treasuries* reflects the risk of variation of *treasuries* price in U.S. dollar and the risk of exchange rate variation and, upon the Clearinghouse's discretion, other risks and/or costs related to the execution of *treasuries* pledged as collateral.

#### ▪ **Other Assets and Instruments**

The acceptance criteria, limits, form of evaluation, as well as haircuts are defined on an individual basis in each case submitted to the Clearinghouse evaluation.

### **3.4.2. Limits to the Utilization of Collateral**

BM&FBOVESPA established two groups of limits which restrict the utilization of collateral, as described in the following sub-sections:

- limits for the collateral constituted by bank letters of credit and CDs; and
- limits for the utilization of illiquid collateral.

#### **3.4.2.1 Limits Concerning Bank Letters of Credit and CDs**

At its own discretion, the Clearinghouse may define for each Issuing Bank a limit for the issuance of Letters of Credit and Certificates of Deposit to be pledged as collateral, in observance of the procedures, parameters and conditions described below.

The limits associated with Bank Letters of Credit and CDs refer to volume issued, volume pledged, *collateral substitution*, utilization of *master-type* collateral, among others. In order to define such limits, BM&FBOVESPA may consider, among other factors, the risk exposure of positions held by the Issuing Banks in their own clearing and settlement environments, as well as the characteristics of the collateral they have pledged, in addition to the other collateral of its issuance, of other categories such as bank-guaranteed Rural Product Notes (CPRs). The defined limits may be altered at any time by Clearinghouse, with the new limits becoming promptly applicable.

Limits will be assigned only to the Issuing Banks that are previously registered and regularly send their balance sheets and documentation relating to changes in their corporate and/or managerial structures, and maintain the signature cards of their directors and proxies with power to sign letters of credit duly updated.

To ascertain the participants' adherence to the limits, the Clearinghouse may consider institutions belonging to the same economic and/or financial conglomerate in a joint manner.

The following are the limits concerning the utilization of bank letters of credit and CDs:

- Issuance Limit per Issuing Bank;
- Issuance Limit per Customer;
- Limit for the Pledge of Letter of Credit or Certificate of Deposit through a Broker or Clearing Member Associated with the Issuing Bank; and
- Limits for the Pledge of Master Letters of Credit.

Defined below are the characteristics, prohibitions, and criteria for extending such limits.

▪ **Issuance Limit per Issuing Bank**

- i. The *Issuance Limit* is established per Issuing Bank and includes the total amount of Letters of Credit or Certificates of Deposits issued by the bank and pledged as collateral with the Clearinghouse.
- ii. In the calculation of the issuance limit, BM&FBOVESPA may consider other pledged collateral which represent a credit risk exposure for the issuer, such as bank-guaranteed Rural Product Notes (CPRs).
- iii. The *Issuance Limit* assigned by BM&FBOVESPA to each Issuing Bank,  $IL_{Issuing\ Bank}$ , does not exceed forty percent (40 %) of the issuing bank's net worth, or one (1) time the BM&FBOVESPA equity, whichever is the smaller, in observance of the provisions defined in the next paragraph.

$$IL_{Issuing\ Bank} \leq \min 0,4 \times NW_{Issuing\ Bank} , NW_{BM\&F} \quad (6)$$

- iv. The *Issuance Limit* may be increased beyond the limit established in (iii), provided the Issuing Bank deposits federal government securities with the Clearinghouse, in accordance with the provisions set forth in **Extension of Limits**;
- v. In the events that are characterized as *collateral "substitution"* (for example, when bank A or its associated companies utilize collateral issued by bank B and bank B or its associated companies utilize simultaneously collateral issued by bank A), the issuing/beneficiary bank's *Issuance Limits* may undergo a double impact. The same principle may be applied when more than two institutions are involved in a collateral "substitution" process.

▪ **Issuance Limit per Customer**

- i. From the *Issuance Limit* assigned to a certain Issuing Bank,  $IL_{Issuing\ Bank}$ , no more than twenty-five percent (25 %) can be utilized as collateral for the open positions held by a single Customer, that is,

$$Issuance\ Limit\ per\ Customer_{Issuing\ Bank} \leq 0,25 \times IL_{Issuing\ Bank} \quad (7)$$



- ii. The *Issuance Limit per Customer* may be increased beyond the limit established in (i), provided the Issuing Bank deposits federal government securities with the Clearinghouse, in accordance with the provisions set forth in **Extension of Limits**.
- **Limit for the Pledge of Letter of Credit and Certificate of Deposit through a Broker or Clearing Member Associated with the Issuing Bank ( $LD_{AP}$ )**
    - i. The *Limit for Deposit Through a Broker or Clearing Member Associated with the Issuing Bank* equals the amount of the Letters of Credit or Certificates of Deposit issued by the bank and pledged as collateral by the participants who settle their transactions through a Broker or Clearing Member which is associated with, or is a subsidiary of, or is controlled by or is the controller of the Issuing Bank;
    - ii. The *Limit for the Pledge through a Broker or a Clearing Member associated with the Issuing Bank* cannot exceed the total value of the collateral deposited with the FDO by the economic conglomerate to which the issuing bank belongs, in observance of the provisions set forth in (iii) hereinafter; and
    - iii. The *Limit for the Pledge through a Broker or a Clearing Member associated with the Issuing Bank* may be increased beyond the limit established in (ii), provided the Issuing Bank deposits federal government securities with the Clearinghouse, in accordance with the provisions set forth in **Extension of Limits**.
  - **Limits for the Utilization of Master Letters of Credit**
    - i. The *Limit for the Utilization of Master Letters of Credit* corresponds to the maximum amount of Letters of Credit issued in favor of a Broker, which can be allocated as collateral for the positions of a single Customer;
    - ii. The *Limit for the Utilization of Master Letters of Credit* cannot exceed ten percent (10 %) of the total amount of Letters of Credit issued in favor of the Broker, or the total value of the collateral pledged by the Broker to the FDO, whichever is larger; and
    - iii. When for the proprietary account of the Broker or associated companies, the limit referred to in (ii) may be extended in up to one hundred percent (100 %) of the amount of letters of credit, at BM&FBOVESPA's discretion.

- **Extension of Limits Concerning Bank Letters of Credit and CDs**

BM&FBOVESPA may, at its own discretion, allow that letters of credit and certificates of deposit be used in an amount larger than that established in *Issuance Limit per Issuing Bank*, *Issuance Limit per Customer* and *Limit for the Pledge through a Broker or Clearing Member associated with the Issuing Bank*, if the Issuing Bank deposits federal government securities in favor of the Clearinghouse. The same rules and operating procedures that apply to the set of Clearinghouse collateral and safeguards will also be applicable to federal government securities, pursuant to the provisions of current regulation.

As a general rule, for extending the level of utilization of bank letters of credit and CDs, pledging of securities is required at a 1:1 ratio, pursuant to the criteria described below.

Situation where there is no issuance of collateral for Customers that maintain a contractual relationship with the Broker or the Clearing Member associated with the Issuing Bank

Let us consider variable  $COLL_{Customer}$ , which represents the amount required due to the excess issuance for each Customer:

$$COLL_{Customer} = \sum_{i=1}^N G_i, \quad G_i = \max(V_i - 0,25 \times IL_{Issuing\ Bank}, 0) \quad (8)$$

where

- $V_i$  : the value issued by the *Issuing Bank* for the *i*-th customer;
- $IL_{Issuing\ Bank}$  : the Issuance Limit assigned by BM&FBOVESPA to the Issuing Bank; and
- $N$  : the number of Customers who have collateral issued by the Issuing Bank.

$G_i$  represents the amount required as collateral from the Issuing Bank by reason of the amount issued for the *i*-th customer, should this amount be over twenty-five percent (25 %) of the issuance limit of the Issuing Bank,  $IL_{Issuing\ Bank}$ .

The amount required as collateral from the Issuing Bank due to the “total” excess issuance, is determined as follows, regardless of the amount issued whose risk is already covered by the pledge of securities:

$$COLL_{Total} = \max\left(\sum_{i=1}^N V_i - COLL_{Customer} - IL_{Issuing\ Bank}, 0\right) \quad (9)$$

The amount of the collateral required from the Issuing Bank for extending the utilization of bank letters of credit and CDs is given by

$$Collateral\ required = COLL_{Customer} + COLL_{Total} \quad (10)$$

Situation where there is issuance of collateral for Customers that maintain a contractual relationship with the Broker or the Clearing Member associated with the Issuing Bank

Consider variable  $COLL_{Customer}$ , defined similarly to that of the previous situation,  $COLL_{Customer} = \sum_{i=1}^N G_i$ .

Consider variables  $V_{i,AP}$  and  $RCE_{i,AP}$  thus defined:

$V_{i,AP}$  : value of the bank letters of credit and CDs issued by the Issuing Bank to the *i*-th Customer and utilized as collateral for his positions under Broker or Clearing Member associated with the Issuing Bank; subscript *AP* indicates associated participant; and

$RCE_{i,AP}$  : the *residual credit exposure* of the *i*-th customer at the Broker or the Clearing Member associated with the Issuing Bank, i.e. the amount of collateral issued for the Customer and utilized under the Broker or the Clearing Member, discounted from the value of government

securities deposited by the Issuing Bank by reason of the excess issuance for the Customer:

$$RCE_{i,AP} = \max(V_{i,AP} - G_i, 0) \quad (11)$$

The amount required as collateral from the Issuing Bank due to the excess issuance to Customers under the Broker or Clearing Member associated with it, is determined as follows, regardless of the amount issued to each Customer whose risk is already covered by the pledge of securities:

$$COLL_{AP} = \max\left(\sum_{i=1}^N RCE_{i,AP} - LD_{AP}, 0\right) \quad (12)$$

where  $LD_{AP}$  is the *Limit for the Pledge of Letter of Credit and Certificate of Deposit through a Broker or Clearing Member Associated with the Issuing Bank*.

The amount required as collateral from the Issuing Bank due to the “total” excess issuance, is determined as follows, regardless of the amount issued whose risk is already covered by the pledge of securities:

$$COLL_{Total} = \max\left(\sum_{i=1}^N V_i - COLL_{Customer} - COLL_{AP} - IL_{Issuing Bank}, 0\right) \quad (13)$$

Finally, the amount of the collateral required from the Issuing Bank for extending the utilization of bank letters of credit and CDs is given by

$$Collateral\ required = COLL_{Customer} + COLL_{AP} + COLL_{Total} \quad (14)$$

The deposit of federal government securities utilized to enhance the use of letters of credit and certificates of deposit is made in observance of their *acceptance prices*. The Clearinghouse may, at any time, increase or decrease the number of securities to be required from the Issuing Bank, whenever it verifies an alteration in their *acceptance prices*.

The securities deposited by the Issuing Bank will be retained by the Clearinghouse for as long as the bank makes use of the enhancement of its limit.

The acceptance of a request to transfer such collateral depends on the involved participants' adherence to the applicable limits, as previously described. At the time of the request for pledging or transfer, barring any violation of the limits, the value of the pledge requested is *reserved* to the requesting participant up until the pledge is executed.

▪ **Prohibitions Concerning the Utilization of Bank Letters of Credit and CDs**

- i. A letter of credit or a certificate of deposit cannot be used as collateral for the proprietary account of their Issuing Bank, or of non-resident financial and non-financial companies associated with the

Issuing Bank. Responsibility for compliance with this provision is incumbent on the Issuing Bank, the Broker and the Clearing Member;

- ii. Letters of credit or CDs cannot be used as collateral for the Clearing Fund when the contributing Clearing Member is associated with, or is controlled by, or is the controller of the Issuing Bank.
- iii. The use of a *master* letter of credit issued in favor of a participant not belonging to the Commodities Brokerage House category is forbidden; and
- iv. The use of *master* letters of credit to guarantee funding operations (*box*) in the options markets is forbidden.

### 3.4.2.2 Limits to the Utilization of Illiquid Collateral

As previously defined, **liquid** collateral is that whose time frame for conversion into banking reserve (monetization) at the time it is executed is compatible with the Clearinghouse's settlement window. Conversely, **illiquid** collateral is that whose time frame for monetization exceeds the time frame available up until the time defined for settlement.

As previously defined, Federal government bonds can be considered **liquid**, since, if necessary, the Clearinghouse can execute a sale transaction, either repo or definitive, of such securities, receiving the same corresponding funds in its Settlement Account, on the same day, in a time frame shorter than its settlement window. On the other hand, as an example, stock listed in BM&FBOVESPA are considered illiquid, since the settlement of purchase and sale transactions of such assets occur only on the third business day after registration of the trade, that is, on T+3.

The *guaranteed account contracts* and the *liquidity assistance contracts* allow the Clearinghouse to accept certain types of illiquid collateral.

The **guaranteed account contract** is the contract executed between BM&FBOVESPA and a domestic bank through which the bank offers BM&FBOVESPA the possibility of drawing funds forthwith and unconditionally, according to contracted limits, such loan being based on BM&FBOVESPA's own funds. In case of settlement default by a participant whose transactions are being covered only by illiquid collateral, the funds of the *guaranteed account* may be used to meet the payments due by the Clearinghouse in the settlement window, with the drawn funds being returned after the collateral execution process is completed.

The *liquidity assistance contract*, executed between BM&FBOVESPA and a bank, foresees the monetization of collateral, generally for a limited amount, within the Clearinghouse's settlement window time frame. Such contract, therefore, allows illiquid collateral to be changed into liquid collateral.

In order to control its exposure to illiquid collateral and mitigate the risks related to the financial settlement process, the Clearinghouse imposes restrictions to the utilization of the pledged collateral. To that end, the Clearinghouse classifies the collateral pledged by a participant as **liquid** and **illiquid**, depending on the mechanisms to provide liquidity in a settlement-failure situation, by using half of the

monetization capacity of each type of collateral to ensure its capacity to meet its obligations, even if two participants default simultaneously.

Take as an example U.S. dollars posted as collateral, which are considered, in principle, **illiquid**, since the buying and selling transactions with foreign currency are generally settled two business days after contracting, that is, on T+2. However, if BM&FBOVESPA has executed with domestic banks *limit-opening contracts for U.S. dollar purchase and sale* with a specific clause for settlement on T+0 and within the Clearinghouse's settlement window time frame,

- the amount of dollars pledged by a participant as collateral which does not exceed half of the total limit set forth in such contracts is considered **liquid**; and
- the amount of dollars pledged by the same participant which exceeds half of such limit is considered **illiquid**.

Similarly, *treasuries* pledged as collateral are also, in principle, considered illiquid. With the aim of providing for a speedy, effective monetization process, BM&FBOVESPA can contract with the banks under whose custody such securities are previously-approved *liquidity facilities*, in U.S. dollars and fully collateralized by the *treasuries* deposited in the Exchange's account with the custodians. From the economic standpoint, such facility, called *overdraft account*, is equivalent to a *repo (repurchase agreement)* transaction with *treasuries*, executed between BM&FBOVESPA and the custodian, allowing for the monetization, in dollars, of such securities. From the operational standpoint, however, the withdrawal of funds from a previously-approved facility tends to be faster than the settlement of transactions with securities, since it requires no transfer of securities between different accounts. Therefore, by utilizing the *liquidity facility*, the *treasuries* monetization process translates into a U.S. dollar sale operation, drawn from the facility, to a bank with which BM&FBOVESPA has entered a *limit-opening contract for U.S. dollar purchase and sale*.

For the definition of the limits applicable to the use of **illiquid** collateral by a certain participant, the following variables apply:

- $V_i$  : amount, in local currency, of the total collateral of the  $i$  type,  $i = 1, 2, \dots, n$ , pledged by the participant, except for the collateral constituted of U.S. dollars and *treasuries*;
- $V_{Dol}$  : amount, in local currency, of U.S. dollars pledged as collateral by the participant;
- $V_{Treas}$  : amount, in local currency, of the *treasuries* pledged as collateral by the participant;
- $LQ_i$  : limit, in local currency, for collateral monetization of the  $i$  type,  $i = 1, 2, \dots, n$ , within the Clearinghouse's settlement window time frame, according to the liquidity-providing contracts; for the  $i$ -type collateral considered liquid, regardless of the existence of a monetization contract,  $LQ_i$  assumes an infinite value.
- $LQ_{Dol}$  : limit, in local currency, for U.S. dollar monetization within the Clearinghouse's settlement window time frame, according to liquidity-providing contracts; and
- $LQ_{Treas}$  : value of the liquidity facility, in local currency, contracted by the Clearinghouse with the custodian of the *treasuries* pledged as collateral.

The " $i$ -type" collateral denomination refers to the type of asset, or instrument, which makes up the collateral. Stock shares, CDs, government bonds, etc., are types of collateral.

The portion of the pledged collateral  $V_i$ ,  $i = 1, 2, \dots, n$ , which is considered illiquid by the Clearinghouse is given by the value of such collateral which exceeds half of the limit available for its monetization:

$$V_i^{lliq} = \max\left(V_i - \frac{LQ_i}{2}, 0\right) \quad (15)$$

On the other hand, the portion of collateral  $V_i$  which is considered liquid is given by:

$$V_i^{Liq} = V_i - V_i^{lliq} = \min\left(V_i, \frac{LQ_i}{2}\right) \quad (16)$$

Considering the whole set of collaterals  $V_1, V_2, \dots, V_n$ , the Clearinghouse considers as illiquid and liquid, respectively, portions

$$V^{lliq} = \sum_{i=1}^n V_i^{lliq} \quad \text{and} \quad V^{Liq} = \sum_{i=1}^n V_i^{Liq} \quad (17)$$

Due to the fact that the monetization of *treasuries* in local currency ultimately depends on the limits for U.S. dollar purchase and sale transactions, the liquid and illiquid portions of the collateral made up by *treasuries* and U.S. dollars are jointly calculated.

The amount of *treasuries* that cannot be immediately monetized into U.S. dollars, called  $V_{Treas}^{lliq}$ , is given by the value of the *treasuries* pledged as collateral which exceeds half of the value of U.S. dollar liquidity facility for such assets:

$$V_{Treas}^{lliq} = \max\left(V_{Treas} - \frac{LQ_{Treas}}{2}, 0\right) \quad (18)$$

To the extent that value  $V_{Treas}^{lliq}$  cannot be immediately monetized in U.S. dollars, it cannot be immediately monetized either in local currency, thus being considered as illiquid.

The *treasuries* portion which can be immediately monetized in dollars is given by

$$V_{Treas}^{Liq} = V_{Treas} - V_{Treas}^{lliq} \quad (19)$$

From the collateral monetization process standpoint, such portion is treated the same way as the dollars pledged as collateral, i.e. their monetization in local currency depends only on the dollar sale transaction.

The portion of U.S. dollars and *treasuries monetized into dollars* considered illiquid, called  $V_{Dol}^{lliq}$ , is given by

$$V_{Dol}^{lliq} = \max\left(V_{Dol} + V_{Treas}^{Liq} - \frac{LQ_{Dol}}{2}, 0\right) \quad (20)$$

The sum of terms  $V_{Treas}^{lliq}$  and  $V_{Dol}^{lliq}$ , therefore, represent the portion of the total value of the collateral posted in New York, in U.S. dollars and/or *treasuries*, which cannot be monetized in the Clearinghouse's

settlement window, thus being characterized as illiquid. To the extent that the monetization of such portion is not feasible, its use must be supported by the guaranteed account mechanism.

The total value of the illiquid collateral pledged by the participant is given by

$$V_{Total}^{lliq} = V^{lliq} + V_{Treas}^{lliq} + V_{Dol}^{lliq} \quad (21)$$

In case of default, the value corresponding to  $V_{Total}^{lliq}$  cannot be promptly monetized and must be supported by the *guaranteed account* mechanism. For properly controlling the liquidity risk, the Clearinghouse establishes a fraction of the value available through the *guaranteed account* as the limit for using illiquid collateral, with the value of the illiquid collateral being considered for margin coverage given by

$$Iliquid\ Collateral\ Value\ Considered = \min\left(V_{Total}^{lliq}, \frac{1}{N} \times Value_{GuaranteedAccount}\right) \quad (22)$$

where  $N$  is a parameter set up by the Market Risk Committee, with a value greater than or equal to 1.33.

Pledging illiquid collateral exceeding the abovementioned limit is allowed, but the excess values are not used for margin coverage, which must be met only by the pledge of liquid collateral.

The portion of the total value of U.S. dollars and treasuries pledged as collateral which is considered illiquid, called  $V_{Dol}^{Liq}$ , is given by

$$V_{Dol}^{Liq} = \left[ V_{Dol} + V_{Treas} - V_{Treas}^{lliq} \right] - V_{Dol}^{lliq} \quad (23)$$

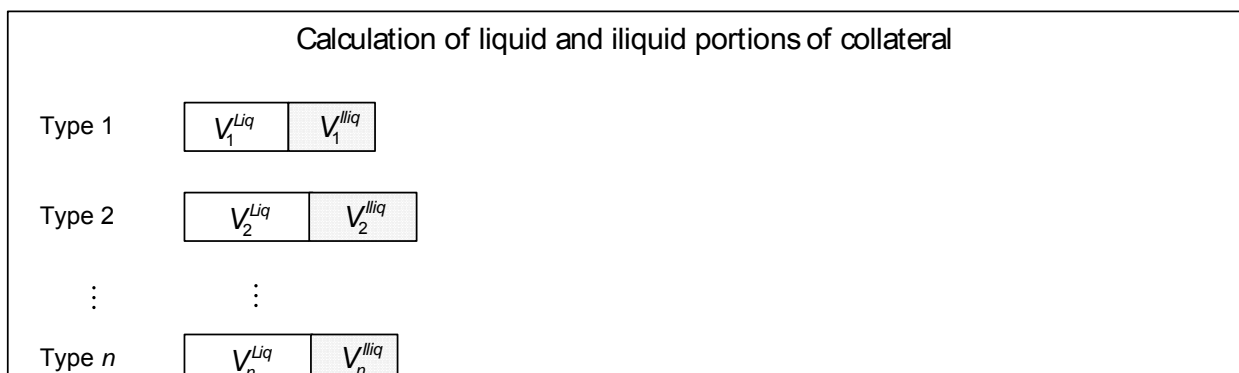
The total value of the collateral which is considered liquid is therefore

$$V_{Total}^{Liq} = V^{Liq} + V_{Dol}^{Liq} \quad (24)$$

In view of this criterion to calculate liquid and illiquid collateral, the value effectively considered by the Clearinghouse for covering the participant's required margin is

$$Total\ Value\ Considered\ for\ Margin\ Coverage = V_{Total}^{Liq} + \min\left(V_{Total}^{lliq}, \frac{1}{N} \times Value_{GuaranteedAccount}\right) \quad (25)$$

The following figure represents the collateral classification.



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**Figure 11 – Calculation of the collateral value effectively used for margin coverage**

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The Clearinghouse periodically discloses the list of collateral considered liquid and those considered illiquid, as well as the financial limits from which illiquid collateral is considered liquid due to the existence of specific monetization contracts.

The following example illustrates the calculation of liquid and illiquid portions of collateral and the value effectively considered for margin coverage.

**Example 1:** Let us consider that BM&FBOVESPA has negotiated the following limits with the banks:

$Value_{GuaranteedAccount}$  : R\$ 600 million

$LQ_{Dol}$  : R\$ 1 billion

$LQ_{Treas}$  : R\$ 1.5 billion

Let us also consider that a participant presents the following variables, corresponding to the collateral it pledged, totaling R\$ 860,000,000:

$V_{Dol}$  : R\$ 350,000,000

$V_{Treas}$  : R\$ 300,000,000



$$V^{lliq} : \text{R\$ } 210,000,000$$

$$V^{Liq} : \text{R\$ } 0$$

From the total R\$ 860,000,000 pledged as collateral by the participant, only R\$ 800,000,000 is effectively considered for margin coverage. In fact, the portions of collateral considered illiquid are

$$V_{Treas}^{lliq} = \max\left(V_{Treas} - \frac{LIQ_{Treas}}{2}, 0\right) = \max\left(300,000,000 - \frac{1,500,000,000}{2}, 0\right) = 0$$

$$\begin{aligned} V_{Dol}^{lliq} &= \max\left(V_{Dol} + V_{Treas} - V_{Treas}^{lliq} - \frac{LIQ_{Dol}}{2}, 0\right) = \\ &= \max\left(350,000,000 + 300,000,000 - 0 - \frac{1,000,000}{2}, 0\right) = 150,000,000 \end{aligned}$$

$$V_{Total}^{lliq} = V^{lliq} + V_{Treas}^{lliq} + V_{Dol}^{lliq} = 210,000,000 + 0 + 150,000,000 = 360,000,000$$

$$V_{Dol}^{Liq} = \left[V_{Dol} + V_{Treas} - V_{Treas}^{lliq}\right] - V_{Dol}^{lliq} = 350,000,000 + 300,000,000 - 0 - 150,000,000 = 500,000,000$$

$$V_{Total}^{Liq} = V^{Liq} + V_{Dol}^{Liq} = 0 + 500,000,000 = 500,000,000$$

$$\begin{aligned} \text{Total Value Considered for} \\ \text{Margin Coverage} &= V_{Total}^{Liq} + \min\left(V_{Total}^{lliq}, \frac{1}{N} \times \text{Value}_{GuaranteedAccount}\right) = \\ &= 500,000,000 + \min\left(360,000,000, \frac{600,000,000}{2}\right) = 800,000,000 \end{aligned}$$

If the margin required from the participant is R\$ 900,000,000, the pledging of only R\$ 40,000,000 will not be sufficient to cover that margin, even in the form of liquid collateral. One alternative to meet the requirement is to pledge an additional R\$ 100,000,000, solely in the form of liquid collateral.

### 3.5. Position Limits

The limits of open positions, or limits of concentration of positions, represent restrictions to the size of a participant's open interest. BM&FBOVESPA establishes limits for open positions, applicable to the number of contracts held by a Customer or group of Customers operating together.

The imposition of limits for open positions is designed to control and mitigate liquidity, credit, price manipulation, and corner risks.

The Clearinghouse imposes limits to the size of the positions assumed in derivatives markets, differentiated by type of derivative contract, underlying object, and maturity. The adherence of the positions to the limits per Customer or group of Customers operating together is monitored, and their

positions may all be consolidated, regardless of the Brokers and Clearing Members responsible. Ownership positions of Locals are subject to the same rules.

The limit for an open position in a contract  $C$ , with maturity  $v$ , is given by

$$Limite_{C,v} = \max(p_{C,v} \times Q_{C,v}, L_{C,v}) \quad (26)$$

that is, the position of the  $i$ -th participant, on maturity  $v$  of contract  $C$  is within the respective limit if

$$Q_i_{C,v} \leq \max(p_{C,v} \times Q_{C,v}, L_{C,v}) \quad (27)$$

where

$p_{C,v}$  : parameter, in percentage, defined for maturity  $v$  of contract  $C$  ;

$L_{C,v}$  : limit amount defined for maturity  $v$  of contract  $C$ , as a function of the risk volume; and

▪ for position in futures contract:

$Q_i_{C,v}$  : number of contracts of open position of the  $i$ -th participant,  $Q_i \geq 0$  ;

$Q_{C,v}$  : total number of contracts of open position of the market;

▪ for position in options contracts on the same underlying asset

$Q_i_{C,v}$  : delta-equivalent value of the open position of the  $i$ -th participant, and

$Q_{C,v}$  : the delta-equivalent amount of the total open position of the market,

$$Q_{C,v} = \frac{1}{2} \times \sum_i |Q_i_{C,v}| \quad (28)$$

$$Q_i_{C,v} = \sum_x q_i_{call,v,X} \times \Delta_{call,v,X} + \sum_x q_i_{put,v,X} \times \Delta_{put,v,X} \quad (29)$$

with

$q_i_{call,v,X}$  : number of contracts with call options at strike price  $X$  and maturity  $v$ , in the  $i$ -th participant's position,  $q_i > 0$  if long call option position,  $q_i < 0$  if short option position;

$q_i_{put,v,X}$  : number of contracts with put option contracts at strike price  $X$  and maturity  $v$ , in the  $i$ -th participant's position;

$\Delta_{call,v,X}$  : call option delta with strike price  $X$  and maturity  $v$ ; and

$\Delta_{put,v,X}$  : put option delta with strike price  $X$  and maturity  $v$ .

**Example 2:** Let us consider that BM&FBOVESPA establishes for the R\$ / US\$ exchange rate futures contract (FUT DOL) of any maturity the limit amount of 10,000 contracts and 20 % of total open contracts in the market, that is, the limits of open positions in this contract, for any maturity  $v$  are given by

$$Limite_{FUT\ DOL,v} = \max(0.2 \times Q_{FUT\ DOL,v}, 10,000)$$

Consider a participant (participant 1) with an open position at 2 maturities of FUT DOL,  $v_1$  and  $v_2$ , respectively, short in 25,000 contracts and long in 12,000 contracts. Assuming the totals open at such maturities are 200,000 and 37,000 contracts, respectively, then

$$Q_1 \text{ FUT DOL}_{v_1} = 25,000 \text{ e } Q_1 \text{ FUT DOL}_{v_2} = 12,000$$

$$Q \text{ FUT DOL}_{v_1} = 200,000 \text{ e } Q \text{ FUT DOL}_{v_2} = 37,000$$

$$\text{Limite FUT DOL}_{v_1} = \max 0.2 \times 200,000, 10,000 = 40,000$$

$$\text{Limite FUT DOL}_{v_2} = \max 0.2 \times 37,000, 10,000 = 10,000$$

Therefore, the participant has a fit position and an unfit position:

the position at maturity  $v_1$  fits within the limit, since  $Q_1 \text{ FUT DOL}_{v_1} = 25,000 \leq 40,000$

the position at maturity  $v_2$  does not fit within the limit, since  $Q_1 \text{ FUT DOL}_{v_2} = 12,000 > 10,000$

**Example 3:** Let us consider that BM&FBOVESPA establishes for the R\$ / US\$ exchange rate options contract (OPC DOL) of any maturity the limit amount of 8,000 contracts and 20 % of total open contracts in the market, that is, the limits of open positions are

$$\text{Limite OPC DOL}_{v} = \max 0.2 \times Q \text{ OPC DOL}_{v}, 6,000$$

Consider as available for trading the following OPC DOL contracts with maturity  $v^*$ : two call options with strike prices  $X_1$  and  $X_2$ , and a put option with strike price  $X_3$ . The market position is described in the following table.

| Participant              | OPC DOL – calls                 |                                 | OPC DOL – put                    |
|--------------------------|---------------------------------|---------------------------------|----------------------------------|
|                          | Strike price $X_1$<br>Delta 0.3 | Strike price $X_2$<br>Delta 0.9 | Strike price $X_3$<br>Delta -0.5 |
| Participant <sub>1</sub> | -15,000                         | 20,000                          | -12,000                          |
| Participant <sub>2</sub> | 3,000                           | 0                               | -14,000                          |
| Participant <sub>3</sub> | 12,000                          | -20,000                         | 26,000                           |

In order to calculate the delta-equivalent amount of the total open position of the market, it is necessary to obtain the delta-equivalent positions of each participant, according to equation (29).

$$\begin{aligned}
Q_i \text{ OPC DOL}_{v^*} &= \sum_X q_i \text{ call}_{v^*,X} \times \Delta \text{ call}_{v^*,X} + \sum_X q_i \text{ put}_{v^*,X} \times \Delta \text{ put}_{v^*,X} = \\
&= q_i \text{ call}_{v^*,X_1} \times \Delta \text{ call}_{v^*,X_1} + q_i \text{ call}_{v^*,X_2} \times \Delta \text{ call}_{v^*,X_2} + \\
&+ q_i \text{ put}_{v^*,X_3} \times \Delta \text{ put}_{v^*,X_3}
\end{aligned}$$

$$Q_1 \text{ OPC DOL}_{v^*} = -15,000 \times 0.3 + 20,000 \times 0.9 - 12,000 \times -0.5 = 19,500$$

$$Q_2 \text{ OPC DOL}_{v^*} = 3,000 \times 0.3 + 0 \times 0.9 - 14,000 \times -0.5 = 7,900$$

$$Q_3 \text{ OPC DOL}_{v^*} = 12,000 \times 0.3 - 20,000 \times 0.9 + 26,000 \times -0.5 = -27,400$$

$$Q \text{ OPC DOL}_{v^*} = \frac{1}{2} \times \sum_i |Q_i \text{ OPC DOL}_{v^*}| = \frac{1}{2} \times 19,500 + 7,900 + 27,400 = 27,400$$

The limit for open position in the OPC DOL contract is then worth

$$\text{Limite OPC DOL}_{v^*} = \max 0.2 \times 27,400, 8,000 = 8,000$$

Given this limit, only the position of Participant<sub>2</sub> fits within the limit, since

$$Q_1 \text{ OPC DOL}_{v^*} = 19,500 > 8,000$$

$$Q_2 \text{ OPC DOL}_{v^*} = 7,900 < 8,000$$

$$Q_3 \text{ OPC DOL}_{v^*} = 27,400 > 8,000$$

The limits are disclosed to the market by publication on BM&FBOVESPA's Website and in a Circular Letter.

In addition to the limits defined per contract maturity, BM&FBOVESPA may determine the limit for open positions for the sum of the amounts of positions at all maturities of the same contract.

The following aspects should be highlighted:

- BM&FBOVESPA may, whenever deemed necessary and at any moment, change the limits for open positions for one or more participants, on an individualized manner or for the market as a whole, even observing the nature of the risk of the entirety of operations of the participant's portfolio;
- In case of violation of the established limits for open positions, BM&FBOVESPA can also require the reduction of open positions and/or pledging of additional collateral, at its sole discretion. In the latter case, the value of the required additional collateral may be determined proportionally to the violation of the limit for open positions or according to another criterion established by BM&FBOVESPA.

- The Broker may, at its own discretion, establish for its clients limits for open positions lower (more restrictive) than those set forth by BM&FBOVESPA, being also responsible for controlling the positions' adherence to the more rigid limits – the control carried out by BM&FBOVESPA contemplates the limits it defines;
- To control the adherence to the limits for open positions, BM&FBOVESPA may consider the positions of each Customer or group of Customers operating together, consolidated independently from the Broker and Clearing Member responsible for them. In such cases, BM&FBOVESPA may contact all Brokers under whom the Customer maintains open positions; and
- In case there is a reduction of the total amount of open contracts in the market, BM&FBOVESPA may, at its own discretion, allow the holder of the open position within the limit, for reasons outside his own will, not to be obliged to reduce its position. Similarly, BM&FBOVESPA may allow for the position reduction to be within the respective limit to be entirely rolled out to another maturity, even if it temporarily remains unfit for such maturity as a result of the total open reduced amount of the new maturity.

### 3.6. Price Fluctuation Limits

**Lower (upper) price fluctuation limit** is the minimum (maximum) variation allowed for the quotation of a contract, during a trading day, in relation to a reference quotation, generally that of the last trading day.

The imposition of price fluctuation limits aims to prevent sudden and/or excessive volatility increases from yielding excessively high values for settlement on a single day, thus providing for an orderly convergence to a new price level. Therefore, fluctuation limits constitute an important mechanism to mitigate the liquidity risk of the Clearinghouse and its participants.

BM&FBOVESPA can impose such limits to contracts with daily settlement, differentiated by underlying asset, maturity or series, depending on the type of derivative. The values of the limits are defined by the Market Risk Committee and disclosed to the market through a Circular Letter.

In case of a lower (upper) fluctuation limit, no bids (offers) at a price lower (higher) than the price corresponding to the fluctuation limit will be accepted.

Lower and upper fluctuation limits of a contract are suspended from the **N**-th day of trading prior to

- the contract maturity, for contracts with cash settlement; and
- the beginning of the period to present the Delivery Notice, for contracts with physical delivery, with **N** being a parameter defined and disclosed by BM&FBOVESPA.

Any price fluctuation limit can be revoked or altered by BM&FBOVESPA, at any moment, even during trading hours and also for contracts / maturities / series with no limits, through a 30-minute advance notice to the market.

## 4. Settlement Failures

A settlement failure occurs upon non-fulfillment of the obligations.

The non-fulfillment of any obligation by a participant with the Clearinghouse or with the other participants, except when arising from events of an operational nature (in which case it will also be temporary) is characterized as a default. If the non-fulfillment is a result of events of an operational nature, so acknowledged by BM&FBOVESPA, the defaulting participant does not assume the defaulting condition, but rather that of an *Operational Defaulter*.

In any case, the faulty participant – whether *defaulting* or *Operational Defaulter* - shall be liable towards the Clearinghouse and/or other participants for any damage, loss, cost, or expense resulting from his default. The corresponding creditor participant, if any, has to communicate the Clearinghouse of the faulty participant's situation.

#### **4.1. Characterization of the Operational Defaulter Condition**

Once the communication of a participant's fault upon settlement is formalized with the Clearinghouse, it is the latter's sole responsibility to characterize the faulty participant as an *Operational Defaulter*.

#### **4.2. Procedures in Case of the Existence of an Operational Defaulter**

In the situation in which a participant is characterized as an *Operational Defaulter*, the Clearinghouse uses, in order to meet its obligations with the other participants, the collateral pledged by the former, and may use the credit facilities at its disposal, in case there is not enough time to execute the collateral before the time set for paying the Clearinghouse's creditors.

#### **4.3. Default Characterization**

The **Customer** is declared a defaulter by the responsible Broker, or by the responsible Intermediary, as the case may be, when he no longer executes, in the established manner and time frames,

- (i) the payments and/or
- (ii) the deliveries or transfers of assets, documents, or securities to meet the margin call
- (iii) owed to the Broker or to the Intermediary, respectively.

The **Intermediary** is declared a defaulter by the responsible Broker when he no longer executes, in the established manner and time frames,

- (i) the payments and/or
- (ii) the deliveries or transfers of assets, documents, or securities to meet the margin call owed to the Broker.

The **Broker** is declared a defaulter by the responsible Clearing Member when he no longer executes, in the established manner and time frames,

the payments and/or

- (i) the payments and/or
- (ii) the deliveries or transfers of assets, documents, or securities to meet the margin call owed to the Clearing Member.

The **Clearing Member** is declared a defaulter by the Clearinghouse when

- (i) he does not deliver the funds owed to the Clearinghouse, by not entirely transferring the debtor VLM to the corresponding Settlement Bank, in the manner and time frames established by the Clearinghouse; or
- (ii) it fails to transfer the required assets, documents, or securities in the prescribed form and within the established time frame.

#### **4.4. Default Procedures**

As set forth in the Clearinghouse Rulebook, in case of participant default – and such measures are applicable also in the cases of characterization of a participant as an *Operational Defaulter* - the Clearinghouse may, as the case may be

- i. compulsory close the defaulter's position
- ii. use the collateral of the participants involved to cover possible debit balances;
- iii. inform the market and the competent authorities;
- iv. impose the applicable penalties, pursuant to the provisions set forth in the Clearinghouse Rulebook;
- v. transfer the positions under the responsibility of defaulting Clearing Members or Brokers to other Clearing Members or Brokers, respectively upon the latter's previous acceptance.
- vi. execute the necessary transfers of funds through Settlement Banks other than the defaulting one; and
- vii. make use of other mechanisms to ensure the timely fulfillment of the pending obligations towards other participants.

In case of a Customer's default, the responsible Broker must inform the defaulter's situation to the Clearinghouse and request the latter to execute the defaulter's collateral. The communication of the Customer's default situation to the Clearinghouse must be formalized by producing the default declaration correspondence, pursuant to the standard defined by BM&FBOVESPA, together with the required documents.

### **VI. CUSTODY SERVICES**

#### **1. Gold Fungible Custody Service**

On account of the transactions in the gold-based derivatives and spot markets, the Clearinghouse offers a Gold Fungible Custody through which it controls the gold bars kept under its custody, which are deposited in Gold Custodians previously accredited by BM&FBOVESPA. Through this system, gold is registered at the Gold Custodians on behalf of the Clearinghouse. The Clearinghouse, in turn, controls each Customer's position, segregated into two portfolios – one book-entered position and one position of Gold Custody Certificates, issued by Custodians and endorsed to BM&FBOVESPA.

Gold kept under custody is available:

- to be sold in BM&FBOVESPA's Exchange Market;
- to be sold in the OTC market, provided the corresponding trade is registered in Teleouro;
- to be withdrawn in bars by Customers, provided such service is previously requested;
- to be subject to a balance transfer.

Such transfers are executed by means of request from the Customer owner of the bars, through the Broker under which they are registered with BM&FBOVESPA's custody service.

The gold bars registered with BM&FBOVESPA's custody may be used to settle transactions or to cover margin required by the Clearinghouse, to extend the operational limit, to contribute to the Clearing Fund and as collateral for the Gold Refiner or Supplier.

The Clearinghouse controls all gold bars registered in the Fungible Custody System and will make the transfers between the Custodians or between the agencies or branches of the same Custodian. While gold is registered in the Fungible Custody System, the custody fee due to the Custodian will be collected from participants by BM&FBOVESPA, which will then transfer its respective amount.

### **1.1. Responsibilities**

The Clearinghouse is liable to its Custody System users for the integrity, confidentiality, update, deposit, and withdrawal of the assets held under custody, also for settlement purposes, as well as for the maintenance of segregated accounts.

The Clearinghouse exempts itself from any responsibility when Custody System users fail to meet their obligations with their Broker, regardless of the reasons for their failure. In like manner, the Clearinghouse is not liable for the incorrect transfer of gold kept under custody on its behalf by a Broker.

The Custodian is responsible for issuing the Gold Custody Certificates and for the weight of the gold bars under its custody.

The Refiner and the Supplier are responsible for the purity content of the gold bars they refine/supply.

The Broker and the Intermediary are responsible for the customers that use the Custody System, as well as for their registration, the truthfulness of the information therein contained, for the registration of assets in segregated accounts, and for the integrity and confidentiality of the assets kept under custody on their behalf. The Broker and the Intermediary exempt the Clearinghouse from the losses and damages caused by that customer or by third parties. They are responsible to their Customers for the faithful deposit, withdrawal, and transfer of assets ordered by their holders, also for settlement purposes.

### **1.2. Control of the Balance under Custody**

The custody account is controlled in terms of the amount of gold contained, i.e. the balance of a custody account is only the amount, expressed in grams, of gold contained owned by its holder, not containing the identification of the Refiner and/or Supplier, Custodian, numbers, nominal weights and purity content of the bars, being fungible in all those respects.

The total quantity of gold contained in a custody account is equivalent to the sum of the quantities of gold calculated for each bar deposited therein, according to the following equation.



$$\text{Gold Contained} = \frac{\text{Nominal weight} \times \text{Purity content}}{1,000}$$

The system rejects the result as of the fourth decimal place, provided it is not over five ten-thousandths (0.0005) of one gram, in which case the third decimal place is increased by one thousandth (0.001) of one gram.

The following events result in an increase and decrease of the custody account balance, respectively indicated by I and D:

- I1 - reception of a Gold Custody Certificate or letter of transfer duly confirmed by the Custodian;
- I2 - gold bought in BM&FBOVESPA's Exchange Market;
- I3 - purchase of gold in the OTC market duly registered in Teleouro, after transaction settlement; and
- I4 - receipt of gold transferred from another custody account.

D1 - custody withdrawal

D2 - sale of gold in BM&FBOVESPA's Exchange Market;

D3 - sale of gold in the OTC market duly registered in Teleouro; and

D4 - transfer of gold to another custody account.

### **1.3. Gold Bar Specification**

The Clearinghouse accepts registration of gold for custody of bars from Refiners and/or Suppliers previously accredited by BM&FBOVESPA, with punches identifying the Refiner, the Supplier, the purity content, the nominal weight and the bar number, which have

- 250- and 1,000-gram weight, with a minimum purity content of 999 parts of fine gold per 1,000 parts of metallic alloy; or
- 100- and 400-troy ounce weights, with a minimum purity content of 995 parts of fine gold per 1,000 parts of metallic alloy and freely traded in the international market; the weight of such bars can be expressed in grams, with a tolerance in gross weight of up to  $\pm 5$  (five) troy ounces.

Under no circumstance will a gold bar whose actual weight, as calculated by the Custodian, is below the weight declared by the Refiner be accepted.

BM&FBOVESPA periodically discloses the list of Refiners and/or Suppliers whose gold bars are admitted within the scope of the Exchange.

### **1.4. Gold Bar Transfer**

The transfer of gold bars can only be carried out by a request by the respective holder, with the Broker sending the Clearinghouse a standard protocol for each type of transfer.

Transfers must comply with the schedules defined by the Clearinghouse, as well as those for collateral transfer and physical delivery, since the gold under custody can fulfill such purposes.

For the **registration** of deposit of gold under custody, the request must contain:

- the identification of the Clearing Member, Broker and Customer of the custody account to receive the deposit;
- number of the Gold Custody Certificate, if this is the case;
- nominal weight, purity content and number of the gold bar;
- identification of the Custodian; and
- identification of the Refiner.

For each deposited gold bar the weight of contained gold will be automatically calculated, for the purpose of custody account credit.

For the **withdrawal** of the gold under custody, the request must contain:

- the identification of the Clearing Member, Broker and Customer of the custody account to which the gold will be debited;
- the amount of gold to withdraw, in grams or in bars.

At the time of withdrawal request, the participant must inform his option for either receiving gold custody certificates or a book-entered position.

Although BM&FBOVESPA's Gold Custody is fungible, the nominal weight and purity content of the gold bar, the Refiner and the Custodian can be specified at the time the gold under custody is withdrawn. The Clearinghouse tries to meet the request of the optional characteristics of the gold bars, according to their availability, but does not undertake to meet the request, reserving itself the right to charge service fees for meeting such demand.

When the custody account balance is insufficient to allow the withdrawal of one gold bar, the account holder can ask BM&FBOVESPA to sell the needed quantity, or express its intention to sell to BM&FBOVESPA a possible remaining balance of its custody account. The sale of the balance after the withdrawal is executed according to the limits established by BM&FBOVESPA for the amount to be sold.

For **transfer** of balance between custody accounts, information is provided on the origin and destination accounts of the balance being transferred, there being allowed transfers

- between accounts of the same Customer linked to different Brokers;
- from the Broker's own account to the account of a Customer linked to the Broker;
- from a Customer's position to the Broker's own account; and
- between different Brokers' own accounts.

In the last type of transfer, the BM&FBOVESPA requires, in addition to sending the balance transfer protocol, sending of the Balance Transfer Letter by both Brokers involved in the transfer.

### **1.5. Custody Fee**

The custody fee will be charged to the Broker in the following situations:

- Whenever the Broker registers a purchase transaction in BM&FBOVESPA's trading floor;

- Starting the date when the Broker executes the registration of the Customer's gold delivery to BM&FBOVESPA's Custody;
- Starting the date when the Broker executes the registration of the Customer's gold withdrawal from BM&FBOVESPA's Custody; and
- Upon the balances kept in the Clearinghouse Fungible Custody System.

The payment of the custody fee owed to the Custodian will be the Clearinghouse's sole responsibility, from the effective date of registration of the gold delivery, and such fee will be forwarded to the Customer holder of the balance, through the Broker. The amount of the custody fee is calculated according to the following equation:

$$\text{Custody Fee} = \frac{P_{mgOZ1} \times F \times S_{cfd}}{30}$$

where

$P_{mgOZ1}$  : maximum price of OZ1 gold gram as of the reference date;

$F$  : parameter defined by BM&FBOVESPA; and

$S_{cfd}$  : custody balance at the end of the reference date.

The custody fee values are calculated on a daily basis and accrued along the month. Collection occurs on the 4th business day of the succeeding month or at the time the custody balance is offset – whichever occurs first. In any circumstance, the higher value between the custody fee accrued along the period and the custody fee equivalent to 100 grams of gold is charged.

## 2. Agribusiness Securities Custody Service

The Agribusiness Securities Custody Service is offered by BM&FBOVESPA, with the Clearinghouse being in charge of managing its supporting system, the Agribusiness Securities Custody Registration System – SRCA.

The SRCA is a securities custody system. It is responsible for registration of custody of securities issued by virtue of agribusiness activities involving, producers, exporters, industries, investors, and the government. In addition to registration of securities custody, the SRCA is also responsible for registration of transfers and retention of securities registered therewith.

At BM&FBOVESPA's discretion, the following securities can be registered with the SRCA:

- CPR - Physical or financial Rural Product Note;
- CDA / WA – Agribusiness Certificate of Deposit and Agribusiness Warrant;
- CDCA – Certificate of Agribusiness Credit Rights;
- LCA – Agribusiness Letter of Credit; and
- others.

CDCA and LCA securities are issued based on Credit Rights resulting from trades executed between rural producers, cooperatives, and third parties, arising from financing or loans earmarked for agricultural and livestock production. Thus, such securities shall have receivables attached as collateral.

The issuers of CDCA and LCA are responsible for the origin and authenticity of the Credit Rights, as well as for the corresponding physical and cash settlements.

At BM&FBOVESPA's discretion, the following Credit Rights can be registered with the SRCA:

- CPR - Physical or financial Rural Product Note;
- DM – Mercantile Trade Note;
- DR – Rural Trade Note;
- CRP – Securitized Rural Pledge;
- CRHP – Mortgage Rural Pledge Note;
- CRH – Mortgage Rural Note;
- CCB – Bank Credit Note;
- CCE – Export Credit Bill; and
- NCE – Export Credit Note.

BM&FBOVESPA's responsibility for providing such custody service does not include the truthfulness or regular standing of the information provided by the registration parties, the trades carried out with the registered security and corresponding financial transfers, nor the failure risk, of any nature whatsoever, on the part of the issuer of the security registered within its system.

The SRCA admits no transfer of book-entered ownership of a registered security, which should mandatorily occur in the trading systems linked to BM&FBOVESPA and the other exchanges or entities which organize OTC markets, by transferring the securities therein registered to the trading environments.

The registration of custody of securities with the SRCA makes book-entered trading in primary, secondary, and OTC markets feasible, as well as the transfer of ownership to buyers, by means of book-entered endorsement.

Securities registered with the SRCA can be posted as collateral

- in favor of the Clearinghouse, to meet the margin call of transactions registered with and settled through the Clearinghouse, as per the rules and procedures defined by the Clearinghouse to constitute collateral in the form of agribusiness securities; or
- for obligations with third parties,

with the beneficiary of the collateral and the participant that represents him being solely responsible for executing such collateral, pursuant to current legislation.

The reader must refer to the SRCA Rulebook and the SRCA Transactions Manual to obtain details about the system and the registration procedures defined for each type of security.



## VII. PENALTIES AND SUSPENSIONS

Participants, their agents or representatives involved in breach of any obligations with the Clearinghouse and of any provisions contained herein, in the Clearinghouse Rulebook and other BM&FBOVESPA rules are subject to the following penalties, by the Chief Executive Officer or by the Board of Governors:

- warning; and
- fine.

Reasons for losing Trading Rights and/or Settlement Rights or yet the condition of Participant in the Clearinghouse

- i. the failure to fulfill any duties or obligations assumed before BM&FBOVESPA or any other members by virtue of rules issued by BM&FBOVESPA;
- ii. the supervening failure to meet any of the pre-requisites established for member authorization and registration; and
- iii. the occurrence of intervention or extrajudicial liquidation of the participant by Bacen.

Any participant is subject to suspension from its activities with the Clearinghouse if, at BM&FBOVESPA's discretion, it is found in recognized condition of insolvency or lack of liquidity, even if no default with the Clearinghouse has occurred.

## VIII. EMERGENCY SITUATIONS

Emergency situations are:

- the communication interruption between BM&FBOVESPA the participants of its Settlement and Clearing System;
- the capacity reduction or cessation in BM&FBOVESPA's facilities to receive, transmit, send, approve, or process a message, whether of payment or of an administrative nature; and
- the occurrence of any other abnormal situation which, at the discretion of BM&FBOVESPA's Chief Executive Officer, may represent the possibility of loss or discontinuity for Clearinghouse operations.

Upon the occurrence of an emergency situation, the BM&FBOVESPA's Chief Executive Office may declare a contingency condition and/or, with BACEN previous consent,

- modify the operating hours of the Clearinghouse's Settlement and Clearing System;
- establish its total or partial interruption, as well as its interruption for a certain participant or group of participants, until the problem that produced the emergency situation is resolved;
- choose a similar course of action to preserve operations efficiency and security.



Derivatives Clearinghouse

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*This is a free translation offered only as a convenience for English language readers. Any questions arising from the text should be clarified by consulting the original in Portuguese.*

# **BM&F DERIVATIVES CLEARINGHOUSE RULEBOOK**



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## Chapter I – Definitions

- Article 1. For the purposes of this Rulebook, the following definitions shall apply:
1. Settlement Bank [*banco liquidante*] – A financial institution that provides funds transfer services between the Clearing Members and the Clearinghouse;
  2. BM&F – The Brazilian Mercantile & Futures Exchange (BM&F);
  3. Clearinghouse [*câmara*] – The BM&F Derivatives Clearinghouse;
  4. Admission [*cadastramento*] – The procedure for the admission of Participants to the Clearinghouse systems;
  5. Customer [*comitente*] – The Intermediary's client, as well as the Intermediary itself whenever trading its proprietary account;
  6. Clearing [*compensação*] – The procedure for the calculation of the Multilateral Net Amounts due by the Clearing Member to the Clearinghouse or by the Clearinghouse to the Clearing Member;
  7. Clearinghouse Settlement Account [*conta de liquidação*] – An account held by the Clearinghouse in the Reserve Transfer System (STR) for the transfer of funds corresponding to the Transactions in the Clearinghouse systems;
  8. Delivery [*entrega*] – The Settlement of the obligations resulting from a Transaction by means of the physical delivery of the traded assets or Commodities by the Clearinghouse or the selling Customer, as the case may be;
  9. Specification [*especificação*] – The procedure to assign the Customer in a Transaction and the Clearing Member responsible for its Settlement;
  10. Bylaws [*estatutos sociais*] – The Bylaws of the Brazilian Mercantile & Futures Exchange (BM&F);
  11. Funds [*fundos*] – The amounts segregated by the Clearinghouse to guarantee the fulfillment of the Participants' obligations;
  12. Collateral [*garantias*] – The assets, documents, securities and amounts delivered by Participants to the Clearinghouse to guarantee the fulfillment of obligations resulting from their Transactions;
  13. Default [*inadimplemento*] – The failure of a Clearing Member, Settlement Bank, Intermediary, or Customer to fulfill an obligation to the Clearinghouse or the other Participants, resulting from a Transaction or a series of Transactions;
  14. Intermediary [*intermediário*] – A Brokerage House, a Commodities Brokerage House or a Special Brokerage House;
  15. Operational Limits [*limites operacionais*] – The Intraday Risk Limit and all other limits established by the Clearinghouse for each Participant;

16. Intraday Risk Limit [*limite de risco intradiário*] – The risk exposure limit established by the Clearinghouse for each Clearing Member;
17. Settlement [*liquidação*] – The fulfillment of obligations with the Clearinghouse or the Clearing Members resulting from one or more Transactions;
18. Margin [*margem*] – The amount of Collateral required, in view of each Position or group of Positions held by or under the responsibility of one or more Participants;
19. Clearing Member [*membro de compensação*] – The Clearing Member, as defined in the Bylaws;
20. Commodity [*mercadoria*] – Any asset that may be used as an underlying asset for the contracts traded at BM&F;
21. Markets [*mercados*] – The markets managed by or connected to BM&F for Trade Registration and Clearing of the Transactions performed therein and Settlement of the obligations arising therefrom;
22. Transaction [*operação*] – A trade carried out in the BM&F auction systems or in any of its trading systems, and/or registered in any of its systems;
23. Participant [*participante*] – Any individual or legal entity that bound to the Clearinghouse and subject to its rules and regulations;
24. Position [*posição*] – The balance of contracts resulting from Customer's Transactions;
25. Trade Registration [*registro*] – The registration of a Transaction in the Clearinghouse systems;
26. Rulebook [*regulamento*] – This BM&F Derivatives Clearinghouse Rulebook, together with the Operating Procedure Manual and all further rules and regulations issued by the Clearinghouse;
27. STR – The Reserve Transfer System managed by the Central Bank of Brazil; and
28. Gross Amount [*valor bruto*] – The amount that has not been netted and which must be paid by or received from a Participant, whenever the relevant services are utilized, as a result of Settlement of Transactions considered independently ;
29. Bilateral Net Amount [*valor bilateral líquido*] – The amount resulting from the netting of each Participant's debit and credit balances from specific transactions, always in pairs, matched with those of another Participant acting as its counterparty, which must be paid by or received from a Participant in case of utilization of the relevant services;
30. Multilateral Net Amount [*valor multilateral líquido*] – The amount that must be paid to or received from the Clearinghouse resulting from the Clearing of each Clearing Member's debit and credit balances in relation to the other Clearing Members.

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## Chapter II – Clearinghouse

Article 2. Pursuant to the provisions set forth in the Bylaws, the Clearinghouse shall register and clear the Transactions and settle the obligations resulting therefrom.

Paragraph 1. In the performance of its activities the Clearinghouse shall:

- (i) Render custody services to commodities, securities and other assets;
- (ii) Create safeguards and mechanisms to guarantee the fulfillment of the obligations resulting from the Transactions;
- (iii) Create instruments to manage and control the risk exposure of Clearing Members; and
- (iv) Conduct other activities and render other services.

Paragraph 2. Pursuant to the provisions set forth in the Bylaws, the Clearinghouse shall have the following Committees:

- (i) The Risk Analysis Advisory Committee;
- (ii) The Risk Committee; and
- (iii) Other committees that might be created, as the case may be.

Article 3. Pursuant to the provisions set forth in the Bylaws, the Clearinghouse may register and clear Transactions carried out in other exchanges, markets, or trading systems, and settle the obligations resulting therefrom.

Paragraph 1. Pursuant to the provisions of this article, in the case of Transactions registered without the “guarantee feature,” settlement shall be made directly between the parties involved.

Paragraph 2. In the case of the Transactions referred to in the preceding paragraph, the Clearinghouse shall only report the corresponding settlement amounts to the contracting parties and such Transactions shall not be subject to the procedures, Collateral, Funds and safeguards of any nature referred to herein or in the Bylaws.

Paragraph 3. Subject to the provisions set forth by the Central Bank of Brazil, the Clearinghouse may develop systems for the Settlement of specific Transactions based on Gross Amount or Bilateral Net Amount.

Paragraph 4. The Clearinghouse shall use the systems developed, pursuant to the provisions set forth in the preceding paragraph, to:

- (i) Receive the amounts and/or securities due or the confirmation of their settlement directly

- between the Participants, effecting the applicable transfers; and
- (ii) Apply the procedures set forth in the event of default of the Participants involved to fulfill any obligation, subject in any case to the provisions set forth in the next paragraph.
- Paragraph 5. In the event that any obligation in the settlement systems based on Gross Amount or Bilateral Net Amount is not fulfilled, the Clearinghouse shall:
- (i) Not make use of the Collateral, Funds or safeguards of any nature referred to herein or in the Bylaws; and
  - (ii) As the case may be, return to the nondefaulting party the amounts and/or securities transferred to the Clearinghouse as the result of such obligations, taking other necessary measures in accordance with the relevant system.
- Paragraph 6. The Clearinghouse shall define the Transactions for which Settlement based on Gross Amount or a Bilateral Net Amount shall be permitted interchangeably, including the terms and conditions for transfer of funds and securities.

## **Chapter III – Participants**

### **Section I – General Provisions**

- Article 4. The Clearinghouse shall establish the terms and conditions for Admission of Participants, to be classified as direct or indirect Participants, based upon their involvement in Trade Registration and Clearing of Transactions, as well as in Settlement of obligations resulting therefrom.
- Articles 5. For purposes of this Rulebook, the direct Participants of the Clearinghouse are:
- (i) The Clearing Members;
  - (ii) The Settlement Banks; and
  - (iii) The Intermediaries.
- Sole paragraph. Except as otherwise expressly provided and subject to the differences based upon the nature of their activities, the same rules and procedures applicable to the Intermediaries shall also apply to the Brokerage Houses and the Commodities Brokerage Houses.
- Article 6. The indirect Participants of the Clearinghouse are the Customers and all entities that render instrumental services in connection with

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Trade Registration and Clearing of Transactions, as well as Settlement of obligations resulting therefrom. The indirect Participants shall be subject to the provisions set forth herein.

## **Section II – Clearing Members**

- Article 7. The Clearing Members shall:
- (i) Register and clear the Transactions and settle the obligations resulting therefrom; and
  - (ii) Post Collateral, pursuant to the provisions set forth herein.
- Paragraph 1. In the performance of their activities, the Clearing Members shall be fully liable for the Settlement of the obligations resulting from any and all Transactions, which may have been assigned to them, including the receipt, authenticity and legitimacy of all related assets, Collateral and other amounts related to the Transaction.
- Paragraph 2. Pursuant to the provisions of the preceding paragraph, the Clearing Members shall become liable for the Transactions immediately after they are performed in any of the trading systems managed by BM&F or registered in a specific system for this purpose.
- Paragraph 3. BM&F shall establish specific rules for the Clearing Members acting as Direct Settlement Participants.
- Article 8. The Clearing Members that do not hold a “bank reserves” account shall enter into an agreement with a Settlement Bank to transfer funds between themselves and the Clearinghouse, pursuant to the provisions set forth by the Clearinghouse.
- Paragraph 1. The Clearing Members shall remain directly liable for all obligations to which they are originally bound by virtue of this Rulebook or the Bylaws, even after all necessary measures are taken with their respective Settlement Banks to settle their obligations with the Clearinghouse.
- Paragraph 2. In addition to the Settlement Bank referred to in this article, the Clearing Member shall maintain a contractual relationship with another Settlement Bank designated by the Clearinghouse, on the basis of prudential criteria, to provide the transfers due whenever the Clearinghouse deems necessary.
- Article 9. The Admission of Clearing Members shall meet the requirements set forth in the Bylaws and the BM&F Member Admission Rules, subject to:
- (i) The minimum net worth and capital levels required by the Clearinghouse, as well as other established criteria; and

- (ii) The evidence of their managerial, organizational and operational capacities for the performance of their activities.

Article 10. Pursuant to the provisions set forth in the Bylaws, the Clearing Members shall pledge their equity memberships and post the Collateral required by the Clearinghouse, including the Collateral to constitute the Clearing Fund and any other funds that might be created by BM&F.

Sole paragraph. The Clearinghouse may require additional Collateral from the Clearing Members:

- (i) To update or complement the amounts related to the Collateral already pledged; or
- (ii) As result of market conditions that may impact the creditworthiness of the Positions to be settled.

Article 11. The Clearinghouse shall establish the minimum working capital, the Intraday Risk Limit and other Operational Limits applicable to each Clearing Member.

Paragraph 1. Additionally to the provisions set forth in this article, the Clearinghouse may establish other limits, terms and conditions, as a requirement for the performance of Clearing Members' activities, with the possibility to change limits and criteria in force and effect.

Paragraph 2. The Clearing Member may, upon pledge of additional Collateral and prior approval of the Clearinghouse, assume obligations in excess of the Intraday Risk Limit and the Operational Limits attributed by the Clearinghouse.

Article 12. The Clearing Member shall distribute its Intraday Risk Limit among the Intermediaries to which the Clearing Member renders services.

Paragraph 1. The Clearing Members shall be directly responsible for monitoring the use of the Intraday Risk Limit by the Intermediaries.

Paragraph 2. For purposes of the provisions set forth in the preceding paragraph, the Clearing Members may:

- (i) Adjust the Intraday Risk Limit assigned to an Intermediary; or
- (ii) Request the Clearinghouse to prevent a certain Intermediary from registering new Transactions under their responsibility.

Paragraph 3. Additionally to the actions that may be taken by the Clearinghouse, pursuant to the provisions set forth herein, the Clearing Members shall remain directly liable for all Transactions that surpass the Intraday Risk Limit or the criteria established for its use.

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## **Section III – Settlement Banks**

Article 13. The Settlement Banks are the financial institutions that hold a “bank reserves” account and are responsible for the transfers of funds related to or resulting from the Transactions, on behalf and for the account of the Clearing Members.

Paragraph 1. The Settlement Banks shall confirm, within the term established by the Clearinghouse, the total or partial availability of funds to fulfill the Clearing Members’ obligations.

Paragraph 2. The confirmation regarding the funds availability made by the Settlement Banks to the Clearinghouse pursuant to the provisions of the preceding paragraph, does not exempt the Clearing Members from their liability for their total obligations to the Clearinghouse.

Paragraph 3. Additionally to the liability inherent to the Clearing Members, the Settlement Banks shall be responsible for the delivery of all amounts whose availability has been confirmed, pursuant to the provisions of the preceding paragraph.

Paragraph 4. In case of Clearing Members controlled by Settlement Banks that effect their transfer of funds, the Settlement Banks shall be fully liable for the Clearing Members’ obligations, regardless the confirmation of the availability of the amounts due or of any other measure.

Article 14. The Clearinghouse shall establish the rules and conditions for the Admission of Settlement Banks, subject to the following conditions, among others:

- (i) The minimum levels of net worth and capitalization;
- (ii) The evidence of their managerial, organizational and operational capacities for the performance of their activities; and
- (iii) Other Operational Limits, at the discretion of the Clearinghouse.

Article 15. The Clearinghouse may, at its sole discretion and in specific situations, require the Settlement Banks to pledge Collateral.

Article 16. Funds transfer shall be made on a gross basis by the Settlement Banks. Netting between credit and debit amounts of the several Clearing Members is not allowed.

## **Section IV – Intermediaries**



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Article 17. The Intermediaries are the direct users of the services rendered by the Clearing Members, by means of a contractual relationship, subject to the terms and conditions set forth by the Clearinghouse.

Paragraph 1. Each Intermediary shall appoint a primary Clearing Member, which shall be responsible for the Trade Registration and Clearing of all Transactions immediately after their performance, including the Settlement of all obligations resulting therefrom.

Paragraph 2. Additionally to the provisions of the preceding paragraph, the Intermediaries can use other Clearing Members, which will be characterized as secondary Clearing Members, for the assignment of specific Transactions.

Paragraph 3. The secondary Clearing Members shall be liable for the Transactions to which they have been assigned, immediately after the respective assignment has been made.

Article 18. Pursuant to the provisions set forth in the Bylaws, the Intermediaries shall pledge their equity memberships and post the Collateral required by the Clearinghouse and by the Clearing Members.

Article 19. Additionally to other obligations resulting from their nature or their activity, the Intermediaries are liable towards the Clearing Members, pursuant to the provisions set forth in the Bylaws, for the Settlement of all obligations resulting from the Transactions they have performed and/or registered, as well as for the receipt, delivery, authenticity and legitimacy of all assets, documents, securities and other amounts related to such Transactions.

Sole paragraph. Subject to the provisions of this article, the Customers are liable, towards the Intermediaries, for all obligations assumed by them, including the accuracy of all information provided and for the regularity of all assets, documents, securities and amounts delivered.

Article 20. Further to the distribution of Intraday Risk Limits among the Clearing Members, the Clearinghouse shall establish other Operational Limits for the Intermediaries, which may be amended at any time.

Sole paragraph. Upon prior approval of the Clearinghouse and express consent from the Clearing Member(s) involved, the Intermediaries, by pledge of new Collateral, may assume obligations in excess of the Operational Limits or the Intraday Risk Limits

which have been respectively assigned to them by the Clearinghouse and the Clearing Members.

Article 21. The Clearinghouse may establish other requirements to be met by the Intermediaries in any phase of the Settlement process.

## **Section V – Customers**

Article 22. The Customers shall maintain a contractual relationship with the Intermediaries, which shall enroll them in the Clearinghouse systems, with due observance of the procedures established by the Clearinghouse and the applicable regulation.

Sole paragraph. The Clearinghouse, the Clearing Members and the Intermediaries may establish rules, criteria, or limits for Customers or groups of Customers in relation to the performance of their activities.

Article 23. In relation to the Customers, the Intermediaries shall:

- (i) Execute and/or keep all instruments and documentation required by the Clearinghouse or by applicable regulations;
- (ii) Give effect to the Specification, pursuant to the provisions set forth herein; and
- (iii) Maintain a bank account, pursuant to applicable regulations, for the transfer of funds resulting from the Transactions.

## **Chapter IV – Trade Registration and Acceptance**

### **Section I – General Provisions**

Article 24. The Transactions shall be registered in the Clearinghouse systems, subject to terms and conditions established by the Clearinghouse.

Article 25. Further to the responsibility of each Clearing Member to monitor its Intraday Risk Limit and obligations assumed, the Clearinghouse may, based upon the level of utilization of the Intraday Risk Limit:

- (i) Prevent the Trade Registration of new Transactions with a certain Clearing Member; and/or
- (ii) Require the pledge of additional Collateral on the same day, pursuant to the provisions set forth herein.

Sole paragraph. Pursuant to the provisions set forth herein and upon request by the respective Clearing Member, the Clearinghouse may also prevent the Trade Registration of Transactions by Intermediaries.

Article 26. Subject to the characteristics of each market segment, the Clearinghouse shall accept and guarantee the registered

Transactions complying with the terms and conditions applicable to negotiation and Registration.

Paragraph 1. For over-the-counter Transactions, the Clearinghouse shall establish the procedures, conditions and time limits for their acceptance, which, in any case, shall only occur after the pledge of the relevant Collateral.

Paragraph 2. Except for the Transactions registered without the “guarantee feature” as referred to herein, the acceptance of a Transaction implies that the Clearinghouse takes the position, as counterparty, for Settlement purposes.

Article 27. In specific situations, subject to the provisions set forth in the Bylaws, the Clearinghouse may cancel a Transaction that has already been accepted whenever it verifies the violation of any provision set forth herein, in the Bylaws, in other BM&F rules and regulations, or in the applicable legislation.

Sole paragraph. The Customers, Intermediaries and Clearing Members shall be responsible for the Settlement of all obligations resulting from the cancellation of a Transaction.

## **Section II – Customer Specification**

Article 28. The Specification of Customers shall be effected according to the terms and conditions established by the Clearinghouse.

Sole paragraph. Further to the provisions set forth in this article, the Clearinghouse may require the anticipation of the Specification, whenever deemed necessary.

Article 29. In the event that the Specification of Customer is not made or any data or information required is missing, the Clearinghouse shall assign the Transaction to the Participant responsible for its performance and register it in a specific account on behalf of said Participant.

Sole paragraph. The Transactions referred herein above shall be analyzed and monitored by the Clearinghouse, and they shall be closed out on the immediately subsequent trading day, without prejudice to the corresponding Collateral pledge.

## **Section III – Transfer of Positions**

Article 30. The Clearinghouse shall allow the transfer of Positions in specific Markets and establish the relevant procedures.

Paragraph 1. The transfer of Positions shall be effected upon Customer’s request and its destination shall be an

account held by such Customer at another Intermediary.

Paragraph 2. Except for the Positions resulting from the Transactions registered without the “guarantee feature,” the transfer of Positions requested in accordance with this article requires the express consent of the Intermediaries and the Clearing Members involved therein.

Article 31. The Clearinghouse shall also transfer Positions:

- (i) In the event of a Default by an Intermediary or a Clearing Member, or the suspension of their rights, pursuant to the provisions set forth in the Bylaws, at the sole discretion of the Clearinghouse or upon request by the Customer; and/or
- (ii) For prudential reasons, at the sole discretion of the Clearinghouse.

## **Chapter V – Collateral**

Article 32. The Clearinghouse shall establish the Margin to be deposited by the Participants to guarantee the Settlement of the obligations resulting from the Transactions and shall define the amounts and terms for deposits, which can be adjusted whenever deemed necessary or convenient.

Paragraph 1. The Clearinghouse shall define the assets, documents, securities and amounts eligible as Collateral, the procedures for their pledge and custody, and the criteria to be met for their acceptance.

Paragraph 2. In any circumstance, the Clearing Member is responsible for the delivery, receipt, authenticity and legitimacy of all Collateral delivered to the Clearinghouse; the Intermediaries shall be liable to the Clearing Members; and the Customers shall be liable to the Intermediaries, pursuant to the provisions set forth in the Bylaws.

Article 33. In addition to the initial Margin required, the Clearinghouse may require additional Margin, depending upon the volume and risk of the Positions under management by Participants.

Sole paragraph. Further to the provisions set forth in this article, the Clearing Members and Intermediaries, within their scope, may require the deposit of additional Margin.

## **Chapter VI – Clearing and Settlement**

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## Section I – Clearing

Article 34. The obligations resulting from Transactions shall be cleared for the calculation of the Multilateral Net Amounts to be paid or received by the Clearing Members on the day(s) established for their Settlement.

Paragraph 1. Subject to the terms and conditions established by the Central Bank of Brazil, the calculation of Multilateral Net Amounts shall include:

- (i) The amounts corresponding to the cash Settlement of the obligations resulting from Transactions, including variation margin in the futures markets, reset in the forward and OTC markets, and payment and receipt of payment of premiums and exercise of rights in the option markets;
- (ii) The applicable operating and trading costs due to BM&F or other Participants; and
- (iii) Cash Collateral.

Paragraph 2. Pursuant to the provisions set forth herein, the amounts pertaining to the Transactions registered without the “guarantee feature” shall not be included in the calculation of Multilateral Net Amounts.

## Section II – Settlement

Article 35. After the Transactions are cleared, the Clearing Members shall:

- (i) In the case of the calculation of Multilateral Net debit Amounts, transfer the funds due to the Clearinghouse Settlement Account; or
- (ii) In the case of the calculation of Multilateral Net credit Amounts, receive the payment of the corresponding funds and transfer them to the Intermediaries.

Paragraph 1. All transfers of funds referred to in this article shall be made by means of the STR.

Paragraph 2. In the case of Clearing Members that do not hold a “bank reserves” account, the transfers referred to in this article must be effected by using the services rendered by the Settlement Banks, pursuant to the provisions set forth herein.

Paragraph 3. Subject to applicable rules, the Clearinghouse shall establish:

- (i) The term to receive the payment of funds transferred by the Clearing Members with Multilateral Net debit Amounts;
- (ii) The timetable for the transfer of funds received to the Clearing Members with Multilateral Net credit Amounts; and

- (iii) The timetable for the transfer of financial assets or the delivery of Commodities against Transactions to be settled by physical Delivery.

Article 36. Immediately after the Clearinghouse receives from the STR the relevant confirmation messages, the Clearing Members shall have no obligations to the Clearinghouse concerning the funds transfers due during the Settlement process.

Article 37. After the Clearinghouse transfers the funds due to the Clearing Members or their respective Settlement Banks, by means of the STR, it shall have no further obligations to the Clearing Members.

Article 38. Without prejudice to the procedures defined in the preceding articles and with the purpose of achieving risk mitigation, the Clearinghouse may develop special mechanisms to receive funds directly from the Customers and transfer funds on their behalf.

Paragraph 1. In the event referred to in this article, the Commodities Brokerage Houses and Clearing Members connected to the customers authorized to effect the Settlement directly with the Clearinghouse shall remain liable to the Clearinghouse for the fulfillment of all obligations assumed by those Customers and, whenever deemed necessary, the Commodities Brokerage House and Clearing Members may be requested to make the appropriate payments on their behalf.

Paragraph 2. Whenever Settlement is made directly with a creditor Customer:

- (i) The amount to be received by the creditor Customer shall not be considered in the calculation of the Multilateral Net Amount of the relevant Clearing Member; and
- (ii) Clearinghouse obligations to the Customer shall be considered fulfilled whenever the Clearinghouse provides, by means of the STR, the transfer of funds due to the Settlement Bank specially designated for this purpose.

Paragraph 3. Whenever Settlement is made directly with a debtor Customer:

- (i) Customer obligations shall be considered fulfilled immediately after the Clearinghouse receives the corresponding payment confirmation message from the STR; and
- (ii) As soon as the confirmation message referred to in item (i) is received, the amount due by the Customer shall no longer be included in the

calculation of the Multilateral Net Amount of the relevant Clearing Member.

- Article 39. Subject to applicable rules and regulations, the Clearinghouse shall establish:
- (i) The term to receive of the Multilateral Net debit Amounts transferred by the Clearing Members;
  - (ii) The timetable for the transfer to the Clearing Members of the received Multilateral Net credit Amounts; and
  - (iii) The timetable for the transfer of financial assets or for the delivery of Commodities, in the case of Transactions to be settled by physical Delivery.

Article 40. The Clearinghouse shall establish the Delivery procedures for the contracts that allow physical Delivery.

Paragraph 1. The Clearinghouse shall establish the obligations and responsibilities of the Participants involved in the Delivery procedures, subject to the criteria it adopts to manage risk.

Paragraph 2. In any case, pursuant to the provisions set forth herein and in the Bylaws, the Clearing Members and the Intermediaries shall remain liable to the Clearinghouse for the deliveries to be made by the Customers connected to them.

## **Chapter VII – Default**

### **Section I – General Provisions**

Article 41. The failure of a Participant to meet any obligation to the Clearinghouse or to the other Participants shall be considered a Default.

Paragraph 1. For the purposes hereof, the failure of a Participant to meet an obligation must be reported to the Clearinghouse by the Participant's creditor.

Paragraph 2. The failure of a Participant to meet an obligation for operational reasons shall not be considered a Default by the Clearinghouse. In this case, the Clearinghouse may establish new conditions for the fulfillment of such obligation, in addition to the use of Collateral from the relevant Participant(s) and the imposition of penalties, whenever applicable.

Paragraph 3. The Clearinghouse shall be solely responsible for characterizing the failure to meet an obligation as a result of an operational problem.

Paragraph 4. The defaulting Participant or the Participant that does not meet an obligation due to an operational problem

shall be liable to the Clearinghouse and/or to the other Participants for any damage, loss, cost, or expenses resulting from such Default or delay.

## **Section II – Declaration of a Default**

- Article 42. The Clearing Member shall be declared in default whenever:
- (i) It fails to deliver the funds due to the Clearinghouse or to other Participants with whom it has obligations, subject to the term established; or
  - (ii) It fails to deliver the assets, documents, or securities required within the established time frame.
- Article 43. The Settlement Bank shall be declared in default whenever it fails to deliver the funds due, subject to the term established by the Clearinghouse.
- Article 44. The Intermediary shall be declared in default whenever:
- (i) It fails to deliver the funds due to the Clearing Members according to the established terms; or
  - (ii) It fails to transfer the required assets, documents, or securities according to the prescribed form and within the established term.
- Article 45. The relevant Intermediary shall request the Clearinghouse, within the established term, to declare in default the Customer that:
- (i) Fails to make a payment or a delivery within the established term; or
  - (ii) Fails to transfer assets, documents, or securities to meet Margin calls within the established term.

## **Section III – Procedures in the Event of a Default**

- Article 46. In the event of Default, the Clearinghouse may, where applicable:
- (i) Liquidate the Positions held by the defaulting Participant;
  - (ii) Use the Collateral of the Participant(s) involved to cover existing debt balances;
  - (iii) Notify the market and competent authorities;
  - (iv) Impose the applicable penalties, pursuant to the provisions set forth herein;
  - (v) Transfer to other Clearing Members or Intermediaries, upon their prior consent, the Positions held by the defaulting Clearing Members or Intermediaries, pursuant to the provisions set forth herein;
  - (vi) Transfer the relevant corresponding funds through another Settlement Bank; or
  - (vii) Make use of other mechanisms to ensure the timely fulfillment of pending obligations to other Participants.



Article 47. In an event of Default, the use of Collateral shall obey the following order:

- (i) The Collateral pledged by the Participant;
- (ii) The Collateral pledged by third parties on behalf of the Participant;
- (iii) The Collateral pledged by Intermediaries or other agents; and
- (iv) The Collateral pledged by Clearing Members.

Paragraph 1. In the event that there is still a Collateral balance after all obligations have been fulfilled, this balance shall be returned to the pledgor of the Collateral.

Paragraph 2. In the event that the Collateral referred to in this article is not sufficient, the Clearinghouse may also resort to the Funds constituted for this purpose, pursuant to the specific rules governing their use and the provisions set forth in the Bylaws.

## **Chapter VIII – Funds and Safeguards**

Article 48. Pursuant to the provisions of the Bylaws, BM&F shall maintain Funds and safeguards, which shall be used pursuant to specific rules.

## **Chapter IX – Penalties**

Article 49. BM&F shall impose on Participants, whenever a failure to fulfill any obligations or referred to herein, the penalties established in the Bylaws and further rules and regulations.

## **Chapter X – General Provisions**

Article 50. This Rulebook shall be subject to the provisions set forth in the Bylaws.

Article 51. The Clearinghouse Operating Procedure Manual and further rules and regulations established by BM&F are considered an integral part of this Rulebook.

Article 52. In addition to the provisions set forth herein, the Clearinghouse may adopt emergency procedures in specific situations, pursuant to the provisions set forth in the Bylaws, in order to ensure an efficient and regular development of its activity.

Article 53. In view of the requirements of the Clearinghouse, BM&F shall define, pursuant to the provisions set forth in the Bylaws, the operating and trading costs to be charged from Participants.

Article 54. BM&F's Chief Executive Officer shall:

- (i) Resolve any conflict arising from or relating to the Clearinghouse activity or the Transactions, pursuant to the provisions set forth in the Bylaws; and
- (ii) Resolve the cases omitted from this Rulebook and from the further rules issued by the Clearinghouse.

Article 55. Without prejudice to the provisions of the preceding article, the Participants can resort to arbitration to resolve any kind of dispute arising from or relating to the Clearinghouse activity or the Transactions, pursuant to BM&F's Arbitration Panel Rules.

***This English translation is prepared only for the convenience of English language readers and is not legally binding.***

## **FORM FBOT SUPPLEMENT S-1—EXHIBIT A-6**

**Request:** Evidence of the authorization, licensure or registration of the clearing organization pursuant to the regulatory regime in its home country jurisdiction(s) and a representation by its regulator(s) that it is in good regulatory standing in the capacity in which it is authorized, licensed or registered.

**Response:**

BVMF has requested that the BACEN confirm to the Commission BVMF's current regulatory good standing and confirmation of its status. BVMF expects that BACEN will communicate directly with the Commission under separate cover.

**FORM FBOT SUPPLEMENT S-1—EXHIBIT A-7**

**Request:** A summary of any disciplinary or enforcement actions or proceedings that have been brought against the clearing organization, or any of the senior officers thereof, in the past five years and the resolution of those actions or proceedings.

**Response:**

There have been no disciplinary or enforcement actions or proceedings brought against BVMF's Clearinghouse, or any of its senior officers, in the past five years.

**FORM FBOT SUPPLEMENT S-1—EXHIBIT A-8**

**Request:** An undertaking by the chief executive officer(s) (or functional equivalent[s]) of the clearing organization to notify Commission staff promptly if any of the representations made in connection with this supplement cease to be true or correct, or become incomplete or misleading.

**Response:**

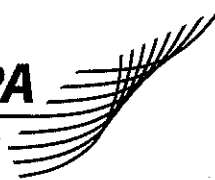
See Attachment SA-8-1

**UNDERTAKING PURSUANT TO 17 C.F.R. PART 48,  
APPENDIX—FORM FBOT, EXHIBIT SA-8**

The undersigned hereby undertakes promptly to notify the Commodity Futures Trading Commission Staff if any of the representations made by BVM&F in connection with, or related to, this FORM S-1 and the Exhibits thereto ceases to be true or correct, or becomes incomplete or misleading to the best of my knowledge.

By:  
Name: Edemir Pinto  
Title: Chief Executive Officer  
For: BM&F Bovespa  
.

Dated: \_\_\_\_\_

**Attachment SA-8-1**

*An undertaking by the chief executive officer(s) (or functional equivalent[s]) of the clearing organization to notify Commission staff promptly if any of the representations made in connection with this supplement cease to be true or correct, or become incomplete or misleading.*

**CERTIFICATION PURSUANT TO 17 C.F.R. PART 48,  
APPENDIX—FORM S-1 SUPPLEMENT TO FORM FBOT, EXHIBIT A-8**

The undersigned hereby undertakes promptly to notify the Commodity Futures Trading Commission Staff if any of the representations made by BVMF in connection with, or related to, this Form S-1 Supplement and the Exhibits thereto ceases to be true or correct, or becomes incomplete or misleading to the best of my knowledge.

By: 

Name: Eduardo Refinetti Guardia

Title: Chief Financial, Corporate Affairs, and IR Officer

For: BM&amp;FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros

Dated: August 17, 2012By: 

Name: Cicero Augusto Vieira Neto

Title: Chief Operating, Clearing, and Depository Officer

For: BM&amp;FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros

Dated: August 17, 2012

## FORM FBOT SUPPLEMENT S-1—EXHIBIT B

**Request:** Attach the following, separately labeling each description:

- (1) A description of the categories of membership and participation in the clearing organization and the access and clearing privileges provided to each by the clearing organization.
- (2) A description of all requirements for each category of membership and participation and the manner in which members and other participants are required to demonstrate their compliance with these requirements. The description should include, but not be limited to, the following:
  - (i) Professional Qualification. A description of the specific professional requirements, qualifications, and/or competencies required of members or other participants and/or their staff and a description of the process by which the clearing organization confirms compliance with such requirements.
  - (ii) Authorization, Licensure and Registration. A description of any regulatory or self-regulatory authorization, licensure or registration requirements that the clearing organization imposes upon, or enforces against, its members and other participants including, but not limited to any authorization, licensure or registration requirements imposed by the regulatory regime/authority in the home country jurisdiction(s) of the clearing organization, and a description of the process by which the clearing organization confirms compliance with such requirements.
  - (iii) Financial Integrity. A description of the following:
    - (A) The financial resource requirements, standards, guides or thresholds required of members and other participants.
    - (B) The manner in which the clearing organization evaluates the financial resources/holdings of its members or other participants.
    - (C) The process by which applicants for clearing membership or participation demonstrate compliance with financial requirements including:
      - (1) Working capital and collateral requirements, and
      - (2) Risk management mechanisms.
  - (iv) Fit and Proper Standards. A description of any other ways in which the clearing organization ensures that potential members/other participants meet fit and proper standards.

**Response:**

BVMF has two types of access rights, Trading Rights (DNs) and Settlement Rights (DLs) relevant to this Application.<sup>1</sup> BVMF requires that its access rights holders be fit and meet financial soundness requirements. These requirements are discussed in greater detail below and in Form FBOT Exhibit B.

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<sup>1</sup> See BVMF Circular Letter 078/2008 (November 4, 2008) establishing the rules and procedures for granting access authorization to trading and settlement systems of BVMF (included as Attachment B-1). In addition, BVMF has two additional access rights, custody and registry rights which are not relevant to this Application.



## *Requirements for Membership and Participation; Settlement Rights*

Settlement Rights granted by BVMF enable the holders to use the clearing and settlement systems managed by the Exchange, permitting for the clearance and settlement of transactions by the Derivatives Clearinghouse.<sup>2</sup> Settlement Rights are divided into various categories. These include:

- Type 1 DL, which are permitted to settle only their proprietary trades and those of affiliates;
- Type 2 DL, which may settle the same transactions as the Type 1 DL and transactions of customers of Commodity Brokerage Houses that are under a common corporate ownership with the DL holder; and
- Type 3 DL, which may settle the same transactions as the Type 2 DL, the transactions performed by customers of Commodity Brokerage Houses that are not under common ownership with the DL holder and Locals.<sup>3</sup>

The requirements for holding Settlement Rights vary depending upon whether the entity is a Type 1, Type 2 or Type 3 DL. All Settlement Rights Holders must be Brazilian legal entities with their headquarters or offices in São Paulo. In addition, DL holders must be financial institutions whose operations are authorized by the Central Bank of Brazil.

DL holders must also meet minimum professional standards with respect to their supervisory and compliance personnel<sup>4</sup> and with respect to their back office managers and employees.<sup>5</sup> Such personnel must demonstrate their competence through a testing program administered by BVMF, and though meeting minimum required documentation and educational standards. BVMF as part of this program issues professional certifications to persons found to be professionally qualified. The certification is valid for a period of two years and new DL holders must meet these minimum professional standard requirements within six months.

Pursuant to the Rules and Operations Manual of the Derivatives Clearing House,<sup>6</sup> DL holders are responsible for the positions which they carry, including settlement of such positions. As a consequence, they must meet high proprietary working capital requirements and must pledge significant collateral to the FDO. Specifically, Type 1, 2 and 3 Settlement Rights Holders must maintain working capital of R\$6, 7 and 8 million, respectively and must contribute R\$5.5, 6.5 and 7.5 million respectively, to the FDO.<sup>7</sup> In addition, as a consequence of their status as Settlement Rights Holders, they must contribute to the Clearing House's clearing fund in the amount of R\$2, 3 and 4 million, respectively.<sup>8</sup>

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<sup>2</sup> As discussed *infra* there are in addition, clearinghouses for Foreign Exchange and Securities transactions. Those clearinghouse are not relevant to this application.

<sup>3</sup> See MDDA at 12.

<sup>4</sup> See *id.* at 16.

<sup>5</sup> See BVMF Circular Letter 038/2007-DG (May 2,2007) which establishes these professional certification requirements (Attachment B-2).

<sup>6</sup> See Derivatives Clearinghouse Rulebook (Attachment SA-5-3) and Operating Procedure Manual (Attachment SA-5-2).

<sup>7</sup> See BVMF Circular Letter 078/2008-DP, Attachment IV, Chapter II, Items 3.6.1.1 and 3.6.1.2.

<sup>8</sup> See *id.* at Item 3.6.1.3.

DL holders are also required to implement risk management systems and procedures that are appropriate to the nature, volume and complexity of the positions that they carry.<sup>9</sup> DL holders are also required to have an account with the Central Bank of Brazil or have a correspondent relationship with such an institution.<sup>10</sup>

DL holders also must meet technical requirements, including those of the CVM and the Central Bank of Brazil. These requirements are specified in the MDDA and Annex II thereto.

A list of current Settlement Rights Holders of the Derivatives Clearing House is included as Attachment B-4.

#### Direct Market Access Through Globex

As discussed in Form FBOT Exhibit B, access is available to BVMF through a Globex terminal connection. In the first instance, entities with a Globex terminal will have satisfied both CME and BVMF access rules with respect to Globex. This includes the BVMF requirement that all such market users have their direct market access rights guaranteed by a BVMF Settlement Rights Holder. Thus, all positions that are entered into the BVMF trading system through a Globex terminal will be required to be cleared by a BVMF Settlement Rights Holder (clearing member). In addition, each Globex user will receive authorization for the direct market access from a local Commodity Brokerage House (a DN holder). The BVMF clearing member, through the clearing relationship with the DN holder, and as a requirement for and, as a condition of the DN holder's permitting direct access to the BVMF trading system of the Globex user, is required to:

- guarantee and assume all financial responsibility for all activity related to BVMF markets conducted through each Globex user's (Authorized Customer) direct market access connection;
- assist in a timely manner BVMF in any investigation into potential violations of BVMF Rules, the Commodity Exchange Act ("CEA"), or the terms and conditions set forth in the requested no-action relief, including, but not limited to, requiring the Authorized Customer to answer questions from BVMF, and/or appear in connections with the investigation; and
- suspend or terminate the Authorized Customer's access if BVMF determines that the actions of the Authorized Customer threatens the integrity or liquidity of any contract, violates any BVMF Rule, or if the Authorized Customer fails to cooperate in an investigation.

Orders for execution on the BVMF market by Globex terminal users that have not satisfied BVMF's access requirements will be rejected by the trading engine.

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<sup>9</sup> See MDDA at 14.

<sup>10</sup> *Id.*

## FORM FBOT SUPPLEMENT S-1—EXHIBIT C

**Request:** Attach the following:

- (1) A description of the requirements applicable to membership on the governing board and significant committees of the clearing organization.
- (2) A description of how the clearing organization ensures that potential governing board and committee members meet these standards.
- (3) A description of the clearing organization's provisions to minimize and resolve conflicts of interest with respect to membership on the governing board and significant committees of the clearing organization.
- (4) A description of the clearing organization's rules with respect to the disclosure of material non-public information obtained as a result of a member's performance on the governing board or on a significant committee.

**Response:**

BVMF's clearing operations share the same governing board as the exchange (foreign board of trade).

CVM Rule 461/07 requires a majority of independent board members, and the *Novo Mercado* listing segment regulations establish that, at a minimum, 20% of the board members must be independent.

Law 6404/76, Article 147, prevents persons from acting as board members or officers of Brazilian corporations who are restricted by special legislation (for example, state law may impose restrictions for people working in public functions from acting as officers or board members of Brazilian corporations), have filed for bankruptcy, been convicted of certain crimes, including corruption, crimes against the popular economy and crimes against property or public faith, or are subject to criminal sanctions preventing them from exercising governmental positions (for example, crimes associated with fraud in election processes may result in sanctions that prevent convicted individuals from exercising governmental positions). Additionally, CVM Rule 461/07, Article 23, prohibits individuals condemned for capital markets crimes and crimes against the financial system from being elected to the entity's management.

Pursuant to Article 22 of the BVMF Bylaws, the Board of Directors must consist of at least seven, but no more than 11, members. A majority of the Directors must be Independent

Directors, according to CVM Rule 461/07.<sup>1</sup> At no time may the Board include more than one Director with ties to a permit holder with access to the BVMF markets or having ties with such an entity, conglomerate, or economic group.<sup>2</sup> In addition to meeting all applicable legal and regulatory requirements, to be eligible for the Board of Directors, a person must: (a) be over 25 years old; (b) have an upstanding reputation and knowledge of the functions, operations, and practices of the capital markets operated and managed by BVMF and/or its subsidiaries; (c) not have a spouse, domestic partner, or relative to the second degree serving as director or officer of, or employed with, BVMF or any of its subsidiaries; and (d) not hold a position in any company deemed to be a competitor of BVMF or its subsidiaries and, in addition, does not have or represent any party that has a conflict of interest with BVMF or its subsidiaries.<sup>3</sup> Pursuant to Article 22, Paragraph 2 of the BVMF Bylaws, the Board has established Internal Regulations governing its operation, the rules, rights and responsibilities of Directors, and the Board's relationship with the Executive Management Board and with other corporate bodies.<sup>4</sup>

The Board of Directors is advised by four mandatory committees, described in detail below, in addition to industry-specific advisory committees.<sup>5</sup> The BVMF Bylaws also provide for CEO-established advisory committees.<sup>6</sup> The mandatory committees are established by the BVMF

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<sup>1</sup> The BVMF Bylaws define "Independent Director" as a person that meets the following requirements: "(a) all of the independence standards established in the Novo Mercado Listing Rules and in CVM Rule 461/07, cumulatively; and (b) not holding, and not having ties with any shareholder that holds, whether directly or indirectly, ownership interest in 5% or more of the issued and outstanding shares of stock, or voting stock of the Company." BVMF Bylaws, Article 22, Paragraph 6. The Novo Mercado listing regulation defines "Independent Member" as being a member of the Board of Directors who: (i) has no ties to the Company except for owning an equity share of its capital stock; (ii) is not a Controlling Shareholder, the Controlling Shareholder's spouse or a relative to the second degree, is not or has not been linked in the last 3 years to a company or entity with ties to the Controlling Shareholder (this restriction does not apply to people linked to governmental institutions of education and research); (iii) has not been a Senior Manager of the Company or employed by or worked for the Company, the Controlling Shareholder or any other company controlled by the Company; (iv) is not a direct or indirect supplier or purchaser of the Company's services or products or both, to a degree that results in loss of independence; (v) is not an employee or manager of a company or entity that supplies services or products or both to, or buys these from, the Company; (vi) is not a spouse or a relative to the second degree of any Senior Manager of the Company; and (vii) does not receive any compensation from the Company except for that related to its activities as member of the Board of Directors (this restriction does not apply to cash from equity interests in the capital stock). The CVM Rule 461/07, Article 26, defines an "independent director" as one who has no relationship to: (i) the managing entity, the direct or indirect controller thereof, or otherwise the company under a directly or indirectly common control therewith; (ii) any officer of the managing entity, the direct or indirect controller thereof, or otherwise any controlled entity thereunder; (iii) a person authorized to trade in its market; and (iv) a member who owns an interest of 10% or more of the voting capital of the managing entity.

<sup>2</sup> See BVMF Bylaws, Article 22, Paragraph 8. For purposes of Article 22, "having ties" with a party is defined as: "(a) an employment relationship, or one arising from any agreement for provision of professional services on a continuing basis or from participation in any management or advisory or deliberative body or fiscal council of an entity; (b) any direct or indirect ownership interest in exceeds [sic] 10% of the issued and outstanding shares of stock or voting stock of the Company; or (c) a relationship established through a spouse, domestic partner or relative to the second degree."

<sup>3</sup> See BVMF Bylaws, Article 22, Paragraph 4. For purposes of Article 22, Paragraph 4, a conflict of interest is presumed to exist where a person 1) has been elected by a shareholder that has also elected a director in a competitor company; and 2) has ties arising from a subordinate relationship with the shareholder voting for his/her election. See *id.*

<sup>4</sup> See Internal Regulation of the Board of Directors (Attachment C-1).

<sup>5</sup> Currently, these industry-specific advisory committees are made up of approximately 450 public participants and cover the following sectors: Soybean and Corn, Coffee, Live Cattle, Sugar and Ethanol, Equities, Fixed Income, FX and Derivatives, Real Estate Market, Risk Analysis, Listing, and Trading and Post-Trade.

<sup>6</sup> See BVMF Bylaws, Article 35(f) and (g). There are currently five CEO-established committees, including the Agribusiness Committee, Market Committee, Market Risk Committee, Regulatory Committee, and Athletics Club Committee.

Bylaws and further regulated by internal regulations adopted by the committees.<sup>7</sup> With respect to the four mandatory committees, committee members must be experienced in the practice area of the committee to which they are appointed.<sup>8</sup> Committee coordinators, who act as representatives of the committees before the Board of Directors, must be independent members (with the exception of the Risk Committee Coordinator) and qualify as experts in their committee's practice area.<sup>9</sup>

### *Executive Management Board*

The Executive Management Board ("Executive Board") is vested with senior management power and is in charge of managing and conducting BVMF's corporate business activities, including the acquisition and disposition of corporate assets and authorizing the opening, closing or relocation of branches, agencies, offices or other company establishments.<sup>10</sup> The Executive Board is also responsible for preparing and proposing to the Board of Directors initiatives, business plans, and policies, such as the annual budget, strategic and expansion plans, and investment programs. The Executive Board is comprised of five to nine Officers, including the Chief Executive Officer. All of the Officers are elected and removable by the Board of Directors. All Officers must meet, in addition to all applicable legal and regulatory requirements, the requirements for serving on the Board of Directors described above and outlined in Article 22, Paragraph 4 of the BVMF Bylaws. While in office, Officers are not permitted to have ties with: (1) holders of a permit for access to BVMF's markets, (2) a shareholder or group of shareholders owning a 5% or more interest in the issued and outstanding shares of voting stock in BVMF, (3) any institution that is a participant in the Brazilian or other international securities distribution system, (4) other public companies, (5) portfolio management firms, or (6) institutional investors.

### *Audit Committee*

The Audit Committee is composed of five members, all of whom must be independent.<sup>11</sup> At least one, but up to two, Audit Committee members may be Independent Directors, with the remaining members being external independent members ("External Members"). The Nominations and Corporate Governance Committee nominate candidates for the Audit Committee, which the Board of Directors elects. External Members of the Audit Committee are required to (1) be knowledgeable about, or experienced in auditing, compliance and controls, accounting, taxation, and other similar matters; (2) hold no position in the Board of Directors or Executive Management Board of BVMF or any of its subsidiaries; (3) hold no interest in BVMF shares, including no interest held by a spouse or domestic partner; (4) hold no controlling or minority interest in, and do not act as a management member or employee of, a shareholder of BVMF or its subsidiaries; (5)

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<sup>7</sup> See BVMF Bylaws, Article 45.

<sup>8</sup> See Internal Regulation for the Board Advisory Committees, pg. 4 (Attachment C-2).

<sup>9</sup> See *id.*

<sup>10</sup> Section II of the BVMF Bylaws governs the Executive Management Board. In addition, the Executive Management Board has established the Internal Regulation of the Board of Executive Officers (Attachment C-3), which further outlines the requirements and responsibilities of the Executive Management Board.

<sup>11</sup> Section II, Subsection I governs the Audit Committee. In addition the Audit Committee has adopted an exclusive Internal Regulation, which further outlines the requirements and responsibilities of the Audit Committee.

within the 12-month period preceding appointment, not have had ties with (i) BVMF, its subsidiaries, or direct or indirect controlling shareholders or companies under common control, (ii) any of the Directors and Officers of BVMF and its subsidiaries, or, direct or indirect controlling shareholders or companies under common control, (iii) holders of permits for access to BVMF's markets, or (iv) a shareholder or group of shareholders holding a 10% or greater interest in the issued and outstanding shares of voting stock of BVMF; (6) not hold at the time, or in the 5 year period preceding their appointment, a position as: (i) officer or employee of the Company, its subsidiaries and affiliates, or its direct or indirect controlling shareholders or companies under common control; or (ii) member and lead auditor of the audit team in charge of auditing the financial information of the Company; (7) not be a spouse, lineal, or collateral blood relative to the third degree, or relative by affinity to the second degree, of any of the persons alluded to in item (6) above; and (7) fulfill the requirements set forth in paragraphs 4 and 5 of Article 22 of the BVMF Bylaws and those of article 147 of Brazilian Corporate Law.<sup>12</sup>

### *Compensation Committee*

The Compensation Committee is established by the Board of Directors and composed of three members of the Board of Directors, two of whom must be Independent Directors.<sup>13</sup> The Compensation Committee is responsible for recommending to the Board of Directors the standards and guidelines for compensating BVMF's managers, members of other Board advisory groups, and the Board of Directors and Officers. The Compensation Committee is also responsible for preparing management succession plans and ensuring BVMF adopts appropriate competencies and leadership models to attract and retain management in line with BVMF's strategic plan.

### *Nominations and Corporate Governance Committee*

The Nominations and Corporate Governance Committee is established by the Board of Directors and comprised of three members of the Board of Directors, at least two of whom must be independent members.<sup>14</sup> With respect to nominations, the Nominations and Corporate Governance Committee is responsible for identifying, recruiting, and nominating potential Board members and potential Board advisory committee members, including potential replacements to fill vacancies on the Nominations and Corporate Governance Committee. With respect to corporate governance issues, the Nominations and Corporate Governance Committee is responsible for conducting periodic reviews of the competencies and qualifications of Board members, including a yearly formal self-evaluation by Board members, and preparing and promoting corporate governance guidelines and governance documents.

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<sup>12</sup> The requirements of Article 147 are described at the second paragraph of this section.

<sup>13</sup> Section II, Subsection II governs the Compensation Committee. In addition, together with the other mandatory committees, the Compensation Committee has adopted the Internal Regulation for the Board Advisory Committees, which further outlines the requirements and responsibilities of the Compensation Committee.

<sup>14</sup> Section II, Subsection III governs the Nominations and Corporate Governance Committee. In addition, together with the other mandatory committees, the Nominations and Corporate Governance Committee has adopted the Internal Regulation for the Board Advisory Committees, which further outlines the requirements and responsibilities of the Nominations and Corporate Governance Committee.

## *Risk Committee*

The Risk Committee is comprised of four members from the Board of Directors.<sup>15</sup> The Risk Committee is responsible for assessing and monitoring risk, including central counterparty risk, financial risk, liquidity risk, operational risk, and strategic risk. The Risk Committee is also responsible for recommending to the Board risk management guidelines and strategies, including establishing specific risk limits if necessary, and conducting periodic assessments of these risk management strategies.

In addition to the Nominations and Corporate Governance Committee's periodic and annual reviews of the Board of Directors, described above, the Board of Directors election procedures help ensure that potential governing board and committee members meet the standards articulated above. Only candidates who are either (1) nominated by the Board of Directors, as advised by the Nominations and Corporate Governance Committee, or (2) appointed by shareholders as prescribed by the BVMF Bylaws may run for election to the Board.<sup>16</sup> On the date the shareholders' meeting to elect the members of the Board is called, the Board of Directors must make available for each candidate a signed statement containing (1) his/her complete identification information, (2) a complete description of his/her professional experience, (3) information regarding disciplinary or judicial proceedings in which a final judgment of guilty has been entered, and (4) information on any conflicts of interest candidates may have with the company.<sup>17</sup>

With respect to conflicts of interest, according to the Brazilian Corporations Law, BVMF's Policy on Conflicts of Interest and Related Party Transactions ("Conflicts Policy") clarifies instances involving conflicts of interest and prescribes specific rules for decisions involving related parties and other conflicts of interest. Specifically, the Conflicts Policy requires that upon identification of a conflict, Directors and Officers promptly make the conflict of interest known to BVMF and abstain from taking part in discussions concerning, and from voting on any such matter.<sup>18</sup> A Director or Officer with a conflict may participate in discussions concerning the matter only if specifically requested by the Chairman of the Board or the Chief Executive Officer and only to provide information on the conflict, the transaction, or the parties involved.<sup>19</sup> A Director or Officer who fails to disclose a conflict is deemed to have breached the Conflicts Policy and the matter will be submitted to the Nomination and Corporate Governance Committee for evaluation and possible corrective action.<sup>20</sup> To further avoid conflicts of interest and according to the Novo Mercado listing rules, the Chairman of the Board may not also occupy the position of Chief Executive Officer.<sup>21</sup> Directors are also prohibited from serving as executive officers of BVMF or any of its subsidiaries.<sup>22</sup>

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<sup>15</sup> Section II, Subsection IV governs the Risk Committee. In addition, together with the other mandatory committees, the Risk Committee has adopted the Internal Regulation for the Board Advisory Committees, which further outlines the requirements and responsibilities of Risk Committee.

<sup>16</sup> See BVMF Bylaws, Article 23, Paragraph 1.

<sup>17</sup> See *id.* at Paragraph 2.

<sup>18</sup> See Conflicts Policy, Paragraph 4 (Attachment C-4).

<sup>19</sup> See *id.*

<sup>20</sup> See *id.*

<sup>21</sup> BVMF Bylaws, Article 20, Sole Paragraph.

<sup>22</sup> See Internal Regulation of the Board of Directors, Paragraph 5.

With respect to disclosure of material non-public information, all Directors of Officers must adhere to the BVMF Manual of the Material Disclosures and Securities Trading Policy (the “MNPI Policy”).<sup>23</sup> The MNPI Policy governs 1) the use and release of information related to BVMF, specifically information classified as “material fact” that would have the capacity to influence the value of BVMF shares; 2) the processes related to the confidential information; and 3) trading in BVMF securities. The MNPI Policy prohibits directors from trading on material nonpublic information (“MNPI”).<sup>24</sup> The MNPI Policy outlines BVMF’s internal procedures for the disclosure and release of MNPI.<sup>25</sup> Section VI of the MNPI Policy limits the trading activities in securities issued by BVMF. Specifically, it provides for blackout periods, trading restrictions prior to the disclosure of MNPI, and closed periods preceding the release of financial reports. In addition, the Code of Conduct prohibits Officers from trading any public company’s securities. Officers are able to negotiate securities only if they submit an individual investment program to BVMF for analysis and approval, according to the conditions described in the Code of Conduct. Trading in the derivatives and futures markets is prohibited, without exception.

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<sup>23</sup> See BVMF Bylaws, Article 21, Sole Paragraph. The MNPI Policy is included as Attachment C-5.

<sup>24</sup> See MNPI Policy, Section V(9)(i).

<sup>25</sup> See *id.* at Section V.



## FORM FBOT SUPPLEMENT S-1—EXHIBIT D-1

**Request:** A description of the clearing and settlement systems, including, but not limited to, the manner in which such systems interface with the foreign board of trade's trading system and its members and other participants.

**Response:**

*Overview*

BVMF includes within its corporate organization four integrated clearinghouses and a settlement bank. These clearinghouses and the BVMF Settlement Bank coordinate the registration, clearing, settlement and risk management activities associated with trades executed on the Exchange. The Derivatives Clearinghouse clears futures, options on futures, options on actuals, forwards and gold spot market. It also registers OTC derivatives transactions and clears OTC derivatives that are submitted for clearing.<sup>1</sup>

The Derivatives Clearinghouse is the counterparty to BVMF futures, options, forwards and spot transactions over financial and commodities contracts. BVMF becomes the counterparty to each buyer and seller of transactions executed on the Exchange through novation of the contracts. Novation occurs at the time the transaction is executed by the trading system or registered in the trading floor. As explained in greater detail below, the Derivatives Clearinghouse settles transactions through multilateral netting, thereby reducing the number of payments institutions are required to make, reducing transaction costs and related operational risks.

The risk management system of the Derivatives Clearinghouse measures position risks every 10 minutes, on average, and determines the collateral amount necessary to mitigate these risks. To do so, it operates a margining system under which parties to a contract deposit a good faith performance bond to assure that the party will fulfill its obligations under the contract. This margining system includes the requirement that original margin be deposited and that positions be marked-to-market on a daily basis in order to maintain required minimum margin levels. As of June 29, 2012, the Derivatives Clearinghouse held total margin pledged by market participants in the amount of approximately R\$109.60 billion (\$52.89 billion).

BVMF maintains a Clearing Fund which is funded in the amount of R\$397.40 million (\$196.61 million) and which is available in the unlikely event of a Settlement Rights Holder's default. This protects counterparties from such a default.

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<sup>1</sup> In addition to the Derivatives Clearinghouse, BVMF's is responsible for the registration, clearing, settlement and risk management in the foreign exchange spot Brazilian interbank market (Foreign Exchange Clearinghouse), the Brazilian government-issued securities market, and the equities (spot, forward, options on actual, futures and lending of securities) and corporate bonds (spot and lending of securities) markets (Equity and Corporate Debt Clearinghouse). These three clearinghouses are not involved in clearing and settlement of the contracts on the Derivatives Clearinghouse and are not included within the scope of this Application..

As of June 29, 2012, the FDO (a safeguard structure created for the Derivatives Clearinghouse after the demutualization of BVMF, composed of DN Holders and DL Holders deposits) stood at R\$ 1.12 billion (\$553.90 million).

Customer funds/collaterals are also protected through a system of segregation which operates by permitting customers to directly deposit their funds with the Derivatives Clearinghouse rather than with their Commodity Brokerage House. In addition, BVMF maintains a separate reimbursement mechanism to make customers whole in the event of a customer loss resulting from a Commodity Brokerage House's wrongful use of customer funds or other similar loss.

The BVMF Settlement Bank performs an important supplementary role in the Derivatives Clearinghouse's risk management. The Derivatives Clearinghouse can access the intraday BACEN credit facility through the BVMF Settlement Bank, making it possible for BVMF to promptly access customer collateral and/or liquidate government securities pledged as collateral. In addition, the BVMF Settlement Bank facilitates contract settlement and collateral management.

In this way, and as discussed in greater detail below, BVMF provides for procedures comparable to those used by U.S. contract markets to ensure the financial integrity of transactions entered into through its facilities.

#### *Clearing Procedures*

The Derivatives Clearinghouse systems were developed internally by BVMF and are fully integrated with the Puma System. The Puma System, the Risk Management Systems, the Collateral Management Systems and the Payment System, run in Windows platform, .Net and VB6 and database Sql\*server, while the other systems use the platform IBM mainframe, Natural and Adabas.

Systems integration is carried out in real-time, near-time and, in some cases, in batch process. The information exchange between the mainframe and the Windows platform is carried out on a near-time basis using specific data synchronization tools (typically minute by minute) and in some cases using MQ queue.

Systems integration occurs primarily during trade registration and trade allocation processes. Trade registration is processed using the Windows platform, while trade allocation is processed in the mainframe platform. Information exchange between both platforms is performed using MQ series.

There are contingency sites for both environments – CT1 and CT2 -, where all information is synchronized. .

The clearing process of an electronic trade is initiated by the Puma System's automatic entry into the clearing system of details of an executed trade. Trades are accepted by the clearinghouse when a bid and offer are matched on the trading system. For clearing purposes, trades entered into through the Puma System in the regular trading session are cleared overnight with daily

settlement made on a T + 1 basis. Trades entered into the Puma System after regular market session are included for clearing during the subsequent trading day.<sup>2</sup> However, if for daily settlement purposes, such T + 2 positions would result in a debit amount in a customer's account, the amount will be included in the T + 1 margin requirement.<sup>3</sup> Processing of trades is accomplished over-night and reports are generated prior to the start of trading on the next trading day showing open interest and required pays and collects, or as termed in the BVMF Clearing Operations Manual, "cash settlement."

In T + 0, BVMF requires the trade allocation to the final customer account. If it is not performed, the trade is allocated to the carrying intermediary account.

Certain allocation-related functions, such as providing trade allocation or give-up/take-up instructions that were not included in the order when it was entered into the trading system, can also be entered by intermediaries as post-trade adjustments through the clearing system. These clearing-related functions are made through the BVMF Serviços Mainframe Platform. The BVMF Serviços Mainframe Platform provides secure access by intermediaries to the BVMF clearing system. That site also provides intermediaries with position and other clearing-related information.

The BVMF clearing system also accommodates give-up/take-up relationships. Give-ups can be designated at the time of order entry through the Puma System. Trades given-up through the Puma System are provided a unique identifier with a "bipartite link number."<sup>4</sup> That number represents an end customer-executing firm give-up relationship. Upon designation that a trade is to be given-up, the take-up firm will receive notification of the trade and must accept or reject the trade. If the take-up firm rejects the trade, the trade is carried by the executing firm. Give-up relationships require that an agreement be entered into among the broker giving-up a trade and the broker taking-up the trade. Position transfers and other post-trade adjustments can also be made using the BVMF Serviços Mainframe Platform.<sup>5</sup>

All trades are subject to an intra-day Trading Rights Holder's Risk Limit. Depending on the current obligations of the DN holder, BVMF can require additional margin collateral to be posted in support of such positions. Until the additional margin has been posted, BVMF can prevent the DN holder from registering additional transactions.<sup>6</sup> Trades are also subject to BACEN, CVM and the Council for Financial Activities Control. After the customer's identity has been verified, trades that violate rules or policies of any of the foregoing regulators can be cancelled within the T+0 period. Such trades are subject to reversal if identified subsequently.<sup>7</sup>

The Derivatives Clearinghouse nets open positions only at the customer level, although settlement is netted at the DL holder level. The multilateral net amount with respect to DL holders includes variation margin payment on positions entered into in both floor trading and on the Puma System and includes reset amounts on cleared OTC positions, as well as the cash value

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<sup>2</sup> See BVMF Derivatives Clearinghouse Operations Manual, Chapter IV (See attachment SA-5-2).

<sup>3</sup> *Id.*

<sup>4</sup> See *id.* at Chapter III, Sections 1.6, 1.7 and 1.9.

<sup>5</sup> See *id.* at Chapter III, Section 1.10.

<sup>6</sup> *Id.* at Chapter V, Section 3.3.

<sup>7</sup> *Id.* at Chapter III.

of physically settled contracts.<sup>8</sup> BVMF requires that all margin amounts be met in cash.<sup>9</sup> Subsequently, collateral can be substituted for such cash deposits.

BVMF requires that all transactions for customers be identified to the Clearinghouse as customer positions. In this regard, BVMF requires that customers be registered with the Clearinghouse by the intermediary. This identifying information with respect to customers must be updated in the BVMF systems at all times. If the customer registration information is incomplete, the Clearinghouse will treat such positions as the house accounts of the carrying intermediary.<sup>10</sup>

### *Risk Management*

BVMF has developed and implemented procedures to measure risk parameters of the products listed for trading on the Exchange. It also monitors price trends in the futures and the underlying cash markets, monitors price volatility and conducts simulations of the effect of these risks on accounts carried by its members. Using these risk management procedures and analyses, BVMF determines the appropriate level of margins which should be required and whether extraordinary intra-day margin calls are appropriate. Margins are required to be paid to the Clearinghouse on a gross basis, that is, from each individual customer.

### *Margining system*

In May 2001, BVMF adopted a new portfolio margining calculation system. The implementation of this system was in conjunction with the implementation of the new Brazilian Payment System, which required market participants to monitor their risk and cash flows for financial futures contracts.

BVMF developed the new system for calculating margin based on stress testing and analysis of the financial variables that directly influence derivatives' prices. These include:

1. the cash or spot market prices;
2. the term structure of interest rates (for BVMF contracts, term structures are taken into account both in Brazilian Reals (fixed rate yield curve) and U.S. Dollars (ID x U.S. Dollar spread yield curve); and
3. the market volatility level.

The margin calculation uses a portfolio-based approach to overall risk. Accordingly, risks of various contracts in a customer's account are combined; the risks of certain positions may be reduced or off-set by other positions in the portfolio yielding a calculation based upon the overall risk of the positions held in the account. The accounts are then subjected to stress testing using a number of possible scenarios involving changes in the above factors. The Risk Committee, an executive-level management committee, determines the scenarios that will be applied.<sup>11</sup> These possible scenarios can result from both technical/statistical analysis and

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<sup>8</sup> See *id.* at Chapter IV, Section 1.1 for a detailed description of the netting process.

<sup>9</sup> *Id.* at Chapter IV, Section I.

<sup>10</sup> *Id.* at Chapter III, Section 1.5.

<sup>11</sup> The Risk Committee, which is established in the BVMF Bylaws and is composed of a number of executive officers of the Exchange, defines the scenarios and sets the parameters to be used in the risk analysis.

subjective market evaluations. Typical scenarios include: shifts in the yield curves, changes in foreign exchange rates, and increased implied option volatility.

The model then examines the hypothetical gains and losses of the portfolio in response to changes in the above criteria. All possible scenario combinations are analyzed to obtain the one leading to the highest hypothetical loss. This determines the amount that will be required as collateral for the portfolio.

BVMF developed an application that allows brokers to simulate, in real-time, the effect that buying and selling contracts has on margin requirements. This enables market participants to anticipate the potential effect of the margin requirement on their cash flows. Risk calculations are updated on an intra-day basis as new transactions are entered into. Thus, it is necessary for market participants to have or pledge collateral to maintain their operational limit with respect to such intra-day trading.<sup>12</sup> Free-balances, however, are determined and made available on a T+1 basis.

In addition, all scenarios used by the model are disclosed daily in BVMF's Daily Bulletin, enabling market participants to evaluate the amplitude of scenarios and the degree of coverage they offer the Clearinghouse.

Margins are due to the Clearinghouse in cash. However, the Clearinghouse in its discretion may accept additional forms of collateral, including government bonds, gold, shares of stock of companies included in the IBOVESPA Index, certain investment funds, U.S. treasury bonds, bank letters of credit and such other assets as the Clearinghouse may permit. Haircuts are taken against certain of the above instruments used as collateral.<sup>13</sup>

#### *Segregation of Customer Funds*

As a general matter, the funds and securities amounts belonging to customers, the transfer of which is ordered by these customers, are legally considered as segregated from the funds and collaterals of the Commodity Brokerage Houses and DL Holders. This general rule is applicable to collateral posted by the customers with Commodity Brokerage Houses and DL Holders. Thus, securities that are deposited as collateral are held as assets that are specifically segregated for the benefit of the depositing customer. Deposits of cash are made by the customer directly to a BVMF account that complies with the requirements of Commission Rule 30.7. The Clearinghouse directly controls each customer's cash balance. Accordingly, both collateral and cash deposit amounts are recognized as segregated from that of the Commodity Brokerage Houses and DL holders.

Apart from the Clearinghouse's control of customers' cash balances as a means of complying with the requirements of Commission rule 30.7, any customer that meets a specified threshold level of volume established by BVMF is able to establish a Special Settlement Account ("CEL") directly with the BVMF Settlement Bank.<sup>14</sup> The CEL account enables customers to settle their

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<sup>12</sup> See BVMF Derivatives Clearinghouse Operations Manual at Chapter V, Section 3.3.

<sup>13</sup> *Id.* at Chapter V, Section 3.4.

<sup>14</sup> U.S. based customers are able to establish an account with one of the correspondent U.S. Settlement banks with respect to dollar denominated contracts.

trades directly with the Clearinghouse. This bypasses the need for the customer's funds to be held by and forwarded to the Clearinghouse by the Commodities Brokerage House and DL holders. In so doing, the customer's funds are completely segregated from those of the intermediaries. Bypassing the intermediaries in this manner has the consequence that even if an intermediary had the unlawful intention of using customer segregated funds for proprietary purposes, as a practical matter it can never do so because it never exercises control over such customer funds.<sup>15</sup>

The customer's ability to directly deposit funds with the Clearinghouse through the CEL account does not alter the legal responsibility for making payments. Thus, as a legal matter, despite the customer's ability to directly deposit funds with the Clearinghouse, the Clearinghouse looks to the DL holder and the DL holder to the DN holder, for satisfaction of the obligations to pay. Thus, in the case of a shortfall in a CEL account, the Commodities Brokerage House and in turn the DL holder would be obligated to pay the amount due to the Clearinghouse. Operationally, the Commodity Brokerage House informs the Customer of the amount owed by the Customer for that day's settlement. After verifying the receipt of the amount from the Customer, the Clearinghouse adjusts the DL holder's multilateral net amount.

#### *Default Remedies and Procedures*

BVMF has made explicit the procedures that it would follow in the unlikely event of a default. In the event of a default, the Clearinghouse may close out the positions held by the defaulting participant; use the defaulting participant's collateral to cover debit balances; notify the market and competent authorities; transfer to other DL or DN holders, upon prior agreement, customer positions carried by the defaulting intermediary; transfer funds through another Settlement Bank, or make use of other mechanisms to ensure the timely fulfillment of pending obligations.<sup>16</sup>

The Clearinghouse has the following lines of defense which are explicitly set forth in the Clearing House Rulebook. Under the Clearinghouse rules, in the event of a default, collateral shall be used to satisfy the shortfall in the following order:

1. collateral pledged by the defaulting participant;
2. collateral pledged by the defaulting participant but issued by third parties;
3. collateral pledged by the intermediaries;
4. collateral pledged by DL Holders; and
5. funds and safeguards.<sup>17</sup>

As discussed above, the final line of defense includes the various funds and safeguards. Additionally, in compliance with provisions of Article 5 of Law 10,214 of March 27, 2001 and of Article 19 of Circular 3,057 of the Brazilian Central Bank, of August 31, 2001, BVMF maintains a special equity, in the amount of R\$ 40,73 million (US\$ 20,15 million).

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<sup>15</sup> See BVMF Derivatives Clearinghouse Operations Manual Section 8.10.

<sup>16</sup> See BVMF Derivatives Clearinghouse Rulebook at Chapter VII (See attachment SA-5-3).

<sup>17</sup> *Id.* at Chapter VIII.

In addition, DL holders have invested in the Clearing Fund, the purpose of which is to guarantee transactions. The liability of each DL holder to the Clearing Fund is joint and several. Liability is limited to twice the value of the required deposit, which is determined by access rights category. The total held in the Clearing fund as of June 29, 2012, is R\$397.40 million (US\$ 196.61 million). In addition, as noted above, the “Mecanismo de Ressarcimento de Prejuízos” (“MRP”) exists as a special purpose to assure reimbursement of customers losses resulting from errors in the execution of orders or from the inadequate or irregular use of customer funds by intermediaries. As of June 29, 2012, the MRP stood at R\$ 320.82 million (US\$ 158.72 million).

## **FORM FBOT SUPPLEMENT S-1—EXHIBIT D-2**

**Request:** A certification, signed by the chief executive officer (or functional equivalent) of the clearing organization, that the clearing system observes (1) the current Recommendations for Central Counterparties that have been issued jointly by the Committee on Payment and Settlement Systems and the Technical Committee of the International Organization of Securities Commissions, as updated, revised or otherwise amended, or (2) successor standards, principles and guidance for central counterparties or financial market infrastructures adopted jointly by the Committee on Payment and Settlement Systems or the International Organization of Securities Commissions (RCCPs).

**Response:**

A certification to the above by BVMF's Chief Financial, Corporate Affairs and IR Officer and Chief Operating, Clearing and Depository Officer is included at Attachment S-D-2-1.

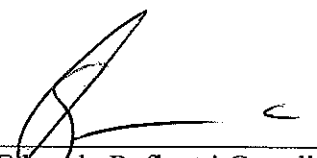


**Attachment SD-2-1**

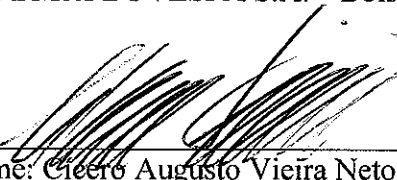
*A certification, signed by the chief executive officer (or functional equivalent) of the clearing organization, that the clearing system observes (1) the current Recommendations for Central Counterparties that have been issued jointly by the Committee on Payment and Settlement Systems and the Technical Committee of the International Organization of Securities Commissions, as updated, revised or otherwise amended, or (2) successor standards, principles and guidance for central counterparties or financial market infrastructures adopted jointly by the Committee on Payment and Settlement Systems or the International Organization of Securities Commissions (RCCPs).*

**CERTIFICATION PURSUANT TO 17 C.F.R. PART 48,  
APPENDIX—FORM S-1 SUPPLEMENT TO FORM FBOT, EXHIBIT D-2**

The undersigned hereby certifies that BVMF observes: (1) the current Recommendations for Central Counterparties that have been issued jointly by the Committee on Payment and Settlement Systems and the Technical Committee of the International Organization of Securities Commissions, as updated, revised or otherwise amended, or (2) successor standards, principles and guidance for central counterparties or financial market infrastructures adopted jointly by the Committee on Payment and Settlement Systems or the International Organization of Securities Commissions.

By:   
Name: Eduardo Refinetti Guardia  
Title: Chief Financial, Corporate Affairs, and IR Officer  
For: BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros

Dated: August 17, 2012

By:   
Name: Cleber Augusto Vieira Neto  
Title: Chief Operating, Clearing, and Depository Officer  
For: BM&FBOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros

Dated: August 17, 2012

### **FORM FBOT SUPPLEMENT S-1—EXHIBIT D-3**

**Request:** A detailed description of the manner in which the clearing organization observes each of the RCCPs or successor standards and documentation supporting the representations made, including any relevant rules or written policies or procedures of the clearing organization. Each RCCP should be addressed separately within the exhibit.

**Response:**

Please see the attached self-assessment by BVMF.

*VIA Electronic Mail*

**Paul M. Architzel**

August 17, 2012

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+1 202 663 6363(f)

paul.architzel@wilmerhale.com

Assistant Secretary of the CFTC  
for FOIA Matters  
Commodity Futures Trading Commission  
Three Lafayette Center  
1155 21st Street, N.W.  
Washington, DC 20581

Re: BM&FBOVESPA S.A. Limited Application for Registration as a Foreign Board of Trade  
Under Part 48 of the Commission's Regulations—Request for Confidential Treatment

Dear Sir or Madam:

BM&FBOVESPA S.A. ("BVMF") hereby request that the document(s) listed below, and all attachments thereto, to the above referenced Limited Application for Registration as a Foreign Board of Trade, including Supplement S-1 thereto, submitted on the date of this letter, and as covered by this letter, be afforded confidential treatment in accordance with the Freedom of Information Act ("FOIA"), 5 U.S.C. 552, and CFTC Rules thereunder, 17 C.F.R. 145.9, for an indefinite period of time due to the trade secrets contained in such document(s) and the sensitive commercial and proprietary nature of the information contained therein, public disclosure of which could be detrimental to BVMF. As prescribed by 17 C.F.R. 145.9(d)(4), each page of the document(s) included in this request, bears the legend, "Confidential Treatment Requested by BVMF" Specifically, this letter requests the confidential treatment of the document(s) titled:

- Attachment SD-3-1 (Self-Assessment of BVMF)

In accordance with the foregoing regulations, kindly notify me at the above address or telephone number of any request under FOIA for access to the enclosed document(s) to enable BVMF to substantiate the grounds for confidential treatment, or if you have any questions regarding this document(s).

Best regards,



Paul M. Architzel

**BM&F BOVESPA**

*A Nova Bolsa*



August 2012

**BVMF**

**SELF-ASSESSMENT**

PRINCIPLES FOR FINANCIAL MARKET  
INFRASTRUCTURES

# Summary

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| <b>PRINCIPLE 1. LEGAL BASIS</b>   |  |
| An FMI should have a well-founded, clear, transparent, and enforceable legal basis for each aspect of its activities in all relevant jurisdictions. |  |
| <b>PS X CSD X SSS X CCP X TR X</b>  |  |
| KC 1.1  | The legal basis should provide a high degree of certainty for each material aspect of an FMI's activities in all relevant jurisdictions.<br><b>PS X CSD X SSS X CCP X TR X</b>   |
| KE 1. Identification of each material aspect of the FMI's activity requiring legal certainty.   | <p><b>Q.1.1.1: What are the material aspect(s) of the FMI's activities that require legal certainty (for example, rights and interests in financial instruments, settlement finality, and netting)?</b></p> <p>The Brazilian capital markets and financial systems are regulated and monitored by the National Monetary Council (Conselho Monetário Nacional - "CMN"), the Brazilian Central Bank (Banco Central do Brasil - "Central Bank") and the Brazilian Commission for Securities (Comissão de Valores Mobiliários - "CVM"). The current regulatory structure governing the Brazilian financial system and capital markets is based on: (1) Law No. 4595/64, as amended, which sets forth the organization of the Brazilian financial system and the roles of its agents, including the Central Bank; (2) Law No. 4728/65, as amended, which defines the roles of the CMN and the Central Bank in the financial and capital markets; and (3) Law No. 6385/76, as amended, which is referred to as the "Brazilian Securities Law", and governs the organization of the Brazilian capital markets and the role of its agents, and created the CVM as its authority.</p> <p>In accordance with Brazilian regulations, the creation and operation of organized securities markets and custody and settlement systems require prior authorization of the CVM and the Central Bank, depending on the market. Furthermore, entities that engage in those activities and their agents are subject to specific and strict regulatory oversight.</p> <p>BM&amp;FBOVESPA has undertaken an assessment of the legal and regulatory framework affecting its activities and has analyzed implications of the current framework for legal certainty on different aspects, which are mentioned below.</p> <p>BM&amp;FBOVESPA through its clearing house activities is a member of the Brazilian Payment System regulated by the Brazilian Central Bank according to Law 10,214/01 and Brazilian Central Bank rules.</p> <p>Pursuant to CMN Resolution No. 2,882, the Central Bank is required to promote the operation and continued enhancement of the Brazilian Payment System (Sistema de Pagamentos Brasileiro), or SPB. In addition, CMN Resolution No. 2,882 grants authority to the Central Bank to authorize and to regulate the operation of clearing and settlement systems. Except in relation to government notes and private securities issued by banks, the authority of the Central Bank is shared with the CVM in connection with the settlement of</p> |



transactions with securities.

Law 10,214/01 and the Central Bank Circular Letter 3,057 provide the legal basis for the role of systemically important clearing houses within the Brazilian Payment System. Those rules define the concepts of multilateral netting and novation of contracts by substitution. They also recognize the finality and irrevocability of settlements and ensured the clearing houses' priority over securities posted as collateral, in case of a Participant default.

The finality and irrevocability of settlement are addressed in the BM&FBOVESPA Derivatives Clearing House Rulebook in article 34, BM&FBOVESPA Equities Clearing House Rulebook in Title IV, Chapter II, article 65, and BM&FBOVESPA Foreign Exchange Clearing House Rulebook in article 14, and BM&FBOVESPA's Derivatives Clearing House Operating Manuals in Chapter IV, and BM&FBOVESPA's Equities Clearing House Operating Manuals in Chapter III, and BM&FBOVESPA's Foreign Exchange Clearing House Operating Manuals (Chapter 13).

The multilateral settlement are addressed in BM&FBOVESPA Derivatives Clearing House Rulebook in article 34, BM&FBOVESPA Equities Clearing House Rulebook equities in Title IV, Chapter III, and BM&FBOVESPA Foreign Exchange Clearing House Rulebook in Chapters VII and VIII; articles 14 and 15, and BM&FBOVESPA's Derivatives Clearing House Operating Manuals in Chapter IV, and BM&FBOVESPA's Equities Clearing House Operating Manuals in equities in Chapter III, and BM&FBOVESPA's Foreign Exchange Clearing House Operating Manuals in Chapters 13 and 14.

The procedures of defaults are addressed in BM&FBOVESPA Derivatives Clearing House Rulebook (article 46), BM&FBOVESPA Equities Clearing House Rulebook (Title VII, Chapter II), and BM&FBOVESPA Foreign Exchange Clearing House Rulebook (articles 25 and 26). BM&FBOVESPA's Equities Clearing House Operating Manuals sets in Chapter IV, and BM&FBOVESPA's Foreign Exchange Clearing House Operating Manuals (Chapters 16 and 17).

BM&FBOVESPA's four clearing houses keep a separate safeguard and funding structure in segregated accounts, each recorded under the ultimate beneficiaries' names. They are also qualified as systemically important, according to the Brazilian Payment System rules and principles. The novation is addressed in the BM&FBOVESPA Derivatives Clearing House Rulebook in article 26, BM&FBOVESPA Equities Clearing House Rulebook, Title IV, Chapter II articles 62, 63, and 64, and BM&FBOVESPA Foreign Exchange Clearing House Rulebook in articles 10 and 11, and BM&FBOVESPA's Derivatives Clearing House Operating Manuals, Chapter III, and BM&FBOVESPA's Equities Clearing House Operating Manuals in Chapter II, and BM&FBOVESPA's Foreign Exchange Clearing House Operating Manuals in Chapter 11.

BM&FBOVESPA acts as CCP for the equity, equity derivatives, derivatives, commodities, FX spot transactions, corporate and government bonds, as well as its securities lending

service. By straight-through-processing ("STP") the CCPs affect the novation of contracts established between the original counterparties in real-time, immediately after capturing the transaction from the trading system.

The relevant law relating to the safeguarding and administration of assets belonging to users of BM&FBOVESPA's facilities ("Central Securities Depository - CSD") is set out in Law 6,385/76, Law 6,404/76, CVM Rule 89, CVM Rule 115 and CVM Rule 461. Law 6,385/76 states in its article 24 that the CVM has authority to regulate the custody of securities and that only financial institutions and clearing houses authorized by the CVM can practice this activity. CVM Rule 89 establishes the requirements for obtaining a license to act as a custodian, or to be a custodial services provider (for funds and for international clients' portfolios, under the CSD structure and as a registrar). CVM Rule 461 states in article 13, that exchanges may themselves provide clearing and custody services, as long as they are authorized by the CVM. Law 6,404/76, in article 41, regulates custody over fungible shares, establishing that the depository of fungible shares has fiduciary ownership over those assets. CVM Rule 115 regulates, in more detail, the custody over fungible shares. Fiduciary ownership under Brazilian law does not impose any additional obligation to the custodian other than those generally applied to this kind of service. Fiduciary ownership is granted to the custodian of fungible shares in order to ensure that the securities under custody are not mingled with the other assets of the custodian. The obligations of the custodian are to safe keep the securities under its custody, to ensure that all corporate payments and events are forwarded to the securities owner and to deliver periodical statements on the owner's account.

BM&FBOVESPA has systems, arrangements and rules to ensure that assets belonging to users of those facilities are properly safeguarded and administered. The BM&FBOVESPA CSD framework is fully compliant with the CVM, legal and regulatory requirements.

According to the BM&FBOVESPA Equities Clearing House Rulebook, title IV, chapter VI, section I, the account structure adopted is based on individually identified Custody Accounts. Holdings are segregated for each ultimate investor (i.e. at customer, not clearing member level), that is, for every beneficial owner.

Given that Brazil is a final beneficial owner market, all securities traded in BM&FBOVESPA's trading systems are identified at the final investor level, and every investor must be linked to a locally-established custodian that is responsible for this investor under the BM&FBOVESPA CSD. Every custodian must identify its investors through a system that registers all investor's data. The custodian is responsible for all the information posted on this system, and it must be updated.

This system also generates an individual beneficial owner account, so every security related to an investor must be allocated in his/her single account. This way, BM&FBOVESPA has information and details in relation to all the final beneficiaries of the securities provided to



it as collateral. BM&FBOVESPA also controls all the transactions in its systems and sends information directly to final investors.

The link between BM&FBOVESPA as an exchange and clearing members is established through the access of the clearing house and its clearing members. Orders input to trade BM&FBOVESPA's markets are 100% electronic, and trades are locked-in for settlement in STP models. In this sense, orders input into the trading systems bring information on clients' identification to the exchange and identification of the brokerage firm member. This identification also shows the clearing member representing this broker and consequently, his/her client.

All assets deposited with the BM&FBOVESPA CSD are held in dematerialized form by electronic book-entry. The BM&FBOVESPA's CSD compares the number of securities held in its Depository Service with those registered with the security's issuer and those registered with the custodians. Hence a daily reconciliation is carried out.

The BM&FBOVESPA CSD holds the fiduciary ownership of the shares deposited with it, but allocates each security in beneficial owner accounts in the name of each final investor. Securities of investors cannot be used by BM&FBOVESPA to pay other defaults of the investor.

Furthermore, BM&FBOVESPA keeps up-to-date records that identify the assets of each Participant and segregate the system's own assets from the assets of participants. The depository systems utilized by BM&FBOVESPA are in-house developed, proprietary systems.

This account structure is maintained through a set of hardware and software that allows custody agents to send specific instructions related to asset transactions and to consult asset transfers and the historical database. In order to ensure the proper functioning of participants' systems, BM&FBOVESPA established the PQO program, which establishes minimum requirements to allow institutions to participate as intermediaries of BM&FBOVESPA's systems.

Also, BM&FBOVESPA has established a set of rules and obligations that custody agents must comply with, which guarantees the proper safeguarding and administration of assets. In the same way, BM&FBOVESPA must comply with a set of rules and obligations that assure the proper functioning of the CSD framework. Details of the obligations and rights of BM&FBOVESPA and its participants are set out in the Equities Clearing House Rulebook, Title V.

Additionally, BM&FBOVESPA adopts a technology infrastructure consistent with its operations as a CSD, fulfilling the security requirements established by the Central Bank and the CVM. The technology infrastructure encompasses a variety of system portfolios to

operate integrated trading and trading-related systems on an interconnected basis.

As part of its business continuity, contingency/disaster recovery plan, BM&FBOVESPA also maintains an alternate contingency facility (back-up site). BM&FBOVESPA's participants are likewise required to maintain contingency/disaster recovery resources for their critical processes.

The relevant law relating to the level of protection which the arrangements provide against the risk of theft or other types or causes of loss is set out in CVM Rule 89 and CVM Rule 461. Article 16 of CVM Rule 89 requires that custodians are directly responsible for losses caused by mistakes or irregularities in custody services. Article 77 of CVM Rule 461 states that exchanges must establish and maintain a mechanism that allows aggrieved investors to seek recovery of losses caused by members acting as intermediaries or providing custody services ("Loss Recovery Mechanism").

All securities must be held under the name of the final beneficial owner. A security can only be traded or transferred on the instruction of the beneficial owner. The investor, according to the BM&FBOVESPA Equities Clearing House Rulebook, title V, chapter VII, section II, has the right to receive information about his/her position and transactions that occur in his/her account in two different ways: (i) through BM&FBOVESPA (mailing and website) and (ii) through his/her custody agent. Therefore, the beneficial owner can double-check the data stemming from these two sources in order to ensure that his/her securities are kept in his/her name. BM&FBOVESPA sends to the final investor information about any security transaction under an account in its name through a bi-weekly statement. Monthly statements are also sent, even when no transactions have occurred.

As assets are held under specific accounts under the final beneficial owner's name, and BM&FBOVESPA sends periodic reports to allow investors to check their positions and asset transfers, and also check this with the information provided by their custody agents, operational risks and Participant fraud are considerably mitigated. The reconciliation process explained above is a relevant tool in this process.

Access to BM&FBOVESPA CSD systems is granted only to authorized users. All access logs are registered, monitored, and stored, which guarantees the traceability for both controlling and auditing purposes. Besides that, the PQO program sets specific requirements in respect of controls and risk monitoring of custody agents, mainly regarding access authorization to systems and the sending of instructions.

The relevant law relating to whether the arrangements ensure that assets are only used or transferred in accordance with the instructions of the owner of those assets or in accordance with the terms of the agreement by which the UK recognized body undertook to safeguard and administer those assets is set out in the Civil Code (Law 10406/02), and Laws 6,385/76 and 6,404/76. The Civil Code, in article 627; Law 6,385/76, article 24, first

paragraph; Law 6,404/76, article 41, first paragraph; and CVM Rule 115, article 3, all require that the custodian receives the assets from the owner and should only transfer them back to the owner or according to his instructions, or those of someone acting on his behalf.

According to the BM&FBOVESPA Equities Clearing House Rulebook, title V, chapter III, section I, the custody agent has the responsibility of transferring a security only upon an investor's order or request. Furthermore, the custody agent must keep a record of all securities transferred and inform the investors those transfers affecting assets recorded in his/her name. According to this Rulebook, the custody agents must ensure the integrity of securities held under custody and keep confidential all information regarding the securities' characteristics and volumes. Also, they must implement any deposits, withdrawals, and transfers of securities on the basis only of movements instructed by the customer (BM&FBOVESPA Equities Clearing House Rulebook, title V, chapter III, section I).

Access to BM&FBOVESPA CSD systems is only granted to authorized users. All access logs are registered, monitored and stored, which ensures traceability for both controlling and auditing purposes. Besides that, the PQO program sets specific requirements in respect of controls and risk monitoring of custody agents, mainly regarding access authorization to systems and the sending of instructions.

As explained above, article 627 of the Brazilian Civil Code, and article 41, first paragraph of Law 6,404/76, both state that the custodian is to receive the assets from the owner and will only transfer them back to owner or according to his instructions, or those made by someone acting on his behalf.

Securities belonging to investors held by BM&FBOVESPA in its capacity as a CSD cannot be used by BM&FBOVESPA to pay for other liabilities of the investor. Normally, the collateral deposited by the investor is enough to clear any defaulting positions. If the securities were delivered as collateral, BM&FBOVESPA may block the investor's account, and the investor cannot use any assets in his/her portfolio (or sell them) if BM&FBOVESPA needs to use the assets (e.g. to apply them against a loss). In any case, the brokerage house (clearing member) representing the client is responsible for clear transactions if the client does not perform its obligations.

The relevant law relating to the obligations of the custodian regarding the actions of the issuer of those assets is set out in Law 6,385/76 and CVM Rules 89 and 115. Law 6,385/76, article 42, states that the custodian shall transfer to the owner of the assets all rights and dividends received on behalf of the owners. CVM Rule 115 provides that any transfer of those assets to third parties must be communicated to the owner within 5 days, and CVM Rule 89 states that the custodian must provide the owner with an updated report of his account every month, or annually, if no modification has occurred. Currently, BM&FBOVESPA provides monthly statements to final investors on their assets under

custody, regardless of any transactions having been made during the month stated.

According to the BM&FBOVESPA Clearing House Operating Procedures, Chapter VIII, section 5.1, all custody agents have the right to receive information about the companies on a daily basis, which includes any rights originated by the issuer.

Since BM&FBOVESPA has a fully dematerialized securities structure and once it has segregated accounts for each beneficial owner (final investor) the system automatically processes corporate actions (i.e. payments of dividends and interest, bonuses, subscription rights, redemptions, for each type of asset).

The depository service automatically adjusts entitlements for corporate actions. This is possible because BM&FBOVESPA acts as a CSD for all securities traded in its markets. Data relating to corporate actions are delivered to every beneficial owner of every share deposited under the BM&FBOVESPA CSD following a corporate actions cycle, to guarantee that the information will be delivered to the whole market at the same time.

When a company approves a corporate action (such as a dividend payment or corporate split) it must inform BM&FBOVESPA, who then announces the corporate action to the market through different channels (website, file, XML files). BM&FBOVESPA is also responsible for calculating corporate actions and for informing all participants and investors about the calculated corporate actions. BM&FBOVESPA informs not only the corporate actions, but also is responsible for calculating and identifying each investor of its rights. Operationally, BM&FBOVESPA consolidates all data of the corporate action and calculates the rights for each investor, with the information being shared with custodians (who hold assets for the investor) and with the issuer (responsible for the payment).

BM&FBOVESPA exchanges information both automatically and electronically with the custody agents and the issuers. All movements and positions of assets are reconciled in order to ensure the integrity of all assets recorded in BM&FBOVESPA.

Whenever a right is granted, the issuer must specify the date of the event, that is, the date on which the right is granted. Based on the daily reconciliation process, BM&FBOVESPA holds the precise information in relation to the investors' identities and holdings on the date specified by the issuer.

According to Brazilian civil law, the custodian has possession of all assets received in custody. However, the depositor has the ownership of the asset. In case of the custody of fungible shares, according to Law 6,404/76, articles 41, fourth paragraph, the custodian acquires fiduciary ownership over the shares received in custody, with common ownership remaining with the depositor. In either case, assets beneficially owned by the custodian cannot mingle with the assets of the owner. According to CVM Rule 115, the custodian must keep securities in custody in segregated accounts in the name of each owner (the

final investor).

According to the BM&FBOVESPA Equities Clearing House Rulebook, title IV, chapter VI, section I, the account structure adopted is based on individually identified Custody Accounts.

According to the account structure all securities must be held under the name of the beneficial owner and the custody agent must ensure the integrity of information (BM&FBOVESPA Equities Clearing House Rulebook, title V, chapter III, section I). There are no accounts under BM&FBOVESPA that represent a group of investors or a specific class of investors. As a result, all such assets are duly segregated.

The relevant law relating to procedures for the selection, oversight and review of custodians or sub-custodians is set out in CVM Rule 89. CVM Rule 89 establishes the following requirements for authorization of custodians:

- to be a commercial or investment bank, brokerage or dealer firm, or other equivalent entity or a securities exchange, since such organizations have shown that they have the proper technical, operational, and financial capabilities;
- to appoint an officer in charge of the department of these services;
- to send to the CVM an authorization application accompanied by the following documents and information:
  - i. general description of the system to be used to provide the service, in observance of the pertinent provisions of law and securities market rules and practices;
  - ii. organizational chart of the department responsible for carrying out the services to be provided;
  - iii. copy of the minutes of the meeting of the Board of Commissioners or Executive Committee that appointed the officer in charge;
  - iv. list of the companies in which the financial institution holds an equity interest, including indirectly controlled or affiliated companies (sole paragraph of art. 293 of Law 6404/76);
  - v. statement from the institution on the implementation of an employee training program for providing the requested services, with the necessary specifications;
  - vi. example of a standard service agreement;
  - vii. a description of the procedures to be followed for internal audits of the system;
  - viii. appointment of the firm responsible for providing third-party services for auditing the system, as well as a statement by such firm that it is independent;
  - ix. substantiated report by an independent auditor on the accuracy of the information to be produced, and the quality and security of the system.

The BM&FBOVESPA Equities Clearing House Rulebook describes the type of participants eligible to act as custody agents (title III, Chapter II), classifies them and defines which are the requirements demanded (title III). The same document on title V describes all the responsibilities of the participants of the exchange. Every Participant must be aware of the rules contained in this Rulebook and follow it. In case a Participant does not follow the rules the title IX is dedicated to the sanctions. These are set out below.

Eligible participants to qualify as a custody agent are: brokerage houses, broker-dealers, multi-service banks, investment banks, and other institutions, at the discretion of BM&FBOVESPA.

The granting of access permits by BM&FBOVESPA is contingent on a candidate meeting the following requirements for the role of a custody agent: (i) formal adherence to BM&FBOVESPA Operating Rules and Operating Procedures and other applicable regulatory and operating rules adopted by BM&FBOVESPA and entering into a custody service agreement with BM&FBOVESPA; (ii) having recognized organizational and operating capabilities, in particular as regards custody of securities; (iii) having a financial position, in addition to technology and operational infrastructures consistent with the nature of the activities of a custody agent; (iv) having as directors and officers persons of good reputation, including good ethical, professional and credit reputation; (v) meeting the requirements set out in the basic audit guide of the operational qualification program (PQO) established by BM&FBOVESPA; and (vi) formal adherence to the rules and regulations established by BSM and the Market Arbitration Chamber by entering into a custody service agreement with BM&FBOVESPA.

From a financial standpoint, a custody agent must meet the minimum capital adequacy and other requirements of a financial nature, in addition to operating within custody limits established by BM&FBOVESPA. A minimum net worth is required.

From a technology and operating standpoint, custody agents must meet the requirements set forth below irrespective of the category of access permit: i) having been granted access to BM&FBOVESPA systems and the functionalities required by the activities of a custody agent; ii) carrying out daily reconciliation of custody account balances regarding securities deposited with BM&FBOVESPA for which the relevant custody agent is responsible; iii) allocating a minimum of two employees to perform custodial activities who have successfully completed the BM&FBOVESPA qualification and certification program; iv) retaining the services of a settlement bank licensed by the Central Bank and duly registered at BM&FBOVESPA on the basis of the documentation listed in Appendix 1 of the Operating Procedures; the settlement bank being responsible for passing funds through or on behalf of the custody agent; v) providing customers with statements of their Custody Accounts; vi) establishing a proprietary or outsourced custody control system; vii) having a designated officer responsible for custodial activities; viii) keeping documents describing the main

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|  | <p>features of the technology structure and operating systems employed in the provision of custody services, including summary specification of the systems; intrinsic and extrinsic operating routines and related procedures and internal controls, among others.</p> <p>Custody agents are monitored on a regular basis by BM&amp;FBOVESPA in terms of their compliance with these requirements.</p> <p>Additionally, every market Participant needs to be aware of the BM&amp;FBOVESPA Equities Clearing House Rulebook and also must sign a contract confirming its knowledge in respect of its content.</p>   |
| <p>KE. 2. Identification of all relevant jurisdictions for the FMI's activities.</p> | <p><b>Q.1.1.2: What are all of the relevant jurisdictions for each material aspect of the FMI's activities?</b></p> <p>The CMN Resolution 2,687/00 enables non-resident investors (individuals or collective parties, individuals or legal entities, collective investment funds or other entities) to carry out operations in the commodities- and futures markets involving term agreements, future agreements and option agreements referenced in farming and cattle raising products, without the need to internalize the financial resources in Brazil.</p> <p>Thus, the "2,687 investors" financially clear their operations and invest guarantees abroad in accounts opened through commodities- and futures markets exclusively for such purpose. The client registration in the BM&amp;FBOVESPA is done through an associated brokerage firm.</p> <p>BM&amp;FBOVESPA maintains in its clearing bank, in New York, accounts so that the liquidation and investment of guarantees would be done: receiving of the daily adjustment, receiving of margin paid in cash and receiving of margin through stocks.</p> <p>BM&amp;FBOVESPA clears the currency contracts in its clearing bank through the netting of the contracts, what means, the clearing- in BRL through the Brazilian Payment System (SPB) by the netting of the contracts in BRL and clearing- in dollars in New York through the netting of contracts in dollar.</p> <p>The deposits and collection of margins in cash are performed in the specific BM&amp;FBOVESPA Account for that procedure. In case of execution of guarantees, the Brokerage firm informs to the CCP the client's lack of payment, arranging therefore for the compulsory clearing- of the open positions. The CCP begins the execution process of the client's guarantees in the following fashion:</p> <ul style="list-style-type: none"> <li>• Guarantee in cash: the Chamber transfers the amount deposited in the margin account to the account for clearing adjustments and repatriates these resources through a currency exchange contract.</li> </ul> |

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|  | <ul style="list-style-type: none"> <li>• Guarantee in stocks: the CCP, through its clearing bank, exchanges the deposited stocks (at market value), transfers the resources to the account for clearing-adjustments and proceeds to the repatriation through a currency exchange contract.</li> <li>• Other than these transactions, all others are done cleared and settled domestically with Brazilian participant. Thus, there is no other relevant jurisdiction.</li> </ul>   |
| <p>KE. 3. Assurance of high degree of legal certainty for each aspect of the FMI's activities in all relevant jurisdictions.</p> | <p><b>Q.1.1.3: What is the legal framework and how does it provide a high degree of legal certainty for each material aspect of the FMI's activities in all relevant jurisdictions?</b></p> <p>BM&amp;FBOVESPA's activities are supported by the legal framework described in the "Overview" section of this Assessment Report as well as under the legal basis and regulation described in KC 1.1 (KEs 1 and 2).</p> <p>The legal basis for dematerialization of securities is covered in the Instructions 89/1988 and 115/1990 of the CVM, to which Law 10,214/01 (article 10) and Law 6,385/76 (article 8) gives the power to regulate, as well as in 6,404/76 (articles 41 and 42).</p> <p>Legal certainty on novation is provided by the law (see KE.1) and it is not possible to revoke, with the only exception of the default in the primary market.</p> <p>Law 12,543/01 (former Medida Provisoria 539/2011) provides the legal basis for the derivatives Trade Repository, though it was also established through previous Laws. It authorizes the CMN to establish specific conditions for the derivatives trading modifying article 3 of Decreto-Lei 1.783/1980, and articles 1 and 2 of Law 8.894/1994.</p> <p>Specifically the article 2, paragraph 4 of the Law 6,385/76 (as emended by article 1 of the Law 12,543/01) states: "It is a condition for the validity of the derivatives contracts [...] executed after the enacting of Medida Provisoria 539/2011 its registry in a clearinghouse or clearance and settlement institutions authorized by the BCB or CVM".</p> <p>In respect to access, confidentiality and disclosure of data, instruction 461/07 of the CVM establishes the minimum information to be disclosed and how they should be accessed by market authorities (articles 62, 76 and 105). Pursuant to Supplementary Law 105/01, which applies to exchanges, securities intermediaries and financial institutions, confidential information generally may not be disclosed or published. This is subject to some exceptions, such as where the person making the disclosure or publication has the consent of the person to whom the data relates or where the disclosure is subject to a legal or regulatory requirement or the order of a court of competent jurisdiction. Confidential information which is protected for these purposes includes information relating to the identity of the beneficial owner and the amount and type of securities held in his custody account. All information disclosed to the Central Bank and the CVM due to regulatory requirements remains confidential and must not be disclosed to third parties.</p> |



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|                    | <p><b>Do/Does the legal opinion(s)/analysis(es) examine all relevant legal aspects regarding the different perspectives (for example, the FMI’s perspective or the participant’s perspective)?</b></p> <p>All relevant perspectives are examined by legal department of BM&amp;FBOVESPA.</p> |
| KEY CONCLUSION 1.1 |  |

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| KC 1.2 | <p>An FMI should have rules, procedures, and contracts that are clear, understandable, and consistent with relevant laws and regulations.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p> |
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| <p>KE. 1. Clarity of the FMI’s rules, procedures, and contracts.</p> | <p><b>Q.1.2.1: How has the FMI demonstrated that its rules, procedures, and contracts are clearly and understandably formulated?</b></p> <p>Rules and procedures should be approved by Central Bank and published on BVMF website.</p> <p>Rules and procedures are sent to participants via e-mail in a formal communication named “Circular Letter”, posted in both Portuguese and English on the exchange website. Rules and amendments are published on-line on the BM&amp;FBOVESPA website and daily bulletin. The website is constantly updated as soon as any rule is amended or new rules are issued. BM&amp;FBOVESPA constantly ensure that participants know and understand the rules and procedures. Participants are regularly audited to ensure their capability of applying rules. Participants’ employees have to pass a test every three years: there are nine different types of test, depending on the qualification of the employee.</p> <p>See also answer to Q.1.1.1 above.</p> |
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| <p>KE. 2. Consistency of the FMI’s rules, procedures, and contracts with relevant laws and regulations.</p> | <p><b>Q.1.2.2: How does the FMI ensure that its rules, procedures, and contracts are consistent with relevant laws and regulations? For example, has a legal opinion confirmed that these are consistent with relevant laws and regulations? Are the FMI’s rules, procedures, and contracts reviewed or assessed by external authorities or entities? Do the FMI’s rules, procedures, and contracts have to be approved before coming into force, by whom and how? Have any inconsistencies been identified and remedied?</b></p> <p>Rules and procedures are based on laws and regulations and are approved by the regulators (BCB and/or CVM) before being introduced. Should inconsistencies arise, these are addressed through dialogue with the regulators. BM&amp;FBOVESPA rely on their internal legal department to ensure consistency of the rules and procedures with the relevant laws and regulations. Occasionally, BM&amp;FBOVESPA resort to external advisors or international law firms for legal advice on specific issues, in particular when these relates to foreign jurisdictions.</p> <p>Being an entity approved by national authorities, BM&amp;FBOVESPA has the right to comment</p> |
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|                    | on laws and regulations in public consultation during the approval process as well as by participating in advisory committees. |
| KEY CONCLUSION 1.2 |  |

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| KC 1.3   | An FMI should be able to articulate the legal basis for its activities to relevant authorities, participants, and, where relevant, participants' customers, in a clear and understandable way.<br><b>PS X CSD X SSS X CCP X TR X</b>  |
| KE. 1. Ability of the FMI to articulate the legal basis for its activities to relevant authorities, participants, and where relevant, participants' customers. | <b>Q.1.3.1: How does the FMI articulate the legal basis for its activities to relevant authorities, participants, and, where relevant, participants' customers?</b><br><br>BM&FBOVESPA communicates with authorities, participants and, where relevant, participants' customers in order to discuss the legal basis for its activities, including Consulting Boards ("Câmaras Consultivas") with participants, scholars, and others relevant members. Besides, BM&FBOVESPA discloses its proposes of rules to the market in order to receive opinions of the authorities, participants and, where relevant, participants' customers, which are considered to the final version of its rules. Furthermore, BM&FBOVESPA's opinion related to new relevant laws and regulations are disclosed to the market after the analyses of the authorities. |
| KEY CONCLUSION 1.3   |   |

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| KC 1.4   | An FMI should have rules, procedures, and contracts that are enforceable in all relevant jurisdictions, even when a participant defaults or becomes insolvent. There should be a high degree of certainty that actions taken under such rules and procedures will not be stayed, voided, or reversed.<br><b>PS X CSD X SSS X CCP X TR X</b>  |
| KE. 1. Enforceability of the FMI's rules, procedures, and contracts in all relevant jurisdictions. | <b>Q.1.4.1: How does the FMI achieve a high level of confidence that its rules, procedures, and contracts related to its operations are enforceable in all relevant jurisdictions identified in KC 1.1? For example, has a legal opinion verified that the FMI's rules, procedures (including default procedures), and contracts are enforceable in all relevant jurisdictions when a participant defaults or becomes insolvent, or when the FMI is implementing its plan for recovery or orderly wind-down?</b><br><br>BM&FBOVESPA's rules and other legal documents are governed by Brazilian law, so their enforceability is a matter of Brazilian law. BM&FBOVESPA has a significant in-house legal function and uses external counsel to support this function as appropriate. BM&FBOVESPA understands that the express choice of Brazilian law in its rulebook and elsewhere would be respected by English and U.S. courts, meaning that the enforceability of its rules is primarily a matter of Brazilian law. It has also received legal advice in relation to U.S. and English law as to perimeter regulatory issues in connection with its activities in those countries, this application for recognition and its CFTC No-Action letter. |

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|   | All the main relevant issues are covered at the law level and details are regulated through BCB Resolutions, derivatives CCP rule book and operating procedures.  |
| KE. 2. Degree of certainty that actions taken under the FMI's rules, procedures, and contracts will not be stayed, voided, or reversed. | <p><b>Q.1.4.2: What legal precedence, if any, could void or reverse the FMI's actions under its rules, procedures, and contracts?</b></p> <p>See answer to Q.1.4.1.</p> <p><b>Q.1.4.3: How does the FMI achieve a high degree of certainty that its rules, procedures, and contracts will not be voided, reversed, or subject to stays?</b></p> <p>See answer to Q.1.4.1.</p> <p><b>Q1.4.4: Has a court in any relevant jurisdiction ever failed to enforce any of the FMI's activities or arrangements?</b></p> <p>There is no precedent case in which a court failed to enforce any of the BM&amp;FBOVESPA arrangement. The last time a case was taken to a court (Banco Santos fraud, 2004), the case was solved without prejudice for legal certainty.</p> <p>In addition to Brazil, only US jurisdiction is relevant for very particular transactions with foreign investors. See answer to KC 1.1(KE. 2).</p> |
| KEY CONCLUSION 1.4  |   |

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| KC 1.5   | An FMI conducting business in multiple jurisdictions should identify and mitigate the risks arising from any potential conflicts of laws across jurisdictions.<br><b>PS X CSD X SSS X CCP X TR X</b>   |
| KE. 1. Identification of potential conflicts of laws across jurisdictions.     | <p><b>Q.1.5.1: If the FMI conducts business in multiple jurisdictions or deals with contracts governed by a different law, what potential conflict of laws issues has the FMI identified and analysed?</b></p> <p>Not applicable.</p> <p><b>Q.1.5.2: How is the legal analysis for identifying potential conflict-of-laws issues regularly reviewed?</b></p> <p>See answers to KC 1.4.</p> |
| KE. 2. Mitigation of risks arising from conflict of laws across jurisdictions. | <p><b>Q.1.5.3: What steps has the FMI taken to mitigate the legal risks identified in Q.1.5.1?</b></p> <p>See answers to KC 1.4.</p>   |

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| KEY CONCLUSION 1.5 |  |

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| ASSESSMENT OF PRINCIPLE 1 |  |
| COMMENTS                  |  |

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| <b>PRINCIPLE 2. GOVERNANCE</b>  |  |
| An FMI should have governance arrangements that are clear and transparent, promote the safety and efficiency of the FMI, and support the stability of the broader financial system, other relevant public interest considerations, and the objectives of relevant stakeholders. |  |
| <b>PS X CSD X SSS X CCP X TR X</b>  |  |
| KC 2.1  | An FMI should have objectives that place a high priority on the safety and efficiency of the FMI and explicitly support financial stability and other relevant public interests.<br><b>PS X CSD X SSS X CCP X TR X</b>   |
| KE. 1. Identification of the FMI's objectives.  | <p><b>Q.2.1.1: What are the FMI's objectives, and are they clearly identified?</b></p> <p>BM&amp;FBOVESPA has formally defined the basic goals in its bylaws, which is posted on its investor relations site.</p> <p>The bylaws of BM&amp;FBOVESPA provides the following basic objectives for the Organization:</p> <ul style="list-style-type: none"> <li>• Surveillance of exchange markets for the organization, development and maintenance of free and open markets for the trading of all types of securities, titles or contracts that have as references or are backed to spot or future indexes, indicators, rates, merchandise, currencies, energies, transportation, commodities and other assets or rights directly or indirectly related to them;</li> <li>• Maintenance of systems for the trade and auction of securities, bonds, derivatives, rights and titles in the organized exchange market or in the over-the-counter market;</li> <li>• Rendering of registration, clearing and physical and financial settlement services, through an internal body or a company specially incorporated for this purpose, as main and guarantor counterparty for the final clearance or not, according to the law in effect and Company's regulations;</li> <li>• Rendering of services of centralized depository and fungible and non-fungible custody of commodities, securities and any other physical and financial assets;</li> <li>• Rendering of customization, classification, analysis, quotation, preparation of statistics, training of personnel, preparation of studies, publications, information, library and software development services related to the participants of the markets under the Company's direct or indirect surveillance and its interests;</li> <li>• Rendering of technical, administrative, software development and management support for market development, as well as undertaking of educational, promotional and publishing activities related to its corporate purpose and to the markets which are under the Company's surveillance</li> <li>• Undertaking of other similar or related activities expressly authorized by the Securities Commission;</li> </ul> |

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|   | <p>Additionally, the Company has defined and disclosed to its internal personnel, strategic drivers for the conduct of its activities and prioritization of projects for achieving its objectives. These drivers are intended to promote improvements in operational efficiency, better models for risk management and strengthening the safety and soundness of the markets managed by BM&amp;FBOVESPA.</p> <p><b>Q.2.1.2: How is the FMI’s performance in meeting its objectives assessed?</b></p> <p>All Managing Directors have specific targets linked to strategic drivers and the achievements of these goals are assessed by the Executive Board formally every six months. Additionally, there is in place a follow up procedure of strategic projects underway through the PMO, which are linked to strategic drivers, to ensure that objectives are being met as expected.</p>   |
| <p>KE. 2. Prioritization of safety and efficiency in the FMI’s objectives.</p>                                      | <p><b>Q.2.1.3: How does the FMI prioritise safety and efficiency in its objectives?</b></p> <p>The Company has defined internal strategic drivers for conducting its activities and to prioritize the projects in order to achieve its objectives. These drivers are intended to promote improvements in operational efficiency, better models for risk management and strengthening the safety and soundness of the markets managed by BM&amp;FBOVESPA. The existence of strategic drivers specific to operational efficiency and safety ensures appropriate treatment and prioritization of efforts.</p>  |
| <p>KE. 3. Explicit support for financial stability and other relevant public interests in the FMI’s objectives.</p> | <p><b>Q.2.1.4: How do the FMI’s objectives reflect explicit support for financial stability?</b></p> <p>BM&amp;FBOVESPA ensures the financial stability through internal mechanisms of supervision and governance:</p> <ul style="list-style-type: none"> <li>• Internal Audit: responsible for assessing the adequacy of the internal control structure and compliance with internal and external rules;</li> <li>• Corporate Risk: responsible for identifying and monitoring the company's corporate risk through KRI's;</li> <li>• Modeling Risk: does independent evaluations of the models used to manage the counterparty risk, credit risk and market risk carried trough by specialists and segregated from the department which actually performs the management of these risks;</li> <li>• Audit Committee: responsible for conducting the supervision of internal audit activities;</li> <li>• Risk Committee: assesses and monitors the level of risk exposure of the company;</li> <li>• Financial Committee: assesses and monitors the Company adherence to the investment policy approved by the Board of Directors.</li> </ul> |

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|                    | <p><b>Q.2.1.5: How are other relevant public interest considerations identified, and how are they reflected in the FMI’s objectives?</b></p> <p>The Board and Executive Officers of the BM&amp;FBOVESPA keeps constant contact with the Regulators and government entities in order to identify public interests that may contribute to stability and development of capital markets. Due to this proximity, the objectives of the BM&amp;FBOVESPA include identified relevant interests.</p> <p>Additionally, the BM&amp;FBOVESPA has Ombudsman responsible for managing an active communication channel between stakeholders and the Company.</p> <p>Finally, the BM&amp;FBOVESPA is listed on the Novo Mercado segment in which they demanded the highest standards of Corporate Governance.</p> |
| KEY CONCLUSION 2.1 |   |

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| KC 2.2   | <p>An FMI should have documented governance arrangements that provide clear and direct lines of responsibility and accountability. These arrangements should be disclosed to owners, relevant authorities, users, and, at a more general level, the public.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| KE. 1. Identification of the governance arrangements under which the board and management operate. | <p><b>Q.2.2.1: What are the FMI’s governance arrangements under which the board and management operate including a description of the FMI’s corporate group and its ownership structure and organisational form?</b></p> <p>The ultimate decision-making body of BM&amp;FBOVESPA is the shareholders’ meeting. BM&amp;FBOVESPA has a Board of Directors comprised of members with undisputed professional experience in their respective areas. The Board of Directors is composed by 11 members, of which 7 independent and 4 representatives of shareholders.</p> <p>The following Committees are subordinate to the Board of Directors and perform an advisory role: Audit, Corporate Governance and Nomination, Compensation, and Risk. Members of the Committees hold a 2-year term.</p> <p>BM&amp;FBOVESPA is managed by a Board of Executive Officers, including Chief Executive Officer, Chief Financial Officer, Chief Operating Officer, Chief Information Technology and Security Officer, and Chief Products and Customers Officer.</p> <p>According to the Bylaws, the members of Board of Directors cannot be elected to the Executive Board of the company or indicated for the management of subsidiaries. Thus, the Chairman of the Board does not hold any position on the Executive Board.</p> <p>The CEO is supported by Agribusiness Committee, Market Committee, Market Risk Committee, Regulatory Committee and Athletics Club Committee.</p> |

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|   | <p>In addition to the Committees that support the Board of Directors and the CEO, the Advisory Committees were created to ensure a constant liaison with the BM&amp;FBOVESPA market participants. In 2009, these Committees underwent important enhancements, such as the expansion in the number of participants, currently around 450 people. Still last year, the Real Estate Market, and the Trading &amp; Technology Committees were created. There are currently 12 Advisory Committees.</p> <p>The governance arrangements are set in the BM&amp;FBOVESPA Corporate Bylaws and described in the Corporate Governance Guidelines.</p>  |
| <p>KE 2. Identification of lines of responsibilities and accountability within the FMI.</p> | <p><b>Q.2.2.2: What are the lines of responsibilities and accountability within the FMI?</b></p> <p>BM&amp;FBOVESPA has formally defined the responsibilities and accountability of the Board of Directors and the Executive Office in its Bylaws, which is posted on its investor relations website.</p> <p>The Bylaws of BM&amp;FBOVESPA provides responsibilities for the Board of Directors in its Articles 29 and 30. Here some of them are transcribed:</p> <ul style="list-style-type: none"> <li>• determine the general business guidelines of the Company and its controlled companies, including the approval and amendment of the annual budget of the Company and its controlled companies and set the targets and business strategies for the subsequent period, using its best efforts for its proper performance;</li> <li>• elect and remove the Officers of the Company and establish their duties, observing the provisions of the Bylaws;</li> <li>• oversee the management of the Officers, examine the Company’s books and documents at any time, as well as request information on contracts entered into or about to be entered into or any other acts;</li> <li>• decide on the convening of Shareholders’ General Meeting;</li> <li>• submit to the Shareholders’ General Meeting, with its opinion, the Management Report, the accounts of the Executive Committee and the financial statements relating to each fiscal year;</li> <li>• present to the Shareholders’ General Meeting the proposal for the allocation of the net profits of the fiscal year;</li> <li>• grant prior authorization for contracts of any type, as well as transactions and waivers of rights, that result in obligations for the Company in amounts greater than the Reference Amount and that are not provided in the annual budget;</li> <li>• give prior investment authorization, of a single type, that exceed the Reference Amount, when not provided in the annual budget;</li> <li>• give prior authorization for any loan, financing, issuance or cancellation of simple debentures, not convertible into shares and without fixed guarantee, or a granting</li> </ul> |



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|  | <p>of any fixed guarantee or surety by the Company in favor of its controlled companies in an amount greater than the Reference Amount, when not provided in the annual budget;</p> <ul style="list-style-type: none"> <li>• authorize the Executive Office to acquire, alienate and constitute collateral or encumbrances of any type on the goods that form the permanent assets of the Company, in amounts representing a liability greater than the Reference Amount and that are not provided in the annual budget;</li> <li>• grant prior authorization for the entering into of partnership or shareholder agreements involving the Company or its controlled companies;</li> <li>• cast the votes by the Company representative in the Shareholders' General Meetings of the companies in which the Company has any interests, or give prior approval for the amendment of the respective corporate Bylaws, when the amounts of this participation are greater than the Reference Amount;</li> <li>• appoint the Executive Office of the controlled companies, with the appointment of the main executives at the same time of that of the Chief Executive Officer, unless otherwise approved by 75% of the Directors;</li> <li>• decide on the acquisition by the Company of its own shares, to be held in treasury and/or for later cancellation or alienation;</li> <li>• decide, except for the shareholder interests arising from the financial investment policy of the Company and observing the provision of Article 3 of the Bylaws, concerning the Company's participation in other companies, as well as in charitable associations and organizations, when the amounts involved are greater than the Reference Amount;</li> <li>• authorize the Company to grant guarantees in third-party obligations with any amount and, not related to the Company's purposes, mainly with regard to its settlements central office activities (whether performed by itself or its controlled companies);</li> <li>• define the list containing three names of companies specialized in economic valuations of companies for the preparation of a valuation report on the shares of the Company, in cases of cancellation of publicly-held company registration or delisting from the Novo Mercado;</li> <li>• approve the hiring of the registrar of shares;</li> <li>• decide on the payment or credit of interest on shareholders' capital to the shareholders, under the terms of the applicable legislation;</li> <li>• choose and remove the independent auditors; and</li> <li>• appoint, from among its members the members of the permanent advisory Committees and the other Commissions and temporary work groups to be created by the Board of Directors.</li> </ul> <p>The Bylaws of BM&amp;FBOVESPA also provides basic responsibilities for the Executive Office in its Article 38, as follows:</p> |
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|  | <ul style="list-style-type: none"> <li>• authorize the opening, closing or changing of the address of branches, agencies, deposits, offices or any other establishments of the Company in Brazil or abroad;</li> <li>• submit, annually, for the consideration of the Board of Directors, the Management Report and the Executive Office’s financial figures, accompanied by the independent auditors’ report, as well as the proposal for the allocation of profits recorded in the previous fiscal year;</li> <li>• prepare and propose to the Board of Directors, the annual and multiannual budget, the strategic plans, the expansion plans and investment programs;</li> <li>• grant prior authorization to the acquisition or alienation, by the Company or by its controlled companies, of chattel or real property, the creation of fixed guarantees or encumbrances of any type over these assets, the taking out a loan, financing and the concession of a fixed or personal guarantee, in amounts that represent a lower liability than that of the Reference Amount; and</li> <li>• approve, by the Chief Executive Officer’s request, on any matter not within the exclusive power of the Shareholders’ General Meeting or of the Board of Directors.</li> </ul> <p><b>Q.2.2.3: How does the FMI provide accountability to owners, participants, and other relevant stakeholders?</b></p> <p>Decisions taken by the Company, as well as the financial statements approval, have the direct participation of all shareholders, who meet at least once a year in the General Meeting.</p> <p>Also, BM&amp;FBOVESPA has one Executive dedicated only to investor relations, which publishes and disseminates the quarterly and annual results of the company.</p> <p>Additionally, the BM&amp;FBOVESPA is in compliance with the rules and obligations related to accountability established by the laws and regulations.</p> <p>The BM&amp;FBOVESPA is a self-regulator entity responsible for establishing rules and standards for participating. The enforcement of rules regarding the service is performed by BSM.</p> |
| <p>KE 3. Disclosure of the identified governance arrangements.</p> | <p><b>Q.2.2.4: How are the governance arrangements disclosed to owners, relevant authorities, users, and the public?</b></p> <p>The Corporate Bylaws and the Corporate Governance Guidelines are published on the BM&amp;FBOVESPA website.</p>   |
| <p>KEY CONCLUSION 2.2</p>  |  |

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| <p>KC 2.3</p>   | <p>The roles and responsibilities of an FMI’s board of directors (or equivalent) should be clearly specified, and there should be documented procedures for its functioning, including procedures to identify, address, and manage member conflicts of interest. The board should review both its overall performance and the performance of its individual board members regularly.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| <p>KE 1. Identification of the roles and responsibilities of the FMI’s board of directors (or equivalent)..</p> | <p><b>Q.2.3.1: What are the roles and responsibilities of the FMI’s board of directors (or equivalent), and are they clearly identified?</b></p> <p>The responsibilities of the Board are listed in Articles 29 and 30 of the Bylaws. These include establishing guidelines for the company to conduct business and pursue its strategic goals. Moreover, the Board is responsible for approving the main organizational plans and goals, setting specific guidelines for internal implementation, whereas monitoring the performance of the company and the executives.</p> <p>See Q.2.2.2 for more details.</p>   |
| <p>KE 2. Identification of procedures for the functioning of the board.</p>                                     | <p><b>Q.2.3.2: What are the procedures of the board? For example, describe how the board committees have been established to facilitate the functioning of the board. What are the roles, responsibilities, and composition of such committees?</b></p> <p>The roles and responsibilities are:</p> <p><b>ADVISORY COMMITTEES TO THE BOARD OF DIRECTORS</b></p> <p>The Audit, Corporate Governance and Nomination, Compensation, and Risk Committees are linked to the Board of Directors, which they are there to assist within the respective area of expertise of each committee.</p> <p><b>AUDIT COMMITTEE</b></p> <p>Accompanies and assesses the quality of internal and independent audits at the Company and its subsidiaries. It also analyzes the Company’s financial reports and those of its subsidiaries and supervises the area responsible for drawing up audits.</p> <p><b>CORPORATE GOVERNANCE AND NOMINATION COMMITTEE</b></p> <p>Recommends developments in the Company’s corporate governance, assesses the adoption of best practices and selects and nominates members of the Board of Directors, the Executive Board and the Advisory Committees to the Board of Directors.</p> <p><b>COMPENSATION COMMITTEE</b></p> <p>Reviews, proposes and accompanies changes to parameters and guidelines, to remuneration and benefits policy and to human resources management.</p> <p><b>RISK COMMITTEE</b></p> |

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|   | <p>Monitor and assesses the risks that are inherent to the Company’s activities and has a strategic and structural focus.</p>  |
| <p>KE 3. Identification of processes to identify, address, and manage conflicts of interest of members.</p> | <p><b>Q.2.3.3: How does the board identify, address, and manage conflicts of interest? What document describes these processes? Are such documents public or available to owners, relevant authorities, and users?</b></p> <p>The “Policy on conflicts of interest and related party transactions” establishes rules to ensure all decisions, in particular decisions involving related parties or other situations potentially involving conflicts of interests, are taken in line with the interests of BM&amp;FBOVESPA and its shareholders. This Policy applies to all directors, officers and collaborators of the Company and its subsidiaries. The document is available on-line on the BM&amp;FBOVESPA website.</p> <p>On identifying a matter of this nature, directors and officers are required to promptly make their conflict of interest known to the Company. In addition, they are required to abstain from taking part in discussions and voting on any related matter. Upon request of the Chair or the CEO, as the case may be, any director or officer in conflict of interest may participate in part of the discussions so as to provide information on the conflict, the transaction or the parties involved, and in any event will be required to leave when the matter is to be decided.</p> <p>In the event a director or executive officer remained silent about a conflict of interest, any peer may reveal the conflict of interest. In this event, a director’s or officer’s silence will be deemed a breach of the company’s policy on conflicts of interest and the matter will be submitted to the nomination and corporate governance committee for evaluation and a recommendation to the Board of Directors as to possible corrective actions.</p> <p>Both the notice of an event of conflict of interests and any subsequent abstention from voting shall be recorded in the minutes of Board meetings.</p> <p>Upon taking office, the directors and officers of BM&amp;FBOVESPA are required to sign a document acknowledging awareness of, and adherence to the Policy on Conflicts of Interest and Related Party Transactions.</p> |
| <p>KE 4. Review of board’s performance</p>  | <p><b>Q.2.3.4: What are the procedures established to review the performance of the board as a whole?</b></p> <p>Every year the Chairman of the Board of Directors, as advised by the Nomination and Corporate Governance Committee, presides over a formal and structured process of evaluation of the Board with the aim of improving efficiency and governance. This process requires Board members to make assessments in answer to specific questions that encompass the five key dimensions of effective corporate governance:</p>   |

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|                    | <ul style="list-style-type: none"> <li>• Strategic focus;</li> <li>• Knowledge and information about the business;</li> <li>• Board independence and decision-making process;</li> <li>• Operation of Board meetings and performance of the advisory committees;</li> <li>• Motivation and alignment of interests.</li> </ul> <p>The compiled results of these assessments are discussed at Board meetings, which then evaluate improvement proposals and plans.</p> <p>The Company’s annual report includes a section discussing the Board self-evaluation and the primary driving factors of annual improvement plans subsequently adopted.</p> <p><b>Q.2.3.5: What are the procedures established to review the performance of individual board members?</b></p> <p>See Q.2.3.4.</p> |
| KEY CONCLUSION 2.3 |   |

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| KC 2.4   | <p>The board should contain suitable members with the appropriate skills and incentives to fulfil its multiple roles. This typically requires the inclusion of independent board member(s).</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>   |
| KE. 1. Identification of the appropriate skill sets for board members. | <p><b>Q.2.4.1: What skill sets are necessary for the FMI’s board members? What are the processes for identifying potential board members with the required skills?</b></p> <p>As stated in Company Bylaws, Directors are required to be at least 25 years old and have an upstanding reputation, and knowledge of the functions, operations and practices of the capital markets operated and managed by the Company and/or its subsidiaries.</p> <p>The Articles 23 to 25 of Company Bylaws define the rules for electing Board members. It states that the election of members of the Board of Directors shall observe the slate system and only the slates of candidates nominated by the Board of Directors, as advised by the Governance and Appointment Committee; or those that are appointed by any shareholder or Group of Shareholders may run.</p> |
| KE. 2. Identification of appropriate incentives for board members.     | <p><b>Q.2.4.2: What are the incentives that the FMI provides to members of the board, particularly incentives to attract and retain members of the board with appropriate skills?</b></p> <p>The Company aims to maintain a competitive remuneration before the market in order to retain and attract talent that can meet its strategic objectives in the short, medium and</p>  |

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|  | <p>long term.</p> <p>In this sense, there is a balance between base salary (fix income), short-term remuneration (PLR) and the medium and long-term remunerations (Stock Options). In this way, the employee has an incentive to meet and exceed the semiannual and annual goals that are linked to PLR Program, as well as implementing medium-term and long-term actions that added value to the Company and will be reflected in its share markets values, and, it is associated to options granted on the stock options program. (2012 Reference Form).</p> <p><b>Q.2.4.3: How do these incentives reflect the long-term achievement of the FMI's objectives?</b></p> <p>The company aims to have a remuneration based on short, medium and long term according to the Company's objectives, maintenance of the competitive remuneration before the market, attractiveness to retain its executives and pay salaries to its employees according their responsibilities and compatible with their positions and performance. In this sense, the fix remuneration of Company executives is placed on the median of the market and the diferencial is given by the variable remuneration of short and long term which are linked to the overall performance of the Company and individual performance. (2012 Reference Form).</p>   |
| <p>KE 3. Inclusion of non-executive board members.</p> | <p><b>Q.2.4.4: What is the FMI's policy on the composition of its board of directors (or equivalent), including whether there has to be a minimum number of non-executive and/or independent directors. How does the FMI define independent board members?</b></p> <p>The Board comprises eleven directors, six of whom are independent from management, market participants and holders of material ownership interests in our shares, which means any ownership interest in excess of five percent (5%) of the shares issued by the Company.</p> <p>A detailed description of eligibility requirements applicable to independent Board members is provided by the Company Bylaws and the internal regulation of the Board. The Company Bylaws states that independent Board members are those who meet, cumulatively, the criteria for independence established in the Listing Regulation of the Novo Mercado and in CVM Instruction No. 461/07; and do not hold, direct or indirectly, voting interest equal or higher than 5% of the Company's total capital stock or voting capital stock or do not have any relationship with a shareholder with interest equal or higher than 5% of the Company's total capital stock or voting capital stock.</p> <p>The Listing Regulation of the Novo Mercado establishes that independent Board member is characterized by: (i) not having any form of affiliation with the Company, except for capital participation; (ii) not being Controlling Shareholder, spouse or relative up to second degree, or have been in the past three years, linked to a company or entity related to the</p> |

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|                    | <p>Controlling Shareholder (individuals involved in public education and / or research are excluded from this restriction); (iii) has not been, for the past three years, employee or Director of the Company, the Controlling Shareholder or a subsidiary of the Company; (iv) not being supplier or buyer, directly or indirectly, of Company's services and / or products, in magnitude that results in loss of independence; (v) not being employee or director of a company or entity offering or demanding services and / or products to the Company; (vi) not being spouse or second degree relative of any officer of the Company; (vii) not receiving any Company's compensation beyond the one due to his or hers advisory services (cash from capital interest are excluded from this restriction).</p> <p>The CVM Instruction No. 461/07 states that independent Board member is characterized as one who not maintains ties with: (i) the entity, its direct or indirect parent companies, subsidiaries or corporation subject to direct or indirect common control; (ii) the administrator of the entity, its direct or indirect parent companies, or subsidiaries; (iii) the person authorized to operate in its markets; and (iv) the shareholder with 10% or more of the voting capital of the entity.</p> <p><b>Q.2.4.5: How does the FMI assess the independence of the board member(s)?</b></p> <p>Upon taking office, the directors and officers of BM&amp;FBOVESPA are required to sign a document acknowledging awareness of, and adherence to the Policy on Conflicts of Interest and Related Party Transactions. This assignment is disclosed on the Reference Form issued by the Company at CVM website.</p> |
| KEY CONCLUSION 2.4 |  |

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| KC 2.5  | <p>The roles and responsibilities of management should be clearly specified. An FMI's management should have the appropriate experience, a mix of skills, and the integrity necessary to discharge their responsibilities for the operation and risk management of the FMI.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>   |
| KE 1. Identification of the roles and responsibilities of the FMI's management. | <p><b>Q.2.5.1: What are the roles and responsibilities of management?</b></p> <p>The Executive Office is in charge of proposing initiatives, business plans, and policies to the Board of Directors, as well as to implement the strategy adopted by the Board and implementing the day to day operation of the company. The Executive Office is currently composed by 5 managers and their responsibilities are stated in the Company Bylaws, Articles 31 to 38.</p> <p>The Executive Office represents the Company, having the power to perform all acts of the management of corporate business. The Executive Office members have the power to: (i) observe and enforce the terms and conditions of the Bylaws, the decisions of the Board of Directors and of the Shareholders' Meeting; (ii) perform, within its powers, all of the acts necessary for the ordinary operation of the Company and consecution of the corporate</p> |

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|  | <p>purpose, and (iii) coordinate the activities of the Company’s subsidiaries.</p> <p>The Executive Office members are subject to specific internal rules, such as: Manual on Policies for Disclosure of Act, Fact and Securities Trading, Code of Conduct, Information Security Policy, and Policy for Related Party Transaction and other situations involving conflicts of interest.</p> <p><b>Q.2.5.2: How are the roles and objectives of senior management set?</b></p> <p>The board of executive officers has the mission of ensuring that business is conducted for protection and appreciation of Company assets, whereas maximizing long-term return for shareholders, in line with the mission of the Board of Directors (“Board”). The executive officers make up the senior management of the Company, in charge of managing and conducting day-to-day business activities, and responsible for proposing to the Board initiatives, business plans and policies aimed at implementing the strategies the Board defines, pursuant to the Internal Regulation of the Board of Executive Officers.</p>  |
| <p>KE 2. Identification of skills, experience and integrity of management.</p> | <p><b>Q.2.5.3: What is the process and criteria for selecting senior management?</b></p> <p>The executive officers are required to work for the Company on an exclusive dedication basis, and pursuant to Article 22, paragraph 8, of the Bylaws may not while acting as officers have ties with: (i) holders of permits granting access to BM&amp;FBOVESPA markets, (ii) shareholders or groups of shareholders (as defined in the Bylaws) individually or collectively holding ownership interest in 5% or more of the Company’s voting stock, (iii) participants of the securities distribution system in Brazil or elsewhere, (iv) other public companies; (v) institutions that operate in the capacity of securities portfolio managers; (vi) qualified institutional buyers (as per paragraph 8 of Article 22 of the Bylaws).</p> <p>Pursuant to the Bylaws, eligibility to serve as executive officer of the Company requires a person to meet the following, in addition to other legal and regulatory requirements: (a) be over 25 years of age; (b) have irreproachable reputation and knowledge of the markets managed by the Company and/or a subsidiary; (c) not have a spouse, common-law spouse or relative to the second degree holding a position as director or officer of, or having an employment relationship with, the Company or any subsidiary; and (d) not hold a position in any company that may be deemed a competitor of the Company or any subsidiary, and not have or represent conflicting interests with those of the Company or any subsidiary, provided persons that meet the following cumulative conditions shall be deemed to have a conflict of interests with the Company: (i) a person elected by a shareholder that in turn acts as director of a competitor; and that (ii) has a subordinate relationship with the shareholder electing such person. (Internal Regulation of the Board of Executive Officers).</p> <p><b>Q.2.5.4: What processes are there for ensuring senior management positions are filled by</b></p> |



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|                    | <p><b>staff with the required skills necessary for the operation and risk management of the FMI?</b></p> <p>See Q.2.5.3 - Pursuant to the Bylaws, eligibility to serve as executive officer of the Company requires a person to meet the following, in addition to other legal and regulatory requirements: (b) have irreproachable reputation and knowledge of the markets managed by the Company and/or a subsidiary.</p> <p><b>Q.2.5.5: How is management performance assessed?</b></p> <p>The Board of Directors, at any time, overseeing management by the executive officers, examining the company’s books and records, requesting information on transactions, whether closed or about to be closed, and any other acts, due regard given to the confidentiality required with respect to transactions carried out and/or registered in Company systems and markets.</p> <p>Formal annual evaluations of performance of the executive officers by the Board should be performed, pursuant to the BM&amp;FBOVESPA CORPORATE GOVERNANCE GUIDELINES.</p> <p><b>Q.2.5.6: What is the process to remove senior management if necessary?</b></p> <p>Electing and removing the executive officers of the Company, as well as establishing their duties are responsibilities of the Board of Directors, pursuant to the Company Bylaws.</p> |
| KEY CONCLUSION 2.5 |   |

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| KC 2.6   | <p>The board should establish a clear, documented risk-management framework that includes the FMI’s risk-tolerance policy, assigns responsibilities and accountability for risk decisions, and addresses decision making in crises and emergencies. Governance arrangements should ensure that the risk-management and internal control functions have sufficient authority, independence, resources, and access to the board.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| KE. 1. Identification of the risk-management framework established by the board. | <p><b>Q.2.6.1: What is the risk-management framework that has been established by the board?</b></p> <p>The framework of the methodology for Enterprise Risk Management is based on ISO 31000:2009 and is structured into the following steps:</p> <ul style="list-style-type: none"> <li>• Understanding the objectives and process mapping;</li> <li>• Risk identification;</li> <li>• Analysis and classification of the inherent and residual risks;</li> <li>• Identification of internal controls;</li> </ul> |

- Monitoring of key risk indicators.

The Audit and Corporate Risk Department also uses as a model for evaluating internal controls the COSO ERM Framework (Committee of Sponsoring Organizations of the Treadway Commission) and COBIT Framework (Control Objectives for Information and Related Technologies).

**Q.2.6.2: How does this framework address the FMI's risk-tolerance policy, assign responsibilities and accountability for risk decisions (such as limits on risk exposures), and address decision making in crises and emergencies?**

The Enterprise Risk Management framework adopted by the Company establishes the communication across all participants who take part in the process of managing risk, which includes the Board of Directors, the Risk Committee, the Executive Office, the Process Owner, and the Risk Owner.

Periodically, the Audit and Corporate Risk Director holds meetings with the Executive Officers, the Risk Committee and the Board of Directors to present and validate the risks identified.

The treatment of risks reflects the position (response) of the Administration with respect to risk factors considering its consequences, tolerance / risk appetite and cost-effective mitigation and should also be assessed whether this response can generate new risks to be managed. This step involves identifying and evaluating options to treat risks and develop action plans to mitigate those risks.

In order to treat the risks identified the Risk Owner must decide on the risk response, proposing the most appropriate approach between those described below:

- Acceptance: the current risk level is below the risk tolerance / appetite, being assumed by the Company with no actions defined for its treatment. In this case, the decision must be submitted for approval of the Managing Director for risks classified up to moderate level and presented to the Executive Office. An acceptance of risks classified as high should be approved by the Executive Office and presented to the Risk Committee. The risks with extreme level must be approved by the Risk Committee.
- Avoidance: take action to exit the activities that give rise to the risks.
- Reduction: actions taken to reduce the likelihood and / or the impact of risk (eg improving controls that aims to protect assets, prevent and detect theft and fraud timely, improvement in obtaining information for decision making etc.)
- Transfer: activities that aim to reduce the impact and / or likelihood of risk through risk transfer or in some cases sharing a part of the risk (eg insurance policies or review of contracts that exclude liability to the Company in matters

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|  | <p>related to risk).</p> <p>For these last three options (elimination, reduction or transfer), the Risk Owner should develop action plans for risk mitigation with the Audit and Corporate Risk Department.</p>   |
| <p>KE. 2. Identification of board processes to determine, endorse, and regularly review the risk-management framework.</p>   | <p><b>Q.2.6.3: What is the process for determining, endorsing, and reviewing the risk-management framework?</b></p> <p>Whenever improvements of the risk management framework are identified, proposals of revision are submitted by the Audit and Corporate Risk Director to the Risk Committee.</p>   |
| <p>KE 3. Identification of authority, independence, resources, and access to the board of the risk management and internal control functions in governance arrangements.</p> | <p><b>Q.2.6.4: What are the roles, responsibilities, authority, reporting lines, and resources of the risk-management and audit functions?</b></p> <p>The Risk Committee is responsible for (i) assessing and monitoring exposure to risks intrinsic to the business activities of the Company, with particular focus on structural and strategic risk management; (ii) assessing and recommending the Company’s risk management guidelines and strategies; and (iii) conducting periodic reassessments of the risk management strategies adopted by the Company.</p> <p>The Audit Committee is responsible for (i) evaluating the effectiveness and adequacy of the controls and risk management systems, including legal, tax and labor related risks, and (ii) issuing a prior opinion to the Board of Directors on the annual report regarding the Company’s internal controls and risk management system. Both Committees report to the Board.</p> <p>The BM&amp;FBOVESPA Market Risk Committee’s role is to provide risk-related technical assistance to the Chief Executive Officer and BM&amp;FBOVESPA’s executive body. Among its duties are: (i) assess the effects of the political and economic scenarios on the markets where BM&amp;FBOVESPA operates; (ii) propose policies, methodologies, criteria, and parameters for managing the risks incurred by BM&amp;FBOVESPA; (iii) propose enhancements to risk systems; (iv) analyze the system’s leverage level; and (v) perform the analyses deemed necessary for the proper execution of its activities (vi) this committee reports to CEO.</p> <p><b>Q.2.6.5: What is the board’s role regarding the adoption and use of risk-management models? How are these models and the related methodologies validated?</b></p> <p>The Department of Risk modeling performs independent assessment of models of management of counterparty risk, credit risk, liquidity risk and market risk. These assessments are conducted by specialist staff and effectively segregated from people who manage these risks.</p> |

KEY CONCLUSION 2.6

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| <p>KC 2.7</p>  | <p>The board should ensure that the FMI’s overall strategy, rules, and major decisions reflect appropriately the interests of its participants and other relevant stakeholders. Major decisions should be clearly disclosed to relevant stakeholders and, where there is a broad market impact, the public.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>   |
| <p>KE 1. Identification of how the legitimate interests of direct and indirect participants and other relevant stakeholders are reflected in the FMI’s design, rules, strategy, and major decisions.</p> | <p><b>Q.2.7.1: How does the FMI identify and take account of the interests of the FMI’s participants and other relevant stakeholders in its decision making in relation to its design, rules, overall strategy, and major decisions?</b></p> <p>The BM&amp;FBOVESPA has channels of communication between managers and market participants (brokers and investors), with some Directorates responsible for identifying stakeholders needs. In addition, the company has an ombudsman, also responsible for capturing the market needs.</p> <p><b>Q.2.7.2: How does the board solicit, assess, and incorporate the views of direct and indirect participants and other relevant stakeholders on these decisions? How are conflicts of interest identified, and how are they addressed?</b></p> <p>See Q.2.7.1.</p> |
| <p>KE 2. Identification of how the FMI discloses major decisions to relevant stakeholders and, where appropriate, the public.</p>  | <p><b>Q.2.7.3: How does the FMI disclose major decisions made by the board to relevant stakeholders and, where appropriate, the public?</b></p> <p>Minutes of Board’s meeting are published on the BM&amp;FBOVESPA website.</p>   |

KEY CONCLUSION 2.7

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| <p>ASSESSMENT OF PRINCIPLE 2</p> |  |
| <p>COMMENTS</p>                  |  |

**PRINCIPLE 3. FRAMEWORK FOR THE COMPREHENSIVE MANAGEMENT OF RISKS**

An FMI should have a sound risk-management framework for comprehensively managing legal, credit, liquidity, operational, and other risks.

KC 3.1 An FMI should have risk-management policies, procedures, and systems that enable it to identify, measure, monitor, and manage the range of risks that arise in or are borne by the FMI. Risk-management frameworks should be subject to periodic review.  
**PS X CSD X SSS X CCP X TR X**

KE 1. Identification of types of risk and risk-management policies and procedures.

**Q.3.1.1: What types of risk arise in the FMI?**

There are five types of risk related to the activities performed by the clearinghouse: credit risk, market risk, liquidity risk, operational risk and legal risk.

Credit risk can assume three distinct dimensions. The first relates to the potential (financial) loss associated with failure by one or more infrastructure providers used in settlement processes. The second dimension concerns the possibility of default by one or more of the clearinghouse’s participants. Because the clearinghouse is responsible for discharging all the obligations of any defaulting participant (closeout), it may have to cover losses that arise during this process. Generally speaking, such losses are associated with market and liquidity risks inherent to the settlement of the defaulting participant’s positions. Finally, there is the credit risk associated with the collateral that is part of the clearinghouse’s safeguard structure. If this collateral needs to be used in connection with the failure of its issuer, the result will be a loss for the clearinghouse.

The CCP is exposed to market risk only in the event of default by one of or more of its participants. In that case the CCP is responsible for discharging all of the defaulting participant’s original obligations under prevailing market conditions, being thus exposed to market risk. The collateral allocated to cover such losses (e.g. margin) can also give rise to market risk, as it usually consists of securities that have their value based upon market variables, such as prices and rates. Although in an indirect way, it is also important to consider the strong correlation between periods of high volatility and default events.

Like market risk, liquidity risk arises only in the event of default by a participant. In this case, liquidity risk can be viewed as the possibility of incurring into a financial loss due to insufficient liquidity in one or more markets related to the closeout process. Liquidity risk therefore assumes two dimensions: (i) Liquidity risk associated with the fulfillment of all the defaulting participant’s original obligations via early settlement (e.g. taking offsetting positions in futures contracts); (iii) Liquidity risk associated with the use of collateral during closeout of the defaulting participant’s positions (e.g. collateral posted by the defaulting participant in the form of assets with limited liquidity).

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|  | <p>The legal risk is associated with uncertainties, absence or shortfall of legislation and regulation to support the clearinghouse’s activities, especially regarding the provision of multilateral clearing and settlement, the procedures for collateral execution and the clearinghouse’s rights to close positions in case of default.</p> <p>Operational risk is related to losses resulting from human failures, systems failures, inadequacy of controls and procedures, discontinuity of processes, frauds, disclosing of incorrect documentation, among others, both internal and external to the clearinghouse or to BM&amp;FBOVESPA. Worth special attention are the systems failures which affect the Clearinghouse’s ability to assess, monitor, and manage risks, as well as to satisfactorily carry out the settlement of its obligations.</p> <p><b>Q.3.1.2: What are the FMI’s policies and procedures in place that help the FMI identify, measure, monitor, and manage the risks that arise in the FMI?</b></p> <p>Please see Q.3.1.5 and Q.3.1.6.</p>   |
| <p>KE. 2. Identification of risk-management systems.</p> | <p><b>Q.3.1.3: What risk-management systems are used by the FMI to help identify, measure, monitor, and manage its range of risks?</b></p> <p>The most important risk management systems are:</p> <ul style="list-style-type: none"> <li>• Risk Management System for Listed Derivatives <ul style="list-style-type: none"> <li>– Intraday Subsystem;</li> <li>– EOD Subsystem.</li> </ul> </li> <li>• Risk Management System for OTC Derivatives</li> <li>• Position Limits System</li> <li>• Collateral Management System</li> <li>• Credit Limits System</li> <li>• Backtesting System</li> </ul> <p>A brief description of each system follows:</p> <ul style="list-style-type: none"> <li>• Risk Management System for Listed Derivatives/Intraday Subsystem: Calculates risk every 3 to 5 minutes aggregating new trades and prices for all portfolios in all levels (client, broker and CM), comparing the new margin requirements with collateral already allocated. Collateral shortfall can give raise to intraday margin calls. Non-allocated trades (i.e. those yet to be assigned to a final client/BO) have their risk assigned directly to the responsible broker/MC. Risk is calculated using stress testing.</li> <li>• Risk Management System for Listed Derivatives/EOD Subsystem: A particular case of the Intraday Subsystem that calculates the residual margin calls for T+1 for all</li> </ul> |

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|                                  | <p>portfolios based upon EOD conditions (100% of the trades allocated to their respective BOs, definitive settlement prices, etc).</p> <ul style="list-style-type: none"> <li>• Risk Management System for OTC Derivatives: Calculates risk for OTC derivatives based upon a stress testing framework. This framework takes into account specific aspects concerning the OTC markets, such as restricted liquidity profiles and longer closeout time frames. Given OTC market dynamics and clearinghouse rules, intraday risk calculation is unnecessary.</li> <li>• Position Limits System: Aggregates all positions at the level of the beneficial owners (BOs) and compares with the position (i.e. concentration) limits set by the clearinghouse for each derivatives contract. Positions are consolidated taking into account the BO's activities in all brokers and CMs, and can also consider financial conglomerates (i.e. group of related BOs). Excess limits can give rise to additional margin requirements (concentration add-on) and/or compulsory closeout.</li> <li>• Collateral Management System: Manages all collateral posted at the clearinghouse, segregating it at the level of the BO, making thus sure that there is no comingling of assets. The system calculates market prices for all assets, applying the respective haircuts and collateral concentration limits (per asset, per liquidity profile and per issuer).</li> <li>• Credit Limits System: Centralizes the control of credit risk-bearing collateral limits (CDs and LCs). Limits are defined per issuer and compared to the total amount of related collateral posted. It also manages diversification rules concerning issuer concentration at BO, broker and CM level. Limits can also consider the aggregate activity of financial conglomerates.</li> <li>• Backtesting System: Calculates, on a daily basis, the potential impact of BO, broker and CM defaults (individual or n-joint) given the total amount of collateral posted, prevalent market conditions and closeout hypotheses. Besides being used for clearinghouse risk management purposes, results are also sent to the Brazilian Central Bank (BCB) as a regulatory requirement.</li> </ul> <p>It is also worth mentioning that, for participants that have direct market access (DMA), the use of (hard) pre-trade credit limits is mandatory. Participants can choose either from BM&amp;FBOVESPA's pre-trade risk management tool (GTSLiNe) or any other software provider (subject to minimum operational requirements and <i>in situ</i> audit).</p> <p><b>Q.3.1.4: How do these systems provide the capacity to aggregate exposures across the FMI or other relevant parties, such as the FMI's participants and their customers?</b></p> <p>All risk management systems reflect the clearinghouse beneficial owner (BO) structure, making thus aggregation at all levels (client, broker, CM) a seamless task (please see Q3.1.3 above). It is also possible to aggregate risk figures considering compound structures, such as financial conglomerates or asset managers.</p> |
| KE. 3. Review of risk-management | <b>Q.3.1.5: How does the FMI assess the effectiveness of risk-management policies,</b>   |

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| <p>policies, procedures, and systems.</p> | <p><b>procedures, and systems?</b></p> <p>The effectiveness of risk management policies, procedures and systems is reviewed in accordance to BM&amp;FBOVESPA's risk governance structure. In that sense:</p> <ul style="list-style-type: none"> <li>• The Board of Directors periodically receives feedback from the Board Risk Committee (Board Members), from the Executive Board and from the Audit Committee, reviewing the clearinghouse risk profile and suggesting any necessary changes in overall risk policies;</li> <li>• The Executive Board periodically receives feedback from the Risk Committee (BM&amp;FBOVESPA Chief Officers and Officers) and reviews the clearinghouse risk profile, suggesting any necessary change in risk policies, procedures and systems;</li> <li>• The Risk Committee continuously reviews the clearinghouse's key (more granular) risk aspects, suggesting any new policies, parameters or procedures necessary;</li> <li>• The Audit Department performs independent periodical assessments considering the clearinghouse's key processes, the critical ones being submitted to independent External Auditors. The Audit Department works closely to the Audit Committee, that provides independent risk management assessment to the Board of Directors;</li> <li>• The Brazilian Central Bank (BCB) continuously assesses the effectiveness of the clearinghouse's risk management policies, procedures and systems based upon information sent on a daily basis (backtests, positions, exposures, collateral posted, etc).</li> </ul> <p><b>Q.3.1.6: What is the process for developing, approving, and maintaining risk-management policies, procedures, and systems?</b></p> <p>The Board of Directors is responsible for defining the company's risk appetite, providing high level guidelines concerning risk management policies. In that matter it relies chiefly upon the assessment provided by the Board Risk Committee, the Audit Committee and the Executive Board. Moreover, any risk management change that would entail an amendment of the clearinghouse rulebook has to be approved by the Board of Directors.</p> <p>Changes in risk management procedures and systems have to be approved by the Risk Committee and confirmed by the Board of Directors. Change requests usually originate from the operational units and have to be properly justified and documented in order to be submitted to the Risk Committee in the first place.</p> <p>Any changes to the clearinghouse rulebook, operational guidebook and risk management guidebook have to be approved by the Brazilian Central Bank (BCB) prior to their publication.</p> <p><b>Q.3.1.7: Do these reviews properly take into account fluctuation in risk intensity, changing environments, and market practices?</b></p> |
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|                    | Yes, as an essential part of the continuous process of risk assessment. (see Q.3.1.5). |
| KEY CONCLUSION 3.1 |  |

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| KC 3.2   | An FMI should provide incentives to participants and, where relevant, their customers to manage and contain the risks they pose to the FMI.<br><b>PS X CSD X SSS X CCP X TR X</b>  |
| KE. 1. Identification of incentives provided to the FMI's participants and their customers to manage and contain risk.   | <p><b>Q.3.2.1: What incentives does the FMI provide for participants and their customers to monitor and manage the risks they pose to the FMI?</b></p> <p>Clearinghouse co-responsibility and safeguard structures promote the proper alignment of interests between participants and the clearinghouse, thus encouraging active risk management practices. The co-responsibility structure formalizes the settlement obligations between clients and their brokers, between brokers and their CMs and between CMs and the clearinghouse, whereas the safeguard structure provides de adequate mix of defaulters-pay and survivors-pay elements.</p>   |
| KE 2. Identification of information provided by the FMI to participants and, where relevant, their customers to manage and contain the risks they pose to the FMI. | <p><b>Q.3.2.2: What information does the FMI provide to its participants and their customers to monitor the risks they pose to the FMI? For example, does the FMI provide them information on their credit and liquidity exposures, overall credit and liquidity limits, and the relationship between the exposures and limits?</b></p> <p>The clearinghouse provides comprehensive access to all relevant risk management information to its participants and, through them, to their customers. That includes individual limits, exposures and full disclosure of the methodologies and parameters used for defining risk management figures (e.g. margin requirements).</p>   |
| KE 3. Review of the policies and procedures for allowing participants and their customers to manage and contain their risks.                                       | <p><b>Q.3.2.3: What policies and systems does the FMI have to enable participants to understand and manage risks? How does the FMI ensure that its policies and systems are effective over time in allowing their participants and customers to manage and contain their risks?</b></p> <p>Participants have access, with a view limited to the positions under their responsibility, to the same systems the clearinghouse uses to manage its risks, particularly the Intraday Subsystem of the Risk Management System for Listed Derivatives. Hence, participants are endowed with the adequate tools to implement a risk management function as rigorous as the clearinghouse's. That also includes access to simulation tools that allow participants to perform what-if analysis. Participants are also subject to periodic audits that, amongst other checks, verify the adequacy of their risk management function, comprising, <i>inter alia</i>, the size and quality of the risk management team, the existence of satisfactory systems and procedures and the adherence to the policies in place.</p> |

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| KEY CONCLUSION 3.2   |  |
| KC 3.3   | An FMI should regularly review the material risks it bears from and poses to other entities (such as linked FMIs, settlement banks, liquidity providers, or service providers) as a result of interdependencies and develop appropriate risk-management tools to address these risks.<br><b>PS X CSD X SSS X CCP X TR X</b>  |
| KE 1. Identification of material risks that the FMI bears from and poses to other entities as a result of interdependencies. | <p><b>Q.3.3.1: What material risks has the FMI identified that it bears from and poses to other entities as a result of interdependencies?</b></p> <p>The clearinghouse does not have links with other clearinghouses and uses the Brazilian Central Bank (BCB) directly for settlement purposes. The only relevant FMI risks are:</p> <ul style="list-style-type: none"> <li>i. Potential outages of CSDs that hold participants collateral;</li> <li>ii. Failure of one or more liquidity providers.</li> </ul> <p><b>Q.3.3.2: How are these risks identified, measured, and monitored?</b></p> <p>The assessment of those risks is part of the overall clearinghouse risk management framework.</p> |
| KE 2. Development of risk-management tools that address risks arising from interdependencies with other entities.            | <p><b>Q.3.3.3: What risk-management tools are used by the FMI to address the risks arising from interdependencies with other entities?</b></p> <p>In both cases (CSD outage and liquidity provider failure), the critical scenario only occurs in the hypothesis of default procedures application. Risk management tools include access to credit lines, BM&amp;FBOVESPA's own capital and provider diversification.</p> <p><b>Q.3.3.4: How does the FMI assess the effectiveness of its risk-management tools that examine interdependencies?</b></p> <p>The relevant risk measure in this case is backtesting considering one or more hypothetical FMI failures.</p>                                |
| KEY CONCLUSION 3.3   |  |

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| KC 3.4   | An FMI should identify scenarios that may potentially prevent it from being able to provide its critical operations and services as a going concern and assess the effectiveness of a full range of options for recovery or orderly wind-down. An FMI should prepare appropriate plans for its recovery or orderly wind-down based on the results of that assessment. Where applicable, an FMI should also provide relevant authorities with the information needed for purposes of resolution planning.<br><b>PS X CSD X SSS X CCP X TR X</b> |
| KE 1. Identification of the scenarios that may potentially prevent the | <b>Q.3.4.1: What are the FMI's processes to identify scenarios that may potentially prevent the FMI from being able to provide its critical operations and services? What scenarios</b>  |

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| <p>FMI from being able to provide its critical operations and services</p>       | <p><b>have been identified as a result of these processes?</b></p> <p>BM&amp;FBOVESPA has implemented two different approaches for identifying, monitoring, and managing its general business and operational risks. In top-down approach, the information about the risk profile is obtained directly from managing directors and consolidated to produce a list of all Company risks and the subset of critical risks to be monitored and evaluated. This analysis generates results of comprehensive information that yield the risk profile and an executive view of Company risks. In bottom-up approach, the risk profile of the Company is created from the operational details of the processes. The detailed level of this view allows a better definition of the response to the risk, risk rating metrics, and continuous oversight of risk management through indicators. The Company still misses a more clear definition of the policies and procedures related to operational risks. The Corporate Risk Department has identified 41 risks, 253 risk factors and 114 consequences. These main risks are periodically assessed by the Senior Management and reported to the Audit Committee and Risk Committee.</p> <p>The Enterprise Risk Management (ERM) procedures are transparent and integrated within the multiple departments of the Company, bringing into light the variety of businesses' inherent risks that take place in every unit of the Company. The Corporate Risk Department has also developed a procedure to capture information from external sources, for example forms 10-K from Americans FMIs. The Division has participated in international forums, like IIA, ISACA and Compliance Week. The potential single points of failure are reported to the Risk Committee.</p> <p>Based on risk identification, the Corporate Risk Department is establishing Key Risk Indicators (KRIs) that will be monitored in order to determine the impacts and the likelihood of the risk materialization. For the risks considered to have a high impact / likelihood, the Company established responses that will minimize risk consequences.</p> <p><b>Q.3.4.2: How do these scenarios take into account both independent and related risks which the FMI is exposed to?</b></p> <p>Please refer to Q.3.4.1</p> |
| <p>KE 2. Preparation of appropriate plans for recovery or orderly wind-down.</p> | <p><b>Q.3.4.3: What plans does the FMI have for its recovery or orderly wind-down?</b></p> <p>Regarding Business Continuity risks, BM&amp;FBOVESPA has adopted a Business Continuity Management (BCM) program in order to prepare appropriate plans for its recovery in case of Datacenter disruption and workplace and/or personnel unavailability. The BCM program includes the following plans:</p> <ul style="list-style-type: none"> <li>• Operational Continuity Plan: A document that lists the company's critical processes and which describes alternative operational procedures to be executed by the business and IT</li> </ul>  |

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|                    | <p>areas, in situations where critical resources for these processes are unavailable;</p> <ul style="list-style-type: none"> <li>• Technology Plan for Disaster Recovery: In case of a disaster or situation that makes use of the primary data center inoperable, this is a plan to reestablish the elements of technological infrastructure required for the BM&amp;FBOVESPA’s critical processes.</li> </ul> <p><b>Q.3.4.4: What are the FMI’s key recovery or orderly wind-down strategies regarding the identified critical operations and services? How can these be implemented?</b></p> <p>Regarding Business Continuity risks, BM&amp;FBOVESPA has adopted a Business Continuity Management (BCM) program in order to prepare appropriate plans for its recovery in case of Datacenter disruption and workplace and/or personnel unavailability.</p> <p>BM&amp;FBOVESPA’s strategies for recovery are already in place. The technology architecture designed to meet the BM&amp;FBOVESPA settlement processing is distributed among the primary data center and contingency data center, eliminating single points of failure.</p> <p>There is an alternative workplace with dedicated IT resources designed to accomplish the need of Settlement process staff.</p> <p><b>Q.3.4.5: How and how often are the plans for the FMI’s recovery and orderly wind-down reviewed and updated?</b></p> <p>Regarding Business Continuity risks, BM&amp;FBOVESPA has adopted a Business Continuity Management (BCM) program in order to prepare appropriate plans for its recovery in case of Datacenter disruption and workplace and/or personnel unavailability.</p> <p>The Business Continuity Plan is updated timely and is tested frequently. Parts of this plan are tested more often.</p> <p>The plans are tested considering scenarios of wide-scale and major disruption.</p> |
| KEY CONCLUSION 3.4 |   |

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| ASSESSMENT OF PRINCIPLE 3 |  |
| COMMENTS                  |  |

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| <b>PRINCIPLE 4. CREDIT RISK</b>  |   |
| <p>An FMI should effectively measure, monitor, and manage its credit exposures to participants and those arising from its payment, clearing, and settlement processes. An FMI should maintain sufficient financial resources to cover its credit exposure to each participant fully with a high degree of confidence. In addition, a CCP that is involved in activities with a more complex risk profile or that is systemically important in multiple jurisdictions should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would potentially cause the largest aggregate credit exposure to the CCP in extreme but plausible market conditions. All other CCPs should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would potentially cause the largest aggregate credit exposure to the CCP in extreme but plausible market conditions.</p> |   |
| <b>PS X CSD SSS X CCP X TR</b>   |   |
| KC 4.1   | <p>An FMI should establish a robust framework to manage the credit risks from its participants and the credit risks involved in its payment, clearing, and settlement processes. Credit risk may arise from current exposure, potential future exposure, or both.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>   |
| KE 1. Establishment of a framework for managing credit exposures from participants.  | <p><b>Q.4.1.1: What is the FMI’s framework for managing credit exposures from its participants?</b></p> <p>The framework for managing credit risk exposures from participants includes the following components:</p> <ul style="list-style-type: none"> <li>i. Admission criteria: Sets the rules and the minimum operational and financial standards for accepting new CMs and brokers and that incumbent CMs and brokers have also to comply with;</li> <li>ii. Co-responsibility structure: Defines the credit relationships - and thus accountability in the case of a default – between clients and brokers, brokers and CMs and CMs and the clearinghouse;</li> <li>iii. Safeguard structure: Establishes a layered collateral structure responsible for absorbing potential losses related to the default of one or more participants (i.e market risk as defined in Q.3.1.1);</li> <li>iv. Daily mark-to-market: Calculates, on a daily basis, the market value of all open positions. As a result, margin values are reassessed and daily settlement values defined;</li> <li>v. Daily and intraday margin calls: Ensures the adequacy of the components of the safeguard structure;</li> <li>vi. Position limits: Defines maximum allowed long and short positions per contract for each client or group of clients acting in concert (conglomerates). Limits may take into account aggregate positions considering all brokers and CMs.</li> <li>vii. Price limits: Defines maximum allowed price variations (positive and negative) in any given trading session, limiting thus daily settlement values (variation margin);</li> <li>viii. Collateral limits: Establishes maximum concentration limits per type of collateral for each client or group of clients acting in concert (conglomerates). Limits may take into account aggregate positions considering all brokers and CMs.</li> </ul> |

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|   | <p>ix. Intraday limits: Defines maximum allowed collateral shortfall on an intraday basis for each broker (see Q.3.1.3, Intraday Subsystem).</p> <p><b>Q.4.1.2: How are current exposures and, where they exist, potential future exposures taken into account in the FMI’s framework to manage credit risks?</b></p> <p>Current exposures and potential future exposures by and large define the total amount of collateral that has to be allocated to the safeguard structure, especially in what regards margin requirements (see Q.3.1.3 and Q.4.1.1, iii).</p>   |
| <p>KE 2. Establishment of a framework for managing credit risks from the FMI’s payment, clearing, and settlement processes.</p> | <p><b>Q.4.1.3: What is the FMI’s framework for managing credit risks from its payment, clearing, and settlement processes?</b></p> <p>There is no credit risk associated to the clearing and settlement processes, as the clearinghouse is solely responsible performing such activities. As for the payment process, the clearinghouse uses its own account at the Brazilian Central Bank for paying to and receiving from its participants, having no credit exposure to a third party (e.g. settlement bank).</p> <p><b>Q.4.1.4: What evidence supports the validity of the framework for managing credit risks from the FMI’s payment, clearing, and settlement processes (for example, backtesting)?</b></p> <p>Please see Q.4.1.4.</p> |
| <p>KEY CONCLUSION 4.1</p>   |  |

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| <p>KC 4.2</p>  | <p>An FMI should identify sources of credit risk, routinely measure and monitor credit exposures, and use appropriate risk-management tools to control these risks.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>   |
| <p>KE. 1. Identification the FMI’s sources of credit risk.</p> | <p><b>Q.4.2.1: What are the sources of credit risk to the FMI?</b></p> <p>Please see Q.3.1.1.</p>   |
| <p>KE 2. Measuring and monitoring credit exposures.</p>        | <p><b>Q.4.2.2: How does the FMI measure credit exposures?</b></p> <p>The clearinghouse measures its credit exposure to its participants on an intraday basis (every 3 to 5 minutes – see Q.3.1.3) considering, for each participant (client/BO, broker and CM), the impact of new positions (trading activity) and the total amount of collateral already allocated. Credit exposures so calculated take into account current exposures (MtM) and potential future exposures. Collateral deficits, depending upon their size and on the broker’s intraday limit, may trigger intraday margin calls. It is also possible, albeit less common, to have intraday margin calls related to intraday mark-to-market procedures (i.e. using intraday instead of settlement/closing prices). Credit exposures are also recalculated at the end of each business</p> |

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|   | <p>day using definitive positions and settlement/closing prices. In this case, any collateral shortfall has to be resolved no latter than in the morning of the next day.</p> <p><b>Q.4.2.3: How frequently does, and how frequently can, the FMI recalculate these exposures? How timely is the information?</b></p> <p>Please see Q.4.2.2 and Q.3.1.3.</p> |
| <p>KE 3. Use of tools to control credit risk.</p> | <p><b>Q.4.2.4: What tools does the FMI use to eliminate, limit, or mitigate credit risk (for example, offering an RTGS or DvP settlement mechanism, limiting net debits or intraday credit, establishing concentration limits, or marking positions to market on a daily basis)?</b></p> <p>Please see Q.4.1.1.</p>  |
| <p>KEY CONCLUSION 4.2</p>                         |  |

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| <p>KC 4.3</p>  | <p>A payment system or SSS should cover its current and, where they exist, potential future exposures to each participant fully with a high degree of confidence using collateral and other equivalent financial resources (see Principle 5 on collateral). In the case of a DNS payment system or DNS SSS in which there is no settlement guarantee but where its participants face credit exposures arising from its payment, clearing, and settlement processes, such an FMI should maintain, at a minimum, sufficient resources to cover the exposures of the two participants and their affiliates that would create the largest aggregate credit exposure in the system.</p> <p><b>PS X CSD SSS X CCP TR</b></p>   |
| <p>KE 1. Coverage of current and potential future exposures to each participant.</p> | <p><b>Q.4.3.1: What composition of financial resources does the FMI use to cover its current and potential future exposures?</b></p> <ul style="list-style-type: none"> <li>i. Participant collateral (i.e. defaulter pays): BRL 108 billion (approximately USD 54 billion);</li> <li>ii. Settlement Fund (i.e. survivors pay): BRL 390 million (approximately USD 195 million);</li> <li>iii. Clearing Funds (BM&amp;FBOVESPA funds): BRL 90 million (approximately USD 45 million);</li> <li>iv. BM&amp;FBOVESPA capital: BRL 4 billion (approximately USD 2 billion).</li> </ul> <p><b>Q.4.3.2: To what extent do these financial resources cover the FMI’s current and potential future exposures fully with a high degree of confidence?</b></p> <p>Margin requirements (and thus participant collateral) are calculated based upon a portfolio risk assessment methodology that considers extremely adverse market conditions (i.e. stress testing), covering both current and potential future exposures. Although there is not a targeted degree of confidence as the stress scenarios can be generated in an <i>ad hoc</i> fashion, implied probabilities usually range from 0,25% to 0,10% (99,75% to 99,90% coverage) considering EVT (extreme value) distributions and a 2-day period.</p> |

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| <p>KE 2. (For DNS payment systems and DNS SSSs in which there is no settlement guarantee) Coverage of the exposures of the two participants and their affiliates that would create the largest aggregate exposure in the system.</p> | <p><b>Q.4.3.3: If the FMI is a DNS payment system or DNS SSS that does not provide a settlement guarantee, do its participants face credit exposures arising from the payment, clearing, and settlement processes? If there are credit exposures in the system, how does the system measure these exposures?</b></p> <p>Not applicable.</p> <p><b>Q.4.3.4: If the FMI has credit exposures among its participants, do the FMI’s financial resources cover, at a minimum, the default of the two participants and their affiliates that would create the largest credit exposure in the system?</b></p> <p>Not applicable.</p> |
| <p>KEY CONCLUSION 4.3</p>  |   |

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| <p>KC 4.4</p>   | <p>A CCP should cover its current and potential future exposures to each participant fully with a high degree of confidence using margin and other prefunded financial resources (see Principle 5 on collateral and Principle 6 on margin). In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important in multiple jurisdictions should maintain additional financial resources to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would potentially cause the largest aggregate credit exposure for the CCP in extreme but plausible market conditions. All other CCPs should maintain additional financial resources sufficient to cover a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would potentially cause the largest aggregate credit exposure for the CCP in extreme but plausible market conditions. In all cases, a CCP should document its supporting rationale for, and should have appropriate governance arrangements relating to, the amount of total financial resources it maintains.</p> <p><b>PS CSD SSS CCP X TR</b></p> |
| <p>KE 1. Coverage of current and potential future exposures to each participant.</p>              | <p><b>Q.4.4.1: What composition of financial resources does the CCP use to cover its current and potential future exposures?</b></p> <p>Please see Q.4.3.1.</p> <p><b>Q.4.4.2: To what extent do these financial resources cover the CCP’s current and potential future exposures fully with a high degree of confidence?</b></p> <p>Please see Q.4.3.2.</p>   |
| <p>KE. 2. Additional financial resources to cover a wide range of potential stress scenarios.</p> | <p><b>Q.4.4.3: What additional financial resources does the CCP maintain to cover a wide range of potential stress scenarios that include, but are not limited to, the default of the participant and its affiliates that would potentially cause the largest aggregate credit exposure in extreme but plausible market conditions?</b></p>  |



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|   | <p>i. Margin requirements (i.e participant collateral) are actually defined considering extreme market conditions (see Q.4.3.2). Thus, strictly speaking, there is no need for additional financial resources from the CCP to cover such events. In other words, the clearinghouse model bundles the typical 2-layer model (margin requirements based on “normal” market conditions + additional financial resources for “extreme” market conditions) into a single, defaulter pays, layer.</p> <p>ii. Notwithstanding the above, BM&amp;FBOVESPA also defines minimum capital levels for backing its CCP activities assuming breakdown scenarios that surpass even the extreme market scenarios used for margin calculation.</p> <p><b>Q.4.4.4: If the CCP is systemically important in multiple jurisdictions or involved in activities with a more-complex risk profile, do the additional financial resources cover, at a minimum, the default of the two participants and their affiliates that would create the largest credit exposure in the CCP in extreme but plausible market conditions?</b></p> <p>Yes, by definition (see Q.4.4.3 and Q.4.4.4).</p> <p><b>Q.4.4.5: Has the CCP considered whether it is systemically important in multiple jurisdictions when setting its level of financial resources?</b></p> <p>No.</p> <p><b>Q.4.4.6: Has the CCP considered its risk profile when setting its level of financial resources (in particular, the clearing of financial instruments that are characterised by discrete jump-to-default price changes or that are highly correlated with potential participant defaults)?</b></p> <p>Yes (see Q.4.4.3, ii).</p> <p><b>Q.4.4.7: What is the frequency at which the FMI evaluates these additional resources to determine their sufficiency?</b></p> <p>On a daily basis.</p> |
| <p>KE 3. Documentation and governance arrangements relating to total financial resources.</p> | <p><b>Q.4.4.8: How does the CCP document its policies regarding its holdings of total financial resources?</b></p> <p>All relevant documents concerning the clearinghouse’s safeguard structure (i.e. margin calculation methodology and parameters, total amount of collateral deposited, collateral breakdown, clearing funds values, settlement fund composition, etc.) are public. Minimum capital levels for backing CCP activities are not public.</p>   |

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|                    | <p><b>Q.4.4.9: What governance arrangements are in place relating to the amount of total financial resources at the CCP?</b></p> <p>i. Definition of margin requirements: BM&amp;FBOVESPA’s Risk Committee (Chief Officers and Officers);</p> <p>ii. Definition of Clearing funds and Settlement Fund values: BM&amp;FBOVESPA’s Board of Governors;</p> <p>iii. Definition of minimum capital levels for backing CCP activities: BM&amp;FBOVESPA’s Board of Governors.</p> |
| KEY CONCLUSION 4.4 |  |

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| KC 4.5  | <p>A CCP should determine and test regularly the sufficiency of its financial resources by rigorous backtesting and stress testing. Backtesting should be conducted daily to demonstrate sufficient initial margin coverage with a 99 percent degree of confidence. Stress tests to check the adequacy of the total financial resources available in the event of a default in extreme but plausible market conditions should be performed at least monthly, or more frequently when the products cleared or markets served in general display high volatility, become less liquid, or when the size or concentration of positions held by a CCP’s participants increases significantly. In addition, more routine daily or weekly stress testing in which a CCP stresses the current positions of its participants using established parameters and assumptions should be considered to be a best practice. Comprehensive stress tests, involving a full validation of models, parameters, and assumptions and reconsideration of appropriate stress scenarios, should be conducted at least annually.</p> <p><b>PS CSD SSS CCP X TR</b></p> |
| KE 1. Details of the CCPs financial resources backtesting and stress testing program. | <p><b>Q.4.5.1: How does the CCP stress test to assess the sufficiency of its total financial resources?</b></p> <p>The stress testing process is indissociable from the intraday and EOD margin calculation processes. Thus, financial resources - in the form of collateral deposits - always reflect the current risk profile of the participants and, ultimately, of the clearinghouse.</p>  |
| KE 2. Communication and use of stress testing results.                                | <p><b>Q.4.5.2: How are stress-testing results communicated to relevant parties? How are these results used to evaluate the adequacy of and adjust the CCP’s total financial resources?</b></p> <p>Please see Q.4.4.8 and Q.4.5.1.</p>   |
| KE 3. Frequency of stress testing   | <p><b>Q.4.5.3: How often does the CCP perform stress testing to check the adequacy of total financial resources in the event of default in extreme but plausible market conditions?</b></p> <p>On a daily basis - please see Q.4.5.1.</p>   |
| KE 4. Analysis of stress-testing scenarios, models, and                               | <p><b>Q.4.5.4: How does the CCP’s stress-testing program take into account various conditions, such as a surge in position and price volatility, position concentration, change in market</b></p>   |

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| underlying parameters and assumptions.               | <p><b>liquidity, and model risk including shift of parameters? How often does the CCP assess the effectiveness and appropriateness of stress testing assumptions and parameters?</b></p> <p>The stress testing model takes into account actual client (BO), broker and CM positions, reflecting the clearinghouse risk profile in a very accurate fashion, whereas position concentration is part of the clearinghouse's ongoing risk management process (see Q.4.1.1). Price volatility is considered in the process of defining stress scenarios, that are key inputs for the stress testing model.</p> <p>BM&amp;FBOVESPA's Risk Committee reviews all relevant stress testing parameters, such as stress scenarios and holding periods, on a weekly basis. Parameters that are less relevant and/or more stable are reassessed at least on a monthly basis.</p> <p>The adequacy of the underlying model is validated considering the results of backtest procedures.</p> <p><b>Q.4.5.5: What is the process of review for the stress testing program?</b></p> <p>The validation of the clearinghouse risk management model is part of continuing process of assessing the CCP's risk management framework carried out by the Risk Committee. Moreover, the clearinghouse risk management model is also subject to:</p> <ul style="list-style-type: none"> <li>i. Brazilian Central Bank (BCB) approval;</li> <li>ii. Peer review from the Risk Management Advisory Committee (market participants);</li> <li>iii. Periodic (yearly) review from the Enterprise Risk Management &amp; Audit Department, that is independent from the CCP;</li> <li>iv. Periodic (yearly) review from external audit of the RMM's key components.</li> </ul> |
| KE 5. Validation of the CCP's risk-management model. | <p><b>Q.4.5.6: How does the CCP carry out a validation of its risk-management model? How often does it perform this validation?</b></p> <p>Please see Q.4.5.5.</p>   |
| KEY CONCLUSION 4.5                                   |  |

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| KC 4.6                             | <p>In conducting stress testing, a CCP should consider the effect of a wide range of relevant stress scenarios in terms of both defaulters' positions and possible price changes in liquidation periods. Scenarios should include relevant peak historic price volatilities, shifts in other market factors such as price determinants and yield curves, multiple defaults over various time horizons, simultaneous pressures in funding and asset markets, and a spectrum of forward-looking stress scenarios in a variety of extreme but plausible market conditions.</p> <p><b>PS CSD SSS CCP X TR</b></p> |
| KE. 1. Identification of scenarios | <b>Q.4.6.1: In conducting stress testing, what scenarios does the CCP consider? What analysis</b>   |

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| <p>for stress testing financial resources.</p> | <p><b>supports the use of these particular scenarios?</b></p> <p>Stress testing considers a comprehensive number of stress scenarios for each one of the risk factors (e.g. FX rate, yield curves, equity indexes, volatility surfaces) that affect derivatives prices and, thus, participants' settlement obligations. BM&amp;FBOVESPA's Risk Committee define conservative, forward-looking stress scenarios based upon:</p> <ul style="list-style-type: none"> <li>i. Quantitative Analysis: Analysis of a broad range of quantitative indicators, such as historical distributions, implied volatilities, conditional volatilities, EVT (extreme value) estimates, etc;</li> <li>ii. Macroeconomic Analysis: Analysis of the current macroeconomic outlook (local and global), trends and possible outcomes that may impact relevant market variables in the near future;</li> <li>iii. Market Survey: Pool of market participants (banks, brokers, institutional investors) that inform their current stress scenarios, serving as independent estimates.</li> </ul> |
| <p>KEY CONCLUSION 4.6</p>                      |   |

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| <p>KC 4.7</p>   | <p>An FMI should have clear and transparent rules and procedures that address how potentially uncovered credit losses would be allocated, including in relation to the repayment of any funds an FMI may borrow from liquidity providers. An FMI's rules and procedures should also indicate its process to replenish any financial resources it may employ during a stress event, including the potential default of the two participants and their affiliates that would cause the largest aggregate credit exposure so that the FMI can continue to operate in a safe and sound manner.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>  |
| <p>KE 1. Explicit rules and procedure to address fully any credit losses.</p> | <p><b>Q.4.7.1: According to the FMI's rules and procedures, how are uncovered credit losses to be allocated, including in relation to the repayment of any funds an FMI may borrow from liquidity providers?</b></p> <p>The loss allocation procedure considers the following sequence (waterfall):</p> <ul style="list-style-type: none"> <li>i. Client's own collateral. In the case of remaining residual losses (collateral shortfall), then;</li> <li>ii. Broker has to use its own capital (co-responsibility). In the case the broker is also a defaulter and residual losses persist, then;</li> <li>iii. CM has to use its own capital (co-responsibility). In the case the CM is also a defaulter and residual losses persist, then;</li> <li>iv. Clearing Funds (FOMA and FEMC) – BM&amp;FBOVESPA is the sole contributor. In the case of remaining residual losses, then;</li> <li>v. Settlement Fund (FLI) – CM contributions and mutualized. In the case of remaining residual losses, then;</li> <li>vi. BM&amp;FBOVESPA's capital.</li> </ul> |
| <p>KE 2. Process for the</p>  | <p><b>Q.4.7.2: What are the FMI's rules and procedures on the replenishment of the financial</b></p>  |

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| replenishment of financial resources during a stress event. | <b>resources that are exhausted during a stress event?</b><br><br>Replenishment of Clearing Funds depends solely on a Board of Director’s decision. There is no limit in size (i.e. values) and number of new contributions (i.e. recourses).<br>Replenishment of the Settlement Fund is limited to one time the current contribution of each CM. |
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KEY CONCLUSION 4.7

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| ASSESSMENT OF PRINCIPLE 4 |  |
| COMMENTS                  |  |

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| <b>PRINCIPLE 5. COLLATERAL</b>   |  |
| An FMI that requires collateral to manage its or its participants' credit exposure should accept collateral with low credit, liquidity, and market risks. An FMI should also set and enforce appropriately conservative haircuts and concentration limits. |  |
| <b>PS X CSD SSS X CCP X TR</b>   |  |
| KC 5.1   | An FMI should generally limit the assets it (routinely) accepts as collateral to those with low credit, liquidity, and market risk<br><b>PS X CSD SSS X CCP X TR</b>   |
| KE. 1. Identification of the acceptable collateral for the FMI.  | <p><b>Q.5.1.1: What guidelines are used in determining whether a specific asset can be accepted as collateral, including for collateral to be accepted on an exceptional basis and the circumstances that would qualify as an exceptional basis?</b></p> <p>The general principles are:</p> <ul style="list-style-type: none"> <li>i. Absence of legal impediments concerning usage as collateral;</li> <li>ii. Price transparency and efficient trading and post-trading environments;</li> <li>iii. Minimum liquidity profile;</li> <li>iv. Existence of liquidity providers/facilities;</li> <li>v. Issuer (CDs, LCs) must comply with credit risk policies;</li> <li>vi. Market risk can be estimated in a meaningful way.</li> </ul> <p>The list of eligible collateral is publicly available, as well as policies concerning prices, haircutting and the application of limits. Although there are provisions for accepting non-eligible collateral on an exceptional basis, this is limited to the cases where rejecting the new collateral would seriously endanger a participant, with potential – undesired – spillover effects. In this case the new collateral has to be approved not only by the clearinghouse but also by the broker and the CM that are responsible for the client. In addition, a deleveraging and/or collateral swap schedule has to be agreed upon.</p> <p><b>Q.5.1.2: How frequently does the FMI adjust its requirements for acceptable collateral?</b></p> <p>At least once a month.</p> <p><b>Q.5.1.3: How does the FMI identify and mitigate possible specific wrong-way risk, for example, by limiting the collateral it accepts?</b></p> <p>Specific collateral limits apply depending upon the asset class considered. Moreover, because positions and collateral are segregated at the level of the client (beneficial owner) at the clearinghouse, wrong-way risk can be easily identified and dealt with (usually via collateral substitution).</p> |

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| KE. 2. Tools available to the FMI to check posted collateral. | <p><b>Q.5.1.4: How does the FMI control that the posted collateral meets the applicable acceptance criteria?</b></p> <p>As collateral is segregated at the level of the client (beneficial owner) at the clearinghouse, each deposit has to be approved via the Collateral Management System, which automatically checks if the collateral meets the acceptance criteria (see Q.3.1.3, Collateral Management System).</p> |
| KEY CONCLUSION 5.1  |   |

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| KC 5.2   | <p>An FMI should establish prudent valuation practices and develop haircuts that are regularly tested and take into account stressed market conditions</p> <p><b>PS X CSD SSS X CCP X TR</b></p>  |
| KE. 1. Identification of the FMI's valuation practices for collateral. | <p><b>Q.5.2.1: How frequently does the FMI mark its collateral to market, and does it do so at least daily?</b></p> <p>All collateral is marked to market least on a daily basis.</p> <p><b>Q.5.2.2: To what extent is the FMI authorised to exercise discretion in valuing assets when market prices do not represent their true value?</b></p> <p>The clearinghouse has full discretionary powers in what regards collateral pricing.</p>   |
| KE 2. Identification of the FMI's haircutting practices.               | <p><b>Q.5.2.3: How does the FMI determine haircuts?</b></p> <p>The process for determining haircuts is akin to the process for establishing stress scenarios (see Q.4.6.1). Specifically in the case of government bonds, haircuts are defined in line with Central Bank's haircuts for rediscount transactions.</p> <p><b>Q.5.2.4: How and how often does the FMI test the sufficiency of haircuts and validate its haircut procedures, including with respect to the potential decline in the assets' value in stressed market conditions involving the liquidation of collateral?</b></p> <p>Please see Q.5.2.3 and Q.4.6.1.</p> |
| KEY CONCLUSION 5.2   |   |

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| KC 5.3  | <p>In order to reduce the need for procyclical adjustments, an FMI should establish stable and conservative haircuts that are calibrated to include periods of stressed market conditions, to the extent practicable and prudent.</p> <p><b>PS X CSD SSS X CCP X TR</b></p> |
| KE 1. Establishment of stable and conservative haircuts to reduce the | <p><b>Q.5.3.1: How does the FMI identify and evaluate the potential procyclicality of its haircut calibrations?</b></p>   |

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| <p>need for procyclical adjustments.</p> | <p>Since haircuts are defined based upon stress scenarios (see Q.5.2.3 and Q.4.6.1), there is little need for recurrent (re)calibration, minimizing thus potential procyclical effects.</p> <p><b>Q.5.3.2: How does the FMI incorporate periods of stressed market conditions during the calibration of haircuts to reduce the need for procyclical adjustments?</b></p> <p>Please see Q.5.3.1.</p> |
| <p>KEY CONCLUSION 5.3</p>                |   |

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| <p>KC 5.4</p>   | <p>An FMI should avoid concentrated holdings of certain assets where this would significantly impair the ability to liquidate such assets quickly without significant adverse price effects.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>   |
| <p>KE 1. Identification of policies and procedures to avoid the concentration of certain assets held as collateral.</p> | <p><b>Q.5.4.1: How does the FMI identify and avoid the concentration of collateral holdings to limit potential adverse price effects at liquidation?</b></p> <p>Since collateral is segregated at the level of the client (beneficial owner) at the clearinghouse, concentrations of collateral holdings are easily identified and respective limits applied.</p> <p><b>Q.5.4.2: What factors (for example, adverse price effects or market conditions) are considered when determining these policies?</b></p> <p>Limits are defined based upon the relevant characteristics of the collateral’s underlying market and existing mechanisms for mitigating liquidity risk. In the case of the equities market, for instance, limits take into account each individual stock’s daily volumes (previous month average) as a proxy for market depth and thus for limiting collateral acceptance. Government bonds, on the other hand, are limited by the size of the clearinghouse’s liquidity mechanisms.</p> <p><b>Q.5.4.3: How and how often does the FMI review and evaluate concentration policies and practices to determine their adequacy?</b></p> <p>On a monthly basis.</p> |
| <p>KEY CONCLUSION 5.4</p>   |  |



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| KC 5.5   | <p>An FMI that accepts cross-border collateral should mitigate the risks associated with its use and ensure that the collateral can be used in a timely manner.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>   |
| KE. 1. Identification of risks resulting from accepting cross-border collateral.           | <p><b>Q.5.5.1: What are the legal, operational, market, and other risks the FMI is exposed to by accepting cross-border collateral?</b></p> <p>Although there is a provision for accepting USD and US Government Bonds as collateral for 2.687 investors (non-residents trading commodities derivatives only), the size of this market is very small.</p> |
| KE 2. Mitigation of risks from accepting crossborder collateral.                           | <p><b>Q.5.5.2: How, and to what extent, has each of these risks been mitigated?</b></p> <p>See Q.5.5.1.</p>   |
| KE 3. Ability of the FMI to ensure cross-border collateral can be used in a timely manner. | <p><b>Q.5.5.3: How does the FMI ensure and verify that cross-border collateral can be used in a timely manner?</b></p> <p>See Q.5.5.1.</p>  |
| KEY CONCLUSION 5.5   |   |

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| KC 5.6  | <p>An FMI should use a collateral management system that is well-designed and operationally flexible.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>  |
| KE 1. Design of the FMI's collateral management system. | <p><b>Q.5.6.1: How, and to what extent, does the FMI track the reuse of collateral and the rights of the FMI to the collateral provided, and accommodate the timely deposit, withdrawal, substitution, and liquidation of collateral?</b></p> <p>There is no collateral reuse, as all collateral has to be transferred to the clearinghouse's accounts at the CSDs. This, together with the fact that collateral is segregated in the name of the beneficial owner provides the clearinghouse full control in what regards deposits, withdraws, substitution and liquidation.</p> <p><b>Q.5.6.2: How, and to what extent, does the FMI's collateral management system, where relevant, allow for the timely calculation and execution of margin calls, management of margin call disputes, and the daily reporting of initial and variation margins?</b></p> <p>The Collateral Management System is fully integrated with all other clearinghouse systems (e.g. Risk Management System – see Q.3.1.3), as well as CSDs systems, working on a real time basis. Therefore, processes such as margin calls and reporting are implemented in an automated, seamless way.</p> |

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| <p>KE 2. Operational flexibility of the FMI's collateral management system.</p> | <p><b>Q.5.6.3: How, and to what extent, does the FMI's collateral management system accommodate changes in the ongoing monitoring and management of collateral?</b></p> <p>Notwithstanding its inherent flexibility, it is always possible to implement new functionalities to the Collateral Management System as it was internally developed (i.e. by BM&amp;FBOVESPA), counting on a dedicated IT team to support it.</p> <p><b>Q.5.6.4: To what extent is the collateral management system staffed to ensure smooth operations even during times of market stress?</b></p> <p>The Collateral Management Department is staffed with 17 experienced people that have a proven track record in handling stressful situations.</p> |
| <p>KEY CONCLUSION 5.6</p>   |  |

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| <p>ASSESSMENT OF PRINCIPLE 5</p> |  |
| <p>COMMENTS</p>                  |  |

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| <b>PRINCIPLE 6. MARGIN</b>   |   |
| A CCP should cover its credit exposures to its participants for all products through an effective margin system that is risk-based and regularly reviewed. |   |
| <b>PS CSD SSS CCP X TR</b>   |   |
| KC 6.1   | A CCP should have a margin system that establishes margin levels commensurate with the risks and particular attributes of each product, portfolio, and market it serves.<br><b>PS CSD SSS CCP X TR</b>  |
| KE 1. Framework of margin system   | <p><b>Q.6.1.1: How would the CCP describe the general framework of its margin system particularly with respect to current and potential future exposures? If the CCP does not use a margining system, what risk-management measures does it take to mitigate its risks?</b></p> <p>The margin system is, generally speaking, based upon a portfolio risk computation that uses stress testing for estimating potential future exposures related to the process of closing out all positions concerning a (potential) defaulter. Current exposures are also accounted for via mark-to-market procedures.</p>   |
| KE 2. Determinants of credit exposure and margin requirements.   | <p><b>Q.6.1.2: What are the determinants of the credit exposures of the CCP, with respect to the attributes of each product, portfolio, and market it serves?</b></p> <p>Margin requirements are calculated considering closeout (i.e. liquidation) assumptions related to each one of the products cleared. In this sense, potential credit exposures reflect the worst case scenario (i.e. largest potential loss) for closing out all the defaulter’s positions (i.e. portfolio) given adverse price movements based upon stress scenarios for each relevant risk factor. Different holding periods for different asset classes (e.g. futures and options) and cash flow structures (e.g. daily settlement vs. settlement at maturity only) are also considered in the process of estimating potential credit exposures.</p> <p><b>Q.6.1.3: How do the CCP’s margin requirements reflect the credit exposures the CCP faces?</b></p> <p>Margin requirements reflect the potential future exposures related to the process of closing out all positions concerning a (potential) defaulter (see Q.6.1.1 and Q.6.1.2).</p> |
| KE 3. Documentation of the margin methodology.   | <p><b>Q.6.1.4: In which document is the margin methodology described?</b></p> <p>The margin methodology is thoroughly detailed in “BM&amp;FBOVESPA Derivatives Clearinghouse - Risk Management Manual”, publicly available.</p> <p><b>Q.6.1.5: Is the detail of the CCP’s margin methodology available to the participants for use in their individual risk-management efforts?</b></p>   |

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|  | Yes.  |
| KE 4. Timeliness and possession of margin payments | <p><b>Q.6.1.6: How does the CCP enforce timelines for margin collection and payment?</b></p> <p>Margin requirements that are not satisfied via collateral deposits until T+1 13:00 generate corresponding CM and broker charges (i.e. debits) that have to be settled until 14:50, together with all other settlement obligations. Therefore, in this case margin collection becomes a Broker and/or CM cash settlement obligation and any failure would result in the application of the corresponding default procedures. There are specific provisions in the clearinghouse rulebook in this regard (Article 32, §2): <i>“In any circumstance, the Clearing Member is responsible for the delivery, receipt, authenticity and legitimacy of all Collateral delivered to the Clearinghouse; the Intermediaries shall be liable to the Clearing Members; and the Customers shall be liable to the Intermediaries, pursuant to the provisions set forth in the Bylaws”</i>.</p> <p><b>Q.6.1.7: How does the CCP address the risk of a participant payment failure that would cause a shortage of required margin to the participant’s position?</b></p> <p>Please see Q.6.1.6.</p> <p><b>Q.6.1.8: How does the CCP enforce timelines for margin payments? If the CCP has participants from different time zones, how does the CCP address issues posed by differences in local funding markets and operating hours of relevant payment and settlement systems?</b></p> <p>Please see Q.6.1.6.</p> |
| KEY CONCLUSION 6.1                                 |   |

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| KC 6.2  | <p>.A CCP should have a reliable source of timely price data for its margin system. A CCP should also have procedures and sound valuation models for addressing circumstances in which pricing data are not readily available or reliable.</p> <p><b>PS CSD SSS CCP X TR</b></p>   |
| KE 1. Reliability of price data for margin systems. | <p><b>Q.6.2.1: How does the CCP determine that the price data it receives is appropriate for the margin system?</b></p> <p>The margin system uses price data that is provided by BM&amp;FBOVESPA’s Pricing Department. This department counts on a highly specialized team and a set of dedicated systems to provide accurate price data data that is used in a number of critical processes, such as margin calculation, definition of settlement values, etc</p> <p><b>Q.6.2.2: How does the CCP evaluate the reliability and accuracy of the prices provided by</b></p> |

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|   | <p><b>any third-party pricing services?</b></p> <p>Not applicable. See Q.6.2.1</p>   |
| KE 2. Identification of valuation models for calculating margin requirements when market prices are not readily available or reliable | <p><b>Q.6.2.3: When prices are not readily available or reliable, how does the CCP estimate prices to calculate margin requirements?</b></p> <p>In this case prices are estimated using pricing models and/or other quantitative tools (e.g. interpolation).</p> <p><b>Q.6.2.4: How does the CCP validate models used to estimate prices or margin requirements when price data are not readily available or reliable?</b></p> <p>Models are internally validated by BM&amp;FBOVESPA's Risk Committee.</p> |
| KEY CONCLUSION 6.2  |  |

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| KC 6.3   | <p>A CCP should adopt initial margin models and parameters that are risk-based and generate margin requirements sufficient to cover its potential future exposure to participants in the interval between the last margin collection and the close out of positions following a participant default. Initial margin should meet an established singletailed confidence level of at least 99 percent with respect to the estimated distribution of future exposure. For a CCP that calculates margin at the portfolio level, this requirement applies to each portfolio's distribution of future exposure. For a CCP that calculates margin at more-granular levels, such as at the subportfolio level or by product, the requirement must be met for the corresponding distributions of future exposure. The model should (a) use a conservative estimate of the time horizons for the effective hedging or close out of the particular types of products cleared by the CCP (including in stressed market conditions), (b) have an appropriate method for measuring credit exposure that accounts for relevant product risk factors and portfolio effects across products, and (c) to the extent practicable and prudent, limit the need for destabilising, procyclical changes.</p> <p><b>PS CSD SSS CCP X TR</b></p> |
| KE 1. Features of the initial margin methodology | <p><b>Q.6.3.1: What is the design of the CCP's initial margin model? What is the methodology used to measure potential future exposure in the margin model?</b></p> <p>Initial margin values reflect the potential future exposures related to the process of closing out all positions concerning a (potential) defaulter. In this sense, potential credit exposures reflect the worst case scenario (i.e. largest potential loss) for closing out all the defaulter's positions (i.e. portfolio) given adverse price movements based upon stress scenarios for each relevant risk factor. Different holding periods for different asset classes (e.g. futures and options) and cash flow structures (e.g. daily settlement vs. settlement at maturity only) are also considered in the process of estimating initial margin. See Q.6.1.1 and Q.6.1.2.</p> <p><b>Q.6.3.2: What are the assumptions of the margin model?</b></p>  |

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|   | <p>Please see Q.6.1.1, Q.6.1.2 and Q.6.3.1.</p> <p><b>Q.6.3.3: How does the CCP estimate the margin model, in particular upon what does the CCP base its determination of the sample periods for historical data for its initial margin model?</b></p> <p>The margin model does not rely directly upon - backward looking - historical simulations, but rather considers on a more robust and forward looking stress testing approach. However, the quantitative tools (see Q.4.6.1) employed by the Risk Committee in the overall process of defining stress scenarios consider up to 10 years of historical data depending, of course, on the type of the analysis being performed (e.g. short term vs. long term statistics).</p>   |
| <p>KE 2. Close out and sample periods for margin model.</p>                         | <p><b>Q.6.3.4: How does the CCP determine an appropriate close-out period for each product? In particular, how does the CCP account for potentially increased liquidation times during stressed market conditions? What factors are considered in this analysis (for example market liquidity, impact of a participant’s default on prevailing market conditions, adverse effects of position concentration, and the CCP’s hedging capability)?</b></p> <p>The closeout period for each product is determined based on its liquidity profile. Generally speaking, the clearinghouse considers a 2-day closeout period for futures contracts, a 5-day closeout period for options contracts and a 21-day closeout period for OTC derivatives (swaps and flex options). It is also important to consider that concentrated positions have a margin add-on that compensates for extended closeout periods and greater market impact (see Q.3.1.3/Position Limits System and Q.4.1.1/vi).</p> <p><b>Q.6.3.5: How does the CCP determine an appropriate sample period for historical data used in the margin model? What factors are considered (for example reflection of new, current, or past volatilities or use of simulated data for new products without much history)?</b></p> <p>Please see Q.6.3.3.</p> <p><b>Q.6.3.6: How does the CCP consider the tradeoff between prompt liquidation and adverse price effects?</b></p> <p>The clearinghouse always tries to minimize the risk of the closeout process.</p> |
| <p>KE 3. Procyclicality and specific wrong-way risk in the CCP’s margin system.</p> | <p><b>Q.6.3.7: How does the CCP address procyclicality in the margin methodology, in particular, does the CCP adopt forward-looking and relatively stable and conservative margin requirements to limit the need for destabilizing procyclical changes?</b></p> <p>The margin methodology relies upon stress scenarios (see Q.6.1.1, Q.6.1.2 and Q.6.3.1.)</p>   |

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|                    | <p>that, by definition, are both conservative and stable. Those stress scenarios can absorb volatility surges with little or no need for recalibration, avoiding thus procyclical effects that are inherent to volatility-indexed methodologies.</p> <p><b>Q.6.3.8: How does the CCP identify and mitigate specific wrong-way risk?</b></p> <p>Please see Q.5.1.3.</p> |
| KEY CONCLUSION 6.3 |  |

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| KC 6.4   | <p>A CCP should mark participant positions to market and collect variation margin at least daily to limit the build-up of current exposures. A CCP should have the authority and operational capacity to make intraday margin calls and payments, both scheduled and unscheduled, to participants.</p> <p><b>PS CSD SSS CCP X TR</b></p>  |
| KE 1. Features of the variation margin methodology.  | <p><b>Q.6.4.1: What is the design of the CCP’s variation margin model? Describe the model in detail including the method used to measure current exposure, frequency of mark-to-market and schedule of margin collection, and intraday margin call capabilities.</b></p> <p>Variation margin, and thus current exposure, is calculated on a daily basis using settlement prices defined by BM&amp;FBOVESPA’s Pricing Department (see Q.6.2.1). Values are calculated on T+0 COB and have to be settled on T+1 until 14:50. It is important to notice that unsettled values on T+1 (i.e. between 9:00 and 14:50) have an impact on the intraday risk assessment of participants. Intraday margin calls are not only possible but constitute an essential part of the intraday risk management process, as new transactions are incorporated and risk calculated for each participant (client, broker and CM) every 3 to 5 minutes (see Q.3.1.3 and Q.4.2.2). Although less common, intraday mark-to-market is possible and can also trigger intraday margin calls.</p> |
| KE. 2. Determination of the CCP’s authority and operational capacity to make intraday calls and payments, both scheduled and unscheduled, to participants. | <p><b>Q.6.4.2: What evidence is there that the CCP has the authority and operational capacity to make and complete intraday margin calls for initial and variation margin?</b></p> <p>The clearinghouse rulebook and its manuals have specific provisions for intraday margin calls. From the operational standpoint, both risk management and collateral management systems support intraday/realtime computations (risk) and procedures (collateral), making thus intraday margin calls a ver straightforward process. Finally, as put in Q.6.4.1, intraday margin calls are an essential part of the intraday risk management process, being performed a significant number of time throughout the day on a “business as usual” basis.</p>   |
| KEY CONCLUSION 6.4   |   |

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| KC 6.5 | <p>In calculating margin requirements, a CCP may allow offsets or reductions in required margin across products that it clears or between products that it and another CCP clear, if the risk of one product is significantly and reliably</p> |
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correlated with the risk of the other product. Where two or more CCPs are authorised to offer cross-margining, they must have appropriate safeguards and harmonised overall risk-management systems.

PS CSD SSS CCP X TR

KE 1. Identification of methodology used for offsets or reductions in margin requirements.

**Q.6.5.1: How does the CCP measure its potential future exposure at the product and portfolio level? How does the CCP's portfolio margining methodology account for offsets or reductions in required margin across products that it clears?**

The clearinghouse calculates potential future exposure, at both product and portfolio level, based upon a stress testing framework (see Q.6.1.2). Offsets are a natural result of calculating new derivatives prices for each considered stress scenario for the relevant underlying risk factors. In this case, common risk factors related to symmetric positions result in smaller net exposures. For instance, consider a futures, strictly linear, portfolio containing one long \$100 position in contract A and one short \$150 position in contract B. Suppose that  $\Delta A \cong EA \times (\Delta X + \Delta Y)$ , where  $\Delta A$  is the expected change in value of the position on futures A given the exposure (EA) and the changes in relevant risk factors X and Y ( $\Delta X$  and  $\Delta Y$ ). Likewise,  $\Delta B \cong EB \times (\Delta X + \Delta Y)$ , where  $\Delta B$  is the expected change in value of the position on futures B given the exposure (EB) and the changes in the relevant risk factors X and Y ( $\Delta X$  and  $\Delta Y$ ). Thus, in this very simple example offsetting at the portfolio level would be accounted for by the means of cancelling out exposures related to the common risk factor X, as:

$$\begin{aligned} \Delta P &\cong EA \times (\Delta X + \Delta Y) + EB \times (\Delta X + \Delta Y) \\ \Delta P &\cong 100 \times (\Delta X + \Delta Y) - 150 \times (\Delta X + \Delta Y) \\ \Delta P &\cong -50 \times \Delta X + 100 \times \Delta Y - 150 \times \Delta Y \end{aligned}$$

It is important to notice that risk factor representations of derivatives contracts are not the result of an *ad hoc* process, but rather consistent with pricing models based on non arbitrage arguments. The same framework is applied to more complex, non-linear (e.g. options) derivatives contracts, considering, in this case, a full valuation approach (e.g.  $\Delta O = BS(S; K; \sigma; \tau; r; \tau) - BS(S + \Delta S; K; \sigma + \Delta \sigma; \tau + \Delta \tau; r + \Delta r; \tau + \Delta \tau)$ ).

Risk factor commonality is a necessary, but not sufficient condition for offsetting margin across different products, as differences in payment structures (daily vs. at maturity), closeout periods (2-day vs. 5-day) and market structures (listed vs. OTC), amongst others, can seriously impair the stress scenario unicity hypothesis. In those cases, risk is calculated considering different silos (e.g. listed derivatives and OTC derivatives).

Additionally, correlations among risk factors are not considered, as they are notoriously difficult to predict given stressful events. Yet, there are mechanisms that allow for ruling out scenario combinations that are internally inconsistent (e.g. symmetric scenarios for two equity indexes that have 2/3 of the stocks in common).

**Q.6.5.2: How does the cross-margining arrangement offset or reduce required margin both among products and among CCPs?**



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|   | There are no cross-margining arrangements among different CCPs.  |
| KE 2. Robustness of the methodology.  | <p><b>Q.6.5.3: How does the CCP confirm the robustness of its portfolio and cross-margining methodologies? How does the CCP’s methodology account for the degree of price dependency, its stability in stressed market conditions, and the impact of default arrangements on overall financial resources?</b></p> <p>The clearinghouse performs daily backtests in order to ensure that the margining methodology is robust. Moreover, there is also a very comprehensive review process that involves BM&amp;FBOVESPA’s Risk Committee, the Brazilian Central Bank (BCB) and market participants – see Q.4.5.5.</p> |
| KE. 3. Identification of risks from cross-margining and implementation of appropriate safeguards and harmonised risk-management programmes at the CCPs. | <p><b>Q.6.5.4: In the case of cross-margining, how do the CCPs harmonise their approaches to risk management?</b></p> <p>Not applicable.</p> <p><b>Q.6.5.5: What are the legal and operational arrangements to govern the cross-margining arrangements?</b></p> <p>Not applicable.</p>   |
| KEY CONCLUSION 6.5  |  |

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| KC 6.6                         | <p>A CCP should analyse and monitor its model performance and overall margin coverage by conducting rigorous daily backtesting and at least monthly, and more-frequent where appropriate, sensitivity analysis. A CCP should regularly conduct an assessment of the theoretical and empirical properties of its margin model for all products it clears. In conducting sensitivity analysis of the model’s coverage, a CCP should take into account a wide range of parameters and assumptions that reflect possible market conditions, including the most-volatile periods that have been experienced by the markets it serves and extreme changes in the correlations between prices.</p> <p><b>PS CSD SSS CCP X TR</b></p> |
| KE 1. Margin model performance | <p><b>Q.6.6.1: Describe in detail the backtesting methodologies and model performance including both target confidence level and the result of overall margin coverage. Does such testing address portfolio effects within and across asset classes within the CCP and cross-margining programmes with other CCPs?</b></p> <p>The margin model backtesting methodology comprises two major components:</p> <ul style="list-style-type: none"> <li>• Stress scenario backtesting;</li> <li>• Closeout backtesting.</li> </ul> <p>Stress scenario backtesting assesses the adequacy of individual stress scenarios for risk</p>   |

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|  | <p>factors, comparing the current levels of protection with historical data (usually 10 years). Target confidence levels range typically between 99,75% and 99,90% - see Q.4.3.1.</p> <p>Closeout backtesting assesses the overall adequacy of the margin model, particularly in what regards risk offsets and closeout assumptions. Essentially, it simulates the default of each one of the participants (i.e. all portfolios) and compares the amount of collateral required at the moment of the hypothetical default with the total closeout cost calculated using actual market conditions.</p> <p><b>Q.6.6.2: What procedures will the CCP follow if the model does not perform as expected?</b></p> <p>Backtest violations are reported to the Brazilian Central Bank (BCB) and to BM&amp;FBOVESPA's Risk Committee. Scenario violations may entail changes in stress scenarios, whereas closeout violations, if not due to deficient stress scenarios, may entail changes related to closeout and offsetting assumptions.</p> |
| KE 2. Sensitivity analysis of model performance and overall margin coverage. | <p><b>Q.6.6.3: Describe in detail the sensitivity analysis of model performance and overall margin coverage initial margin methodology. What range of parameters, assumptions, historical and hypothetical market conditions, and participant positions including stressed conditions are covered by the analysis?</b></p> <p>Not applicable.</p> <p><b>Q.6.6.4: What are the identified potential shortcomings of the margin model?</b></p> <p>Not applicable.</p>  |
| KE 3. Disclosure of backtesting and sensitivity analysis results.            | <p><b>Q.6.6.5: How does the CCP disclose the results of its backtesting and sensitivity analysis?</b></p> <p>Please see Q.6.6.2.</p>   |
| KEY CONCLUSION 6.6   |  |

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| KC 6.7  | A CCP should regularly review and validate its margin system.   |
| KE 1. Regular review and validation of the margin system. | <p><b>Q.6.7.1: How does the CCP regularly review and validate its margin system including its theoretical and empirical properties? How frequently is this done?</b></p> <p>The continuous risk assessment process (see Q.3.1.5 and Q.4.5.5) includes the validation and review of margin systems.</p> <p><b>Q.6.7.2: How does the CCP incorporate material revisions and adjustments of the margin methodology including parameters into its governance arrangement?</b></p> |

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|                    | <p>Please see Q.3.1.5 and Q.4.5.5.</p> <p><b>Q.6.7.3: How does the CCP disclose both the method and the results of this review and validation?</b></p> <p>Generally speaking, results from the margin system validation/ review process are discussed at Risk Committee and Executive Board level.</p> |
| KEY CONCLUSION 6.7 |  |

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| ASSESSMENT OF PRINCIPLE 6 |  |
| COMMENTS                  |  |

**PRINCIPLE 7. LIQUIDITY RISK**

An FMI should effectively measure, monitor, and manage its liquidity risk. An FMI should maintain sufficient liquid resources in all relevant currencies to effect same-day and, where appropriate, intraday and multiday settlement of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate liquidity obligation for the FMI in extreme but plausible market conditions.

**PS X CSD SSS X CCP X TR**

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| KC 7.1  | <p>An FMI should have a robust framework to manage its liquidity risks from its participants, settlement banks, nostro agents, custodian banks, liquidity providers, and other entities.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>  |
| KE 1. Identification of liquidity risks in each currency. | <p><b>Q.7.1.1: What are the nature and size of the liquidity needs, and the associated sources of liquidity risks, that arise in the FMI in each relevant currency?</b></p> <p>Liquidity risk arises only in the event of default by a participant. In this case, liquidity risk can be viewed as the possibility of incurring into a financial loss due to insufficient liquidity in one or more markets related to the closeout process. Liquidity risk therefore assumes two dimensions: (i) liquidity risk associated with the fulfilment of all the defaulting participant’s original obligations via early settlement (e.g. taking offsetting positions in future contacts); (ii) Liquidity risk associated with the use of collateral during closeout of the defaulting participant’s positions (e.g. collateral posted by the defaulting participant in the form of assets with limited liquidity).</p> <p><b>Q.7.1.2: How does the FMI take into account the potential aggregate liquidity risk presented by an individual entity and its affiliates that may play multiples roles with respect to the FMI?</b></p> <p>The Clearinghouse monitors the aggregate liquidity risk presented by a group of related entities (conglomerates) based on its ability to assess all participants in all levels (BO model). Please see, for instance, Q.4.1.1/vi/viii.</p> <p><b>Q.7.1.3: In light of the FMI’s particular payment and settlement structure, how, and to what extent, are the liquidity risks in each currency borne directly by the FMI, by its participants, or both?</b></p> <p>Given the defined co-responsibility structure (see Q4.1.1/ii and Q.4.7.1), liquidity risk management tools have to be put in place not only by the clearinghouse, but also by brokers and CMs. Yet, when assessing the scope and sufficiency of its own mechanisms, the clearinghouse considers a worst-case-scenario, were all other mechanisms (i.e. those put in place by CMs and brokers) fail.</p> |
| KE 2. Establishment of a                                  | <b>Q.7.1.4: What is the FMI’s framework for measuring, monitoring, and managing the</b>   |

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| <p>framework for measuring, monitoring, and managing liquidity risks in each currency.</p> | <p><b>identified liquidity risks in each currency and across all currencies?</b></p> <p>The framework for monitoring and managing liquidity risk has two major components:</p> <ul style="list-style-type: none"> <li>• Settlement values analysis;</li> <li>• Collateral liquidity analysis.</li> </ul> <p>The first component focus on potential liquidity needs that might arise due to settlement failure of one or more CMs. Collateral liquidity analysis, on the other and, ensures that, in the case of a default and subsequent closeout process, collateral can be monetized in a timely fashion (see Q.5.1.1).</p> |
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KEY CONCLUSION 7.1

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| <p>KC 7.2</p> | <p>An FMI should have effective operational and analytical tools to identify, measure, and monitor its settlement and funding flows on an ongoing and timely basis, including its use of intraday liquidity.</p> <p><b>PS X CSD SSS X CCP X TR</b></p> |
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| <p>KE 1. Identification of operational and analytical tools to identify, measure, and monitor settlement and funding flows on an ongoing and timely basis.</p> | <p><b>Q.7.2.1: What operational and analytical tools does the FMI have to identify, measure, and monitor settlement and funding flows?</b></p> <p>The Clearinghouse has system that calculated settlement obligations across all levels (client, broker and CM) and monitors settlement and funding flows on a real-time basis. These tools are also made available to participants (i.e. brokers and CMs) in order to assist them in managing their liquidity risks.</p> <p><b>Q.7.2.2: How do these tools enable the FMI and its participants to monitor the size, and to identify the potential materialisation, of the identified liquidity risks they face in a timely manner?</b></p> <p>The identification process occurs in a seamless way, as those tools operate on a real time basis</p> <p><b>Q.7.2.3: How do these tools enable the FMI to monitor and to deploy in a timely manner the available liquid resources it has to address liquidity risks that might materialise?</b></p> <p>The process of deploying liquid resources depends, to a larger extent, on the analysis of the default event that caused the liquidity event.</p> |
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KEY CONCLUSION 7.2

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| KC 7.3  | <p>A payment system or SSS, including one employing a DNS mechanism, should maintain sufficient liquid resources in all relevant currencies to effect same-day settlement, and where appropriate intraday or multiday settlement, of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate payment obligation in extreme but plausible market conditions.</p> <p><b>PS X CSD SSS X CCP TR</b></p>  |
| <p>KE 1. Quantification of the minimum liquidity resource requirement in each currency.</p> | <p><b>Q.7.3.1: What is the estimated size of the liquidity shortfall in each currency that would need to be covered to effect settlement of payment obligations, following the default of the participant and its affiliates that would generate the largest aggregate payment obligation in each currency in extreme but plausible market conditions?</b></p> <p>It is important to bear in mind that all risk management estimates - market and liquidity - consider only stress scenarios (see Q.4.3.2). In this case the estimated shortfall would be BRL 2 billion.</p> <p><b>Q.7.3.2: How, and to what extent, is the FMI's process for estimating the size of this minimum liquidity resource requirement in each currency integrated into the FMI's overall liquidity-risk management framework (see KC 7.1) and its stress-testing program for determining the adequacy of its liquidity resources (see KC 7.9)?</b></p> <p>Not applicable. Please see Q.7.9.1.</p> |
| <p>KE 2. Quantification of additional liquidity resource requirements.</p>                  | <p><b>Q.7.3.3: What is the estimated size of any additional liquidity shortfall in each currency that would need to be covered to effect of payment obligations under a wide range of other relevant stress scenarios identified by the FMI?</b></p> <p>See Q.7.3.1.</p> <p><b>Q.7.3.4: How, and to what extent, is the FMI's process for estimating the size of this additional minimum liquidity resource requirement in each currency integrated into the FMI's overall liquidity risk-management framework (see KC 7.1) and its stress-testing program for determining the adequacy of its liquidity resources (see KC 7.9)?</b></p> <p>Not applicable. Please see Q.7.9.1.</p>  |
| <p>KEY CONCLUSION 7.3</p>   |  |

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| KC 7.4  | <p>A CCP should maintain sufficient liquid resources in all relevant currencies to settle securities-related payments, make required variation margin payments, and meet other payment obligations on time with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate payment obligation to the CCP in extreme but plausible market conditions. In addition, a CCP that is involved in activities with a more-complex risk profile or that is systemically important in multiple jurisdictions should consider maintaining additional liquidity resources sufficient to cover a wider range of potential stress scenarios that should include, but not be limited to, the default of the two participants and their affiliates that would generate the largest aggregate payment obligation to the CCP in extreme but plausible market conditions.</p> <p><b>PS CSD SSS CCP X TR</b></p> |
| KE 1. Minimum liquidity resource requirement in each currency to cover a participant default.   | <p><b>Q.7.4.1: What is the estimated size of the liquidity shortfall in each currency that would need to be covered, following the default of the participant and its affiliates that would generate the largest aggregate payment obligation to the CCP in extreme but plausible market conditions?</b></p> <p>Please see Q.7.3.1.</p> <p><b>Q.7.4.2: How, and to what extent, is the CCP's process for estimating the size of this minimum liquidity resource requirement in each currency integrated into the CCP's overall liquidity riskmanagement framework (see KC 7.1) and its stress testing program for determining the adequacy of its liquidity resources (see KC 7.9)?</b></p> <p>Not applicable. Please see Q.7.9.1.</p>  |
| KE 2. Additional minimum liquidity resource requirements.   | <p><b>Q.7.4.3: What is the estimated size of any additional liquidity shortfall in each currency that would need to be covered under a wide range of other relevant stress scenarios identified by the CCP?</b></p> <p>Please see Q.7.3.1.</p> <p><b>Q.7.4.4: How, and to what extent, is the CCP's process for estimating the size of this additional minimum liquidity resource requirement in each currency integrated into the CCP's overall liquidity risk-management framework (see KC 7.1) and its stress testing program for determining the adequacy of its liquidity resources (see KC 7.9)?</b></p> <p>Not applicable. Please see Q.7.9.1.</p>   |
| KE 3. Consideration to cover the default of two participants by a CCP involved in activities with a more-complex risk profile or that is systemically important in multiple | <p><b>Q.7.4.5: How, and to what extent, is the CCP involved in activities with a more-complex risk profile or systemically important in multiple jurisdictions?</b></p> <p>The clearinghouse does not operate in other jurisdictions.</p> <p><b>Q.7.4.6: What is the estimated size of the liquidity shortfall in each currency that would</b></p>  |

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| jurisdictions.     | <p><b>need to be covered following the default of the two participants and their affiliates that would generate the largest aggregate payment obligation to the CCP?</b></p> <p>BRL 3 billion.</p> <p><b>Q.7.4.7: Within the CCP’s overall liquidity riskmanagement framework (see KC 7.1) and when conducting its stress-testing program for determining the adequacy of its liquidity resources (see KC 7.9), how does the CCP consider the additional liquidity resources that would be needed to cover the default of the two participants and their affiliates that would generate the largest aggregate payment obligation in extreme but plausible market conditions?</b></p> <p>Not applicable. Please see Q.7.9.1.</p> |
| KEY CONCLUSION 7.4 |   |

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| KC 7.5 | <p>For the purpose of meeting its minimum liquid resource requirement, an FMI’s qualifying liquid resources in each currency include cash at the central bank of issue and at creditworthy commercial banks, committed lines of credit, committed foreign exchange swaps, and committed repos, as well as highly marketable collateral held in custody and investments that are readily available and convertible into cash with prearranged and highly reliable funding arrangements, even in extreme but plausible market conditions. If an FMI has access to routine credit at the central bank of issue, the FMI may count such access as part of the minimum requirement to the extent it has collateral that is eligible for pledging to (or for conducting other appropriate forms of transactions with) the relevant central bank. All such resources should be available when needed.</p> <p><b>PS X CSD SSS X CCP X TR</b></p> |
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| KE 1. Composition of qualifying liquid resources | <p><b>Q.7.5.1: What is the size and composition of the FMI’s liquid resources in each currency that is held?</b></p> <p>Client Collateral: On an aggregate basis, around 90% of the collateral posted by clients is in the form of highly liquid government bonds denominated in Brazilian Reais (BRL);</p> <p>BM&amp;FBOVESPA's own capital: BM&amp;FBOVESPA's own capital is invested in investment funds that allow for high resource availability, as they invest on government bonds only. This amounts to approximately BRL 2Billion.</p> <p>Liquidity facilities:</p> <table> <thead> <tr> <th><b>Value (BRL Million)</b></th> <th><b>Collateral</b></th> </tr> </thead> <tbody> <tr> <td>950</td> <td>---</td> </tr> <tr> <td>11,500</td> <td>Brazilian Government Bonds</td> </tr> <tr> <td>50</td> <td>Agro receipts</td> </tr> </tbody> </table> <p><b>Q.7.5.2: How, and on what basis, has the FMI determined that its prearranged funding</b></p> | <b>Value (BRL Million)</b> | <b>Collateral</b> | 950 | --- | 11,500 | Brazilian Government Bonds | 50 | Agro receipts |
|--|---|----------------------------|-------------------|-----|-----|--------|----------------------------|----|---------------|
| <b>Value (BRL Million)</b>                       | <b>Collateral</b>   |                            |                   |     |     |        |                            |    |               |
| 950  | ---   |                            |                   |     |     |        |                            |    |               |
| 11,500   | Brazilian Government Bonds  |                            |                   |     |     |        |                            |    |               |
| 50   | Agro receipts   |                            |                   |     |     |        |                            |    |               |



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|  | <p><b>arrangements to convert its readily available collateral and investments into cash would be highly reliable in extreme but plausible market conditions?</b></p> <p>The Clearinghouse defined the size of prearranged liquidity facilities based upon historical volumes. The adequacy of such liquidity facilities is assessed on a daily basis.</p> <p><b>Q.7.5.3: If the FMI has access to routine credit at the central bank of issue, what is the FMI's relevant borrowing capacity for meeting its minimum liquidity resource requirement in that currency?</b></p> <p>No.</p> |
| <p>KE 2. Coverage and availability of qualifying liquid resources.</p> | <p><b>Q.7.5.4: To what extent does the size and the availability of the FMI's qualifying liquid resources cover its identified minimum liquidity resource requirement in each currency to effect settlement of payment obligations on time?</b></p> <p>The current liquidity resources available cover approximately 3.5 times the minimum requirements.</p>  |
| <p>KEY CONCLUSION 7.5</p>  |   |

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| <p>KC 7.6</p>  | <p>An FMI may supplement its qualifying liquid resources with other forms of liquid resources. If the FMI does so, then these liquid resources should be in the form of assets that are likely to be saleable or acceptable as collateral for lines of credit, swaps, or repos on an ad hoc basis following a default, even if this cannot be reliably prearranged or guaranteed in extreme market conditions. Even if an FMI does not have access to routine central bank credit, it should still take account of what collateral is typically accepted by the relevant central bank, as such assets may be more likely to be liquid in stressed circumstances. An FMI should not assume the availability of emergency central bank credit as a part of its liquidity plan.</p> <p><b>PS X CSD SSS X CCP X TR</b></p> |
| <p>KE 1. Composition of supplemental liquid resources.</p> | <p><b>Q.7.6.1: What is the size of any supplemental liquid resources following a default?</b></p> <p>There are no supplemental liquid resources apart from those described in Q.7.5.1</p> <p><b>Q.7.6.2: How, and on what basis, has the FMI determined that these assets are likely to be saleable or acceptable as collateral to obtain the relevant currency, even if this cannot be reliably prearranged or guaranteed in extreme market conditions?</b></p> <p>Not applicable.</p> <p><b>Q.7.6.3: What proportion of these supplemental assets qualifies as collateral at the relevant central bank?</b></p>  |

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|  | Not applicable.   |
| KE 2. Use, coverage, and availability of supplemental liquidity resources. | <p><b>Q.7.6.4: When, and how would, the FMI use its supplemental liquid resources in advance of, or in addition to, using its qualifying liquid resources?</b></p> <p>Not applicable.</p> <p><b>Q.7.6.5: To what extent does the size and availability of the FMI’s supplemental liquid resources, in conjunction with its qualifying liquid resources, cover the relevant liquidity needs identified through the FMI’s stress testing program for determining the adequacy of its liquidity resources (see KC 7.9)?</b></p> <p>Not applicable.</p> |
| KEY CONCLUSION 7.6   |   |

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| KC 7.7  | <p>An FMI should obtain a high degree of confidence, through rigorous due diligence, that each provider of its minimum required qualifying liquid resources, whether a participant of the FMI or an external party, has sufficient information to understand and to manage its associated liquidity risks, and that it has the capacity to perform as required under its commitment. Where relevant to assessing a liquidity provider’s performance reliability with respect to a particular currency, a liquidity provider’s potential access to credit from the central bank of issue may be taken into account. An FMI should regularly test its procedures for accessing its liquid resources at a liquidity provider.</p> <p><b>PS X CSD SSS X CCP X TR</b></p> |
| KE 1. Identification of the FMI’s minimum required qualifying liquid resources.   | <p><b>Q.7.7.1: Who are the providers of the FMI’s minimum required qualifying liquid resources?</b></p> <ul style="list-style-type: none"> <li>• BM&amp;FBOVESPA (in the form of capital);</li> <li>• Clients (in the form of high liquidity collateral - government bonds);</li> <li>• Private banks (in the form of liquidity facilities - see Q.7.5.1);</li> <li>• BM&amp;F Bank - a BM&amp;FBOVESPA subsidiary (in the form of liquidity facilities - see Q.7.5.1).</li> </ul>   |
| KE 2. Due diligence by the FMI to assess the sufficiency of information for each liquidity provider to understand and to manage its associated liquidity risks. | <p><b>Q.7.7.2: How, and on what basis, has the FMI determined that each of its liquidity providers has sufficient information to understand and to manage its associated liquidity risk in each relevant currency on an ongoing basis?</b></p> <p>There is no specific process related to this aspect.</p>   |
| KE 3. Due diligence by the FMI to assess the capacity of each liquidity provider to perform as required under its commitment.                                   | <p><b>Q.7.7.3: How, and on what basis, has the FMI determined that each of its liquidity providers has the capacity to perform on its commitment in each relevant currency on an ongoing basis?</b></p>  |

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|                    | <p>The clearinghouse performs monthly tests aiming at verifying the adequacy and effectiveness of the operational procedures in place in each one of the liquidity providers. Those tests consist in actually activating the liquidity facilities and analysing the relevant results (e.g. promptness and timeliness).</p> <p><b>Q.7.7.4: How, and to what extent, does the FMI take into account a liquidity provider's potential access to credit at the central bank of issue?</b></p> <p>All liquidity providers have to have access to the Brazilian Central Bank.</p> <p><b>Q.7.7.5: How does the FMI regularly test the timeliness and reliability of its procedures for accessing its liquid resources at a liquidity provider?</b></p> <p>Please see Q.7.7.3.</p> |
| KEY CONCLUSION 7.7 |  |

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| KC 7.8   | <p>An FMI with access to central bank accounts, payment services, or securities services should use these services, where practical, to enhance its management of liquidity risk.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>  |
| KE 1. Access to central bank accounts, payment services, or securities services. | <p><b>Q.7.8.1: To what extent does the FMI currently have, or is the FMI eligible to obtain, access to accounts, payment services, and securities services at each relevant central bank that could be used to conduct its payments and settlements and to manage liquidity risks in each relevant currency?</b></p> <p>The clearinghouse only have direct access to the Brazilian Central Bank in what regards its settlement account, that is, the account it uses for receiving payments from debtor CMs and transferring resources to creditor CMs.</p> <p>Yet, the clearinghouse have indirect access via Banco BM&amp;F, a wholly owned, specific purpose bank* that have access to the Central Bank rediscount facility.</p> <p>(* ) Banco BM&amp;F can act solely as a settlement bank for clearinghouses, and its not allowed to offer credit nor to manage a trade book.</p> |
| KE 2. Use of central bank services to enhance management of liquidity risk.      | <p><b>Q.7.8.2: To what extent does the FMI use each of these services at each relevant central bank to conduct its payments and settlements and to manage liquidity risks in each relevant currency?</b></p> <p>Please see Q. 7.8.1.</p> <p><b>Q.7.8.3: If the FMI employs services other than those provided by the relevant central banks, to what extent has the FMI analysed the potential to enhance the management of liquidity risk by expanding its use of central bank services?</b></p>  |

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|   | <p>Please see Q. 7.8.1.</p> <p><b>Q.7.8.4: What, if any, practical or other considerations to expanding its use of relevant central bank services have been identified by the FMI?</b></p> <p>According to the Brazilian legislation, only financial institutions such as banks can have full access to central bank services.</p>   |
| KEY CONCLUSION 7.8  |  |
| KC 7.9  | <p>An FMI should determine the amount and regularly test the sufficiency of its liquid resources through rigorous stress testing. An FMI should have clear procedures to report the results of its stress tests to appropriate decision makers at the FMI and to use these results to evaluate the adequacy of and adjust its liquidity risk-management framework. In conducting stress testing, an FMI should consider a wide range of relevant scenarios. Scenarios should include relevant peak historic price volatilities, shifts in other market factors such as price determinants and yield curves, multiple defaults over various time horizons, simultaneous pressures in funding and asset markets, and a spectrum of forward-looking stress scenarios in a variety of extreme but plausible market conditions. Scenarios should also take into account the design and operation of the FMI, include all entities that might pose material liquidity risks to the FMI (such as settlement banks, nostro agents, custodian banks, liquidity providers, and linked FMIs), and where appropriate, cover a multiday period. In all cases, an FMI should document its supporting rationale for, and should have appropriate governance arrangements relating to, the amount and form of total liquid resources it maintains.</p> <p><b>PS X CSD SSS X CCP X TR</b></p> |
| KE 1. Identification of the FMI's stress testing program. | <p><b>Q.7.9.1: How and how frequently does the FMI use stress testing to determine and to test the sufficiency of the size and composition of its liquid resources in each currency?</b></p> <p>The Clearinghouse performs backtest analysis on a monthly basis in order to assess the adequacy of its liquid resources. A formal liquidity stress test program is already being considered, but it's still in a planning/definition stage</p> <p><b>Q.7.9.2: How is this stress testing program integrated into the FMI's overall liquidity riskmanagement framework (see KC 7.1), the FMI's quantification of its minimum liquidity resource requirements (see KC 7.3 for a payment system or SSS, and KC 7.4 for a CCP), and the FMI's establishment of its supplementary liquid resources?</b></p> <p>Not applicable. Please see Q. 7.9.1.</p>   |
| KE 2. Communication and use of stress testing results.    | <p><b>Q.7.9.3: What is the process for reporting on an ongoing basis the results of its liquidity stress tests to appropriate decision makers at the FMI, for the purpose of supporting their timely evaluation and adjustment of the size and composition of its liquidity resources and the FMI's liquidity risk-management framework?</b></p> <p>Not applicable. Please see Q. 7.9.1.</p>   |

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|   | <p><b>Q.7.9.4: What is the process for using the results of the stress tests for timely adjustment of the size and composition of the FMI’s liquidity resources and of the FMI’s liquidity riskmanagement framework?</b></p> <p>Not applicable. Please see Q. 7.9.1.</p>   |
| <p>KE 3. Analysis of stress-testing scenarios, models, and underlying parameters and assumptions.</p> | <p><b>Q.7.9.5: What scenarios are used in the stress tests, and to what extent do they take into account a combination of peak historic price volatilities, shifts in other market factors such as price determinants and yield curves, multiple defaults over various time horizons, simultaneous pressures in funding and asset markets, and a spectrum of forward-looking stress scenarios in a variety of extreme but plausible market conditions?</b></p> <p>Not applicable. Please see Q. 7.9.1.</p> <p><b>Q.7.9.6: How do the scenarios and stress tests take into account the FMI’s particular payment and settlement structure (for example, real-time gross or deferred net; with or without a settlement guarantee; DVP model 1, 2, or 3 for SSSs), and the extent to which liquidity risks are borne directly by the FMI, by its participants, or both?</b></p> <p>Not applicable. Please see Q. 7.9.1.</p> <p><b>Q.7.9.7: How do the scenarios and stress tests take into account the nature and size of the liquidity needs, and the associated sources of liquidity risks, that arise in the FMI to settle its payment obligations on time, including the potential that individual entities and their affiliates may play multiples roles with respect to the FMI?</b></p> <p>Not applicable. Please see Q. 7.9.1.</p> |
| <p>KE 4. Documentation and governance.</p>  | <p><b>Q.7.9.8: Where and to what extent does the FMI document its supporting rationale for, and its governance arrangements relating to, the amount and form of total liquid resources it maintains?</b></p> <ul style="list-style-type: none"> <li>• Liquidity facilities: amount and form are defined at the Executive Board level, considering Finance Committee and Risk Committee assessments. Decisions and supporting documents are registered accordingly;</li> <li>• BM&amp;FBOVESPA cash position: amount and form are defined at Board of Directors level. Decisions and supporting documents are registered accordingly.</li> </ul>  |
| <p>KEY CONCLUSION 7.9</p>   |  |

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| KC 7.10   | <p>An FMI should establish explicit rules and procedures that enable the FMI to effect sameday and, where appropriate, intraday and multiday settlement of payment obligations on time following any individual or combined default among its participants. These rules and procedures should address unforeseen and potentially uncovered liquidity shortfalls and should aim to avoid unwinding, revoking, or delaying the same-day settlement of payment obligations. These rules and procedures should also indicate the FMI’s process to replenish any liquidity resources it may employ during a stress event, so that it can continue to operate in a safe and sound manner..</p> <p><b>PS X CSD SSS X CCP X TR</b></p>  |
| <p>KE 1. Identification of explicit rules and procedures to enable the FMI to settle following any individual or combined default among its participants.</p> | <p><b>Q.7.10.1: What are the rules and procedures that would enable the FMI to settle payment obligations on time following any individual or combined default among its participants?</b></p> <p>The clearinghouse’s rulebook establishes that, in an event of default the clearinghouse may liquidate the positions held by the defaulting participant and use the defaulting participant collateral to cover existing debt balances on a timely fashion.</p> <p><b>Q.7.10.2: How, and to what extent, would these rules and procedures address unforeseen and potentially uncovered liquidity shortfalls to avoid unwinding, revoking, or delaying the same-day settlement of payment obligations?</b></p> <p>Totally unforeseen events can be handled using BM&amp;FBOVESPA's cash position in order to avoid any disruption in the settlement process.</p> |
| <p>KE 2. Identification of a process to replenish any liquidity resources employed during a stress event.</p>   | <p><b>Q.7.10.3: What rules and procedures does the FMI have in place for replenishing any liquidity resources employed during a stress event?</b></p> <p>Replenishment of Clearing Funds and/or cash position depends solely on a Board of Director’s decision.</p>   |
| <p>KE 3. Documentation and communication.</p>   | <p><b>Q.7.10.4: To what extent are these rules and procedures discussed with and communicated to participants?</b></p> <p>The rules must be approved by the Brazilian Central Bank (BCB) and the Board of Directors, being to a large extent, publicly available. Prior to their formal approval, such rules and procedures are usually discussed with participants via BM&amp;FBOVESPA’s Consultative Committees.</p>  |
| KEY CONCLUSION 7.10   |   |

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| ASSESSMENT OF PRINCIPLE 7 |  |
| COMMENTS                  |  |

**PRINCIPLE 8. SETTLEMENT FINALITY**

An FMI should provide clear and certain final settlement, at a minimum, by the end of the value date. Where necessary or preferable, an FMI should provide final settlement intraday or in real time.

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| KC 8.1  | An FMI's rules and procedures should clearly define the point at which settlement is final.<br><b>PS X CSD SSS X CCP X TR</b>  |
| KE 1. Identification of the point at which settlement is final based on the FMI's rules and procedures. | <p><b>Q.8.1.1: At what point is the settlement of a payment, transfer instruction, or other obligation final, meaning irrevocable and unconditional?</b></p> <p>The Brazilian Central Bank (BCB) Circular 3057 defines settlement finality as a definitive event which means that is an irrevocable and unconditional basis. According to the Brazilian Payment System rules, BM&amp;FBOVESPA settles its operations in Central Bank money through its settlements accounts in the Central Bank system called STR. Payments are final and irrevocable in real time.</p> <p>In BM&amp;FBOVESPA's clearinghouses environment, settlement is considered final when the funds are transferred from the clearinghouse settlement account before the Central Bank, to the clearing members that are creditors in funds resulted from a multilateral netting basis. Clearing Members must have a Central Bank settlement account or a Settlement Bank with reserve account.</p> <p><b>Q.8.1.2: How does the FMI's legal framework and rules, including the insolvency law, acknowledge the discharge of a payment, transfer instruction, or other obligation between the FMI and its participants, or between participants?</b></p> <p>Pursuant to the provisions set forth in article 4 of Federal Law No. 10214, the Clearinghouse assumes the contracting party position solely to the Clearing Members for the purpose of settling the obligations resulting from the transactions accepted by the Clearinghouse for clearing and settlement. As far as the other participants are concerned, the Clearinghouse is not responsible for defaults between each other, regardless of the reason for the default. Before its Clearing Members, BM&amp;FBOVESPA's clearinghouses acknowledge the discharge of payments having information of settlements accounts credits from Brazilian Central Bank.</p> <p>The non-fulfillment of any obligation by a participant with the Clearinghouse or with the other participants, except when arising from events of an operational nature (in which case it will also be temporary) is characterized as a default. If the non-fulfillment is a result of events of an operational nature, so acknowledged by the Clearinghouse, the defaulting participant does not assume the defaulting condition, but rather that of an operational debtor. In any case, the faulty participant – whether defaulting or operational debtor - shall be liable towards the Clearinghouse and/or other participants for any damage, loss,</p> |

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|  | <p>cost, or expense resulting from his default.</p> <p>Among the procedures defined for a default situation are the closing of positions of the defaulting participant and the execution of collateral.</p> <p><b>Q.8.1.3: How does the FMI ensure that finality is achieved under all relevant jurisdictions?</b></p> <p>See Q.8.1.1</p> <p><b>Q.8.1.4: In case of a SSS, how is consistency of finality achieved between the SSS and, if relevant, the LVPS where the cash leg is settled?</b></p> <p>For the cash equities and corporate bonds (former CBLC) and government bonds clearinghouses, at the same time that clearinghouse commands funds transfer from its settlement account before the Brazilian Central Bank, it commands transfers of related securities from its own securities settlement account at CSD to the net creditor's securities account. When those transfers are finished, the delivery versus payment process is considered as concluded and the settlement is done as final and irrevocable. All related funds transfers are made in STR.</p> <p><b>Q.8.1.5: In case of a CCP for cash products, what is the relation between the finality of obligations in the CCP and the finality of the settlement of the CCP claims and obligations balances in other systems, depending on the rules of the relevant CSD/SSS and payment system?</b></p> <p>Although BM&amp;FBOVESPA is vertically integrated for the cash equities market which means that BVMF provides all post trading services (CCP, SSS and CSD), when DvP process is started, the CCP point of view wait both the CSD and the payment system responses in order to considering the settlement done, final and irrevocable. For the government bonds CCP, although the CSD is outside BM&amp;FBOVESPA, the same procedure is valid.</p> |
| <p>KE 2. Clarity of the documentation.</p> | <p><b>Q.8.1.6: Where is the FMI's definition of the point of settlement finality defined? How is this information disclosed, and to whom is it disclosed?</b></p> <p>See Q 8.1.1</p> <p>Those definitions are disclosed in the clearinghouses' Operational Procedures that are available at the company website.</p>   |
| <p>KEY CONCLUSION 8.1</p>                  |  |

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| <p>KC 8.2</p> | <p>An FMI should complete final settlement no later than the end of the value date, and preferably intraday or in real</p> |
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|   | <p>time, to reduce settlement risk. An LVPS, CSD, or SSS should consider adopting RTGS or multiple-batch processing during the settlement day.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>   |
| <p>KE. 1. Occurrence of final settlement no later than the end of the value date.</p> | <p><b>Q.8.2.1: Is the FMI designed to provide final settlement on the value date (or same-day settlement)? How does the FMI ensure that final settlement occurs no later than the end of the intended value date?</b></p> <p>On the value date, settlements occur in real time according to a specific timeframe for each clearing house. The multilateral settlement processing follows the positions consolidation, with the calculation, for each participant, of the settlement amount, either payable or receivable, called Multilateral Settlement Amount.</p> <p>The Multilateral Settlement Value of a participant is the cash amount to be settled, resulting from his positions and/or transactions undertaken, through the Clearinghouse’s net multilateral deferred cash settlement service.</p> <p>In a cash settlement, Clearinghouse liability to the Clearing Member terminates when the Clearinghouse sends a transfer instruction to debit its Settlement Account and credit the Banking Reserves account of the Settlement Bank indicated by the Clearing Member; in a physical delivery, Clearinghouse liability to the Clearing Member terminates when the asset / commodity delivery is made, under the terms and conditions specified in the contracts and in the Clearinghouse Operating Procedure Manual.</p> <p><b>Q.8.2.2: Has the FMI experienced any deferral of final settlement to the next business day? If so, under which circumstances? What steps have been taken to prevent a similar situation in the future?</b></p> <p>No.</p> |
| <p>KE. 2. Occurrence of intraday or real time final settlement.</p>                   | <p><b>Q.8.2.3: How does the FMI provide intraday or real-time final settlement?</b></p> <p>See Q 8.2.1</p> <p><b>Q.8.2.4: If settlement occurs through multiple-batch processing, what is the frequency of the batches and within what timeframe do they operate? What happens if a participant does not have enough funds or securities at the settlement time? Are transactions entered in the next batch? If so, what is the status of those transactions and when would they become final?</b></p> <p>Not applicable.</p> <p><b>Q.8.2.5: Does the FMI inform participants of final account balances as quickly as possible, preferably in real time?</b></p> <p>Apart from clearing houses information, for the cash leg of settlements, clearing houses</p>   |

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|  | <p>participants receive accounts balances information direct from the Brazilian Central Bank in real time. For the securities leg of settlement, clearing houses participants receive information in real time from the CSD. The multilateral clearing is processed by the Clearinghouse systems overnight, after daily closing of the transactions registration systems, that is, after the registration and allocation of the trades, with the reports concerning the settlement being issued and made available to the participants, such reports containing the provisional or final settlement amounts according to the settlement date (from T+1 to T+3). The Clearinghouse provides the information needed for the Clearing Member to perform the functions attributed to it for settlement of the transactions in regard to the users of its clearing services and to Clearinghouse.</p> |
| <p>KE 3. Consideration of the potential risk-reducing benefits of changing current processes to adopt RTGS, to adopt multiple-batch processing, and/or to complete final settlement earlier in the day, as applicable.</p> | <p><b>Q.8.2.6: If settlement does not occur intraday or in real time, how has the LVPS or SSS considered the introduction of either of these modalities?</b></p> <p>Not applicable.</p>  |
| <p>KEY CONCLUSION 8.2</p>  |  |

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| <p>KC 8.3</p>   | <p>An FMI should clearly define the point after which unsettled payments, transfer instructions, or other obligations may not be revoked by a participant.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>  |
| <p>KE 1. Identification of the points after which unsettled payment, transfer instructions, or other obligations may not be revoked by a participant.</p> | <p><b>Q.8.3.1: How does the FMI define the point at which unsettled payments, transfer instructions, or other obligations may not be revoked by a participant? How does the FMI prohibit the unilateral revocation of accepted and unsettled payments, transfer instructions, or obligations after this time?</b></p> <p>Transfers instructions either for payments in Central Bank money and securities deliveries before the CSD are processed in real time. There is no room for revocation. On the other hand if a participant doesn't accomplish with its obligations until the time established in the Clearinghouse Operating Procedure Manual, it is the Clearinghouse's responsibility to actuate its safeguarding mechanisms to ensure the proper settlement of the registered transactions, in the established manner and time frames.</p> <p>See also Q.8.1.1.</p> <p><b>Q.8.3.2: Under what circumstance can an instruction or obligation accepted by the system for settlement still be revoked (for example, queued obligations)? Who can revoke unsettled payment or transfer instructions?</b></p> <p>See Q.8.1.1.</p> <p><b>Q.8.3.3: Under what conditions does the FMI allow exceptions and extensions to the revocation deadline?</b></p> |

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|                                     | See Q.8.1.1. There is no possibility of revocation of the deadline.  |
| KE 2 .Clarity of the documentation. | <p><b>Q.8.3.4: Where does the FMI define this information? How is this information disclosed, and to whom is it disclosed? Is the information clearly articulated to the FMI's participants?</b></p> <p>Rules are defined in the Clearinghouse's operating procedures manual, public available on-line at the BM&amp;FBOVESPA website.</p> |
| KEY CONCLUSION 8.3                  |  |

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| ASSESSMENT OF PRINCIPLE 8 |  |
| COMMENTS                  |  |

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| <b>PRINCIPLE 9. MONEY SETTLEMENTS</b>   |  |
| An FMI should conduct its money settlements in central bank money where practical and available. If central bank money is not used, an FMI should minimise and strictly control the credit and liquidity risks arising from the use of commercial bank money. |  |
| <b>PS X CSD SSS X CCP X TR</b>  |  |

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| KC 9.1 | An FMI should conduct its money settlements in central bank money, where practical and available, to avoid credit and liquidity risks.<br><b>PS X CSD SSS X CCP X TR</b> |
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| KE. 1. Identification of settlement assets. | <p><b>Q.9.1.1: What types of money settlement does the FMI carry out? What are the different cases according to types of operations and currencies, if relevant?</b></p> <p>All payments in BRL (Brazilian currency) from participants to clearinghouses and vice-versa must be made in central bank money through STR system.</p> <p>For foreign currency transfers, the clearinghouse holds accounts abroad at correspondent banks. Their names are published and updated by BMF&amp;BOVESPA's Circular Letters. Delivery of USD can be made in FED funds or by book transfer.</p> <p><b>Q.9.1.2: How does the FMI complete these money settlements using central bank money and/or commercial bank money? What factors were considered in determining the settlement asset?</b></p> <p>The Brazilian Central Bank rules specify that the net positions of systemically important clearinghouses must be settled in central bank money and funds transfers between accounts must be made through STR system, whose regulations are publicly disclosed, owned and operated by BCB.</p> <p>See also Q.9.1.1</p> |
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KEY CONCLUSION 9.1

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| KC 9.2 | If central bank money is not used, an FMI should conduct its money settlements using a settlement asset with little or no credit or liquidity risk.<br><b>PS X CSD SSS X CCP X TR</b> |
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| KE 1. Credit or liquidity risk of settlement assets used for money settlement. | <p><b>Q.9.2.1: If commercial bank money is used, how does the FMI assess the credit and liquidity risk of the settlement asset used for money settlement?</b></p> <p>Not applicable</p> |
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| KEY CONCLUSION 9.2  |   |
| KC 9.3  | <p>If an FMI settles in commercial bank money, it should monitor, manage, and limit its credit and liquidity risks arising from the commercial settlement banks. In particular, an FMI should establish and monitor adherence to strict criteria for its settlement banks that take account of, among other things, their regulation and supervision, creditworthiness, capitalisation, access to liquidity, and operational reliability. An FMI should also monitor and manage the concentration of credit and liquidity exposures to its commercial settlement banks.</p> <p><b>PS X CSD SSS X CCP X TR</b></p> |
| KE. 1. Identification of strict criteria for settlement banks.  | <p><b>Q.9.3.1: What criteria has the FMI established for selecting its settlement banks? In particular, how does the FMI evaluate the banks' regulation, supervision, creditworthiness, capitalisation, access to liquidity, and operational reliability?</b></p> <p>Not applicable</p>   |
| KE. 2. Assessment of the FMI monitoring settlement banks' adherence to the criteria mentioned in KE.1.  | <p><b>Q.9.3.2: How does the FMI monitor the banks' adherence to those criteria?</b></p> <p>Not applicable</p>   |
| KE 3. Management of the concentration of credit and liquidity risks to the commercial settlement banks. | <p><b>Q.9.3.3: How does the FMI monitor, manage, and limit its credit and liquidity risks arising from the commercial settlement banks?</b></p> <p>Not applicable</p> <p><b>Q.9.3.4: How does the FMI monitor and manage the concentration of credit and liquidity exposures to the banks?</b></p> <p>Not applicable</p> <p><b>Q.9.3.5: How does the FMI assess its potential losses and liquidity pressures as well as those of its participants if there is a failure of its largest settlement bank?</b></p> <p>Not applicable</p>   |
| KEY CONCLUSION 9.3  |   |

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| KC 9.4   | <p>If an FMI conducts money settlements on its own books, it should minimise and strictly control its credit and liquidity risks.</p> <p><b>PS X CSD SSS X CCP X TR</b></p>                                 |
| KE 1. Risks associated with money settlements on the books of the FMI. | <p><b>Q.9.4.1: How does the FMI conduct money settlements on its own books?</b></p> <p>Not applicable.</p> <p><b>Q.9.4.2: How does it minimize and strictly control its credit and liquidity risks?</b></p> |

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|                    | Not applicable. |
| KEY CONCLUSION 9.4 |                 |

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| KC 9.5  | An FMI's legal agreements with any settlement banks should state clearly when transfers on the books of individual settlement banks are expected to occur, that transfers are to be final when effected, and that funds received should be transferable as soon as possible, at a minimum by the end of the day and ideally intraday, in order to enable the FMI and its participants to manage credit and liquidity risks.<br><b>PS X CSD SSS X CCP X TR</b>  |
| KE 1. Provisions of the FMI's legal agreements with its settlement banks. | <p><b>Q.9.5.1: Do the FMI's legal agreements with its settlement banks state when transfers occur, that transfers are final when effected, and that funds received are transferable?</b></p> <p>Not applicable because settlement are carried out in Central Bank accounts.</p> <p><b>Q.9.5.2: Are funds received transferable by the end of the day at the latest? If not, why? Are they transferable intraday? If not, why?</b></p> <p>Not applicable because settlement are carried out in Central Bank accounts.</p> |
| KEY CONCLUSION 9.5  |  |

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| ASSESSMENT OF PRINCIPLE 9 |  |
| COMMENTS                  |  |

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| <b>PRINCIPLE 10. PHYSICAL DELIVERY</b>   |   |
| An FMI should clearly state its obligations with respect to the delivery of physical instruments or commodities and should identify, monitor, and manage the risks associated with such physical deliveries. |   |
| <b>PS CSD X SSS X CCP X TR</b>   |   |
| KC 10.1  | An FMI's rules should clearly state its obligations with respect to the delivery of physical instruments or commodities.<br><b>PS CSD X SSS X CCP X TR</b>  |
| KE. 1. Identification and documentation of the FMI's obligations with respect to delivery of physical instruments or commodities.  | <p><b>Q.10.1.1: Which asset classes does the FMI accept for physical delivery?</b></p> <p>In physical delivery,</p> <ul style="list-style-type: none"> <li>• a commodity lot is considered eligible for delivery when it is in conformity with the standards set forth in the respective contract being settled, duly classified by an accredited company or by BM&amp;FBOVESPA, depending on the commodity; and</li> <li>• in order to be eligible to make delivery, the seller must provide specific documentation to evidence that he is the legal owner of the lots of the commodity to be delivered.</li> </ul> <p><b>Q.10.1.2: How does the FMI define its obligations and responsibilities with respect to the delivery of physical instruments or commodities?</b></p> <p>The Clearing Members and the Intermediaries are liable to the Clearinghouse for the physical deliveries to be made by the Customers connected to them. The Clearinghouse is not responsible for physical delivery.</p> <p>The settlement upon maturity of the physical delivery contract takes place through the delivery of the commodity by the selling party and the payment of the settlement value by the buying party, according to the Delivery versus Payment (DvP) principle, under which the delivery of the underlying asset occurs if payment is made.</p> <p>The delivery and receipt of the commodity are coordinated with the corresponding cash settlement – the payment due by the buyer to the seller of the commodity received. Such cash settlement occurs via the Clearinghouse's Multilateral Cash Settlement.</p> <p><b>Q.10.1.3: In which documents are these responsibilities defined? What is the disclosure status of these documents?</b></p> <p>Responsibilities are defined in the clearinghouses' Operational Procedures.</p> <p><b>Q.10.1.4: Is there evidence that the participants have an understanding of their obligations and the procedures for effecting physical delivery?</b></p> |

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|  | See Q.1.2.1. |
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KEY CONCLUSION 10.1

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| KC 10.2 | An FMI should identify, monitor, and manage the risks associated with the storage and delivery of physical instruments or commodities.<br><b>PS CSD X SSS X CCP X TR</b> |
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| KE. 1. Identification, management, and monitoring of the risks with the storage and delivery of physical instruments or commodities. | <p><b>Q.10.2.1: What procedures, processes, and controls has the FMI put in place to identify, monitor, and manage the risks and costs associated with storage and delivery of physical instruments or commodities?</b></p> <p>Any product and object of physical delivery, should be placed in storage facilities accredited by BM&amp;FBOVESPA.</p> <p>This accreditation follows a set of financial, legal, fiscal, insurance and storage requirements, controlled by BVMF participants registration department and described in BM&amp;FBOVEPSA regulation.</p> <p>Periodically, these storage facilities send BM&amp;FBOVEPSA updated information regarding financial and insurance issues.</p> <p>BM&amp;FBOVESPA’s classification department is responsible for periodic inspection in these storage facilities to assess their conditions.</p> <ul style="list-style-type: none"> <li>• Storage risks of coffee: at registration in the warehouse, it is required financial balance, debt clearances certificate and insurance stocks. This registration is regulated by the rules of PDA – Depositories Participants Agribusiness</li> <li>• Storage costs of coffee: the cost is managed by the storage space available. The static capacity of registered warehouses is 15 million bags and the annual delivery average is 0,45 million bags. Since 1991, the maximum annual delivery average was 0,91 million bags in 2009.</li> </ul> <p><b>Q.10.2.2: How do the FMI’s policies and procedures ensure that the FMI’s record of physical assets accurately reflects its holding of assets?</b></p> <p>For products classified by BVMF, BM&amp;FBOVESPA’s classification department is responsible for periodic inspection in the storage facilities to check the lots classified.</p> <p>For products not classified by BVMF, the certification of quality and quantity of the stored lots are proved or checked by classification appraisal/report issued by a Quality Supervisor which must be accredited by BM&amp;FBOVESPA.</p> |
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| KE 2. Matching participants for delivery and receipt for FMIs | <b>Q.10.2.3: Under what circumstances will the FMI match participants for delivery and receipt?</b> |
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| <p>serving commodity markets</p> | <p>The clients on short position should express their intention to delivery the product itself on replacement of their short position.</p> <p>The intention of delivery and the product specification are available to the buyers clients make the choice of the product to be received.</p> <p>If there is intention not chosen, BVMF determines, among the buyers clients, who will be responsible for receiving the product. (The Exchange offers the lot to the buyer with the oldest position and he has the right to refuse it. However, whether other buyers don't want this lot, the exchange determines the oldest position holder as receiver.)</p> <p>Costumers have the option to indicated a third party to comply with their responsibilities with the exchange.</p> <p>This procedure is described in a contractual specification of each product.</p> <p><b>Q.10.2.4: Are legal obligations for delivery clearly expressed in the rules in such instances? Do they address the compensation issue in the event of a loss?</b></p> <p>Procedures defined in Clearinghouse operational manual. Specific procedures defined by commodity.</p> <p><b>Q.10.2.5: For an FMI holding margins, when does it release the margin of the matched participants?</b></p> <p>The margins required regarding physical delivery process are released when the obligations of each party are settled, that means, the buyer pays for the product and the seller delivery it.</p> <p><b>Q.10.2.6: How does the FMI ensure that its participants have the necessary systems and resources to be able to fulfil their physical delivery obligations?</b></p> <p>The Exchange provides systems that control all the process of physical delivery to participants:</p> <ul style="list-style-type: none"> <li>• Registration of the delivery intention;</li> <li>• Products' specification to be delivered;</li> <li>• Choice of product by buyer;</li> <li>• Maintenance of billing information;</li> <li>• Evaluate of values of settlement.</li> </ul> |
| <p>KEY CONCLUSION 10.2</p>       |   |

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| ASSESSMENT OF PRINCIPLE 10 |  |
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**PRINCIPLE 11: CENTRAL SECURITIES DEPOSITORIES**

A CSD should have appropriate rules and procedures to help ensure the integrity of securities issues and minimise and manage the risks associated with the safekeeping and transfer of securities. A CSD should maintain securities in an immobilised or dematerialized form for their transfer by book entry.

**PS CSD X SSS CCP TR**

KC 11.1 A CSD should have appropriate rules, procedures, and controls, including robust accounting practices, to safeguard the rights of securities issuers and holders, prevent the unauthorised creation or deletion of securities, and conduct periodic and at least daily reconciliation of securities issues it maintains.

**PS CSD X SSS CCP TR**

KE 1. Rules, procedures, and controls to safeguard the rights of securities issuers and holders (including accounting practices).

**Q.11.1.1: What are the accounting practices used by the CSD?**

The Securities Depository Service offered by BM&FBOVESPA is supported by an individualized account structure, which identifies the final beneficial owner, under the responsibility of the Custodians.

Securities deposited in Custody Accounts within the CSD Accounts Structure are booked only after they are shown in the Issuer records to be under fiduciary ownership of BM&FBOVESPA. On being booked the securities are segregated from the assets of BM&FBOVESPA.

BM&FBOVESPA holds Securities Settlement Accounts in its name at the Central Securities Depository in order to settle operations under its responsibility with assets deposited at the Securities Depository Service.

Custodians are the only parties permitted to move securities in the Central Securities Depository, provided they do so within the appropriate procedures timetable

**Q.11.1.2: How are the rights of securities issuers and holders safeguarded by the rules, procedures, and controls of the CSD?**

All BM&FBOVESPA CSD’s rules and procedures are previously approved by the Brazilian Securities Commission and by the Brazilian Central Bank . Internal Controls and procedures of the BM&FBOVESPA CSD are audited, internally and externally, in a yearly basis. The CSD has also a internal control department that maps, measures and controls continuously all CSD’s activities.

**Q.11.1.3: Are frequent end-to-end audits conducted to examine the procedures and internal controls used in the safekeeping of securities? Do audits review whether there are sufficient securities to satisfy customer rights?**

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|  | <p>Internal and external audits are done in the CSD once a year. Procedures, internal controls and the reconciliation process are verified during the execution of the audits.</p> <p><b>Q.11.1.4: How are key aspects of the CSD’s rules and procedures identified in KE 1 described and made available to participants?</b></p> <p>All BM&amp;FBOVESPA CSD’s rules and procedures are previously approved by the Brazilian Securities Commission and by the Brazilian Central Bank and are made available publically for all CSD participants (custodians and investors) through the internet.</p>  |
| <p>KE 2. Rules, procedures, and controls to prevent the unauthorised creation or deletion of securities.</p>                 | <p><b>Q.11.1.5: What are the CSD’s internal procedures to authorise the creation and deletion of securities?</b></p> <p>Securities are only created or deleted after the actual transfers of securities to/from the BM&amp;FBOVESPA’s fiduciary account within the issuers records done by the registrar/issuer.</p> <p><b>Q.11.1.6: What are the internal controls to prevent the unauthorised creation and deletion of securities?</b></p> <p>Most of the creation or deletion of securities in BM&amp;FBOVESPA’s CSD are done automatically by the CSD systems and guaranteed by the reconciliation process between CSD records and Issuer records. If creation or deletion needs to be done manually, a double command is necessary and in the end of the day, all creations and deletions are analyzed by the internal control department of the CSD and informed to the head of the CSD.</p>  |
| <p>KE 3. Rules, procedures, and controls for conducting periodic and at least daily reconciliation of securities issues.</p> | <p><b>Q.11.1.7: Does the CSD conduct periodic and at least daily reconciliation of the totals of securities issues in the CSD for each issuer (or its issuing agent)? Does the CSD ensure that the total number of securities recorded in the CSD for a particular issue is equal to the amount of securities of that issue held on the CSD’s books?</b></p> <p>BM&amp;FBOVESPA’s CSD conducts a daily reconciliation process with the registrars/issuers in order to ensure that the total number of securities recorded in the CSD is equal to the number of securities registered in BM&amp;FBOVESPA fiduciary account within the issuer’s records.</p> <p><b>Q.11.1.8: Is the CSD the official registrar of the issues held on its books? If not, how does the CSD reconcile its records with official registrar?</b></p> <p>BM&amp;FBOVESPA does not act as registrar and conducts an automatic reconciliation process with the issuer registrars.</p> |
| <p>KEY CONCLUSION 11.1</p>   |   |

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| KC 11.2   | A CSD should prohibit overdrafts and debit balances in securities accounts<br><b>PS CSD X SSS CCP TR</b>   |
| KE 1. Prohibition of overdrafts or debit balances in securities accounts. | <p><b>Q.11.2.1: What are the CSD’s policies for prohibiting overdraft or debit balances in securities accounts?</b></p> <p>Overdraft and debit balances are explicitly prohibited in the CSD in BM&amp;FBOVESPA rules and procedures.</p> <p><b>Q.11.2.2: How are debit positions in securities accounts prevented?</b></p> <p>BM&amp;FBOVESPA’s CSD system rules does not allow debit positions and to prevent it, an automatic internal reconciliation process done eleven times during the day verifies the existence of debit positions in any securities account.</p> |
| KEY CONCLUSION 11.2   |  |

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| KC 11.3  | A CSD should maintain securities in an immobilised or dematerialised form for their transfer by book entry. Where appropriate, a CSD should provide incentives to immobilize or dematerialise securities.<br><b>PS CSD X SSS CCP TR</b>   |
| KE 1. Immobilisation or dematerialisation of securities. | <p><b>Q.11.3.1: Are securities issued or maintained in a dematerialised form? What percentage of securities is dematerialised, and what percentage of the total volume of transactions applies to these securities?</b></p> <p>All securities within BM&amp;FBOVESPA’s CSD are dematerialized.</p> <p><b>Q.11.3.2: If securities are issued as a physical certificate, is it possible to immobilise them and allow the holding and transfer of these securities in a book-entry system? If relevant, what percentage of securities is immobilised, and what percentage of the total volume of transactions applies to immobilised securities?</b></p> <p>There is no physical certificate issuance.</p> <p><b>Q11.3.3: How does the CSD provide incentives to immobilise or dematerialise securities?</b></p> <p>All securities are already dematerialized.</p> |
| KEY CONCLUSION 11.3                                      |   |

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| KC 11.4 | A CSD should protect assets against custody risk through appropriate rules and procedures consistent with its legal framework.<br><b>PS CSD X SSS CCP TR</b> |
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| <p>KE 1. Rules and procedures for protecting assets from custody risk.</p> | <p><b>Q.11.4.1: How do the CSD’s rules and procedures protect participants’ assets against custody risk, including the risk of loss because of the CSD’s negligence, misuse of assets, fraud, poor administration, inadequate recordkeeping, or failure to protect participants’ interests in their securities?</b></p> <p>Issues related to CSD internal failure are detailed in BM&amp;FBOVESPA rules and procedures which are approved by the Brazilian Securities Commission and the Brazilian Central Bank. The rules and procedures are publicly available to participants and investors.</p> <p><b>Q.11.4.2: Are those rules and procedures consistent with the legal framework?</b></p> <p>Yes.</p> <p><b>Q.11.4.3: What other methods, such as insurance or other compensation schemes, does the CSD employ to protect its participants against misappropriation, destruction, and theft of securities?</b></p> <p>Not applicable.</p> |
| <p>KEY CONCLUSION 11.4</p>   |   |

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| <p>KC 11.5</p>  | <p>A CSD should employ a robust system that ensures segregation between the CSD’s own assets and the securities of its participants and segregation among the securities of participants. Where supported by the legal framework, the CSD should also support operationally the segregation of securities belonging to a participant’s customers on the participant’s books and facilitate the transfer of customer holdings</p> <p><b>PS CSD X SSS CCP TR</b></p>  |
| <p>KE 1. Identification of segregation mechanisms for securities.</p> | <p><b>Q.11.5.1: What policies and procedures ensure that the securities belonging to the CSD are segregated from those of participants?</b></p> <p>BM&amp;FBOVESPA CSD operates a final beneficial owner model, therefore all accounts are segregated in the name of the final investor and is applicable for the CSD’s own accounts as well. This model is also enforced by the Brazilian Legislation.</p> <p><b>Q.11.5.2: What segregation arrangements are in place at the CSD? Does the CSD provide separate accounts to segregate the securities belonging to participants?</b></p> <p>As mentioned before, all accounts are segregated in the CSD’s system. Securities belonging to participants are completely segregated from securities belonging to other investors.</p> <p><b>Q.11.5.3: Where supported by the legal framework, does the CSD support the operational segregation of securities belonging to participants’ customers from the participants’ book? Does the CSD facilitate the transfer from these customers’ accounts</b></p> |

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|  | <p><b>to another participant?</b></p> <p>Yes. Transfers to other participants can be done manually, by files or by messages. In some special cases, the CSD can command the transfers itself.</p> |
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KEY CONCLUSION 11.5

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| KC 11.6 | <p>A CSD should identify, measure, monitor, and manage its risks from other activities that it may perform; additional tools may be necessary in order to address these risks.</p> <p><b>PS CSD X SSS CCP TR</b></p> |
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| <p>KE 1. Identification, measurement, monitoring, and management of risks to the CSD deriving from other activities it may perform.</p> | <p><b>Q.11.6.1: Does the CSD provide services other than central safekeeping and administration of securities and settlement? If so, what services?</b></p> <p>Yes, the CSD operates the services of “Tesouro Direto”, which is a product/program owned by the Brazilian National Treasury that allows natural people to buy and sell federal government bonds through the internet. The CSD maintains the trade, settlement and custody environment of Tesouro Direto. Additionally, the CSD conducts the registration of investment clubs in Brazil.</p> <p><b>Q.11.6.2: How does the CSD identify, measure, monitor, and manage the risks associated with those activities, including potential credit and liquidity risks?</b></p> <p>All CSD activities without exceptions are mapped, measured monitored by the CSD internal controls department. All potential risks are verified and controlled by the CSD.</p> |
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KEY CONCLUSION 11.6

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| ASSESSMENT OF PRINCIPLE 11 |  |
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**PRINCIPLE 12. EXCHANGE-OF-VALUE SETTLEMENT SYSTEMS**

If an FMI settles transactions that involve the settlement of two linked obligations (for example, securities or foreign exchange transactions), it should eliminate principal risk by conditioning the final settlement of one obligation upon the final settlement of the other.

**PS X CSD SSS X CCP X TR**

KC 12.1 An FMI that is an exchange-of-value settlement system should eliminate principal risk by linking the final settlement of one obligation to the final settlement of the other.

**PS X CSD SSS X CCP X TR**

KE. 1. Elimination of principal risk by linking the two settlement phases

**Q.12.1.1: How does the FMI’s settlement mechanism ensure that the final settlement of relevant financial instruments eliminates principal risk? What procedures ensure that the final settlement of one obligation occurs if and only if the final settlement of a linked obligation also occurs?**

The settlement of a financial transaction at BM&FBOVESPA’s clearinghouse involve settlement of two linked obligations, such as the delivery of securities versus payment of cash for equities market and payment of one currency versus payment of another currency for FX transactions.

In the interbank FX market, the principal risk is associated with losses resulting from settlement problems, when the buying bank pays in Brazilian currency but does not receive the foreign currency in exchange due to default of the selling bank, or vice-versa. The clearinghouse deals with the principal risk in two ways. Firstly, the risk is reduced through the settlement of credit and debit amounts in Brazilian and foreign currency on a net basis, up to the point where they become fully equivalent. Secondly, the risk is eliminated through payment versus payment of cleared amounts. For banks participating in the clearinghouse, the guarantee of the elimination of the principal risk occurs when defaulting banks are not delivered the amounts to which they would have been entitled. The clearinghouse then converts these undelivered amounts into the proper currency, to which non-defaulting banks are entitled, and delivers it to them.

For securities cash market, the clearinghouse receiveS funds in its settlement account before the Brazilian Central Bank and securities in its securities settlement account before the CSD. Having received both legs of the settlement, the clearing house at the same time instructs the debt of funds from its settlement account and the credit to funds creditor and at the CSD instructs the debt of securities from its securities settlement account and credit on a net basis to the creditor custody accounts.

**Q.12.1.2: Are each of the linked obligations settled on a gross or net basis?**

Both.



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| <p>KE 2. Achievement of final settlement of twolinked obligations</p> | <p><b>Q.12.1.3: Is the finality of settlement of linked obligations simultaneous? If not, what is the timing of finality for both obligations? Is the length of time between the blocking and final settlement of both obligations minimised? Are blocked assets protected from a claim by a third party?</b></p> <p>Yes. See Q.12.1.1</p> |
| <p>KEY CONCLUSION 12.1</p>  |  |

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| <p>ASSESSMENT OF PRINCIPLE 12</p> |  |
| <p>COMMENTS</p>                   |  |

**PRINCIPLE 13. PARTICIPANT-DEFAULT RULES AND PROCEDURES**

An FMI should have effective and clearly defined rules and procedures to manage a participant default that ensure that the FMI can take timely action to contain losses and liquidity pressures, and continue to meet its obligations.

**PS X CSD X SSS X CCP X TR**

KC 13.1 An FMI should have default rules and procedures that enable the FMI to continue to meet its obligations in the event of a participant default and that address the replenishment of resources following a default.  
**PS X CSD X SSS X CCP X TR**

KE 1. Identification of default rules and procedures.

**Q.13.1.1: Do the FMI’s rules and procedures clearly define an event of default (both a financial and an operational default of a participant) and the method for identifying a default?**

Yes.

**Q.13.1.2: How do the FMI’s rules and procedures address the following key aspects: (a) the actions that the FMI can take when a default is declared; (b) the extent to which the actions are automatic or discretionary; (c) changes to normal settlement practices; (d) the management of transactions at different stages of processing; (e) the expected treatment of proprietary and customer transactions and accounts; (f) the probable sequencing of actions; (g) the roles, obligations, and responsibilities of the various parties, including non-defaulting participants; and (h) the existence of other mechanisms that may be activated to contain the impact of a default?**

- a. Actions may vary according to the type of defaulting participant, i.e. CM, Broker or Client. In any case, actions generally include, but are not limited to, closing out the defaulter's portfolio of positions; prohibition to trade, unless for risk reduction purposes; usage of the defaulter's collateral to cover losses related to closeout process;
- b. These actions are, to a large extent, automatic as they are defined in the clearinghouse's rulebook, manuals and other relevant documents;
- c. There are no changes in the normal settlement practices, unless for those related exclusively to handling a default (e.g. access to liquidity facilities) and that do not affect other (non-defaulting) participants;
- d. All transactions, independently of their processing stage, are to be settled normally, causing no disruptions to non-defaulting participants;
- e. In the case of CM or broker default, proprietary positions will be closed-out, whereas clients positions and collateral will be transferred to other, non-defaulting, CMs and/or brokers;
- f. The events described in (e) above will occur most probably in parallel;
- g. See Q.4.7.1;
- h. Besides the mechanisms described in Q.4.7.1, there are also liquidity risk

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|   | containment mechanisms.   |
| KE 2. Use and sequencing of financial resources.  | <p><b>Q.13.1.3: How do the FMI’s rules and procedures allow the FMI to use promptly any financial resources that it maintains for covering losses and containing liquidity pressures arising from default, including liquidity facilities?</b></p> <p>The clearinghouse rules and procedures state clearly how financial resources (e.g. collateral, settlement fund) are to be used in the case of a default.</p> <p><b>Q.13.1.4: How do the FMI’s rules and procedures address the order in which the financial resources can be used?</b></p> <p>The clearinghouse rules and procedures describe, in detail, the sequence (waterfall) explained in Q.4.7.1.</p>        |
| KE 3. Identification of default rules and procedures that address the replenishment of resources following a participant default. | <p><b>Q.13.1.5: How do the FMI’s rules and procedures address the replenishment of resources following a default?</b></p> <p>Replenishing of resources relate, to a large extent, to the process of replenishing the clearinghouse's settlement fund and clearing funds (see Q.4.7.1). Rules and procedures define that settlement fund replenishment is immediate up to the size of each original individual contribution (i.e. 1:1). New rounds of replenishment have to be defined by BM&amp;FBOVESPA's Board. Clearing funds replenishment follows a specific Board's decision on values and timeframes right after any event that entails access to those funds.</p> |
| KEY CONCLUSION 13.1   |   |

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| KC 13.2   | <p>An FMI should be well prepared to implement its default rules and procedures, including the exercise of any appropriate discretionary procedures provided in its rules.</p> <p><b>PS X CSD X SSS X CCP X TR</b></p>  |
| KE. 1. Preparation of an FMI to implement its default rules and procedures. | <p><b>Q.13.2.1: Does the FMI’s management have clearly articulated plans to address a participant default which delineate roles and responsibilities, including in respect to any discretionary procedures?</b></p> <p>Yes.</p> <p><b>Q.13.2.2: What type of communication procedures does the FMI have to reach in a timely manner all relevant stakeholders, including regulators, supervisors, and overseers?</b></p> <p>Apart from informal communication channels, the clearinghouse uses a comprehensive set of <i>communiqués</i> aiming at providing timely information to all relevant stakeholders.</p> |

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|                     | <p><b>Q.13.2.3: How frequently are the internal processes to manage a default reviewed?</b></p> <p>Whenever there is a material change in the operational procedures and/or rules that might possibly impact the default management processes.</p> |
| KEY CONCLUSION 13.2 |  |

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| KC 13.3  | <p>An FMI should publicly disclose key aspects of its default rules and procedures.</p> <p><b>PS X CSD X SSS X CCP X TR</b></p>   |
| <p>KE. 1. Disclosure of key aspects of default rules and procedures to the public.</p> | <p><b>Q.13.3.1: How are the key aspects of the FMI’s participant-default rules and procedures made publicly available?</b></p> <p>Rules and procedures are available on-line at the BM&amp;F BOVESPA’s website.</p> <p><b>Q.13.3.2: Do they include: (a) the circumstances in which action may be taken; (b) who may take those actions; (c) the scope of the actions which may be taken, including the treatment of both proprietary and customer positions, funds, and assets; (d) the mechanisms to address an FMI’s obligations to non-defaulting participants; and (e) the mechanisms to help address the defaulting participant’s obligations to its customers?</b></p> <p>a. Yes;<br/>b. Yes;<br/>c. Yes;<br/>d. Yes;<br/>e. No.</p> |
| KEY CONCLUSION 13.3  |   |

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| KC 13.4   | <p>An FMI should involve its participants and other stakeholders in the testing and review of the FMI’s default procedures, including any close-out procedures. Such testing and review should be conducted at least annually or following material changes to the rules and procedures to ensure that they are practical and effective.</p> <p><b>PS X CSD X SSS X CCP X TR</b></p>  |
| <p>KE 1. Testing and review of the default procedures with Participants and other stakeholders.</p> | <p><b>Q.13.4.1: How does the FMI engage with its participants and other relevant stakeholders in the testing and review of its participant-default procedures? At what frequency does it engage in these tests and reviews? Are these tests performed following material changes to the related rules and procedures?</b></p> <p>There is no such process.</p> <p><b>Q.13.4.2: What range of potential participant default scenarios and procedures do these tests cover? How does the FMI test the implementation of the resolution regime for its participants?</b></p> |

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|                     | <p>Please see Q.13.4.1.</p> <p><b>Q.13.4.3: How are the test results used? Are the results shared with the board, risk committee, and relevant authorities?</b></p> <p>Please see Q.13.4.1.</p> |
| KEY CONCLUSION 13.4 |   |

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| ASSESSMENT OF PRINCIPLE 13 |
| COMMENTS                   |

| <b>PRINCIPLE 14. SEGREGATION AND PORTABILITY</b>   |  |
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| A CCP should have rules and procedures that enable the segregation and portability of positions of a participant's customers and the collateral provided to the CCP with respect to those positions. |  |
| <b>PS SSS CSD CCP X TR</b>   |  |
| KC 14.1  | A CCP should, at a minimum, have segregation and portability arrangements that effectively protect a participant's customers' positions and related collateral from the default or insolvency of that participant. If the CCP additionally offers protection of such customer positions and collateral against the concurrent default of the participant and a fellow customer, the CCP should take steps to ensure that such protection is effective.<br><b>PS CSD SSS CCP X TR</b>   |
| KE 1. Identification of the segregation and portability arrangements that protect customer positions and related collateral.   | <p><b>Q.14.1.1: What are the segregation arrangements that the CCP has in place to permit the identification and separate treatment of participants' customers' positions and collateral?</b></p> <p>Brazil is a Final Beneficial Owner market. This means that the inventor's representatives have to identify the final client owning responsible for every transaction carried out at BM&amp;FBOVESPA's trading and post trading systems. As part of this requirement, client due diligence processes (CDD process) conducted by custodial services providers and brokerage houses will require final beneficiary identification, an extremely relevant aspect of the Brazilian financial and capital markets regulation.</p> <p>It is important to notice that every process before BM&amp;FBOVESPA's clearing house or CSD is made in the level of the final beneficiary. Final Beneficial Owners are registered in BM&amp;FBOVESPA's systems which allow BM&amp;FBOVESPA to send information on custody, collateral and position balances direct to final investor even throughout the internet.</p> <p><b>Q.14.1.2: What are the CCP's portability arrangements?</b></p> <p>See Above Q.14.1.1.</p> <p><b>Q.14.1.3: If the CCP serves a cash market and does not provide segregation arrangements, how is protection of customers' assets achieved?</b></p> <p>Not applicable. Brazil is a Final Beneficial Owner market.</p> |
| KE 2. Legal support for such segregation and portability arrangements under applicable law.  | <p><b>Q.14.1.4: What evidence is there that the legal framework provides a high degree of assurance that it will support the CCP's arrangements to protect and transfer the positions and collateral of a participant's customers?</b></p> <ul style="list-style-type: none"> <li>• Law no. 8.021/1990: sets forth that no payment or redemption, regarding any security or investment shall be made out to unidentified beneficiaries, and that</li> </ul>  |

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|                     | <p>neither securities nor payments shall be issued or paid in bearer form, the identity of the beneficiary being a legal requirement.</p> <ul style="list-style-type: none"> <li>• Law no. 6.404/1976: expressly provides that corporate bonds and shares must be issued in nominative/registered form.</li> <li>• CVM Instruction no. 387/2003: also sets forth the obligation upon brokerage entities to dutifully keep records of their clients and to provide the exchanges and the clearing entities with accurate client data.</li> <li>• CVM Instructions no. 325/2000 and no. 419/2005: determine that the same rules be applied for foreign investors.</li> </ul> <p><b>Q.14.1.5: What analysis has the CCP conducted regarding the enforceability of its customer segregation and portability arrangements, including with respect to any foreign/remote participants? In particular which foreign laws has the CCP determined to be relevant to its ability to segregate or transfer customer positions and collateral? How have any identified issues been addressed?</b></p> <p>In order to create a contractual framework for investor’s identification, the Brazilian system has adopted the following:</p> <ul style="list-style-type: none"> <li>• Prohibition of anonymous accounts or accounts held under fictitious names;</li> <li>• Creation of policies that describe the CDD process;</li> <li>• Approval of the CDD process by competent authorities;</li> <li>• “Know your client” internal procedures;</li> <li>• Maintenance of record keeping.</li> </ul> <p>See also Q.14.1.1</p> |
| KEY CONCLUSION 14.1 |   |

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| KC 14.2  | <p>A CCP should employ an account structure that enables it readily to identify positions of a participant’s customers and to segregate related collateral. A CCP should maintain customer positions and collateral in individual customer accounts or in omnibus customer accounts.</p> <p><b>PS CSD SSS CCP X TR</b></p>  |
| KE 1. Identification of the account structure for positions of a participant’s customers and related collateral. | <p><b>Q.14.2.1: What account structure does the CCP use for the positions and related collateral of participants’ customers? In particular, are customers’ positions and collateral segregated from participants’ positions and collateral, and the CCP’s positions and collateral? Are collateral and positions belonging to customers maintained in individual or omnibus accounts?</b></p> <p>All process and systems handled by BM&amp;FBOVESPA’s clearinghouse, such as position and collateral management, respect the identification of the final client.</p> <p>See also Q.14.1.1</p> |

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| <p>KE 2. Ability of the CCP to readily identify positions of its participants' customers and to segregate related collateral.</p> | <p><b>Q.14.2.2: If the CCP (or its custodians) holds collateral supporting customers' positions, what does this collateral cover (e.g., initial margin or variation margin requirements)?</b></p> <p>The CCP has an account structure that segregates the positions and related collateral in the level of final beneficial owner. The deposited collateral is calculated to cover initial margin requirements.</p> <p><b>Q.14.2.3: Does the CCP rely on the participant's records containing the sub-accounting for individual customers to ascertain each customer's interest? If so, describe how the CCP ensures its access to this information. Is customer margin obtained by the CCP from its participants collected on a gross or net basis? Is a customer's collateral exposed to "fellow-customer risk"?</b></p> <p>Individual customers (final beneficial owner) must be fully registered at the CCP registration system; there is no registration of only sub-accounting.</p> <p>Customer margin is collected on a gross basis, there is no commingling of assets, assuring that is no "fellow-customer" risk at the CCP.</p> |
| <p>KEY CONCLUSION 14.2</p>  |   |

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| <p>KC 14.3</p>  | <p>A CCP should structure its portability arrangements in a way that makes it highly likely that the positions and collateral of a defaulting participant's customers will be transferred to one or more other participants.</p> <p><b>PS CSD SSS CCP X TR</b></p>   |
| <p>KE 1. Identification of the CCP's portability arrangement.</p> | <p><b>Q.14.3.1: In which ways do the CCP's portability arrangements make it highly likely that the positions and collateral of a defaulting participant's customers will be transferred to one or more other participants? How do the CCP's rules and procedures require participants to facilitate the transfer of customer positions and collateral?</b></p> <p>The final beneficiary owner model ensures that all individual investors' positions and collateral are under the CCP control, ensuring position and collateral transfers in case of a participant default.</p> <p>Transfers are performed in the CCP position and collateral systems. The individual investors choose the new participant of their convenience to transfer the position and collateral.</p> <p><b>Q.14.3.2: How does the CCP obtain the consent of the participant(s) to which positions and collateral are to be ported? Are the consent procedures set out in the CCP's rules, policies, or procedures? If so, please describe them. If there are any exceptions, how are they disclosed?</b></p> <p>Not applicable because the portability does not depend on the defaulters participant information, given the final beneficiary owner model.</p> |



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|                     | <p><b>Q.14.3.3: Has the CCP had any actual experience in transferring the positions and collateral belonging to customers of a defaulting participant? If so, please describe this experience.</b></p> <p>Yes. BM&amp;FBOVESPA has had a couple of experiences in transferring final beneficiary owner positions and collateral from a defaulter participant to another.</p> <p>In each case, the final beneficiary owner informed the CCP about which participant he/she had settled to have its positions and collateral transferred.</p> |
| KEY CONCLUSION 14.3 |   |

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| KC 14.4  | <p>A CCP should disclose its rules, policies, and procedures relating to the segregation and portability of a participant’s customers’ positions and related collateral. In particular, the CCP should disclose whether customer collateral is protected on an individual or omnibus basis. In addition, a CCP should disclose any constraints, such as legal or operational constraints, that may impair its ability to segregate or port a participant’s customers’ positions and related collateral.</p> <p><b>PS CSD SSS CCP X TR</b></p>   |
| KE. 1. Disclosure of the rules, policies, and procedures relating to the segregation and portability of customer positions and collateral. | <p><b>Q.14.4.1: How are the CCP’s segregation and portability arrangements disclosed?</b></p> <p>The CCP’s segregation and portability arrangements are related in the Rules and Procedures books and disclosure in the BM&amp;FBOVESPA website to all participants.</p> <p><b>Q.14.4.2: How does the CCP disclose whether a participant’s customers’ collateral is protected on an individual or omnibus basis?</b></p> <p>This information is related in the Rules and Procedures books and disclosure in the BM&amp;FBOVESPA website to all participants. See also Q.14.1.1 - Brazil is a Final Beneficial Owner market.</p> |
| KE. 2. Disclosure of any constraint that may impair the CCP’s ability to segregate or port customer positions and collateral.              | <p><b>Q.14.4.3: Where and how are the risks, costs, and uncertainties associated with the CCP’s segregation and portability arrangements identified and disclosed? How does the CCP disclose any constraints (such as legal or operational), that may impair the CCP’s ability fully to segregate or port a participant’s customers’ positions and collateral?</b></p> <p>Not applicable.</p>   |
| KEY CONCLUSION 14.4  |   |

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| ASSESSMENT OF PRINCIPLE 14 |  |
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| <b>PRINCIPLE 15. GENERAL BUSINESS RISK</b>  |  |
| An FMI should identify, monitor, and manage its general business risk and hold sufficient liquid net assets funded by equity to cover potential general business losses so that it can continue operations and services as a going concern if those losses materialise. Further, liquid net assets should at all times be sufficient to ensure a recovery or orderly wind-down of critical operations and services. |  |
| <b>PS X CSD X SSS X CCP X TR X</b>  |  |
| KC 15.1   | An FMI should have robust management and control systems to identify, monitor, and manage general business risks, including losses from poor execution of business strategy, negative cash flows, or unexpected and excessively large operating expenses.<br><b>PS X CSD X SSS X CCP X TR X</b>  |
| KE 1. Management and control systems to identify, monitor, and manage general business risks.   | <p><b>Q.15.1.1: How does the FMI identify and monitor its general business risks, including new and emerging business risks? What are the general business risks identified by the FMI?</b></p> <p>BM&amp;FBOVESPA has implemented two different approaches for identifying, monitoring, and managing its general business risks. In top-down approach, the information about the risk profile is obtained directly from directors and consolidated to produce a list of all the risks of the Company and the subset of critical risks to be monitored and evaluated. This analysis generates results of comprehensive information that yield the risk profile and an executive view of the risks of the Company. In bottom-up approach, the risk profile of the Company is created from the operational details of the processes. The level of detail of this view allows a better definition of the response to the risk, risk rating metrics, and continuous oversight of risk management through indicators. The Company still misses a more clear definition of the policies and procedures related to operational risks. The Corporate Risk Department has identified 41 risks, 253 risk factors and 114 consequences.</p> <p>These main risks are periodically assessed by the Executive Office and reported to the Audit Committee, Risk Committee and the Board of Directors.</p> <p><b>Q.15.1.2: Has the FMI developed the capacity to assess its business risks on an ongoing basis?</b></p> <p>Based on the identification of risks, the Audit and Corporate Risk Department is establishing Key Risk Indicators (KRIs) that will be monitored in order to determine the impacts and the likelihood of materialization of risks. For the risks considered to have a high impact / likelihood, the Company established responses that will minimize the consequences of the risks.</p> <p><b>Q.15.1.3: How does the FMI manage the general business risks that it has identified?</b></p> <p>During the risk assessment, the Corporate Risk Department should identify the controls to mitigate/manage the risks identified. In case of a lack of controls, the Management should</p> |

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|                            | <p>establish action plans to implement controls. The controls identified are assessed periodically by Internal Audit Department based on the Audit Plan approved by Audit Committee.</p> |
| <p>KEY CONCLUSION 15.1</p> |  |

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| <p>KC 15.2</p>   | <p>An FMI should hold liquid net assets funded by equity (such as common stock, disclosed reserves, or other retained earnings) so that it can continue operations and services as a going concern if it incurs general business losses. The amount of liquid net assets funded by equity an FMI should hold should be determined by its general business risk profile and the length of time required to achieve a recovery or orderly wind-down, as appropriate, of its critical operations and services if such action is taken.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| <p>KE 1. Amount of liquid net assets funded by equity held by the FMI.</p> | <p><b>Q.15.2.1: How is the required amount of liquid net assets funded by equity to cover the FMI's general business losses calculated? How would the FMI cover losses that exceed the amount of liquid net assets funded by equity set aside for business risk?</b></p> <p>Regarding the non CCP core business, which reflects the operational cash flow needs, we estimate the required amount hold on liquid assets by forecasting, in a short term basis, the total amount of expenditures required. We have in place short term borrowing credit lines that could supply in excess the total amount estimated.</p> <p><b>Q.15.2.2: How does the FMI analyse its business risk profile when determining an appropriate amount of liquid net assets funded by equity to hold? How does the FMI determine the length of time and associated operating costs of achieving an orderly recovery or winddown of critical operations and services?</b></p> <p>Since the volatility in terms of cash flow generation and the risks associated to the CCP business we maintain a stable and low financial leverage.</p> |
| <p>KEY CONCLUSION 15.2</p>   |  |

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| <p>KC 15.3</p> | <p>An FMI should maintain a viable recovery or orderly wind-down plan and should hold sufficient liquid net assets funded by equity to implement this plan. At a minimum, an FMI should hold liquid net assets funded by equity equal to at least six months of current operating expenses. These assets are in addition to resources held to cover participant defaults or other risks covered under the financial resources principles. However, equity held under international risk-based capital standards can be included where relevant and appropriate to avoid duplicate capital requirements.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p> |
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| <p>KE 1. Identification of a viable plan to achieve a recovery or orderly wind-down.</p> | <p><b>Q.15.3.1: Has the FMI developed a plan to achieve a recovery or orderly wind-down?</b></p> <p>We maintain, in addition to resources held to cover participant defaults, an amount on liquid assets estimated by forecasting, in a short term basis, the total amount of expenditures required to provide continuity of business activity.</p> <p><b>Q.15.3.2: If so, what does this plan take into consideration (for example, the operational, technological, and legal requirements for participants to establish and move to an alternative arrangement)?</b></p> <p>We take into consideration all main business aspects and requirements, including market simulation under different scenarios.</p>  |
| <p>KE 2. Minimum holdings of liquid net assets funded by equity.</p>                     | <p><b>Q.15.3.3: Does the FMI hold liquid net assets funded by equity to cover general business risk that is at least the maximum of:</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> six months of current operating expenses; or</li> <li><input checked="" type="checkbox"/> the amount of liquid net assets funded by equity needed to implement the FMI’s plan discussed in Q.15.3.2?</li> </ul> <p>Yes, the FMI hold liquid net assets to cover general business risks needed to implement the FMI’s recover plan based on current operating expenses.</p> <p><b>Q.15.3.4: How are the resources designated to cover business risks and losses separated from resources designated to cover the default of a member?</b></p> <p>We segregate the liquid net assets by: market participants cash collateral and others, restricted funds and available funds.</p> <p>This last one is the FMI’s available segregated funds to cover the business risks regarding CCP activity and others.</p> |
| <p>KE 3. Inclusion of capital held under international risk-based capital standards</p>  | <p><b>Q.15.3.5: Does the FMI include capital held under international risk-based standards to cover general business risks?</b></p> <p>We maintain funds formed by BM&amp;FBOVESPA’s equity allocated to guarantee the proper settlement of transactions and losses resulting from operating or administrative failures.</p>   |
| <p>KEY CONCLUSION 15.3</p>   |  |

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| <p>KC 15.4</p> | <p>Assets held to cover general business risk should be of high quality and sufficiently liquid in order to allow the FMI to meet its current and projected operating expenses under a range of scenarios, including in adverse market conditions.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p> |
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| <p>KE 1. Identification of assets to cover general business risk.</p> | <p><b>Q.15.4.1: In which high quality assets are the FMI’s liquid net assets funded by equity held? How will the FMI convert these assets into cash at little or no loss of value in adverse market conditions?</b></p> <p>BM&amp;FBOVESPA’s policy for cash investments favors alternatives with very low risk, high liquidity and sovereign risk (Brazil), whose overall performance is tied to the Selic rate / CDI, resulting in a significant proportion of Brazilian federal government securities in its portfolio, purchased directly, via repurchase agreements backed by government bonds and also through exclusive and non-exclusive funds. Investments in those assets have minimal loss of value compared to fixed interest rate notes. This is the main reason the BM&amp;FBOVESPA allocates its funds in floating rate assets linked to Selic rate / CDI.</p> <p><b>Q.15.4.2: How does the FMI regularly assess the quality and liquidity of its liquid net assets funded by equity to meet its current and projected operating expenses under a range of scenarios?</b></p> <p>We assess the BMFBOVESPA’s liquidity requirements under different stress scenarios that take into account assets’ quality and intraday liquidity.</p> |
| <p>KEY CONCLUSION 15.4</p>  |   |

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| <p>KC 15.5</p>  | <p>An FMI should maintain a viable plan for raising additional equity should its equity fall close to or below the amount needed. This plan should be approved by the board of directors and updated regularly.</p> <p><b>PS X SSS X CSD X CCP X TR X</b></p>   |
| <p>KE 1. Identification of a viable plan for raising additional equity capital.</p> | <p><b>Q.15.5.1: What are the main features of the FMI’s plan to replenish equity capital should it approach or fall below minimum requirements?</b></p> <p>We annually establish a legal reserve by allocating 5% of net income and not exceeding 20% of the capital. The legal reserve is intended to ensure the integrity of the capital and can only be used to offset losses and increase capital.</p> <p>We also establish an statutory reserve that represents funds and safeguard mechanisms required for the activities of BM&amp;FBOVESPA, in order to ensure the proper settlement and reimbursement of losses arising from the intermediation of transactions carried out in its trading sessions and/or registered in any of its trading, registration, clearing and settlement systems, and from custody services.</p> <p><b>Q.15.5.2: How often is the plan to replenish equity capital regularly reviewed and updated?</b></p> <p>Pursuant to the bylaws, the Board of Directors may, when the amount of statutory reserves is sufficient to meet its objectives, propose that parts of the reserve be reversed for distribution to the shareholders of the Company.</p> |

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| KE 2. Approval of the plan to replenish capital by the FMI's board of directors (or equivalent). | <b>Q.15.5.3: What is the role of the FMI's board (or equivalent) in reviewing and approving the FMI's plan to raise additional equity capital if needed?</b><br><br><a href="#">See Q.15.5.2.</a> |
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KEY CONCLUSION 15.5

ASSESSMENT OF PRINCIPLE 15

COMMENTS

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| <b>PRINCIPLE 16. CUSTODY AND INVESTMENT RISK</b>   |   |
| An FMI should safeguard its own and its participants' assets and minimise the risk of loss on and delay in access to these assets. An FMI's investments should be in instruments with minimal credit, market, and liquidity risks.<br><b>PS X CSD X SSS X CCP X TR</b> |   |
| KC 16.1  | An FMI should hold its own and its participants' assets at supervised and regulated entities that have robust accounting practices, safekeeping procedures, and internal controls that fully protect these assets.<br><b>PS X CSD X SSS X CCP X TR</b>  |
| KE 1. Characteristics of the entities at which the FMI holds its assets.   | <b>Q.16.1.1: What is the FMI's custody policy? With which entities does the FMI hold its assets, such as cash and securities, including assets provided by its participants? How does it check that these entities are supervised and regulated?</b><br><br>Most of BM&FBOVESPA assets consist of Federal Bonds. These are held in the BM&FBOVESPA account at SELIC. Although all assets are registered in the same account, they are segregated in BM&FBOVESPA internal accounts. Assets held in funds are audited in a regular basis. |
| KE 2. Ability of the entities to protect the FMI's and its participants' assets.   | <b>Q.16.1.2: How does the FMI verify that these entities have robust accounting practices, safekeeping procedures, and internal controls that fully protect its and its participants' assets?</b><br><br>BM&FBOVESPA does not verify these entities at a regular basis, however, entities in which its funds are held are in top tier public and audited financial institutions in Brazil.  |
| KEY CONCLUSION 16.1  |   |

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| KC 16.2  | An FMI should have prompt access to its assets and the assets provided by participants, when required.<br><b>PS X CSD X SSS X CCP X TR</b>  |
| KE. 1. Prompt access to FMI 's and participants' assets. | <b>Q.16.2.1: How has the FMI established that it has a sound legal basis to support enforcement of its interest or ownership rights in assets held in custody?</b><br><br>Law 10,214/01, CMN Resolution No. 2,882 and the Central Bank Circular Letter 3,057 provide the legal basis for recognizing the finality and irrevocability of settlements and assures the BM&FBOVESPA clearinghouses' priority over the securities posted as collateral, in case of a participant default, thus enabling the continuance of the settlement process, and supporting the enforcement of its interest or ownership rights in assets held in custody.<br><br>Furthermore, Law 10,214/01 (articles 6 and 7) specifically provides that assets posted as collateral to clearinghouses cannot be seized even by judicial order, and that the bankruptcy law does not affect the fulfillment by a participant of its obligations to a clearing or settlement system, which will be brought to completion and settled in |

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|                     | <p>accordance with the system regulation.</p> <p>Additionally, Law 6,404/76 (article 41) and CVM Rule 115 regulates custody over fungible shares, establishing that the depository of fungible shares has fiduciary ownership over those assets. CVM Rule 115 regulates, in more detail, the custody over fungible shares. Fiduciary ownership under Brazilian law does not impose any additional obligation to the custodian other than those generally applied to this kind of service. Fiduciary ownership is granted to the custodian of fungible shares in order to ensure that the securities under custody are not mingled with the other assets of the custodian. The obligations of the custodian are to safe keep the securities under its custody, to ensure that all corporate payments and events are forwarded to the securities owner and to deliver periodical statements on the owner's account. BM&amp;FBOVESPA has systems, arrangements and rules to ensure that assets belonging to users of those facilities are properly safeguarded and administered.</p> <p>For further reference, please check answer to Q.1.1.1.</p> <p><b>Q.16.2.2: How does the FMI ensure that it can have prompt access to its assets, including securities that are held with a custodian in another time zone or legal jurisdiction, in the event of participant default?</b></p> <p>BM&amp;FBOVESPA clearinghouses accepts securities traded in the international markets as collateral for trades with BM&amp;FBOVESPA equities markets. This procedure is available for non-resident investors depositing collateral, and such securities must be transferred to BM&amp;FBOVESPA's accounts held at the Depository Trust &amp; Clearing Corporation (DTCC) or Euroclear.</p> <p>To ensure the prompt monetization of deposited assets, BM&amp;FBOVESPA performs, monthly, execution tests of international securities deposited as collateral, in order to ensure that the process occurs without fault and in the shortest time possible. This process is monitored based on an analytical reports containing data on the efficiency of systems, assets liquidity and of the effective time needed to monetize in the international market. Still, the collateral custody accounts in European and American markets allows the BM&amp;FBOVESPA acting on different time zones, ensuring greater security and coverage for their operations.</p> |
| KEY CONCLUSION 16.2 |  |

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| KC 16.3 | <p>An FMI should evaluate and understand its exposures to its custodian banks, taking into account the full scope of its relationships with each.</p> <p><b>PS X CSD X SSS X CCP X TR</b></p> |
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| <p>KE 1. Evaluation of the FMI's exposure to its custodian banks.</p> | <p><b>Q.16.3.1: How does the FMI evaluate and understand its exposures to its custodian banks? In managing those exposures, how does it take into account the full scope of its relationship with each custodian bank? For instance, does the FMI use multiple custodians for the safekeeping of its assets to diversify exposure to any single custodian? How does the FMI monitor concentration of risk exposures to its custodian banks?</b></p> <p>BM&amp;FBOVESPA uses multiple top tier financial institutions in Brazil as custodians for its Investments in funds. Assets purchased directly are in custody at SELIC.</p> |
| <p>KEY CONCLUSION 16.3</p>  |   |

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| <p>KC 16.4</p>  | <p>An FMI's investment strategy should be consistent with its overall risk-management strategy and fully disclosed to its participants, and investments should be secured by, or be claims on, high-quality obligors. These investments should allow for quick liquidation with little, if any, adverse price effect.</p> <p><b>PS X CSD X SSS X CCP X TR</b></p>   |
| <p>KE 1. Investment strategy of the FMI.</p>                              | <p><b>Q.16.4.1: How does the FMI ensure that its investment strategy is consistent with its overall risk-management strategy?</b></p> <p>BM&amp;FBOVESPA's policy for cash investments favors alternatives with very low risk. This strategy is presented on a monthly bases to the Financial Committee whose members includes the Chief Financial Officer, Financial Director, Risk Director, Audit Director, Clearing Director among others members. In addition, BM&amp;FBOVESPA discloses asset allocation of all its investments at the quarterly financial report.</p> <p><b>Q.16.4.2: Are all of the FMI's investments secured by, or claims on, high-quality obligors?</b></p> <p>The great majority of BM&amp;FBOVESPA investments are in Brazilian sovereign bonds or assets backed by sovereign bonds.</p> <p><b>Q.16.4.3: How does the FMI consider its overall exposure to an obligor in choosing investments? What investments are subject to limits to avoid concentration of credit risk exposures? Does the FMI invest in participants' own securities or those of its affiliates?</b></p> <p>BM&amp;FBOVESPA has minimal exposure to private credit risk. More than 99% of its asset allocation is linked to Brazilian government securities.</p> |
| <p>KE 2. Disclosure of the FMI's investment strategy to participants.</p> | <p><b>Q.16.4.4: How does the FMI disclose its investment strategy to its participants?</b></p> <p>Quarterly and annual financial reports.</p>   |

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| <p>KE 3. Characteristics of the FMI's investments.</p> | <p><b>Q.16.4.5: How does the FMI ensure that its investments allow for quick liquidation?</b></p> <p>BM&amp;FBOVESPA allocates almost 100% of its funds at high liquid investments. These funds are available at least at the same day, but most of it are at available within one hour.</p> <p><b>Q.16.4.6: How does the FMI ensure that its investments are exposed to little, if any, adverse price effects?</b></p> <p>As a financial investment policy and considering the need for immediate liquidity with the least possible impact from interest rate fluctuations, BM&amp;FBOVESPA maintains its financial assets and liabilities indexed to floating interest rates.</p> |
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KEY CONCLUSION 16.4

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| ASSESSMENT OF PRINCIPLE 16 |  |
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| <b>PRINCIPLE 17. OPERATIONAL RISK</b>  |  |
| An FMI should identify the plausible sources of operational risk, both internal and external, and mitigate their impact through the use of appropriate systems, policies, procedures, and controls. Systems should be designed to ensure a high degree of security and operational reliability and should have adequate, scalable capacity. Business continuity management should aim for timely recovery of operations and fulfilment of the FMI’s obligations, including in the event of a wide-scale or major disruption. |  |
| <b>PS X CSD X SSS X CCP X TR X</b>   |  |

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| KC 17.1 | An FMI should establish a robust operational risk-management framework with appropriate systems, policies, procedures, and controls to identify, monitor, and manage operational risks.<br><b>PS X CSD X SSS X CCP X TR X</b> |
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| KE 1. Identification of operational risk. | <p><b>Q.17.1.1: What are the FMI’s policies and processes for identifying the full range of operational risks on an ongoing basis?</b></p> <p>See KC 15.1.</p> <p><b>Q.17.1.2: What are the sources of operational risks identified by the FMI? How do the FMI’s processes ensure that the full range of operational risks is identified, whether these risks arise from internal sources (for example, the arrangements of the system itself, including human resources), from the FMI’s participants, or from external sources? How has the FMI identified and addressed potential single points of failure in its operations?</b></p> <p>About the first question see KC 15.1.</p> <p>The Enterprise Risk Management (ERM) procedures are supposed to be transparent and integrated within the multiple departments of the Company, bringing into light the variety of businesses’ inherent risks that take place in every unit of the Company. The Corporate Risk Department has also developed a procedure to capture information from external sources, for example forms 10-K from Americans FMIs. The Division has participated in international forums, like IIA, ISACA and Compliance Week. The potential single points of failure are reported to the Risk Committee.</p> |
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| KE 2. Operational risk-management framework | <p><b>Q.17.1.3: What are the FMI’s systems, policies, procedures, and controls addressing the identified operational risks? Where are these systems, policies, procedures, and controls defined?</b></p> <p>The BM&amp;FBOVESPA managers are responsible for identifying operational risks and the implementation of internal controls to mitigate these risks. The documentation and dissemination of implementation of internal controls are also the responsibility of managers of the areas and is under the supervision of the Executive Office.</p> |
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The task of identification of risks is supported by some specific departments of the Company, such as the Internal Audit, Corporate Risk and Business Process Departments, performing specific tasks aimed at identifying risks, analyzing the effectiveness of internal controls and remodeling processes in order to improve process and reduce the risks.

**Q.17.1.4: What policies, processes, and controls does the FMI employ to ensure that operational procedures are implemented appropriately? To what extent do the FMI's systems, policies, processes, and controls take into consideration relevant international, national, and industry level operational risk-management standards?**

The internal audit is conducted by the Audit and Corporate Risk Department, whose work plan is defined / approved annually by the Audit Committee, which reports directly to the Board. The plan is set according to the relevance of existing risks in each business area and also in the historical data of the work previously done.

The procedures and internal controls in place in the BM&FBOVESPA were implemented considering the best practices and also requirements of Regulatory Agencies. The procedures are documented and available to employees and the company also has a Board dedicated to analysis and improvement of existing procedures in order to optimize the performance of the areas and reduce the risks.

**Q.17.1.5: What are the FMI's human resources policies to hire, train, and retain qualified personnel, and to mitigate the effects of high rates of personnel turnover or key-person risk? Moreover, how do the FMI's risk-management policies address fraud prevention?**

BM&FBOVESPA has formally defined the policy of human resources management, which contains specific items related to staff training, performance assessment, quality of life programs and policy for long-term compensation (stock options). The effectiveness of the policy is regularly measured through various indicators, including an indicator of turnover.

Regarding to fraud prevention, the Company performs activities such as periodic reviews of accesses / segregation of duties into systems, training on the code of ethics and of continuous internal and external audit.

**Q.17.1.6: How, and to what extent, do the FMI's change-management and project-management policies and processes ensure that changes and major projects do not affect the smooth functioning of the system?**

The BM&FBOVESPA has formal processes of Change Management, with an area exclusively dedicated to this function. Moreover, the main changes are monitoring by the PMO, which tracks the progress of projects.

KEY CONCLUSION 17.1

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| KC 17.2  | <p>An FMI's board of directors should clearly define the roles and responsibilities for addressing operational risk and should endorse the FMI's operational risk-management framework. Systems, operational policies, procedures, and controls should be reviewed, audited, and tested periodically and after significant changes.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| KE 1. Identification of roles and responsibilities for operational risk.   | <p><b>Q.17.2.1: How has the board of directors defined the key roles and responsibilities for operational risk management?</b></p> <p>The Risk Committee monitors and assesses operational risks, market risk, liquidity risk, credit risk and systemic market risk managed by the Company, focusing on strategic and structural issues.</p>   |
| KE. 2. Endorsement of the risk-management framework by board of directors. | <p><b>Q.17.2.2: How, and how frequently, does the FMI's board explicitly review and endorse the FMI's operational risk-management framework?</b></p> <p>Whenever improvements of the risk management framework, including operational risks, are identified, proposals of revision are submitted by the Audit and Corporate Risk Director to the Risk Committee.</p> <p>Once a year the Audit and Corporate Risk Department issues an internal controls report which states the level of the internal controls structure of the Company. This report is composed by the risk definition, risk factors and consequences and risk response. It also contains an evaluation carried out by the Management. This report is addressed to the Board of Directors, Executive Office, Audit Committee and Risk Committee. Also, the Risk Committee meets four times a year to review the results of the Audit and Corporate Risk Department.</p>             |
| KE 3. Auditing and testing.  | <p><b>Q.17.2.3: How, and how frequently, does the FMI review, audit and test its systems, operational policies, procedures, and controls, including its operational risk-management arrangements with participants?</b></p> <p>The internal audit is conducted by the Audit and Corporate Risk Department, whose work plan is defined / approved annually by the Audit Committee, which reports directly to the Board. The plan is set according to the relevance of existing risks in each business area and also in the historical data of the work previously done.</p> <p>For participants, the audit is conducted by a subsidiary company of BM&amp;FBOVESPA (named BSM), which annually conducts audit tests in all participants to verify that they are in compliance with the rules set by CVM and BM&amp;FBOVESPA.</p> <p><b>Q.17.2.4: To what extent is the FMI's operational risk-management framework subject to external audit?</b></p> |

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|                     | The operational risk-management framework is not subject to external audit. The external audit uses the internal audit working papers for its planning and each control improvement suggested by the external audit is followed up by the internal audit. |
| KEY CONCLUSION 17.2 |   |

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| KC 17.3                                  | An FMI should have clearly defined operational reliability objectives and should have policies in place that are designed to achieve those objectives.<br><b>PS X CSD X SSS X CCP X TR X</b>   |  |
| KE 1. Operational reliability objectives | <p><b>Q.17.3.1: What are the FMI’s operational reliability objectives, both qualitative and quantitative? Where and how are they documented?</b></p> <p>BM&amp;FBOVESPA has formally defined the basic goals in its Bylaws, which is posted on its investor relations website.</p> <p>The Bylaws of BM&amp;FBOVESPA provides the following basic objectives for the Organization:</p> <ul style="list-style-type: none"> <li>• Surveillance of exchange markets for the organization, development and maintenance of free and open markets for the trading of all types of securities, titles or contracts that have as references or are backed to spot or future indexes, indicators, rates, merchandise, currencies, energies, transportation, commodities and other assets or rights directly or indirectly related to them;</li> <li>• Maintenance of systems for the trade and auction of securities, bonds, derivatives, rights and titles in the organized exchange market or in the over-the-counter market;</li> <li>• Rendering of registration, clearing and physical and financial settlement services, through an internal body or a company specially incorporated for this purpose, as main and guarantor counterparty for the final clearance or not, according to the law in effect and Company’s regulations;</li> <li>• Rendering of services of centralized depository and fungible and non-fungible custody of commodities, securities and any other physical and financial assets;</li> <li>• Rendering of customization, classification, analysis, quotation, preparation of statistics, training of personnel, preparation of studies, publications, information, library and software development services related to the participants of the markets under the Company’s direct or indirect surveillance and its interests;</li> <li>• Rendering of technical, administrative, software development and management support for market development, as well as undertaking of educational, promotional and publishing activities related to its corporate purpose and to the markets which are under the Company’s surveillance</li> <li>• Undertaking of other similar or related activities expressly authorized by</li> </ul> |  |

the Securities Commission;

Additionally, the Company has defined and disclosed to its internal personnel, strategic drivers for the conduct of its activities and prioritization of projects for achieving its objectives. These drivers are intended to promote improvements in operational efficiency, better models for risk management and strengthening the safety and soundness of the markets managed by BM&FBOVESPA.

**Q.17.3.2: How do these objectives ensure a high degree of security and operational reliability?**

The Company has defined internal strategic drivers for conducting its activities and to prioritize the projects in order to achieve its objectives. These drivers are intended to promote improvements in operational efficiency, better models for risk management and strengthening the safety and soundness of the markets managed by BM&FBOVESPA. The existence of strategic drivers specific to operational efficiency and safety ensures appropriate treatment and prioritization of efforts.

The Company has defined internal strategic drivers for conducting its activities and to prioritize the projects in order to achieve its objectives. These drivers are intended to promote improvements in operational efficiency, better models for risk management and strengthen the safety and soundness of the markets managed by BM&FBOVESPA. The existence of strategic drivers specific to operational efficiency and safety ensures appropriate treatment and prioritization of efforts.

In addition to that, BM&FBOVESPA ensures a high degree of security and operational reliability through internal mechanisms of supervision and governance:

- Internal Audit: responsible for assessing the adequacy of the internal control structure and compliance with internal and external rules;
- Corporate Risk: responsible for identifying and monitoring the company's corporate risk through KRI's;
- Modeling Risk: does independent evaluations of the models used to manage the counterparty risk, credit risk and market risk carried through by specialists and segregated from the department which actually performs the management of these risks;
- Audit Committee: responsible for conducting the supervision of internal audit activities;
- Risk Committee: assesses and monitors the level of risk exposure of the company.

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| <p>KE 2. Policy to achieve the operational reliability objectives.</p> | <p><b>Q.17.3.3: How, and to what extent, are the FMI’s reliability objectives integrated into its operational risk-management framework (see KC 17.1)?</b></p> <p>The framework of the methodology for Enterprise Risk Management is based on ISO 31000:2009 and is structured into the following steps:</p> <ul style="list-style-type: none"> <li>• Understanding the objectives and process mapping;</li> <li>• Risk identification;</li> <li>• Analysis and classification of the inherent and residual risks;</li> <li>• Identification of internal controls;</li> <li>• Monitoring of key risk indicators.</li> </ul> <p>The Audit and Corporate Risk Department also uses as a model for evaluating internal controls the COSO ERM Framework (Committee of Sponsoring Organizations of the Treadway Commission) and COBIT Framework (Control Objectives for Information and Related Technologies).</p> <p><b>Q.17.3.4: How and to what extent are these objectives integrated into the FMI’s review, auditing, and testing of its systems, operational policies, procedures, and controls (see KC 17.2)?</b></p> <p>During the risk assessment, the Corporate Risk Department identifies activity controls to mitigate/manage risks identified. In case of a lack of controls, the Management should establish action plans to implement these controls. The existing activity controls are assessed periodically by Internal Audit Department based on the Audit Plan approved by the Audit Committee.</p> <p>The task of risk identification is supported by some specific areas of the Company, such as Internal Audit, Corporate Risk and Business Process Departments, which perform specific tasks aimed to identify risks, analyze the effectiveness of internal controls and remodeling processes in order to improve process and reduce risks.</p> <p><b>Q.17.3.5: What are the processes to review the FMI’s objectives and performance and take appropriate action as needed?</b></p> <p>BM&amp;FBOVESPA has implemented two different approaches for identifying, monitoring, and managing its general business and operational risks. In top-down approach, the information about the risk profile is obtained directly from managing directors and consolidated to produce a list of all Company risks and the subset of critical risks to be monitored and evaluated. This analysis generates results of comprehensive information that yield the risk profile and an executive view of Company risks. In bottom-up approach, the risk profile of the Company is created from the operational details of the processes. The detailed level of this view allows a better definition of the response to the risk, risk rating metrics, and</p> |
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|                     | <p>continuous oversight of risk management through indicators. The Company still misses a more clear definition of the policies and procedures related to operational risks. The Corporate Risk Department has identified 41 risks, 253 risk factors and 114 consequences. These main risks are periodically assessed by the Senior Management and reported to the Audit Committee and Risk Committee.</p> <p>The Enterprise Risk Management (ERM) procedures are transparent and integrated within the multiple departments of the Company, bringing into light the variety of businesses' inherent risks that take place in every unit of the Company. The Corporate Risk Department has also developed a procedure to capture information from external sources, for example forms 10-K from Americans FMIs. The Division has participated in international forums, like IIA, ISACA and Compliance Week. The potential single points of failure are reported to the Risk Committee.</p> <p>Based on risk identification, the Corporate Risk Department is establishing Key Risk Indicators (KRIs) that will be monitored in order to determine the impacts and the likelihood of the risk materialization. For the risks considered to have a high impact / likelihood, the Company established responses that will minimize risk consequences.</p> |
| KEY CONCLUSION 17.3 |  |

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| KC 17.4                  | <p>An FMI should ensure that it has scalable capacity adequate to handle increasing stress volumes and to achieve its service-level objectives.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| KE 1. Scalable capacity. | <p><b>Q.17.4.1: How, and how frequently, does the FMI review, audit, and test the scalability and adequacy of its capacity?</b></p> <p>BM&amp;FBOVESPA's Department of Projects and Process Management carries out capacity testing per requirement (performance, load, limit, availability), as well as certification testing.</p> <p>The capacity planning methodology document describes the procedures and techniques for evaluating systems using prototypes, benchmarks and data capture. Another evaluation technique is performance modeling, simulation and load testing.</p> <p>Requirements arise from new business development and BM&amp;FBOVESPA's strategic positioning needs, as well as organic systems growth. Estimates are based on projections for and previous experience of growth in the use of services.</p> <p><b>Q.17.4.2: How frequently are capacity plans reviewed and tested and how are the test results used? How are situations where operational capacity is neared or exceeded addressed?</b></p> <p>BM&amp;FBOVESPA uses tools to manage performance proactively, collecting data for assessments of IT resource capacity and performance. The process includes production of</p> |

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|  | <p>capacity management reports, which serve as a basis for calibrating capacity and performance needs.</p> <p>In situations where the limit of operational capacity is nearing or exceeded, IT areas start projects to update the capacity of technologic resources, adapting it's to the demand.</p> |
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KEY CONCLUSION 17.4

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| KC 17.5 | <p>An FMI should have comprehensive physical and information security policies that address all potential vulnerabilities and threats.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p> |
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| KE 1. Physical security policies. | <p><b>Q.17.5.1: What are the FMI's policies and processes for identifying, monitoring, assessing, and managing the full range of physical vulnerabilities and threats on an ongoing basis?</b></p> <p>The BM&amp;FBOVESPA' responsible to conduce critical activities to control and mitigate physical risks are:</p> <p>1 – Building's Control Access, comprising:</p> <ul style="list-style-type: none"> <li>• Fire detection and Fire Fighting System</li> <li>• Control Access using Badge System</li> <li>• Control Access to the Data Centers using Biometrical System</li> <li>• Monitoring by Closed-circuit television (CCTV)</li> <li>• Surveillance System (24/7) with its own Monitoring Central</li> </ul> <p>2 - Maintaining of facilities, comprising:</p> <ul style="list-style-type: none"> <li>• BMS (Building Management System)</li> <li>• Air Conditioning System monitored (24/7) by its own Monitoring Central</li> <li>• Power Grid and UPS system</li> <li>• On site Mission Critical Team (24/7) with its training routine</li> <li>• Preventive and Predictive Maintenance routine</li> <li>• Several facilities infrastructure tests according an annual pre-defined schedule</li> </ul> <p>The Data Processing Centre (DPC) is located in a segregated environment, fitted with access controls, temperature and humidity controls, and fire prevention and Fire Fighting equipment, in addition to an alternative power source, which in the case of a power shortage should at least permit completing ongoing operational.</p> <p><b>Q.17.5.2: To what extent do the FMI's policies, processes, controls, and testing take into consideration relevant international, national, and industry-level standards for physical security? How are deviations from the security policies and risk mitigations documented?</b></p> <p>The following processes consider relevant international and national standards for physical</p> |
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|   | <p>security:</p> <p>Fire prevention and Fire Fighting System according to NFPA 72 – National Fire Alarm and Signaling Code and NFPA 2001 – Standard on Clean Agent Fire Extinguishing Systems.</p> <p>Surveillance System (24/7) with its own Monitoring Central according to Federal Law 7.102/1983.</p> <p>All deviations related to the building’s Control Access processes, are identified and registered into an Occurrence Report. This document is sent to analyses of Direction and corrective actions are defined to eliminate the deviation.</p> <p><b>Q.17.5.3: How, and to what extent, do the FMI’s change-management and project-management policies and processes ensure that changes and major projects do not affect the physical security of the system?</b></p> <p>BM&amp;FBOVESPA Change Management process assures that changes and major projects must be fully approved, including a step for risk assessment and impact analysis in the physical security of the systems.</p>   |
| <p>KE 2. Information security policies.</p> | <p><b>Q.17.5.4: What are the FMI’s policies and processes for identifying, monitoring, assessing, and managing the full range of information security vulnerabilities and threats on an ongoing basis?</b></p> <p>BM&amp;FBOVESPA has a SOC (Security Operations Center), operating on a 24x7 basis. SOC is responsible for IT security monitoring and incident handling (detecting and responding to hacking attempts).</p> <p>Ethical hacking processes, as well as Internal and external audits continuously assess BM&amp;FBOVESPA’s information security controls, including information security incident handling.</p> <p><b>Q.17.5.5: To what extent do the FMI’s policies, processes, controls, and testing take into consideration relevant international, national, and industry-level standards for information security?</b></p> <p>BM&amp;FBOVESPA Information Security Office adopts international standards and best practices, such as ISO 27000 family.</p> <p><b>Q.17.5.6: How, and to what extent, do the FMI’s change-management and project-management policies and processes ensure that changes and major projects do not affect the information security of the system? What reliance is placed on outside expertise to test resilience?</b></p> |

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|  | <p>BM&amp;FBOVESPA Change Management process assures that any deployment to Production must be fully approved, including a step for risk assessment.</p> <p>Any change request classified as of “critical” or “high” impact must be analyzed, reviewed and approved by the Change Management committee.</p> |
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KEY CONCLUSION 17.5

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| <p>KC 17.6</p> | <p>An FMI should have a business continuity plan that addresses events posing a significant risk of disrupting operations, including events that could cause a wide-scale or major disruption. The plan should incorporate the use of a secondary site and should be designed to ensure that critical information technology (IT) systems can resume operations within two hours following disruptive events. The plan should be designed to enable the FMI to complete settlement by the end of the day of the disruption, even in case of extreme circumstances. The FMI should regularly test these arrangements.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p> |
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| <p>KE 1. Business continuity plan.</p> | <p><b>Q.17.6.1: How, and to what extent, does the FMI’s business continuity plan reflect objectives, policies, and procedures that allow for the rapid recovery and timely resumption of critical operations following a wide-scale or major disruption?</b></p> <p>BM&amp;FBOVESPA has adopted a Business Continuity Management (BCM) program in order to minimize the financial, operational, legal and regulatory impacts resulting from the unavailability of human, material and technological resources, which are essential for the sound functioning of its operations.</p> <p>Through a Business Impact Analysis (BIA), the BCM office established Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO) for all relevant Business process.</p> <p><b>Q.17.6.2: How, and to what extent, are the FMI’s business continuity objectives and plan aimed at being able to resume operations within two hours following disruptive events, and to complete settlement by the end of the day even in the case of extreme circumstances?</b></p> <p>All Settlement processes have Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO) defined through a Business Impact Analysis process. There are IT Disaster Recovery plan for Settlement process, they were developed considering the fulfillment of RTO/RPO.</p> <p><b>Q.17.6.3: How does the contingency plan ensure that the status of all transactions can be identified in a timely manner, at the time of the disruption and if there is a possibility of data loss, what are the procedures to deal with such loss (for example, reconciliation with participants or third parties)?</b></p> <p>The technology architecture designed to meet the BM&amp;FBOVESPA settlement processing is distributed among the primary data center and contingency data center, eliminating single</p> |
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|   | <p>points of failure. The technological environment of the BM&amp;FBOVESPA has the following solutions:</p> <ul style="list-style-type: none"> <li>• Load balancing: the primary site and contingency site using load balancing service to distribute workload evenly across two or more computers in order to get optimal resource utilization;</li> <li>• High availability: whether a specific IT resource presents a problem, another on the same site can replace it, and</li> <li>• Disaster recovery: if one or more resources on the same site have problems, another on the contingency site can replace it.</li> </ul> <p>In addition, in case of process' disruption, the business areas have procedures to check the integrity of the data. These procedures can be performed in the primary site or in the secondary site, after a recovery procedures execution.</p>   |
| <p>KE 2. Crisis management and communication.</p> | <p><b>Q.17.6.4: How, and to what extent, does the FMI's crisis management procedures address the need for effective communications internally and with key external stakeholders and authorities?</b></p> <p>Currently the BM&amp;FBOVESPA has a Crises Management Plan in place for Trading Process. In short time, it will develop Crises Management Plan for all the critical processes identified through the Business Impact Analysis.</p>  |
| <p>KE 3. Adequate secondary site.</p>             | <p><b>Q.17.6.5: How, and to what extent, has the FMI set up a secondary site with sufficient resources, capabilities, functionalities, and appropriate staffing arrangements that would not be affected by a wide-scale disruption and would allow the secondary site to take over operations if needed?</b></p> <p>The technology architecture designed to meet the BM&amp;FBOVESPA settlement processing is distributed among the primary data center and contingency data center, eliminating single points of failure.</p> <p>There is an alternative workplace with dedicated IT resources designed to accomplish the need of Settlement process staff.</p> <p><b>Q.17.6.6: To what extent is the secondary site located at a geographical distance from the primary site that is sufficient for the secondary site to have a distinct risk profile from that of the primary site?</b></p> <p>The BM&amp;FBOVESPA owns 5 data centers: 2 primary sites and 3 contingency sites. The primary sites are: Praça Antonio Prado and XV de Novembro – and the Contingency sites are: Tivit, Diveo and Florêncio de Abreu (UEC):</p> |

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|  | <p>The Florêncio de Abreu building (UEC) is the only located close to the primary site (700 meters or 0.7 Km). However the communication and power grid infrastructure are completely independent and follow distinct paths.</p> <p>In order to mitigate the risk related to the current geographical distance between the sites, the BM&amp;FBOVESPA is building a new own Datacenter, localized more than 20 Km far from its primary sites. Some systems will be transferred to the new Datacenter maintaining an adequate configuration to ensure the resilience of critical processes.</p> <p><b>Q.17.6.7: Has the FMI considered alternative arrangements to allow the processing of timecritical transactions in extreme circumstances?</b></p> <p>Settlement transactions are attended by Operational Continuity Plans agreement with the Central Bank. The Plan contains alternative procedures to allow the continuity of the process in case of disruption.</p> |
| <p>KE 4. Review and testing of business continuity arrangements.</p> | <p><b>Q.17.6.8: How, and how often, are the FMI’s business continuity and contingency arrangements reviewed and tested, including with respect to scenarios related to wide-scale and major disruptions?</b></p> <p>The Business Continuity Plan is updated timely and is tested frequently. Parts of this plan are tested more often.</p> <p>The plans are tested considering scenarios of wide-scale and major disruption.</p> <p><b>Q.17.6.9: How, and how often, does review and testing involve the FMI’s participants, critical service providers, and linked FMIs as relevant (see KC 17.7)?</b></p> <p>Frequently participants and critical service providers of BM&amp;FBOVESPA, are invited to participate of the tests. They must collect and send to the Business Continuity area, evidences about their participation.</p>   |
| <p>KEY CONCLUSION 17.6</p>   |   |

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| <p>KC 17.7</p>   | <p>An FMI should identify, monitor, and manage the risks that key participants, other FMIs, and service and utility providers might pose to its operations. In addition, an FMI should identify, monitor, and manage the risks its operations might pose to other FMIs.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p> |
| <p>KE 1. Identification, monitoring, and management of risks posed by participants, other FMIs, and service and utility providers.</p> | <p><b>Q.17.7.1: How, and to what extent, does the FMI identify, monitor, manage, and mitigate both direct and indirect effects on its ability to process and settle transactions from risks that stem from an external operational failure of participants, other FMIs, and service and utility providers?</b></p>    |

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|  | <p>The BM&amp;FBOVESPA business continuity plan covers these situations.</p> <p>For detailed information, please refer to KC.17.6.</p> <p><b>Q.17.7.2: If the FMI has outsourced some of its operations to an external service provider, how, and to what extent, does the FMI ensure that those operations meet the same reliability and contingency requirements they would need to meet if they were provided internally?</b></p> <p>If the contractor indicates this need, the contract of critical services' suppliers will have clauses to ensure an adequate Service Level Agreement, including availability and contingency requirements. The supply is followed and monitored by the contractor.</p> |
| <p>KE 2. Identification, monitoring, and management of risks posed by the FMI to other FMIs.</p> | <p><b>Q.17.7.3: How, and to what extent, does the FMI identify, monitor, and mitigate the risks it may pose to another FMI?</b></p> <p>Not applicable.</p> <p><b>Q.17.7.4: How, and to what extent, does the FMI coordinate its business continuity arrangements with those of other interdependent FMIs?</b></p> <p>Not applicable.</p>  |
| <p>KEY CONCLUSION 17.7</p>   |   |

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| <p>ASSESSMENT OF PRINCIPLE 17</p> |  |
| <p>COMMENTS</p>                   |  |

**PRINCIPLE 18. ACCESS AND PARTICIPATION REQUIREMENTS**

An FMI should have objective, risk-based, and publicly disclosed criteria for participation, which permit fair and open access.

**PS X CSD X SSS X CCP X TR X**

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| KC 18.1 | An FMI should allow for fair and open access to its services, including by direct and, where relevant, indirect participants and other FMIs, based on reasonable risk-related participation requirements.<br><b>PS X CSD X SSS X CCP X TR X</b> |
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| KE 1. Access policies of the FMI. | <p><b>Q.18.1.1: What are the FMI’s criteria and requirements for participation (including fees and other costs)?</b></p> <p>Banks and brokers complying with the requirements set out in the system’s regulations can act as clearing members or as direct settlement participants. Clearing members are participants that clear their own transactions as well as transactions carried out by their customers. Direct settlement participants are participants that clear only their own transactions, or transactions relating to some special investors as defined in the system’s regulations.</p> <p>The following persons may apply for access permits granting either restricted or full trading rights (DN) to trade in derivatives contracts:</p> <ul style="list-style-type: none"><li>• legal entities duly organized in Brazil and authorized to trade for their own account or as intermediaries for third-party customers, pursuant to applicable regulations, in particular CVM Instruction 402/04; and</li><li>• Brazilian individuals over 21 years of age, except in the case of restricted rights granted for trading in OTC derivatives.</li></ul> <p>Holders of trading rights related to derivatives contracts are required to meet the minimum net working capital requirements below, and to continue to meet and give evidence of compliance with these requirements, as an essential condition for keeping the access rights permit.</p> <ul style="list-style-type: none"><li>• Full rights: BRL 3,750,000.00</li><li>• Restricted rights related to derivatives based on interest rates, equity indices and FX contracts: BRL 3,000,000.00</li></ul> <p>Other restricted rights related to derivatives contracts: BRL 1,000,000.00</p> <p>The minimum net working capital requirement applicable to holders of two or more categories of restricted trading rights correspond to the sum of the minimum net working capital amounts required for each DN rights category, provided the minimum net working capital amount required from holders of full trading rights shall operate as a cap. The minimum net working capital required from each Participant that individually holds both trading rights (DN) and settlement rights (DL) shall correspond to the greater of the</p> |
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amounts applicable to each kind of access rights, rather than the sum of such amounts.

Settlement rights to perform clearing and settlement activities vis-à-vis the Derivatives Clearinghouse may be granted to the following categories:

- i. Derivatives Clearing Type 1 DL rights: grants holders rights to perform clearing activities vis-à-vis the Derivatives Clearinghouse in connection with:
  - a DL holder's own portfolio;
  - the portfolio of companies belonging to the same conglomerate as the DL holder; and
  - portfolios managed or administered by a DL holder or companies belonging to the same conglomerate as the DL holder.
- ii. Derivatives Clearing Type 2 DL rights: grants holders rights to perform clearing activities vis-à-vis the Derivatives Clearinghouse in connection with:
  - any of the trades a Derivatives Clearing Type 1 DL holder is eligible to clear; and
  - trades executed by DN rights holders belonging to the same conglomerate as the DL holder.
- iii. Derivatives Clearing Type 3 DL rights: grants holders rights to perform clearing activities vis-à-vis the Derivatives Clearinghouse in connection with:
  - any of the trades a Derivatives Clearing Type 2 DL holder is eligible to clear;
  - trades executed by any DN rights holder not belonging to the same conglomerate
  - as the DL holder; and
  - trades executed by Locals.

Clearing Participants of the Derivatives Clearinghouse are required to meet the minimum net working capital requirements below, and are further required to continue to adhere to, and give evidence of compliance with these requirements as an essential condition for keeping the access rights permit.

- Type 1 DL Rights: BRL 6,000,000.00
- Type 2 DL Rights: BRL 7,000,000.00
- Type 3 DL Rights: BRL 8,000,000.00

The minimum net working capital required from each Participant that individually holds both trading rights (DN) and settlement rights (DL) correspond to the greater of the amounts applicable to each kind of access rights, rather than the sum of such amounts.

Participants holding settlement rights (DL) related to derivatives contracts must comply with the requirements set forth in the Basic Audit Guidelines of the Operating Qualification

Program (Roteiro Básico de Auditoria do Programa de Qualificação Operacional), or PQO, established by BM&FBOVESPA.

(Equities clearinghouse)

Criteria for participation include the payment of admission costs and fees, operational and technological requirements, financial requirements, and pledge of collateral.

The admission procedure and requirements are set in Circular Letter 078/2010-DP available on-line on the BM&FBOVESPA website.

In order to operate as Clearing Agents, Custodian Agents or Gross Settlement Agents vis-à-vis the CH, applicant institutions must be eligible to the aimed permit category and meet the applicable access, capital, technical and operating requirements, as well as make contractual undertakings in accordance with applicable Regulation, including by expressly committing to submit to arbitration by the Market Arbitration Chamber any disputes related to their permits and operations as Clearing Agents, Custodian Agents or Gross Settlement Agents vis-à-vis the CH.

The following categories of participants exist:

- Full Clearing Agents perform clearing activities for their own and their customers' portfolios, as well as for other brokerage firms and large institutional investors known as Qualified Buyers.
- Proper Clearing Agents perform collateralization and clearing activities in connection with: (i) their own and their customers' portfolios; (ii) trades intermediated by brokerage firms within their own conglomerates (iii) and trades carried out by companies within their own conglomerates, which are intermediated by any other firms; (iv) the collective investment schemes they manage or are in any way related to their own conglomerates.
- Special Clearing Agents perform collateralization and clearing activities related to fixed income securities of private issuers other than financial institutions, whose securities are listed to trade on trading environments. These activities are performed in connection with: (i) their own and their customers' portfolios; (ii) trades intermediated by brokerage firms within their own conglomerates; (iii) trades carried out by companies within their own conglomerates, which are intermediated by any other firms; (iv) the collective investment schemes they manage or are in any way related to their own conglomerates.
- Custodian Agents.
- Gross Settlement Agents.

**Q.18.1.2: What evidence is there that these requirements allow for fair and open access to its services, including by direct and, where relevant, indirect participants and other FMIs?**

CVM Instruction No. 461/07 regulates the securities markets and provides that the entities

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|  | <p>who are authorized by CVM to manage organized securities markets (such as BM&amp;FBOVESPA) must approve rules regarding the procedures for admission of participants. The Instruction (Article 51, Paragraph 2) also provides that “the requirements for admission of participants must observe the principles of equality of access and respect for competition.”</p> <p>The requirements for admission of participants are regulated in BM&amp;FBOVESPA “Circular 078/2008-DP”, which complies with CVM Instruction No. 461/07 and was approved by CVM prior to coming into force.</p> <p><b>Q.18.1.3: For a TR, how do the terms of access for use of its services help ensure that competition and innovation in post-trade processing are not impaired?</b></p> <p>Before implementing a new service or even improving an existing one, internal analysis are made in order to ensure the quality and the business continuity. In addition, internal (by BVMF’s team) and external (by participant’s teams) certifications are made before implementation. Moreover, the changes are widely communicated and publicized in advance to participants in order to enable them to fit the new requirements.</p> <p><b>Q.18.1.4: For a TR, how do the terms of access support interconnectivity with other FMIs and service providers?</b></p> <p>Although each FMI has its own model, authorities require that certain information must be common and should be given by the market participants at registration moment in order to facilitate the monitoring process. There is no direct interconnectivity between FMIs nowadays, but each TR model allows the tracking of transactions migrated to and from other entities.</p> |
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KEY CONCLUSION 18.1

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| <p>KC 18.2</p>  | <p>An FMI’s participation requirements should be justified in terms of the safety and efficiency of the FMI and the markets it serves, be tailored to and commensurate with the FMI’s specific risks, and be publicly disclosed. Subject to maintaining acceptable risk control standards, an FMI should endeavour to set requirements that have the least restrictive impact on access that circumstances permit.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| <p>KE 1. Description of participation requirements.</p> | <p><b>Q.18.2.1: How are the participation requirements for the FMI justified in terms of the safety and efficiency of the FMI and the markets it serves, and tailored to and commensurate with the FMI’s specific risks?</b></p> <p>As part of the admission process of a new participant, the BSM team performs a pre-operational audit for the evaluation of processes and internal controls of the applicant to verify their adherence to the requirements of Circular 078/2008-DP. The result of this evaluation is submitted to the Department of Registration of Participants. The Registration</p> |

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|   | <p>Department is responsible for forwarding the report, along with the documentation regarding the admission process, to the Chief Executive Officer, for submission to the Board. A market Participant will be regularly audited in accordance with the schedule of BSM.</p> <p><b>Q.18.2.2: Are there participation requirements that are not risk-based but required by law or regulation? If so, what are these requirements?</b></p> <p>Participants must comply with the legal requirements and rules related to its activities, including authorization by BCB, CVM or other regulatory authorities, wherever necessary. CVM Instruction No. 461/07 (which regulates the securities markets), Article 51, Paragraph 4, provides that the entities who are authorized by CVM to manage organized securities markets (such as BM&amp;FBOVESPA) must approve rules regarding the procedures for admission of participants, including untainted reputation or other requirements priory defined in the rules set forth by its Board of Directors.</p> <p>The requirements and rules regarding the admission of participants are established in BM&amp;FBOVESPA “Circular 078/2008-DP”.</p> <p>For further reference, please check answer to Q.18.3.3.</p> <p><b>Q.18.2.3: Are all classes of participants subject to the same access criteria? If not, what is the rationale for the different criteria (for example, size or type of activity, additional requirements for participants that act on behalf of third parties, additional requirements for participants that are non-regulated entities)?</b></p> <p>See KC 18.1 - KE 1.</p> |
| <p>KE 2. Impact of requirements on access.</p>          | <p><b>Q.18.2.4: How, and how often, are the access restrictions and requirements reviewed to ensure that they have the least restrictive access that circumstances permit, consistent with maintaining acceptable risk controls?</b></p> <p>Besides the requirements and rules regarding the admission of participants established in BM&amp;FBOVESPA “Circular 078/2008-DP”, the operational requirements are reviewed annually..</p>   |
| <p>KE. 3. Disclosure of participation requirements.</p> | <p><b>Q.18.2.5: How, and to whom, are participation criteria, including restrictions in participation, disclosed and explained?</b></p> <p>Participation criteria are disclosed and explained to Brazil’s regulators (CVM and Central Bank) prior to the public. After their approval, criteria are published to the public by a BM&amp;FBOVESPA’s Circular Letter as a rule.</p>  |

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| KC 18.3   | <p>An FMI should monitor compliance with its participation requirements on an ongoing basis and have clearly defined and publicly disclosed procedures for facilitating the suspension and orderly exit of a participant that breaches, or no longer meets, the participation requirements.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| <p>KE. 1. Monitoring of compliance with participation requirements.</p> | <p><b>Q.18.3.1: How does the FMI monitor the participants' ongoing compliance with the access criteria? How does the FMI ensure that the information it uses to monitor compliance with participation criteria is timely and accurate?</b></p> <p>"Circular 078/2008-DP" establishes the access conditions for the BVMF participants, that comprehends financial, operational and technological requirements.</p> <ul style="list-style-type: none"> <li>• Financial requirements are monitored in a monthly basis.</li> <li>• Operational and technological requirements are verified in periodic audit works, at least annually.</li> </ul> <p><b>Q.18.3.2: What duties do participants have to report on developments that may affect their ability to fulfil the participation requirements?</b></p> <p>As a current participant, it was submitted to operational examination, that verifies participants' compliance with rules, which involve:</p> <ul style="list-style-type: none"> <li>• compliance with standards in files and documents;</li> <li>• "money laundering" procedures and identification of politically-exposed persons (PEPs);</li> <li>• registration of offers in the trading system and specification/re-specification of trading operations;</li> <li>• criteria related to receipt, registration, validity terms, priority, execution, distribution and cancellation of trade orders;</li> <li>• loans for and financing of margin accounts;</li> <li>• payments and settlement of payments by clients, especially related to compliance with standard settlement terms and assurance that the related amounts were delivered and/or paid by duly authorised holders or parties;</li> <li>• procedures to control the flow of trading operations carried out by other parties;</li> <li>• trading for participants' own portfolios, managed portfolios and other related parties;</li> <li>• registration of persons and independent brokers bound to members to carry out functions;</li> <li>• transfer of assets between distinct legal entities, with different tax registry enrolment numbers, such assets under the custody of BM&amp;FBOVESPA;</li> <li>• procedures referring to Ombudsman activities, Code of Conduct and disclosure of</li> </ul> |

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|  | <p>information;</p> <ul style="list-style-type: none"> <li>• management of third-party assets;</li> <li>• non-disclosure of information;</li> <li>• operating risk, market and liquidity management structure;</li> <li>• systems surveillance, contemplating physical security and logic, evaluation of tapping systems and analysis of contingency plan; and</li> <li>• analysis of information disclosed by members on web pages.</li> </ul> <p><b>Q.18.3.3: What are the FMI’s policies for conducting enhanced surveillance of, or imposing additional controls on, a participant whose risk profile deteriorates?</b></p> <p>The exchange rule “Circular 078/2008-DP” establishes the access conditions for the BM&amp;FBOVESPA participants, that comprehend financial, operational and technological requirements.</p> <ul style="list-style-type: none"> <li>• Financial requirements are monitored in a monthly basis.</li> <li>• Operational and technological requirements are verified in periodic audit works, at least annually.</li> </ul> <p>Participants that fail in meeting those requirements are subject to administrative penalties, according to the “BSM Regulation”, which are:</p> <ul style="list-style-type: none"> <li>• Warning;</li> <li>• Fines;</li> <li>• Suspension from activities (for a maximum period of 90 days);</li> <li>• Temporary disqualification (for a maximum of 10 years to hold positions as senior management members, employees, traders, agents and representatives of either BSM, or the Sponsor Member, or of Participants and Agents); and</li> <li>• Other penalties foreseen in BM&amp;FBOVESPA rules.</li> </ul> <p>Notwithstanding, BSM can monitors in a shortly basis Participants who had its risk increased. Additionally, can ask for a Work Plan to solve the problems detected in its inspection.</p> |
| <p>KE 2. Procedures for facilitating the suspension and orderly exit of a participant that fails to meet participation requirements.</p> | <p><b>Q.18.3.4: What are the FMI’s procedures for managing the suspension and orderly exit of a participant that breaches, or no longer meets, those requirements?</b></p> <p>Participants that fail in meeting those requirements are subject to administrative penalties, according to the “BSM Regulation”.</p> <p>The Self-Regulation Director shall have powers to apply the following penalties:</p> <ul style="list-style-type: none"> <li>• Warning;</li> </ul>  |

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|                     | <ul style="list-style-type: none"> <li>• Fines;</li> <li>• Suspension from activities, subject to a maximum period of ninety (90) days;</li> <li>• Temporary disqualification, which may not exceed the maximum of ten (10) years to hold positions as senior management members, employees, traders, agents and representatives of either BSM, or the Sponsor Member, or of Participants and Agents; and</li> <li>• Other penalties foreseen in the operating and regulatory rules issued by BM&amp;FBOVESPA.</li> </ul> <p><b>Q.18.3.5: How and to whom are the FMI's procedures for managing the suspension and orderly exit of a participant disclosed?</b></p> <p>CVM Instruction No. 461/07 regulates the securities markets and provides that the entities who are authorized by CVM to manage organized securities markets (such as BM&amp;FBOVESPA) must approve rules regarding the procedures for admission, suspension and exclusion of participants.</p> <p>Such rules were approved by BM&amp;FBOVESPA's Board of Directors, according to its Articles of Incorporation, and are included in BM&amp;FBOVESPA "Circular 078/2008-DP".</p> <p>According to BM&amp;FBOVESPA "Circular 078/2008-DP" (Attachment II, Article 12 and Attachment III, Article 26), participants who fails to comply with the rules established there in are subject to exclusion, suspension and other administrative penalties. Participants may also be excluded or suspended for inactivity, impossibility to operate (including bankruptcy of the participant) or voluntary exit.</p> |
| KEY CONCLUSION 18.3 |  |

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| ASSESSMENT OF PRINCIPLE 18 |  |
| COMMENTS                   |  |

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| <b>PRINCIPLE 19. TIERED PARTICIPATION ARRANGEMENTS</b>  |  |
| An FMI should identify, monitor, and manage the material risks to the FMI arising from tiered participation arrangements. |  |
| <b>PS X CSD X SSS X CCP X TR X</b>  |  |

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| KC 19.1 | An FMI should ensure that its rules, procedures, and agreements allow it to gather basic information about indirect participation in order to identify, monitor, and manage any material risks to the FMI arising from such tiered participation arrangements.<br><b>PS X CSD X SSS X CCP X TR X</b> |
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| KE 1. Ability to gather and assess information on risks to the FMI arising from tiered participation arrangements. | <p><b>Q.19.1.1: What tiered participation arrangements does the FMI have?</b></p> <p>Fund administrators, asset managers, dealers, global custodians are considered examples of indirect participants that use the services of BM&amp;FBOVESPA’s direct participants (brokers, clearing members, banks and custodians).</p> <p><b>Q.19.1.2: How does the FMI gather information about indirect participants? Which information is collected and how often is it updated?</b></p> <p>As BM&amp;FBOVESPA operates a final beneficiary transparent model and system, BM&amp;FBOVESPA has the most part of the information related to indirect participants in its internal systems. Additional information can also be gathered and accessed by external audits enforcement. BM&amp;FBOVESPA rules and procedures allow it to collect information about indirect participants through BM&amp;FBOVESPA’s direct participants.</p> <p><b>Q.19.1.3: How does the FMI evaluate its risks arising from these dependencies?</b></p> <p>Despite BM&amp;FBOVESPA’s risk systems that continually evaluates risk in the level of the final beneficial owner, BM&amp;FBOVESPA also evaluates the risks arising from participants dependencies in the risk committee that meets in a weekly basis. Credit, liquidity and operational risk are constant themes discussed in the risk committee meetings.</p> |
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| KEY CONCLUSION 19.1 |  |
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| KC 19.2 | An FMI should identify material dependencies between direct and indirect participants that might affect the FMI.<br><b>PS X CSD X SSS X CCP X TR X</b> |
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| KE 1. Identification of dependencies between direct and indirect participants that can affect the FMI. | <p><b>Q.19.2.1: What are the interdependencies considered and how are they identified?</b></p> <p>Based on a final beneficiary model system within a vertically integrated company (trade and post trade), BM&amp;FBOVESPA is able to segregate and identify each participant and investors transactions and holdings. This fact along with a clear understanding of the Brazilian market model enables BM&amp;FBOVESPA to identify the multi-tier participants</p> |
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|                     | arrangement that can affect its operations (SSS, CCP and CSD). |
| KEY CONCLUSION 19.2 |  |

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| KC 19.3   | <p>If an FMI identifies material risks arising from tiered participation arrangements, it should periodically review the system rules and procedures with its board to determine whether there are potential issues related to indirect participation in terms of legal structure, finality, or the stable operation of the system, and ensure that the nature of each user's participation is clearly defined.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| KE 1. Identification of key indirect participants.                                    | <p><b>Q.19.3.1: Has the FMI identified (a) the proportion of activity that direct participants conduct on behalf of indirect participants in relation to the direct participants' capacity, (b) direct participants that act on behalf of a material number of indirect participants, (c) indirect participants responsible for a significant proportion of turnover in the system, and (d) indirect participants whose transaction volumes or values are large relative to the capacity of the direct participant through which they access the FMI to manage risks arising from these transactions?</b></p> <p>Yes, BM&amp;FBOVESPA constantly monitors volume and frequency of all its direct and indirect participants transactions and holdings. In order to mitigate risks, BM&amp;FBOVESPA applies operational and concentration limits based on the direct participants operational and financial capacity.</p>  |
| KE 2. Management of the risks arising from transactions of key indirect participants. | <p><b>Q.19.3.2: How does the FMI manage the risks arising from its key indirect participants?</b></p> <p>BM&amp;FBOVESPA has a transparent multi-tier system which operates a final beneficiary model throughout its entire chain of processes, therefore BM&amp;FBOVESPA can monitor the risk arising from all participants (direct and indirect). In addition, collaterals are also pledged in the level of the final beneficiary and all transactions are final and irrevocable.</p> <p>Operational risk is mitigated through periodical external audits done by BM&amp;FBOVESPA in its direct participants. In these audits, data from indirect participants are also audited.</p> <p>Operational limit for direct participants are applied for trades, collaterals and holdings.</p> <p>A risk committee meeting is held weekly where tiered participation arrangements issues are also debated. The risk committee can suggest changes in system rules and procedures.</p> |
| KEY CONCLUSION 19.3   |  |

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| KC 19.4   | <p>An FMI should regularly review risks arising from tiered participation arrangements and should take mitigating action when appropriate.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>   |
| KE 1. Review of risks arising from tiered participation arrangements. | <p><b>Q.19.4.1: What are the FMI’s policies for reviewing its rules and procedures in order to mitigate risks to the FMI arising from tiered participation?</b></p> <p>BM&amp;FBOVESPA regularly reviews the risks resulting from tiered participation arrangements and updates its rules and procedures when necessary by the legal department alongside with the risk committee, audit and other departments.</p>          |
| KE 2. Implementation of mitigating actions.                           | <p><b>Q.19.4.2: What are the FMI’s criteria to determine when mitigating actions are required? What steps can the FMI take, or has the FMI taken, to mitigate its risks?</b></p> <p>BM&amp;FBOVESPA’s risk committee is the main forum where mitigating actions takes place. Amendments in rules and procedures, changes in operational and concentration limits are examples of actions often applied by the committee.</p> |
| KEY CONCLUSION 19.4   |  |

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| ASSESSMENT OF PRINCIPLE 19 |  |
| COMMENTS                   |  |

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| <b>PRINCIPLE 20. FMI LINKS</b>  |   |
| An FMI that establishes a link with one or more FMIs should identify, monitor, and manage link-related risks. |   |
| <b>PS CSD X SSS X CCP X TR X</b>  |   |
| KC 20.1   | Before entering into a link arrangement and on an ongoing basis once the link is established, an FMI should identify, monitor, and manage all potential sources of risk arising from the link arrangement. Link arrangements should be designed such that each FMI is able to observe the other principles in this report.<br><b>PS CSD X SSS X CCP X TR X</b>  |
| KE 1. Identification of potential sources of risk arising from prospective link arrangements.                 | <b>Q.20.1.1: What process is used to identify potential sources of risk (such as, legal, credit, liquidity, custody, and operational risks) arising from prospective links? How does this affect the FMI's decision whether to establish the link?</b><br><br>Prior to the establishment of a link, a dull dilligence process needs to be conducted. In this process all types of risks are assessed (legal, credit, liquidity, custody and operational risks). A link only become operational after an signed agreement between the parties.   |
| KE 2. Identification, monitoring, and management of risk arising from established links.                      | <b>Q.20.1.2: What links have been established with other FMIs?</b><br><br>BM&FBOVESPA's CSD has a link with the Spanish CSD (Iberclear) and with Argentinian CSD (Caja de Valores) in order to promote the listing of Depositary Receipts (DR) of Brazilian securities (equities) in these markets<br><br><b>Q.20.1.3: What processes are in place to identify, monitor, and manage risks arising from an existing link on an ongoing basis? What is the policy for updating this analysis?</b><br><br>A daily reconciliation process is conducted between BM&FBOVESPA's CSD and the foreign CSDs in order to avoid creation or deletion of receipts (DRs). |
| KE 3. Effect of link arrangements on observance of other principles.  | <b>Q.20.1.4: How does the FMI ensure that link arrangements allow for it to remain observant of the other principles? How often is this analysis conducted?</b><br><br>BM&FBOVESPA continuously ensure that the principles are followed. Prior to the establishment of links or prior to any change in an existing link, an analysis needs to be conducted by the legal and business departments.   |
| KEY CONCLUSION 20.1   |   |

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| KC 20.2  | <p>A link should have a well-founded legal basis, in all relevant jurisdictions, that supports its design and provides adequate protection to the FMIs involved in the link.</p> <p><b>PS CSD X SSS X CCP X TR X</b></p>  |
| <p>KE 1. Legal basis to support operation of any link arrangement.</p> | <p><b>Q.20.2.1: What is the relevant legal framework supporting any link arrangements?</b></p> <p>The BM&amp;FBOVESPA’s CSD links are supported by the current DR (Depository Receipt) related legislation issued and controlled by the Brazilian Securities Commission (CVM).</p> <p><b>Q.20.2.2: How does the FMI validate that its links have a well-founded legal basis and provide it with adequate protection against legal risk?</b></p> <p>BM&amp;FBOVESPA follows closely the Brazilian legislation regarding DR (Depository Receipts) issuance, cancelation and custody.</p> <p><b>Q.20.2.3: How does the FMI ensure that the well-founded legal basis and adequate protection are maintained over time?</b></p> <p>BM&amp;FBOVESPA has a specialized legal department for all its business lines. This department is responsible to ensure that the well-founded legal basis and adequate protection are maintained over time.</p> |
| KEY CONCLUSION 20.2  |   |

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| KC 20.3  | <p>Linked CSDs should measure, monitor, and manage their credit and liquidity risks arising from each other. Any credit extensions between CSDs should be covered fully with high-quality collateral and be subject to limits.</p> <p><b>PS CSD X SSS X CCP TR</b></p>   |
| <p>KE. 1. Measurement, management, and monitoring of credit and liquidity risk arising from linked CSDs.</p> | <p><b>Q.20.3.1: What processes are in place to measure, monitor, and manage credit and liquidity risks arising from any established links?</b></p> <p>Not applicable.</p> <p><b>Q.20.3.2: If a CSD extends credit to a linked CSD, what processes exist to ensure that credit extensions to the linked CSD are fully covered by high-quality collateral and that credit limits are appropriate?</b></p> <p>Not applicable.</p> |
| KEY CONCLUSION 20.3  |  |

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| KC 20.4   | Provisional transfers of securities between linked CSDs should be prohibited or, at a minimum, the retransfer of provisional transferred securities should be prohibited prior to the transfer becoming final.<br><b>PS CSD X SSS X CCP TR</b> |
| KE 1. Restrictions on provisional transfer of securities between linked CSDs. | <p><b>Q.20.4.1: If the link permits provisional transfers of securities across the link, is the retransfer of these securities prohibited until the first transfer is final?</b></p> <p>Not applicable.</p>                                    |
| KEY CONCLUSION 20.4   |  |

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| KC 20.5  | An investor CSD should only establish a link with an issuer CSD if the arrangement provides a high level of protection for the rights of the investor CSD's participants.<br><b>PS CSD X SSS X CCP TR</b>  |
| KE 1. Level of protection for investor CSD's participants. | <p><b>Q.20.5.1: For any established link, how has the investor CSD determined that the rights of its participants have a high level of protection?</b></p> <p>BM&amp;FBOVESPA has a final beneficial owner CSD where assets are segregated among the final investors accounts. BM&amp;FBOVESPA applies the same level of protection and rights for accounts belonging to the other CSDs.</p> <p><b>Q.20.5.2: How often is reconciliation of holdings conducted by the entities holding the securities in custody?</b></p> <p>Reconciliation process between linked CSDs is conducted in a daily basis.</p> <p><b>Q.20.5.3: What safeguards does the investor CSD have in place to provide a high-level of protection for the rights of its participants (including, segregation and portability arrangements and asset protection provisions for omnibus accounts)?</b></p> <p>BM&amp;FBOVESPA operates a final beneficial owner model, thus all assets are segregated in the name of the final investor. Investors can transfers their holdings among participants.</p> |
| KEY CONCLUSION 20.5  |  |

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| KC 20.6   | An investor CSD that uses an intermediary to operate a link with an issuer CSD should measure, monitor, and manage the additional risks (including custody, credit, and operational risks) arising from the use of an intermediary.<br><b>PS CSD X SSS X CCP TR</b> |
| KE. 1. Investor CSD measurement, management, and monitoring of the risks arising from the use of an intermediary. | <p><b>Q.20.6.1: What are the criteria used by the CSD to select intermediaries? Are these criteria riskbased?</b></p> <p>Not applicable.</p>  |

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|                     | <p><b>Q.20.6.2: If the CSD uses any intermediaries to operate links, what are the respective liabilities of the two linked CSDs and the intermediaries?</b></p> <p>Not applicable.</p> <p><b>Q.20.6.3: What processes exist to measure, monitor, and manage the risks arising from use of the intermediary?</b></p> <p>Not applicable.</p> |
| KEY CONCLUSION 20.6 |  |

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| KC 20.7   | <p>Before entering into a link with another CCP, a CCP should identify the potential spillover effects of the linked CCP's default and assess its ability to cope with such occurrence. If a link has three or more CCPs, each CCP should identify, assess, and manage the risks of the collective links arrangement.</p> <p><b>PS CSD SSS CCP X TR</b></p>   |
| KE. 1. Identification, assessment, and management of potential spillover effects of a linked CCP's default.                     | <p><b>Q.20.7.1: Prior to establishing any links, what analysis was undertaken by the CCP to understand the effects of a linked CCP's default?</b></p> <p>Not applicable.</p>  |
| KE 2. Identification, assessment, and management of the potential spill-over effects in case of networks of links between CCPs. | <p><b>Q.20.7.2: Prior to establishing any links, what analysis was conducted by the CCP to identify and assess the potential spill-over effects of a link arrangement involving three or more CCPs?</b></p> <p>Not applicable.</p> <p><b>Q.20.7.3: In the case of links involving more than two CCPs, what processes are in place for the collective link arrangement to identify, assess, and manage risks arising from the links? What specific risk-management measures have been adopted to address the risks arising from the collective link arrangements?</b></p> <p>Not applicable.</p> <p><b>Q.20.7.4: In case of a network of links between CCPs, is there a clear definition of the respective liabilities of the different CCPs?</b></p> <p>Not applicable.</p> |
| KEY CONCLUSION 20.7   |   |

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| KC 20.8 | Each CCP in a CCP link arrangement should be able to cover, at least on a daily basis, its current and potential future |
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|  | <p>exposures to the linked CCP and its participants, if any, fully with a high degree of confidence without reducing the CCP's ability to fulfil its obligations to its own participants at any time.</p> <p><b>PS CSD SSS CCP X TR</b></p>   |
| <p>KE 1. Ability to cover exposures to the linked CCP.</p> | <p><b>Q.20.8.1: What processes are in place to measure, monitor, and manage inter-CCP exposures?</b></p> <p>Not applicable.</p> <p><b>Q.20.8.2: How does the CCP ensure, on an ongoing basis, that it can cover its current exposure fully?</b></p> <p>Not applicable.</p> <p><b>Q.20.8.3: How does the CCP ensure that it covers its potential future exposure with a high degree of confidence, without reducing its ability to fulfil its own obligations?</b></p> <p>Not applicable.</p>  |
| <p>KE 2. Contribution to linked CCP's default funds.</p>   | <p><b>Q.20.8.4: What arrangements do the linked CCPs have in place to manage the risks arising from the link (such as, a separate default fund, increased margin requirements, or contributions to each other's default funds)?</b></p> <p>Not applicable.</p> <p><b>Q.20.8.5: If the CCPs contribute to each other's default funds, how is it ensured that the contribution to another CCP's default fund does not affect the ability of the CCP to fulfil its obligations to its own participants at any time?</b></p> <p>Not applicable.</p> |
| <p>KE 3. Potential sharing of uncovered losses.</p>        | <p><b>Q.20.8.6: How do the linked CCPs ensure that participants are informed about their exposures to the potential sharing of uncovered losses from the link arrangement?</b></p> <p>Not applicable.</p>   |
| <p>KEY CONCLUSION 20.8</p>                                 |   |

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| <p>KC 20.9</p> | <p>A TR should carefully assess the additional operational risks related to its links to ensure the scalability and reliability of IT and related resources.</p> <p><b>PS CSD SSS CCP TR X</b></p> |
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| <p>KE 1. Assessment of operational risk from links to ensure scalability and reliability of IT and related resources.</p> | <p><b>Q.20.9.1: How does the TR ensure the scalability and reliability of its IT and related resources to take into account the additional operational risks associated with a link to another FMI?</b></p> <p>The infrastructure used to connect to Globex network has High Availability, equipments and links redundancy. Those links are installed in primary and standby Datacenters to ensure high availability. We have a support team who works 24h by 7 day. BVMF use a monitoring and others network tools to validate this infrastructure and do the capacity planning studies.</p> <p><b>Q.20.9.2: How often does the TR validate the adequacy of its scalability and reliability?</b></p> <p>Once a week we perform a capacity planning analysis.</p> |
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KEY CONCLUSION 20.9

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| ASSESSMENT OF PRINCIPLE 20 |  |
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| <b>PRINCIPLE 21. EFFICIENCY AND EFFECTIVENESS</b>   |  |
| An FMI should be efficient and effective in meeting the requirements of its participants and the markets it serves. |  |
| KC 21.1   | An FMI should be designed to meet the needs of its participants and the markets it serves, in particular, with regard to choice of a clearing and settlement arrangement; operating structure; scope of products cleared, settled, or recorded; and use of technology and procedures.<br><b>PS X CSD X SSS X CCP X TR X</b>  |
| KE. 1. Design of the FMI to meet the needs of its participants and the markets it serves.                           | <p><b>Q.21.1.1: How does the FMI’s design, including its clearing and settlement scheme, its operating structure, its delivery systems and technologies, and its individual services and products take into account the needs of its participants and the markets it serves?</b></p> <p>Since the integration of the two exchanges, BM&amp;FBOVESPA has continuously strived to work closer with the participants in its markets. For this purpose, the company maintains several open channels with investors and companies in different categories, which collaborate to develop products, services, and to suggest new practices.</p> <p>In addition to the Committees that support the Board of Directors and the CEO, the Advisory Committees were created to ensure a constant liaison with the BM&amp;FBOVESPA market participants. In 2009, these Committees underwent important enhancements, such as the expansion in the number of participants, currently around 450 people. Still last year, the Real Estate Market, and the Trading &amp; Technology Committees were created.</p> <p>Currently, BM&amp;FBOVESPA has the following Advisory Committees:</p> <ul style="list-style-type: none"> <li>Advisory Committee - Soybean and Corn</li> <li>Advisory Committee - Coffee</li> <li>Advisory Committee - Live Cattle and Feeder Cattle</li> <li>Advisory Committee - Cotton</li> <li>Advisory Committee - Sugar and Ethanol</li> <li>Advisory Committee - Equities</li> <li>Advisory Committee - Fixed Income and FX</li> <li>Advisory Committee - Real Estate Market</li> <li>Advisory Committee - Risk Analysis</li> <li>Advisory Committee - Listing</li> <li>Advisory Committee - Trading &amp; IT</li> <li>Advisory Committee - Post-Trading</li> </ul> <p><b>Q.21.1.2: What methods does the FMI use to determine whether it is meeting the requirements of its participants and other users and continues to meet those</b></p> |

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|                     | <p><b>requirements as they change? How, and how regularly, does the FMI gauge customer satisfaction with its effectiveness and efficiency of its contributions to the markets it serves?</b></p> <p>In order to continuously meet the brokerage houses' requirements, BM&amp;FBOVESPA have a Dealer Development and Relationship Department, which is responsible for:</p> <ul style="list-style-type: none"> <li>• Relationship with brokerage houses and market participants as the main liaison for different activities such as analysis of new business opportunities, strategy reviews and service demands (i.e. development of new applications, product incentives, pre-trade, trade and post trade processes, etc)</li> <li>• New member firms: guidance, orientation and coordination throughout the onboarding process.</li> <li>• PQO (Operational Qualification Program): definition, guidance and orientation in the Basic and Specific guidelines implementation.</li> <li>• HFT Discount Program: main liaison for Brokerage Firms and HFT investors regarding HFT committee decisions and feedbacks.</li> <li>• Development of reports and researches for better understanding of our Distribution Channels strategies and positioning.</li> <li>• Commercial relationship with vendors, ISVs, DMA providers and Co-location clients regarding our Market Data, DMA and Colocation product offerings.</li> </ul> |
| KEY CONCLUSION 21.1 |   |

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| KC 21.2                           | <p>An FMI should have clearly defined goals and objectives that are measurable and achievable, such as in the areas of minimum service levels, risk-management expectations, and business priorities.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| KE 1. FMI's goals and objectives. | <p><b>Q.21.2.1: What are the FMI's goals and objectives as far as the effectiveness of its operations is concerned?</b></p> <p>BM&amp;FBOVESPA's goals and objectives are based in 4 main strategic drives:</p> <ol style="list-style-type: none"> <li>1. Consistently delivering sound financial results</li> <li>2. Focus on clients and market participant relationship</li> <li>3. Guaranteeing excellence and market integrity</li> <li>4. Strengthening Institutional Position</li> </ol> <p>For each one of the drivers, BVMF has cascaded several metrics and targets in order to translate company's strategy and to measure business success.</p> <p>BM&amp;FBOVESPA has more than 50 Key Performance Indicators (KPIs) directly related to each one of the drivers.</p> |

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|                     | <p><b>Q.21.2.2: Have the goals and objectives been achieved? What mechanisms does the FMI have to measure and assess this?</b></p> <p>All BM&amp;FBOVESPA 's goals and KPIs are registered in its management system. This is the tactical tool BM&amp;FBOVESPA uses to follow-up all its initiatives.</p> <p>Furthermore, this system became an important management tool to organization whereas it allows implementing Talent Management and Compensation best practices, linking these Human Resources methodologies to the performance management system. Therefore, it is one of the main pillars of employee incentive model.</p> <p>Most of BM&amp;FBOVESPA 's goals have been achieved for every year and it is reflected by the outcome of the goals and bonus payment for directors. If not, BVMF must address a detailed action plan in order to overcome the difficulties.</p> |
| KEY CONCLUSION 21.2 |  |

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| KC 21.3   | An FMI should have established mechanisms for the regular review of its efficiency and effectiveness.<br><b>PS X CSD X SSS X CCP X TR X</b>   |  |
| KE 1. FMI review of its efficiency and effectiveness. | <p><b>Q.21.3.1: What processes and metrics are used to evaluate the FMI's efficiency and effectiveness?</b></p> <p>As mentioned on Q21.2.2. BM&amp;FBOVESPA has implemented a system to assess its goals and KPIs. All the established KPIs are monitored by each area on a monthly basis. Once a semester the company conducts an entire revision of its goals, and based on this revision links its compensation program (bonus) to the companies' success.</p> <p><b>Q.21.3.2: How often does the FMI evaluate its efficiency and effectiveness?</b></p> <p>In addition to mentioned on Q.21.3.1., BM&amp;FBOVESPA conducts once a year an evaluation process about its metrics and goals, and links them to annual strategic planning process, guaranteeing that its goals are still reflecting company's mission, strategy and believes.</p> |  |
| KEY CONCLUSION 21.3                                   |   |  |

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| ASSESSMENT OF PRINCIPLE 21 |  |
| COMMENTS                   |  |

**PRINCIPLE 22. COMMUNICATION PROCEDURES AND STANDARDS**

An FMI should use, or at a minimum accommodate, relevant internationally accepted communication procedures and standards in order to facilitate efficient payment, clearing, settlement, and recording.

**PS X CSD X SSS X CCP X TR X**

KC 22.1

An FMI should use, or at a minimum accommodate, internationally accepted communication procedures and standards.

**PS X CSD X SSS X CCP X TR X**

KE 1. Use or accommodation of internationally accepted communication procedures.

**Q.22.1.1: How do the FMI's operational procedures, processes, and systems use or otherwise accommodate internationally accepted communication procedures to interact with participants, the customers of participants, and other connected parties (including, where relevant, other linked FMIs)?**

BM&FBOVESPA makes available different connectivity options for market participants: RCB, RCCF and RCCF 2.

RCB is a high-technology communications network that enables participants to access the trading and market data systems directly. This can be done via communications lines or services acquired by participants directly. Participants who access systems via RCB are free to choose service provider, speed, technology and contingency backup level and must comply with the standards and criteria established by BM&FBOVESPA.

The following BM&FBOVESPA systems and environments can be accessed via RCB:

- Derivatives trading
- Foreign exchange trading
- Equities trading
- Government and private bonds trading
- Post-trading data (as of April 29, 2011)
- BM&FBOVESPA Market Data
- CME Market Data
- Drop copy
- Co-location management
- Physically segregated certification and testing environment (from 2010-11-01), requiring a dedicated link

Access to BM&FBOVESPA's technology infrastructure via RCB to trade using DMA models 1, 2, 3 and 4 is provided for the following systems and environments:

- Derivatives trading
- Equities trading

RCCF is a shared MPLS network administered by an external provider (Primesys Soluções Empresariais S.A.) to give participants access to the BM&FBOVESPA's technology infrastructure, i.e. to the trade and post-trade systems and environments, and to BM&F Settlement Bank.

In addition to BM&FBOVESPA's technological infrastructure, the following systems and environments can be accessed via RCCF:

- Derivatives trading
- Foreign exchange trading
- Equities trading
- Government and private bonds trading
- Treasury Direct trading
- BM&FBOVESPA Market Data – derivatives\*
- BM&FBOVESPA Market Data – equities\*
- CME Market Data\*
- Drop copy
- Post-trade
- BM&F Settlement Bank
- Co-location management
- Certification and testing (a dedicated VPN is required to access this environment)

\* Multicast market data feed available only via RCB and LAN-to-LAN VPN.

**RCCF 2** is a high performance IP network based on a MetroEthernet Core, managed by Primesys Soluções Empresariais S.A., that provides to Participants access to the BM&FBOVESPA's New Technological Structure, that is, to the new the its new environment and trading & post trading systems, as well as the new BM&F Bank system.

Through RCCF 2 it's possible to access the technological infrastructure of the BM&FBOVESPA and the following systems and environments:

- Derivatives Trading
- Exchange Trading
- Shares Trading
- Negotiation of public and private securities
- Market Data BM&FBOVESPA
- CME Market Data
- Drop Copy
- Approval and Testing Environmental physically segmented (from 2010-01-11), this approach requires a dedicated link to such a purpose.

Access to technology infrastructure through the BM&FBOVESPA RCCF 2 for Trading via DMA 1, 2, 3 and 4 is provided for the following systems and environments:

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|  | <ul style="list-style-type: none"> <li>• Derivatives Trading</li> <li>• Shares Trading</li> </ul> <p><b>Q.22.1.2: If the FMI engages in cross-border operations, how do the FMI’s operational procedures, processes, and systems use or otherwise accommodate internationally accepted communication procedures for cross-border operations?</b></p> <p>International customers who want to connect to BM&amp;FBOVESPA use the same connectivity options explained in question 22.1.1.</p>   |
| <p>KE 2. Use or accommodation of internationally accepted communication standards.</p> | <p><b>Q.22.1.3: How do the FMI’s operational procedures, processes, and systems use or otherwise accommodate internationally accepted communication standards for message formats and reference data to identify financial instruments and counterparties?</b></p> <p>BM&amp;FBOVESPA’s trading protocols are FIX based. EntryPoint and MegaDirect are used for order entry and UMDf is used for Market Data.</p> <p><b>EntryPoint</b> is a unified order entry interface based on the FIX 4.4 communication protocol underlying the technological structure of the new trading platform. FIX is a technical specification for electronic communication of trade-related messages. It is an open standard managed by members of FIX Protocol Limited.</p> <p><b>MegaDirect</b> is a FIX 4.2 implementation to provide access to Bovespa segment trading platform. This solution is targeted at simplifying access to Mega Bolsa (BM&amp;FBOVESPA’s equities trading platform) and providing a faster mean of sending orders to the market.</p> <p><b>UMDF</b> (Unified Market Data Feed) specification contemplating the use of FIX 5.0/FAST protocol and the integration of Equities, Derivatives and FX, consolidating the market data feed of the exchange trading platforms, MEGABOLSA (for equities) and PUMA Trading System for derivatives over UDP multicast transport.</p> <p>BM&amp;FBOVESPA’s post-trading protocols are based on SPB (Brazilian Payment System message standard), widely known in Brazil, and ISO 20022, becoming more and more known internationally.</p> <p>BM&amp;FBOVESPA is the Brazilian numbering agency, the only institution authorized to assign ISINs for securities in Brazil. All financial instruments traded in BM&amp;FBOPVESPA have an ISIN code.</p> <p><b>Q.22.1.4: If the FMI engages in cross-border operations, how do the FMI’s operational procedures, processes, and systems use or otherwise accommodate internationally</b></p> |

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|                     | <p><b>accepted communication standards for cross-border operations?</b></p> <p>International customers who want to exchange information with BM&amp;FBOVESPA must comply with the same protocol explained in question 22.1.3.</p> <p><b>Q.22.1.5: If no international standard is used, how does the FMI accommodate systems that translate or convert message format and data from international standards into the domestic equivalent and vice versa?</b></p> <p>BVMF uses standards for its communications with market participants.</p> <p><b>Q. 22.1.6: What processes and procedures does the TR follow to ensure that data recorded is supported both operationally and technically?</b></p> <p>TR is done using reliable and fault tolerant technologies such as FIX Protocol and Message Queue, therefore there is no loss of data.</p> <p>Data is transferred from trading to post-trading to market participants automatically from system to system (STP), without external intervention.</p> |
| KEY CONCLUSION 22.1 |  |

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| ASSESSMENT OF PRINCIPLE 22 |  |
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**PRINCIPLE 23. DISCLOSURE OF KEY RULES AND PROCEDURES**

An FMI should have clear and comprehensive rules and procedures and should provide sufficient information to enable participants to have an accurate understanding of the risks, fees, and other material costs they incur by participating in the FMI. All relevant rules and key procedures should be publicly disclosed.

**PS X CSD X SSS X CCP X TR X**

KC 23.1 An FMI should adopt clear and comprehensive rules and procedures that are fully disclosed to participants and relevant rules and key procedures should be publicly disclosed.

KE 1. Clarity and comprehensiveness of rules and procedures.

**Q.23.1.1: Which documents comprise the system’s rules and procedures?**

In general, the documents comprise the system’s rules and procedures are:

- (i) Rule Book; and
- (ii) Operating Procedures Manuals.

Each market managed by BM&FBOVESPA has a Rule Book and an Operating Procedures Manual for the trading system’s rules and procedures and a Rule Book and an Operating Procedures Manual for the post-trading system’s rules and procedures. Particularly, the post-trading system’s rules and procedures of BM&FBOVESPA comprise a Risk Management Manual to each market.

The current system’s rules and procedures of BM&FBOVESPA comprise:

- Operational Regulations - São Paulo Stock Exchange (BOVESPA);
- Operational Procedure Manual - Bovespa Segment Stocks and Stocks Derivatives;
- Operational Regulations on Over the Counter Market – Bovespa Segment;
- Operational Procedure Manual on Over the Counter Market – Bovespa Segment;
- BOVESPA FIX Regulation;
- SOMA FIX Regulation;
- Post-trading Operating Rules – Bovespa Segment – and Central Securities Depository Rules;
- Post-trading Operational Procedures Manual – Bovespa Segment – and Central Securities Depository Rules;
- Issuer Rules – CBLC;
- BM&F Securities Clearinghouse Rulebook;
- BM&F Securities Clearinghouse Operational Procedures Manual;
- BM&F Securities Clearinghouse Risk Management Manual;
- BM&F Foreign Exchange Clearinghouse Rulebook;
- Foreign Exchange Clearinghouse – Operating Manual;
- Foreign Exchange Clearinghouse – Risk Management Manual;



- US Dollar Spot – Rulebook;
- US Dollar Spot – Operating Manual;
- BM&F Derivatives Clearinghouse Rulebook;
- BM&F Derivatives Clearinghouse Operational Procedures Manual;
- BM&F Derivatives Clearinghouse Risk Management Manual;
- Regulation of Private Issuers of Un-sponsored Level I Brazilian Depositary Receipts – BDRs;
- Registration Regulation for Un-sponsored Level 1 Brazilian Depositary Receipts – BDRs;
- Registration Procedure Manual for Un-sponsored Level 1 Brazilian Depositary Receipts – BDRs;
- Operational Regulations – Derivatives São Paulo Stock Exchange (BM&F);
- SISBEX Rulebook – Public Fixed Income (Bonds);
- SISBEX Operational Procedures Manual – Public Fixed Income (Bonds);
- SISBEX User Manual – Public Fixed Income (Bonds);
- Issuer and Securities Registration Rulebook;
- Novo Mercado Listing Rules (ou Regulation);
- Corporate Governance Level 2 Listing Rules (ou Regulation);
- Corporate Governance Level 1 Listing Rules (ou Regulation);
- Bovespa Mais Listing Rules (ou Regulation);
- Monetary Sanctions Regulation of the Novo Mercado Listing Segment;
- Monetary Sanctions Regulation of the Corporate Governance Level 2 Listing Segment;
- Monetary Sanctions Regulation of the Corporate Governance Level 1 Listing Segment;
- Monetary Sanctions Regulation of the Bovespa Mais Listing Segment;
- Registration Real Estate Credit Note Rulebook;
- Agribusiness Depositary Participants Rulebook;
- Agribusiness Registration Security Rulebook;
- Treasury Direct Rulebook;
- Consultative Chamber Rulebook;
- Access Rulebook – Rules and Procedures (Circular Letter 078/2008-DP);
- Registration Beneficiary Fund related to Tax Incentives Companies Rulebook;
- Investors Central Reference File Rulebook;
- BM&F Bank Rulebook;
- Investment Clubs Rulebook;
- Market Risk Technique Committee Rulebook;
- BM&FBOVESPA Financial Committee Internal Rules;
- Audit Committee Internal Rules;
- BM&FBOVESPA Consultative Chambers Rulebook.

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|  | <p><b>Q.23.1.2: How does the FMI determine that relevant rules and key procedures are clearly articulated?</b></p> <p>BM&amp;FBOVESPA rely on their internal legal department to ensure that relevant rules and key procedures are clearly articulated, accurate, and up-to-date.</p> <p><b>Q.23.1.3: What information do the FMI’s rule and procedures contain on procedures it will follow in non-routine events?</b></p> <p>The rules and procedures of BM&amp;FBOVESPA contain provisions related to non-routine events, including those for addressing financial and operational problems within the systems.</p> |
| KE 2. Disclosure of rules and procedures to participants.            | <p><b>Q.23.1.4: How are rules and procedures disclosed to participants?</b></p> <p>Rules and procedures are publicly available on-line at the BM&amp;FBOVESPA website.</p> <p>See answer to Q.1.2.1.</p>   |
| KE 3. Disclosure of relevant rules and key procedures to the public. | <p><b>Q.23.1.5: How are relevant rules and procedures disclosed to the public?</b></p> <p>Rules and procedures are publicly available on-line at the BM&amp;FBOVESPA website.</p> <p>See answer to Q.1.2.1.</p>  |
| KEY CONCLUSION 23.1  |  |

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| KC 23.2  | <p>An FMI should disclose clear descriptions of the system’s design and operations, as well as the FMI’s and participants’ rights and obligations, so that participants can assess the risks they would incur by participating in the FMI.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| KE 1. Description of the system’s design and operations. | <p><b>Q.23.2.1: Which documents comprise information about the system’s design and operations?</b></p> <p>BM&amp;FBOVESPA has Website (<a href="http://www.bmfbovespa.com.br">www.bmfbovespa.com.br</a>) where it informs about rules, costs, taxation, regulation, risk management, rights and obligations for participants in the markets of BM&amp;FBOVESPA. As participant, each one has connection restricted to other pages on Internet, where can access systems and information about how to operate it.</p> <p><b>Q.23.2.2: How and to whom does the FMI disclose the system’s design and operations?</b></p> <p>BM&amp;FBOVESPA discloses the system’s design and operations for all participants, through BM&amp;FBOVESPA website, BVMFnet website, CBLCnet website and connection restricted.</p> |

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|   | <p><b>Q.23.2.3: How and to whom does the FMI disclose the processes it follows for changing its rules and procedures?</b></p> <p>BM&amp;FBOVESPA has flow of communication with participants. Every change in rules and procedures are planned and communicated through messages on Website or by email sent for all participants. See also answer to Q.1.2.1.</p> <p><b>Q.23.2.4: How and to whom does the FMI disclose the degree of discretion it can exercise over the operation of the system?</b></p> <p>The degree of discretion exercised by BM&amp;FBOVESPA over the operation of the systems is according with its category and level of authorization.</p> |
| <p>KE 2. Description of participants' rights and obligations.</p> | <p><b>Q.23.2.5: What information does the FMI provide to its participants about their rights, obligations, and risks incurred through participation in the FMI?</b></p> <p>The information related to rights, obligations, and risks incurred through participation in the FMI is exposed in BM&amp;FBOVESPA's rules and procedures. See answer to Q.1.2.1.</p>   |
| <p>KEY CONCLUSION 23.2</p>  |   |

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| <p>KC 23.3</p>  | <p>An FMI should provide all necessary and appropriate documentation and training to facilitate participants' understanding of the FMI's rules and procedures and the risks they face from participating in the FMI.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| <p>KE 1. FMI documentation and training for its participants.</p> | <p><b>Q.23.3.1: How does the FMI facilitate its participants' understanding of the FMI's rules, procedures, and the risks associated with participating?</b></p> <p>See answer to Q.1.2.1.</p> <p><b>Q.23.3.2: Is there evidence that the means described above enable and actually result in participants' understanding of the FMI's rules, procedures, and the risks they face from participating in the FMI?</b></p> <p>BM&amp;FBOVESPA regularly audit participants in order to ensure their understanding of rules, procedures and risk, as well as their capability of applying the rules and procedures. Participants' employees have to pass a test every three years and obtain a certification. Nine different types of test exist, depending on the role of the employee.</p> <p>See answer to Q.1.2.1.</p> <p><b>Q.23.3.3: In the event that the FMI identifies a participant who demonstrates a lack of</b></p> |

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|  | <p><b>understanding, what remedial actions are taken by the FMI?</b></p> <p>Assuming that BM&amp;FBOVESPA establishes the relationship with participants through Adhesion Instrument (Compliance Declaration) to regulations and others rules, the participants that do not follow these rules and regulations (and these non-conformities, for instance, may be identified by BSM audits) may receive disciplinary action pursuant to the Bylaw of BSM. Besides the traditional enforcement actions (opening of the Administrative Procedure that might result in penalties), the BSM executes other “corrective actions” as Recommendation Letters and “Warning Letters”. The first one, for instance, indicates the necessity of improvement of internal controls of the Company.</p> <p>In these cases, generally, it requires that the participants present an Action Plan showing what they plan to do to solve those deficiencies and when the timeframe will be implemented. The second one is used as a warning to the participant and shows that BSM detected a possible irregular practice. In this sense, usually the company asks for explanation about the identified behavior and/or determines the disposal of the irregular practice, under penalty of specific Administrative Process.</p> <p>That is important to mention that enforcement actions also have an educational objective. Regarding the “lack of understanding” is worth noting the several BM&amp;FBovespa’s initiatives (including courses provided by Educational Institute) and BSM (Lectures and Meetings with participants) to train and clarify normative issues.</p> |
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KEY CONCLUSION 23.3

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| <p>KC 23.4</p>   | <p>An FMI should publicly disclose its fees at the level of individual services it offers, as well as its policies on any available discounts. The FMI should provide clear descriptions of priced services for comparability purposes.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>  |
| <p>KE. 1. Public disclose of service fees and discounts.</p> | <p><b>Q.23.4.1: What fee and other material cost information on its pricing (i.e. services and associated fees and discounts) does the FMI publicly disclose?</b></p> <p>There is a “Fee Policy” of BM&amp;FBOVESPA which is sent to participants through a formal communication named “Circular Letter”, posted in both Portuguese and English on the exchange website.</p> <p><b>Q.23.4.2: How is this information made available to the public?</b></p> <p>See answer to Q.23.4.1</p> <p><b>Q.23.4.3: What is the FMI’s process for notifying participants and the public of changes to services and fees and what policy is followed regarding the timing of such notifications?</b></p> |

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|                                       | The changes to services and fees of BM&FBOVESPA are previously notified to participants. Besides, the policy followed regarding the timing of such notifications is specified to each market managed by BM&FBOVESPA.   |
| KE 2. Description of priced services. | <p><b>Q.23.4.4: How does the FMI define its priced services? Is there evidence that service definitions are clearly described in a manner that allows for comparability?</b></p> <p>Each asset class and type of instrument traded on the exchange has its own pricing policy, which clearly establishes limits to what constitutes a product and allows for external comparability.</p> <p><b>Q.23.4.5: Does the FMI disclose information on its technology and communication procedures, or any other factors that affect the costs of operating the FMI?</b></p> <p>As a public company, we provide substantial disclosure regarding the technologies employed in our day-to-day operations and the nature of our costs and expenses, using both formal and marketing communication channels.</p> |
| KEY CONCLUSION 23.4                   |  |

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| KC 23.5   | <p>An FMI should complete regularly and disclose publicly responses to the CPSS-IOSCO Disclosure framework for financial market infrastructures. An FMI also should, at a minimum, disclose basic data on transaction volumes and values.</p> <p><b>PS X CSD X SSS X CCP X TR X</b></p>   |
| KE 1. Completion and public disclosure of the CPSS-IOSCO Disclosure framework for financial market infrastructures. | <p><b>Q.23.5.1: When did the FMI last complete the disclosure framework? How frequently is it updated?</b></p> <p>BM&amp;FBOVESPA is listed in Novo Mercado which is a listing segment designed for shares issued by companies that voluntarily undertake to abide by corporate governance practices and transparency requirements in addition to those already requested by the Brazilian Law and CVM (Brazilian Securities and Exchange Commission).</p> <p>Accordingly to CVM's instruction the issuer sends the following information to the CVM through the electronic system available on the CVM website:</p> <ul style="list-style-type: none"> <li>• Registration Form;</li> <li>• Reference Form;</li> <li>• Financial Statements;</li> <li>• Standardized Financial Statement Form – DFP;</li> <li>• Quarterly Information Form – ITR;</li> <li>• The notice set forth in Article 133 of Law 6,404, of December 15, 1976, 1 (one) month prior to the date set for the execution of the ordinary general meeting or in</li> </ul> |

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|  | <p>the same day of its publication, whichever occurs first;</p> <ul style="list-style-type: none"> <li>• Notice of the ordinary general meeting, in up to 15 (fifteen) days prior to the date when the ordinary general meeting will be hold or in the same day of its first publication, whichever occurs first;</li> <li>• All necessary documents for the exercise of the right to vote at ordinary general meetings, in the form established by a specific rule;</li> <li>• Summary of the decisions made at the ordinary general meeting, in the same day of its execution;</li> <li>• Minutes of the ordinary general meeting, in up to 7 (seven) business days following its execution; and the report referred to in Article 68, Paragraph 1, sub-item "b" of Law 6,404, of 1976, where applicable, within 4 (four) months prior to the fiscal year end or in the same day of its publication by the trustee, whichever occurs first</li> </ul> <p>As appears on Law no. 6404, article 176, at the end of each fiscal year, the issuer prepares the following financial statements, which clearly indicate its assets and liabilities as well as the changes which occurred during the fiscal year:</p> <ul style="list-style-type: none"> <li>• Balance sheet</li> <li>• Statement of income</li> <li>• Statement of changes in financial position</li> </ul> <p>Accordingly to CVM's instruction 358 the issuer shall disclose every material information that may significantly influence the market price of the securities issued by the relevant corporation or backed on them, investors' decisions as to buy, sell, or preserve those securities or investors' decision as to exercise any rights inherent to titleholders of securities issued by the relevant corporation or backed on them. This kind of information is carried out as soon as possible.</p> |
| <p>KE 2. Public disclosure of other information.</p> | <p><b>Q.23.5.2: What information in addition to that mentioned in the previous key element does the FMI disclose to the public? How does the FMI disclose any data and information in addition to the disclosure framework?</b></p> <p>BM&amp;FBOVESPA also discloses operational database updated at BM&amp;FBOVESPA IR website such as ADTV and RPC numbers, presentations and transcriptions of our conferences.</p> <p><b>Q.23.5.3: Which media does the FMI use to publicly disclose information? In which language(s)?</b></p> <p>On BM&amp;FBOVESPA website - Portuguese/English (<a href="http://www.bmfbovespa.com.br/ri">www.bmfbovespa.com.br/ri</a>).</p> <p>In Valor (wide circulation newspaper) and in Diário Oficial de São Paulo (official newspaper)</p>  |

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|                     | <p>BM&amp;FBOVESPA discloses the annual financial statements, material facts and the minutes of the meeting of the board of directors. – Portuguese.</p> <p>In IPE (transmission system for periodical and occasional information, developed by CVM and BM&amp;F in order to facilitate the information disclosure) – most of it in Portuguese, some in English.</p> |
| KEY CONCLUSION 23.5 |  |

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| ASSESSMENT OF PRINCIPLE 23 |  |
| COMMENTS                   |  |

**PRINCIPLE 24. DISCLOSURE OF MARKET DATA**

A TR should provide timely and accurate data to relevant authorities and the public in line with their respective needs

**PS CSD SSS CCP TR X**

KC 24.1

A TR should provide data in line with regulatory and industry expectations to relevant authorities and the public, respectively, that is comprehensive and at a level of detail sufficient to enhance market transparency and support other public policy objectives.

KE 1. Provision of data to relevant authorities and the public.

**Q.24.1.1: What data are made available by the TR to the public and the relevant authorities?**

For the public, BVMF provides information of outstanding position and movements made in a daily basis process through the website [www.bmfbovespa.com.br](http://www.bmfbovespa.com.br). For the authorities is sent a file, also in a daily basis process, in a specific layout defined by them, which contain all transactions of the day as well as the analytical outstanding position of each participant.

**Q.24.1.2: How does the TR ensure that its disclosures of data effectively meet the needs of the public and the relevant authorities?**

As the information to the authorities are sent in a daily basis process and more than that in a specific tool provided by them, every day the TR receives feedback whether the process were successful or not. For the public, the information available in the website is the result of requests made during the time by the participants and whenever we receive suggestions for improvement we change de presentation to the public.

KEY CONCLUSION 24.1

KC 24.2

A TR should have effective processes and procedures to provide data to relevant authorities in a timely and appropriate manner to enable them to meet their respective regulatory mandates and legal responsibilities

**PS CSD SSS CCP TR X**

KE 1. Processes and procedures to provide data to relevant authorities.

**Q.24.2.1: What processes and procedures does the TR follow to ensure the timely delivery of data to authorities and the public, including ad hoc data requests by authorities?**

The information is sent to authorities in a daily basis process based on a tool created and provided by them for its purpose. In case the TR receives an ad hoc request, information extraction is performed directly by technology team, following all the internal processes and rules, always respecting the use of the tool provided by authorities for this purpose.

**Q.24.2.2: What processes and procedures does the TR follow to ensure that the provision of data to meet legal and regulatory responsibilities is supported both operationally and technically?**



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|  | The use of the transmission system provided by authorities already ensures that BM&FBOVESPA meets the legal and regulatory responsibilities. |
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KEY CONCLUSION 24.2

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| KC 24.3 | A TR should have robust information systems that provide accurate current and historical data. Data should be provided in a timely manner and in a format that permits it to be easily analysed.<br><b>PS CSD SSS CCP TR X</b> |
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| KE 1. Information systems for the provision of current and historical data. | <b>Q.24.3.1: How does the TR ensure that data remain accurate?</b><br><br>Through regular monitoring of the evolution of records, such as metrics of new operations and events. In addition, daily reconciliation reports are made available to the participants in order to perform their internal balancing processes. |
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| KE 2. Availability and format of data. | <b>Q.24.3.2: How does the TR ensure that data and other relevant information are provided in a format that is generally accessible, comparable, and easily analysed?</b><br><br>The format of the information given by the TR, as well as the way it is provided are already aligned with participants who had access to the systems. Furthermore, before any changes are made, all the participants will be informed in reasonable period of time in order to facilitate its adjustments to the new model. |
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KEY CONCLUSION 24.3

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| ASSESSMENT OF PRINCIPLE 24 |  |
| COMMENTS                   |  |

## FORM FBOT SUPPLEMENT S-1—EXHIBIT E

**Request:** With respect to each relevant regulatory regime or authority governing the clearing organization, attach the following:

- (1) A description of the regulatory regime/authority's structure, resources, staff and scope of authority.
- (2) The regulatory regime/authority's authorizing statutes, including the source of its authority to supervise the clearing organization.
- (3) A description of and, where applicable, copies of the laws, rules, regulations and policies applicable to:
  - (i) The authorization, licensure or registration of the clearing organization.
  - (ii) The financial resource requirements applicable to the authorization, licensure or registration of the clearing organization and the continued operations thereof.
  - (iii) The regulatory regime/authority's program for the ongoing supervision and oversight of the clearing organization and the enforcement of its clearing rules.
  - (iv) The extent to which the current RCCPs are used or applied by the regulatory regime/authority in its supervision and oversight of the clearing organization or are incorporated into its rules and regulations and the extent to which the regulatory regime/authority reviews the clearing systems for compliance therewith.
  - (v) The extent to which the regulatory regime/authority reviews and/or approves the rules of the clearing organization prior to their implementation.
  - (vi) The regulatory regime/authority's inspection, investigation and surveillance powers; and the program pursuant to which the regulatory regime/authority uses those powers to inspect, investigate, sanction, and enforce rules applicable to the clearing organization.
  - (vii) The financial protection afforded customer funds.

### **Response:**

Copies of the relevant laws, rules, regulations and policies were provided in response to Supplement S-1, Exhibit A-4 and Form FBOT Exhibit A-5.

#### *Overview*

The Brazilian capital markets and financial systems are regulated and monitored by the National Monetary Council (Conselho Monetário Nacional – “CMN”), the Brazilian Central Bank (Banco Central do Brasil – “Central Bank”) and the Brazilian Commission for Securities (Comissão de Valores Mobiliários – “CVM”). The current regulatory structure governing the Brazilian financial system and capital markets is based on: (i) Law No. 3,057/64, as amended, which sets forth the organization of the Brazilian financial system and the roles of its agents, including the Central Bank; (ii) Law No. 4728/65, as amended, which defines the roles of the CMN and the Central Bank in the financial and capital markets; and (i) Law No. 6385/76, as amended, which is referred to as the “Brazilian Securities Law,” and governs the organization of the Brazilian capital markets and the role of its agents, and created the CVM as its authority.

In accordance with Brazilian regulations, the creation and operation of organized securities markets and custody and settlement systems requires prior authorization of the Central Bank and the CVM, depending on the market. Furthermore, entities that engage in those activities and their agents are subject to specific and strict regulatory oversight.

BVMF through its clearing house activities is a member of the Brazilian Payment System regulated by the Brazilian Central Bank according to Law 10,214/01 and Brazilian Central Bank rules.<sup>1</sup>

Pursuant to CMN Resolution No. 2,882, the Central Bank is required to promote the operation and continued enhancement of the Brazilian Payment System (Sistema de Pagamentos Brasileiro) (“SPB”). In addition, CMN Resolution No. 2,882 grants authority to the Central Bank to authorize and to regulate the operation of clearing and settlement systems. Except in relation to government notes and private securities issued by banks, the authority of the Central Bank is shared with the CVM in connection with the settlement of transactions with derivatives and securities.

Law 10,214/01 and the Central Bank Circular Letter 3,057 provide the legal basis for the role of systemically important clearing houses within the Brazilian Payment System. Those rules define the concepts of multilateral netting and novation of contracts by substitution. They also recognize the finality and irrevocability of settlements and ensure the clearing houses’ priority over securities posted as collateral, in case of a participant default.

Brazil’s current legislation and the supervisory and regulatory bodies governing its financial and capital markets faithfully reproduce IOSCO’s recommendations in their entirety, and in some cases take them to higher levels through the implementation of even more detailed and rigorous rules. CVM is a founding member of IOSCO and has played an active role in the work carried out by the organization. As a result, it has been given the chairmanship of the Inter-American Committee (from 1995 to 1996, and from 2002 to 2004) and of the working group responsible for enhancing regulation of investment funds. CVM is a signatory of the IOSCO Multilateral Memorandum of Understanding (“MMoU”). It participated directly in drafting the Memorandum and is one of the voting bodies that selects new members. New rules and regulations issued in recent years take IOSCO principles into account. IOSCO principles are clearly referenced for public hearings, as was the case with CVM Instruction No. 461/2007 and CVM Instruction No. 480/2009. CVM oversees and ultimately approves BVMF’s rules, ensuring that they comply with IOSCO principles.

### *Financial Protections*

Exchanges are required to establish financial safeguards and guarantee funds to guard their clearing and settlement operations and facilities, and protect member firms and their customers from defaults, insolvencies or malpractice by market participants. As discussed above, BVMF has established minimum capital requirements for Access Rights Holders. Also as discussed above, it provides financial protections through its clearinghouse, which is the universal counterparty to all exchange transactions.

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<sup>1</sup> Law 10,214/01 is included as Attachment SE-1

BVMF is supervised with respect to issues relating to financial integrity by both BACEN and the CVM. Brazilian law requires that clearinghouses and clearing and settlement services must have mechanisms and safeguards to guarantee settlement of obligations, including adequate security procedures and rules for risk control, contingencies, loss sharing among participants, and the direct execution of positions held in custody, of contracts and of collateral posted by participants. Brazilian law also requires each exchange to maintain an internal audit system. For instance, each exchange is required to monitor its internal controls, and those of the commodities brokerage houses and the Settlement Rights Holders, as applied to executed and registered transactions and their associated risks, as well as require proprietary and customer segregation of funds.

#### *Protection of Customer Funds*

BSM is responsible for maintaining a loss recovery mechanism for the purpose of ensuring that investors can recover their losses arising out of an action or omission of the brokerage house in connection with transactions carried out on an exchange or with custody services.

Concerning the amount applicable for the loss recovery mechanism, CVM enacted, on July 13, 2011, Instruction 499, which increased the amount of indemnification payable under the loss recovery mechanism administered by BSM from R\$60,000 to R\$70,000 per event.

Additionally, it is important to mention that, according to the Article 3 of CVM Instruction 301 the owner of securities (or the parties to futures contracts) must be identified by the entities that perform activities involving custody, emission, distribution, liquidation, negotiation, intermediation, or management of securities. The identification of the owner allows for: (i) a clear identification of the investor; (ii) an incontestable ownership of securities held in custody by intermediaries and the central depository; and (iii) permanent control and fraud prevention.

## **TRANSLATION**

(April 11, 2001)

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## **ACTS OF THE LEGISLATIVE BRANCH**

### **Law No. 10214 of March 27, 2001**

Provides for the activities of clearing houses and clearing service providers within the scope of the Brazilian payment system, and makes other provisions.

I hereby make known that the President of the Republic issued Provisional Measure 2115-16/01, which was approved by the National Congress, and I, Jader Barbalho, President of the Federal Senate, enacted the following Law for the purposes of the provisions set out in article 62, sole paragraph of the Federal Constitution:

**Article 1º** - This Law regulates the activities of clearing houses and clearing service providers within the scope of the Brazilian payment system.

**Article 2º** - The Brazilian payment system dealt with herein comprises the entities, systems and procedures related to the transfer of funds and other financial assets, or to the processing, clearing and settlement of any kind of payments.

**Sole Paragraph** - In addition to the clearing services for checks and other instruments, the following systems are part of the Brazilian payment system, pursuant to the authorization granted to the respective clearing houses or clearing service providers by the Central Bank of Brazil or the Brazilian Securities Commission (*Comissão de Valores Mobiliários*), within their respective spheres of authority:

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I. - clearing and settlement of electronic debit and credit orders;

II. - transfer of funds and other financial assets;

III. - clearing and settlement of trades in securities;

IV. - clearing and settlement of trades on commodities and futures exchanges; and

V. - other systems, including those involving trades in financial derivatives, for which clearing houses or clearing service providers have been authorized under this article.

**Article 3º** - Multilateral clearing of obligations is permitted at the same clearing house or clearing service provider.

**Sole Paragraph** - For the purposes hereof, multilateral clearing of obligations is defined as the procedure for verifying the sum of each client's bilateral debit and credit results vis-à-vis the other clients.

**Article 4º** - At the discretion of the Central Bank of Brazil, in clearing systems where the volume and nature of trades may put at risk the soundness and smooth operation of the financial system, the clearing houses and clearing service providers shall act as a counterparty in relation to each client for settlement of the respective obligations carried out through such clearing house or clearing service provider, without prejudice to any obligations arising out of any law, regulations or contract.

**Paragraph 1º** - The clearing houses and clearing service providers shall not be liable for noncompliance with the issuer's obligations to redeem the principal and

ancillary amounts related to the securities, which are the subject matter of clearance and settlement.

**Paragraph 2°** - The systems dealt with in the main section hereof shall rely on the mechanisms and safeguards devised for the clearing houses and clearing service providers to ensure full settlement of the trades cleared and settled thereby.

**Paragraph 3°** - The mechanisms and safeguards dealt with in the above paragraph  
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comprise, among other aspects, appropriate security devices and rules on control of risks and contingencies, on sharing of losses among the clients and on direct execution of custodial positions, contracts and guarantees provided by the clients.

**Article 5°** - Without prejudice to the provisions of paragraph 3 above, the clearing houses and clearing service providers in charge of one or more systemically relevant environments shall, with due regard for all regulations issued by the Central Bank of Brazil, keep a separate special equity account formed by the assets and rights solely intended to ensure compliance with the obligations entered at each of the systems in operation.

**Paragraph 1°** - The assets and rights that make up the special equity account dealt with in the main section hereof, as well as their yields and earnings, shall be kept separately from the general equity account or other special equity accounts of the same clearing house or clearing service provider, and shall not be used to perform or guarantee any obligation assumed by the clearing house or clearing service provider in a system other than that to which they relate.

**Paragraph 2°** - The acts for the formation of separate equity accounts and the respective allocation thereof, shall be approved or registered pursuant to the law or regulations in effect.

**Article 6°** - The assets and rights that make up the special equity accounts as well as those offered in guarantee by the clients cannot be pledged, and shall not be the subject matter of attachment, seizure, search and impounding or any other act of judicial restraint, except for compliance with the obligations assumed by the clearing house or by the clearing service provider, acting as counterparty, pursuant to the provisions of article 4, main section, of this Law.

**Article 7°** - The civil insolvency, debt rehabilitation (*concordata*), intervention, bankruptcy or extrajudicial liquidation of any client shall not affect compliance with the obligations assumed thereby before the clearing house or clearing service provider, which obligations shall be processed and settled by the clearing house or service provider pursuant to the respective regulations.

**Sole Paragraph** - The proceeds from realization of the guarantees provided by the client subject to any of the events set out in the main section of this article, as well  
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as the bonds, securities and any other assets thereof which are eligible for clearance or settlement, shall be allocated to settle the obligations assumed with the clearing house or clearing service provider.

**Article 8°** - In the events dealt with in the preceding item, or in the event of default of any client of a system, the obligations--subject to the provisions set out in the regulations and procedures of the clearing houses or clearing service providers--shall be settled as follows:

I. - by delivery of the underlying assets or transfer of funds, in the event of

financial transactions; and

II. - by delivery of the proceeds from realization of the guarantees and enforcement of the mechanisms and safeguards dealt with in paragraphs 2 and 3 of article 4 hereof, when the underlying assets or the funds to be transferred are insufficient or inexistent.

**Sole Paragraph** - If, after the procedures dealt with in items I and II above are adopted, there is still a positive balance, such balance shall accrue to the client and shall become a part of the respective estate, if applicable. If there is a negative balance, such balance shall constitute a credit held by the clearing house or clearing service provider against the client.

**Article 9º** - Violation of the legal and regulatory provisions that govern the payment system shall subject the clearing houses and the clearing service providers, their senior managers and members of their audit, advisory and similar committees to the penalties set forth:

I. - in article 44 of Law No. 4595 of December 31, 1964, imposed by the Central Bank of Brazil;

II. - in article 11 of Law No. 6385 of December 7, 1976, imposed by the Brazilian Securities Commission.

**Sole Paragraph** - The decisions handed down by the Central Bank of Brazil and by the Brazilian Securities Commission under this article may be appealed to the National Financial System Appellate Council within fifteen (15) days, with no

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staying effects.

**Article 10.** - The National Monetary Council, the Central Bank of Brazil and the Brazilian Securities Commission, in their respective spheres of authority, shall issue the rules and guidelines required for compliance with this Law.

**Article 11.** - Any acts performed under the aegis of Provisional Measure No. 2115-15 of January 26, 2001 are hereby confirmed.

**Article 12.** - This Law shall come into effect on the date of its publication. National Congress, on March 27, 2001, 180th year of Independence and 113th year of the Republic.

**Senator Jader Barbalho**

**President of the National Congress**

## FORM FBOT SUPPLEMENT S-1—EXHIBIT F-1

**Request:** A description of the clearing organization’s regulatory or compliance department, including its size, experience level, competencies, duties and responsibilities of staff.

**Response:**

The clearinghouse is responsible for (i) clearing operations and monitoring risk, (ii) conducting risk assessments, and (iii) performing activities related thereto. In the event that a Settlement Right Holder’s position is deemed to pose an unacceptable risk to the clearinghouse, BVMF has the authority to take any necessary measures, including suspending the Settlement Rights Holder’s trading, closing open positions and requiring the posting of additional margin, or other necessary action, as set forth in the Clearinghouse Rulebook and Clearing House Operations Manual.<sup>1</sup> BVMF has a staff of 1433 employees.

As discussed in FBOT Exhibit G-1 and as provided by CVM Instruction No. 461<sup>2</sup>, CVM has delegated significant power to SROs, which include BVMF. All SRO rules of conduct are reviewed and approved by CVM.<sup>3</sup> Whenever violations of applicable laws and regulations are detected, SROs are expected to immediately initiate and conduct disciplinary administrative proceedings to prosecute the market participant and, as necessary, apply the appropriate penalties. Further, these bodies examine all complaints concerning the operation of the organized markets, monitoring their progress and the measures that have arisen from those complaints.

To fulfill the purpose established by CVM, SROs are also required to, pursuant to applicable regulations and the Bylaws and internal regulations, prosecute market participants not only when there is a violation of rules or failure to comply with the standards set out by such SRO, but also upon request of the Chief Executive Officer or of any third parties, whether an investor or a whistleblower. In this regard, the regulatory activities are conducted by BM&FBOVESPA Supervisão de Mercado (“BSM”), a legal entity dedicated to carry out regulatory SRO functions inherent to BVMF’s activities, such as (i) to oversee the market and market participants’ operations and (ii) to enforce any sanction that may be applicable to a market participant. These activities include establishing and managing mechanisms to prevent and correct breaches of applicable laws, rules and regulations, as well as ensuring the integrity of the market and protecting customers from unfair or abusive behavior by market participants.

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<sup>1</sup> See *id.* at pp 64-91.

<sup>2</sup> CVM Instruction 461 is included as Attachment A-5-1. CVM Instruction 461 provides for: (1) the form of incorporation and mandatory governance structure of entities managing organized exchange markets; (2) the organization and functioning of self-regulatory departments of entities managing organized exchange markets; (3) the authorization to install trading displays of foreign exchanges; (4) limitations on the equity participation in entities managing organized exchange markets; and (5) specific procedures for the granting and revocation of authorization to manage organized exchange markets

<sup>3</sup> See Law 6385, Article 17, Paragraph 1 (Attachment A-5-2), which provides that “Stock Exchanges, Futures Exchanges, over-the-counter market entities and securities clearing entities, as ancillary entities of the Brazilian Securities Commission, shall be required to supervise their respective members and the securities transaction carried out by them.”



BSM is responsible for the supervision of all operations carried out on markets regulated by BVMF, including its clearinghouse. For operational purposes, BSM is a completely independent legal entity, which prevents BVMF and/or any market participant from attempting to interfere or influence any of the activities carried out by BSM.

As BSM is responsible for the the surveillance of both the clearinghouse activities and the markets under BVMF administration (including derivatives, commodities and future securities), the clearinghouse does not have a separate, dedicated compliance department. Instead, all compliance and audit activities related to market participants are performed by BSM, which also sanctions the market participants as applicable. As of the first semester of 2012, BSM employs 108 professionals directly engaged in market surveillance, audit, and legal analysis. There is no staff allocated exclusively to clearing activities; rather, the staff oversees the markets generally—instead of specific segments.

Because there is no separate self-regulatory organization governing futures professionals (like National Futures Association) in Brazil, BVMF also performs all registration functions for its members. Accordingly, in this capacity, BVMF supplements the BACEN licensing procedure. Subject to direct oversight by CVM, BVMF recognizes and licenses Access Rights Holders.<sup>4</sup>

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<sup>4</sup> Self-regulatory status in Brazil was granted to derivatives exchanges in 1989, and expanded in 1998. BVM&F was expressly designated a “self-regulating entity” by CVM Instruction 283 (1998). This instruction required BVM&F to conform its rules and regulations to standards set forth in that Instruction, and to submit them for approval by CVM, as well as all subsequent rule amendments. The SRO status of exchanges is referred to in CVM Instruction 505/2011, as well as CVM Instruction No. 461/2007 and CVM Instruction No. 480/2009

## FORM FBOT SUPPLEMENT S-1—EXHIBIT F-2

**Request:** A description of the clearing organization’s rules and how they are enforced, with reference to any rules provided as part of Exhibit A-5 that require the clearing organization to comply with one or more of the RCCPs.

**Response:**

BVMF’s rules and procedures are based on laws and regulations and are approved by the regulators (BCB and/or CVM) before being introduced. Considering the derivatives market and BVMF Derivatives Clearinghouse, the most relevant rules are:

- (i) Derivatives Clearinghouse Rulebook;
- (ii) Derivatives Clearing House Operating Procedure Manual;
- (iii) Derivatives Clearing House Risk Management System Manual; and
- (iv) BVMF Operating Rules - Derivatives Systems.

BVMF has undertaken an assessment of the legal and regulatory framework affecting its activities and has analyzed implications of the current framework for legal certainty on different aspects, which are mentioned below. Such rules comply with the RCCPs, as provided in the BVMF self-assessment.

Brazil’s current legislation and the supervisory and regulatory bodies governing its financial and capital markets faithfully reproduce IOSCO’s recommendations in their entirety, and in some cases take them to higher levels through the implementation of even more detailed and rigorous rules. CVM is a founding member of IOSCO and has played an active role in the work carried out by the organization. As a result, it has been given the chairmanship of the Inter-American Committee (from 1995 to 1996, and from 2002 to 2004) and of the working group responsible for enhancing regulation of investment funds. CVM is a signatory of the IOSCO Multilateral Memorandum of Understanding (“MMoU”). It participated directly in drafting the Memorandum and is one of the voting bodies that selects new members. New rules and regulations issued in recent years take IOSCO principles into account. IOSCO principles are clearly referenced for public hearings, as was the case with CVM Instruction No. 461/2007 and CVM Instruction No. 480/2009. CVM oversees and ultimately approves BVMF’s rules, ensuring that they comply with IOSCO principles.

### FORM FBOT SUPPLEMENT S-1—EXHIBIT F-3

**Request:** To the extent not included in Exhibit F-2:

A description of the clearing organization's disciplinary rules, including but not limited to rules that address the following –

- (1) Disciplinary authority and procedures that empower staff to recommend and prosecute disciplinary actions for suspected rule violations and that provide the authority to fine, suspend, or expel any clearing participant pursuant to fair and clear standards.
- (2) The issuance of warning letters and/or summary fines for specified rule violations.
- (3) The review of investigation reports by a disciplinary panel or other authority for issuance of charges or instructions to investigate further, or findings that an insufficient basis exists to issue charges.
- (4) Disciplinary committees of the clearing organization that take disciplinary action via formal disciplinary processes.
- (5) Whether and how the clearing organization articulates its rationale for disciplinary decisions.
- (6) The sanctions for particular violations and a discussion of the adequacy of sanctions with respect to the violations committed and their effectiveness as deterrents to future violations.

**Response:**

As detailed in Exhibits G-3 and S-1 F-2, the regulatory functions of all markets under BVMF's surveillance are exercised by BSM. BSM is therefore the entity that directly follows the activities of market participants.

Market participants are subject to periodic audits to be routinely performed by the BSM audit team and/or surveillance of all negotiations made by such market participant for compliance with the rules established in the BVMF Bylaws, its Exchange Rules, and other Rulebooks that may be applicable. In the case of a participant's failure to comply with the rules and/or procedures set forth in the applicable laws, regulations, and/or rules, including the Clearinghouse Rulebook, BVMF, in the case of limiting market accesses, and/or BSM may impose appropriate penalties for compliance and regulatory violations. Such penalties and disciplinary rules include:

- (i) Warnings;
- (ii) Fines;
- (iii) Suspension from activities (for a maximum period of 90 days);

- (iv) Temporary disqualification (for a maximum of 10 years to hold positions as senior management members, employees, traders, agents and representatives of either BSM, or the Sponsor Member, or of participants and agents);
- (v) Exclusion from activities; and
- (vi) Other penalties as outlined in the applicable rules.

The sanctions to be applied vary according to a number of considerations, including the degree/nature of the offense and the context of the behavior, such as the practices historically adopted by the market participant to be disciplined.

As the market participant is always present during the audit and copies of all accusations and reports related thereto are sent whenever a violation is identified, market participants have their due process rights guaranteed at all times.

## FORM FBOT SUPPLEMENT S-1—EXHIBIT F-4

**Request:** To the extent not provided in Exhibit F-2:

A demonstration that the clearing organization is authorized by rule or contractual agreement to obtain, from members and other participants, any information and cooperation necessary to conduct investigations, to effectively enforce its rules, and to ensure compliance with the conditions of registration.

**Response:**

As an SRO, BVMF is required to implement specific regulations for the registration and trading of securities in all markets under its responsibility as provided by CVM Instruction No. 461/2007 (please refer to Exhibit F-1). For this purpose, the regulatory activities are conducted by BM&FBOVESPA Supervisão de Mercado - BSM, a legal entity dedicated to carrying out regulatory SRO functions that were inherent to BVMF's activities, such as (i) to oversee the market and the market participant's operations and (ii) enforce any sanction that may be applicable to a market participant. These activities include (i) real-time surveillance of the market, which is comprised of the transactions carried out therein; (ii) monitoring the behavior and operational standards of market participants; and (iii) ensuring compliance of all market participants to the applicable legislation and rules in order to protect the integrity of the market.

Clearinghouse participants must comply with the clearinghouse rules and access rules, which subject them to BSM's authority. BSM has the authority to obtain any and all information that may be required by it to fulfill its regulatory functions. The cooperation of market participants is guaranteed by the rules to which they are subject when they obtain market access. These rules allow BSM all the necessary authority to conduct investigations, to effectively enforce the clearinghouse and exchange rules, and to ensure compliance with the conditions of registration and access.

## FORM FBOT SUPPLEMENT S-1—EXHIBIT G

**Request:** Attach the following:

(1) A description of the arrangements among the Commission, the foreign board of trade, the clearing organization, and the relevant foreign regulatory authorities that govern the sharing of information regarding the transactions that will be executed pursuant to the foreign board of trade's registration with the Commission and the clearing and settlement of those transactions. This description should address or identify whether and how the foreign board of trade, clearing organization, and the regulatory authorities governing the activities of the foreign board of trade and clearing organization agree to provide directly to the Commission information and documentation requested by Commission staff that Commission staff determines is needed:

- (i) To evaluate the continued eligibility of the foreign board of trade for registration.
- (ii) To enforce compliance with the specified conditions of the registration.
- (iii) To enable the CFTC to carry out its duties under the Act and Commission regulations and to provide adequate protection to the public or registered entities.
- (iv) To respond to potential market abuse associated with trading by direct access on the registered foreign board of trade.
- (v) To enable Commission staff to effectively accomplish its surveillance responsibilities with respect to a registered entity where Commission staff, in its discretion, determines that a contract traded on a registered foreign board of trade may affect such ability.

(2) A statement as to whether the regulatory authorities governing the activities of the foreign board of trade and clearing organization are signatories to the International Organization of Securities Commissions Multilateral Memorandum of Understanding. If not, describe any substitute information-sharing arrangements that are in place.

(3) A statement as to whether the regulatory authorities governing the activities of the foreign board of trade and clearing organization are signatories to the Declaration on Cooperation and Supervision of International Futures Exchanges and Clearing Organizations. If not, a statement as to whether and how they have committed to share the types of information contemplated by the International Information Sharing Memorandum of Understanding and Agreement with the Commission, whether pursuant to an existing memorandum of understanding or some other arrangement.

**Response:**

### *Overview*

Both BACEN and the CVM have authority to carry out surveillance with respect to trading on BVMF and by participants in the Exchange markets within their respective jurisdiction.

The CVM has entered into a Memorandum of Understanding with the Commission's Division of Enforcement, signed in Washington, D.C. on April 12, 1991. The CVM is also a party to the Windsor Declaration, the Tokyo Communique and the Declaration on Cooperation and

Supervision of International Futures Markets and Clearing Organizations (“Boca Declaration”), and BVMF is a party to the Boca Declaration. Additionally, CVM is a signatory of the International Organization of Securities Commissions (“IOSCO”) Multilateral Memorandum of Understanding (“MMOU”).

In addition, in connection with the CFTC’s consideration of BVMF’s 30.10 Petition, CVM represented to the Commission that: (1) it has entered into information-sharing arrangements with other financial regulators in Brazil, including BACEN, and will undertake best efforts to retrieve any other related information from such financial regulators; and (2) local laws do not serve as an impediment to cooperation and information-sharing with the Commission.<sup>1</sup> Further, BACEN has information sharing arrangements and mechanisms with U.S. banking regulators.

BVMF confirms that it is willing and able to cooperate through information sharing and other means with the Commission, either directly to the extent permitted by law or through its regulator, the CVM, with which the Commission has entered into the information sharing agreements noted above, in relation to the trading on BVMF in connection with this Application.

#### *Operation of the Agreements and the Brazilian Bank Secrecy Act*

In 1991, CVM and the Commission entered into a bi-lateral agreement of mutual assistance and the exchange of information.<sup>2</sup> Under Article 3 of the Bi-lateral MOU, each Commission has agreed to “use all the means provided under the law of its jurisdiction to investigate a violation of any law, rule or regulation within the jurisdiction of the requesting Authority, or to obtain information in connection with the facts contemplated by the request.”<sup>3</sup> The Bi-lateral MOU in Article 3.1 further provides that the “requested Authority will provide to the requesting Authority the fullest mutual assistance within the framework of this Memorandum.” Finally, Article 3.3 provides that in instances where the Authorities may not possess the legal authority to provide the contemplated assistance, the “Authorities will use all reasonable efforts to obtain the necessary authorization to provide the assistance described in the Memorandum.”

It is our understanding that CVM has authority to obtain information relating to capital markets transactions. This includes transactions carried out on the BVMF market and with respect to over-the-counter securities and derivatives transactions as well. We further understand that the CVM is legally empowered to obtain information identifying the flow of funds from a brokerage account into a bank account and vice versa.

In this regard, it should be stressed that a U.S. participant trading on the BVMF market pursuant to this Application, is most typically likely to access the market through the Customer’s Globex connection. In this regard, if a Customer chooses to have his or her account carried by a U.S. F.C.M. many, if not most, of the banking records relating to the transactions will be under the

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<sup>1</sup> In connection with its 30.10 Petition, BVMF has also confirmed that the express statutory provisions of Law 105 (2001) provide that the Brazilian secrecy rights and confidentiality legal provisions cannot be used to obstruct information sharing among market regulators and financial institutions examiners.

<sup>2</sup> “Memorandum of Understanding Between the United States Commodity Futures Trading Commission and The Brazil Comissão de Valores Mobiliários on Mutual Assistance and Exchange of Information, dated April 12, 1991, <http://cftc.gov/stellent/groups/public/@internationalaffairs/documents/file/bcvm91.pdf> (“Bi-lateral MOU”).

<sup>3</sup> Bi-lateral MOU at 2.

control of the U.S. F.C.M. And as noted above, CVM has full access to information with respect to transactions on the exchange, in-flows and out-flows to the bank account receiving proceeds from or funding the exchange transaction, including the beneficial owner of the account, and the records related to the clearing house and settlement of the positions.

It is also important to note that foreign investors, in order to trade on the BVMF market, are required to appoint one or more Legal Representatives in Brazil. In addition to appointing a Brazilian Legal Representative and registering with the CVM as a non-resident investor, a U.S. trader is required to establish a relationship with a local custodian for the account in Brazil, as established by Resolution 2689 enacted by National Monetary Council. Custodians are authorized by CVM or BACEN, and are typically Exchange Settlement Rights Holders.

With respect to the CVM's ability to obtain information relating to banking flows more broadly, the CVM has agreed, through the Bi-lateral MOU, to use its best efforts to obtain such information and CVM has available to it a judicial procedure for obtaining such information. Using for example, the concern that an intermediary might embezzle a customer's funds and transfer them to a third bank account, such a situation could occur regardless of the type of market access used and is not related *per se* to the foreign terminals Application that BVMF is filing. Nevertheless, even with respect to information requests that may relate only tangentially to the relief requested by BVMF to permit direct electronic access (such as tracing funds embezzled by a broker through multiple bank accounts), CVM has agreed, through the Bi-lateral MOU, to use its best efforts to obtain such information.

Equally, if not more importantly, CVM has available to it an established and already tested judicial procedure for obtaining such information.<sup>4</sup> CVM is specifically authorized by law to petition a court to suspend Brazilian bank secrecy provisions and to make such information available to CVM. Under Article 7 of the Bank Secrecy Act, CVM may apply to a court to suspend the bank secrecy provisions in order to conduct an investigation and obtain the necessary information and documents from financial bank institutions. In making its determination to suspend the bank secrecy provisions, the court will consider whether CVM is conducting the investigation within its jurisdiction and whether the records and information sought are reasonably related to the conduct of the investigation.

The time for the court determination to suspend the bank secrecy provisions varies depending upon the nature of the request and the gravity of the potential violation. In this respect, it is our understanding that a request to a court made by CVM in connection with the request of a foreign regulatory authority for assistance would be treated by a court with utmost seriousness and respect, and would be handled expeditiously.

It is our understanding that the provisions of Brazilian Complimentary Law n. 105 providing bank confidentiality cannot be used to obstruct information sharing among market regulators. It is also our understanding that CVM stands ready to respond fully and expeditiously to a request

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<sup>4</sup> It should also be borne in mind that this judicial procedure is not the exclusive avenue that is available to the CFTC for obtaining such banking information. For example, the U.S. Securities and Exchange Commission in cooperation with the U.S. Department of Justice recently obtained information relating to illegal bucket-shop activity in Brazil in coordination with the Brazilian Federal Police. See Press Release, U.S. Department of Justice, Issued March 20, 2008.



for assistance from a foreign regulatory authority, if asked, and that it has the power, authority and willingness to do so.

In connection with the 2008 No-Action Request, BVMF asked CVM to confirm to the Commission our understanding that the current Bi-lateral MOU and associated information-sharing arrangements would apply in the context of the foreign electronic access no-action letter. BVMF also asked CVM to confirm its willingness to share information with the Commission relevant to BVMF transactions entered into under such a foreign electronic access no-action letter on an “as needed” basis under the provisions of the Bi-lateral MOU. The CVM confirmed that: 1) the current Bi-lateral MOU and associated information-sharing arrangements would apply in the context of the foreign electronic access no-action letter, and 2) it was willing to share information with the Commission relevant to BVMF transactions entered into under such a foreign electronic access no-action letter on an “as needed” basis under the provisions of the Bi-lateral MOU.

**FORM FBOT SUPPLEMENT S-1—EXHIBIT H**

**Request:** Any additional information or documentation necessary to demonstrate that the requirements for registration applicable to the clearing organization or clearing system set forth in Commission regulation 48.7 are satisfied.

**Response:**

Not applicable. BVMF is happy to provide any additional information upon request.