

16 Sep 2021  
Eurex Clearing

# EURO STOXX 50® Index Total Return Futures (TESX) – Transition of the reference Funding Rate from €STR plus 0.085 percent to €STR (flat)

**Eurex Clearing Circular 083/21 EURO STOXX 50® Index Total Return  
Futures (TESX) – Transition of the reference Funding Rate from €STR plus  
0.085 percent to €STR (flat)**

## 1. Introduction

This circular contains information with respect to amendments to the Clearing Conditions of Eurex Clearing AG (Clearing Conditions) regarding the transition of the reference Funding Rate from euro short-term rate (€STR) plus the ECB provided EONIA transition spread (0.085 percent or 8.5 basis points) to €STR flat.

On 5 July 2021, Eurex Exchange and Eurex Clearing AG initiated a corresponding consultation (see Eurex Circular **066/21** and Eurex Clearing Circular **060/21**).

After having analyzed the feedback, Eurex Exchange and Eurex Clearing AG have decided to make an amendment of the Clearing Conditions and the Contract Specifications and to implement the methodology and operational steps as proposed in the above-mentioned Eurex Circular and Eurex Clearing Circular.

Eurex Clearing will apply a conversion methodology designed to mitigate the valuation impact due to this change in Contract Specifications for all open

positions held as at the opening of the implementation date and based on calculations performed as at the close on the immediately preceding trading day.

This Eurex Clearing Circular lays out the details of the transition to the extent they relate to Eurex Clearing.

The amendments to the Clearing Conditions will come into effect as of **18 October 2021**.

Learn more about this project on our dedicated initiative page under the following link: Support > Initiatives & Releases > Project Readiness > **EURO STOXX50 Index Total Return Futures – Transition to €STR flat**

## 2. Required action

Clearing Members are requested to pay close attention to the attachments to this circular and prepare for the transition to €STR flat which might have an impact on Clearing Members' internal processes, trading and open positions. Therefore, it might be necessary for Clearing Members to update their internal processes and technical interfaces to adapt for these changes.

Please check whether you have subscribed to our Eurex Clearing circulars and Newsflashes on the subscription website under the following link to remain updated, as any communication will only be distributed via circulars and Newsflashes:

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## 3. Details of the initiative

### A. Background information

In September 2018, the ECB working group on euro risk-free rates recommended to replace EONIA by €STR as the new euro risk-free rate. This was determined as 0.085 percent (8.5 basis points) prior to the implementation of the amended calculation method for EONIA as at 2 October 2019. The ECB working group on euro risk-free rates also recommended that trading participants gradually replace EONIA with €STR for all products and contracts, establishing €STR as the standard reference rate.

In a first step and in line with ECB's working group recommendation, Eurex Exchange amended the Contract Specification of the EURO STOXX 50® Index Total Return Futures (TESX) on the transition date on 2 October 2019, such that the referenced funding rate became €STR plus the ECB provided Spread to EONIA (i.e. Funding Rate (%) = €STR(%) + 0.085%). More details are available in Eurex Circular 087/19. This amendment had no impact on the valuation of outstanding contracts.

Now, in a second step of the transition from EONIA to €STR, Eurex Exchange amends the Contract Specifications applicable to the EURO STOXX 50® Index Total Return Futures to rebase the reference funding rate as €STR flat, i.e. by removing the ECB fixed spread referencing EONIA (see Attachment 1a). The amendment of the Contract Specification shall be accompanied by a conversion approach, such that holders of open positions in these contracts as at the implementation date are not economically impacted by the contractual change to the funding rate.

The amendment to the Contract Specifications of Eurex Exchange and accompanying changes to the Clearing Conditions of Eurex Clearing AG, the determination of the conversion levels, their application to open positions, and the determination of required inputs are all detailed in the attachments to this circular.

## **B. Implementation**

EURO STOXX 50® Index Total Return Futures (TESX) were introduced at Eurex Exchanges as at 2 December 2016 and were amended in 2019 to update the reference funding rate to €STR+8.5 basis points. The Funding Rate is used on each trading day to calculate the Accrued Funding used in the determination of both traded prices and settlement prices in index points for each expiration on that day. Adjustment of the Funding Rate impacts both traded and settlement prices from the implementation date.

Adjustment to the settlement prices will impact the valuation of all open positions held at Eurex Clearing which resulted from trading activity on the premise of the Contract Specifications and Funding Rate, applicable prior to and including the Calculation Date (15 October 2021). Eurex Clearing therefore will apply a conversion methodology to holders of open positions, as at the date of implementation (18 October 2021) of the Funding Rate change, to mitigate the valuation impact of such an amendment (see Attachments 2-4).

To implement these changes at Eurex Clearing, the following provisions will be amended as outlined in Attachment 1b:

- ◆ Chapter II Part 2 Number 2.22 of the Clearing Conditions

## **C. Publication of amendments to the Clearing Conditions**

As of the implementation date, the full version of the amended Clearing Conditions will be available for download on the Eurex Clearing website [www.eurex.com/ec-en/](http://www.eurex.com/ec-en/) under the following link:

**[Rules & Regs > Rules and Regulations > Clearing Conditions](#)**

Unless the context requires otherwise, terms used and not otherwise defined

in this circular shall have the meaning ascribed to them in the Clearing Conditions or FCM Clearing Conditions of Eurex Clearing AG, as applicable.

### Attachments:

- ◆ Attachment 1a – Changes to the Contract Specifications
- ◆ Attachment 1b – Changes to the Clearing Conditions
- ◆ Attachment 2 – Determination of EURO STOXX 50® Index (SX5E) Forward Points
- ◆ Attachment 3 – Conversion Methodology
- ◆ Attachment 4 – Price Correction Service

### Further information

Recipients:	All Clearing Members, Basic Clearing Members, Disclosed Direct Clients of Eurex Clearing AG and vendors
<hr/>	
Target groups:	Front Office/Trading, Middle + Backoffice, IT/System Administration, Auditing/Security Coordination
<hr/>	
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Related Circulars:	Eurex Clearing Circular <b>060/21</b> , Eurex Circulars <b>087/19</b> , <b>066/21</b>
<hr/>	
Web:	Support > Initiatives & Releases > Project Readiness > <b>EURO STOXX50 Index Total Return Futures – Transition to €STR flat</b>
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Authorized by:	Dmitrij Senko

## Further information

- Attachment 1a to Eurex Clearing Circular 083/21
- Attachment 1b to Eurex Clearing Circular 083/21
- Attachment 2 to Eurex Clearing Circular 083/21

[→ Attachment 3 to Eurex Clearing Circular 083/21](#)

[→ Attachment 4 to Eurex Clearing Circular 083/21](#)

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AMENDMENTS ARE MARKED AS FOLLOWS:

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DELETIONS ARE CROSSED OUT

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## Part 1 Contract Specifications for Futures Contracts

[...]

### Subpart 1.22 Contract Specifications for Index Total Return Futures Contracts

[...]

#### 1.22.6. Trading Conventions

[...]

##### 1.22.6.3 Funding Rate

The Funding Rate applicable to Index Total Return Futures Contracts represents the benchmark overnight funding rate over which the TRF Spread quoted and traded is applicable ("Funding Rate"):

- For Index Total Return Futures Contracts on EURO STOXX 50<sup>®</sup> (SX5E) the Funding Rate is euro short-term rate (€STR) as published by the European Central Bank (ECB) (as a percentage), and in respect of any day until (and excluding) the €STR Transition Effective Date, plus the calculated spread between €STR and Eonia<sup>®</sup> (as a percentage) provided by European Central Bank (ECB) is added to €STR and forms part of the respective Funding Rate
- For Index Total Return Futures Contracts on EURO STOXX<sup>®</sup> Banks (SX7E) and EURO STOXX<sup>®</sup> Select Dividend 30 (SD3E) the Funding Rate is euro short-term rate (€STR) as published by the European Central Bank (ECB) (as a percentage)
- For Index Total Return Futures Contracts on iStoxx Europe Collateral Indices the Funding Rate is euro short-term rate (€STR) as published by the European Central Bank (ECB) (as a percentage)
- For Index Total Return Futures Contracts on FTSE<sup>®</sup> 100 is Sterling Overnight Index Average (SONIA) as published by the Bank of England (as a percentage)

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Contract Specifications for Futures Contracts  
and Options Contracts at Eurex Deutschland

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Eurex14e

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As of 18.10.2021

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“€STR Transition Effective Date” shall be 18.10.2021. To maintain orderly trading conditions, the Management Board of Eurex Deutschland may postpone the date, and any such postponement shall be made public by announcement.

[...]

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Chapter II of the Clearing Conditions of Eurex Clearing AG

# Transactions Concluded at Eurex Deutschland

(Eurex Exchange)

As of 18.10.2021



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AMENDMENTS ARE MARKED AS FOLLOWS:

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[...]

## Part 2 Clearing of Futures Contracts

[...]

### 2.22 Clearing of Index Total Return Futures Contracts

[...]

#### 2.22.4 Margin Requirements

[...]

- (2) The STM Variation Margin for Index Total Return Futures Contracts shall reflect the changes between the daily settlement prices expressed in index points.

In deviation from the first sentence and Part 1 Number 1.2 (5) and to compensate the effects of a switch of the applicable funding rate to the daily settlement price, on the €STR Transition Effective Date (€STR Umstellungs-Effektivdatum) (as defined in the Eurex Contract Specifications), the STM Variation Margin for Index Total Return Futures Contracts on EURO STOXX 50® shall reflect the changes between the Conversion Settlement Price calculated prior start of business on such day and the daily settlement price of such day. For the purposes of this Number 2.22.4, the "Conversion Settlement Price" shall be calculated in accordance with the document 'EURO STOXX 50® Index Total Return Futures: Conversion Methodology - €STR Transition' that was published in accordance with Chapter I Part 1 Number 17.2.

[...]

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## **EURO STOXX 50® Index Total Return Futures – Transition to €STR Flat**

### **Attachment 2 – Determination of EURO STOXX 50® Index (SX5E) forward points for use in the conversion methodology**

Status Final  
Author Eurex | Derivatives Markets Trading | Equity & Index Product Design  
Classification Public

Release Date 2021/09/16

# EUREX

## Table of Content

- 1. Introduction ..... 3**
- 2. Determination of the SX5E Index Forward Curve: ..... 4**
  - 2.1. Spot index and nearest futures expiry ..... 4
  - 2.2. Determination of the subsequent expiry months ..... 4
  - 2.3. Determination of the applicable discount factors ..... 5
  - 2.4. Determination of the Forward Points where CNV-U strategy are not available. .... 6
  - 2.5. Determination of the Forward Points where no OESX expiries are available. .... 6
- 3. Trading Parameters and Specified Trading Window Timings. .... 8**
- 4. Publication of the determined Forward Points..... 9**

# EUREX

## 1. Introduction

On 18<sup>th</sup> October 2021 (“**€STR Transition Effective Date**”), Eurex will implement the actions necessary for the EURO STOXX 50® Index Total Return Futures to be changed to use €STR flat as the funding rate. This will be achieved by removing the reference to the ECB determined Spread used as part of the fallback rate of EONIA.

The associated conversion methodology designed by Eurex Clearing to the holders of open interest on the date of implementation is shown at Attachment 3.

The methodology to be implemented by Eurex Clearing requires as an input the market determined forward curve of the EURO STOXX 50® Index (SX5E) for each expiration of the EURO STOXX 50® Index Total Return Futures (TESX). The forward curve will be determined and calculated by Eurex based on market inputs.

These calculations will be done after the close of trading on the trading day immediately preceding the €STR Transition Effective Date i.e. Friday, 15 October 2021 (“**Calculation Date**”)

This paper outlines the methodology to be used by Eurex to determine the forward points of the EURO STOXX 50® Index (SX5E) in relation to the conversion methodology.

In addition, Eurex will ask market participants to submit prices into the Eurex orderbook in the detailed instruments below at the implementation date to be determined.

Note: the forward points determined will not be used in the regular daily settlement process of the EURO STOXX 50® Index Options which occurs after market close.

## 2. Determination of the SX5E Index Forward Curve:

### 2.1. Spot index and nearest futures expiry

Eurex will use the Official Close of the EURO STOXX 50® Index (SX5E) as determined by Stoxx Ltd as the index level for calculation of forward points.

Eurex will use the nearest quarterly expiry in the Mar/Jun/Sep/Dec cycle of the EURO STOXX 50® Index Futures (FESX) to determine the forward price of that nearest quarterly. This will be based upon the official Eurex Daily Settlement Price – determined at the end of day by Eurex (at 17:30 CET).

Eurex will then calculate the basis between the EURO STOXX 50® Index (SX5E) and the front month EURO STOXX 50® Index Futures (FESX) based on these prices in index points.

For example: For the Jun-21 Expiry Date:

- i. EURO STOXX 50® Index Close is determined by Stoxx Ltd as 4070.56
- ii. EURO STOXX 50® Index Future (FESX) Daily Settlement Price for Jun-21 is determined by Eurex as 4066.0 index points

The basis between the spot index and the Jun-21 expiry for the calculation of the conversion methodology will be:  $4066.0 - 4070.56 = -4.56$  index points

### 2.2. Determination of the subsequent expiry months

Eurex will where possible use the prices in the order book of EURO STOXX 50® Index Options (OESX) for each relevant Expiration Date. Specifically, Eurex will use the prices of the Options Volatility Strategy Conversion + Underlying (CNV-U) for each available expiry matching those of the Total Return Futures (excluding the nearest expiration).

The CNV-U options volatility strategy comprises of two options and one futures leg. Specifically at Eurex this strategy, if bought, is a combination of the purchase of EURO STOXX 50® Index Options (OESX) Calls and simultaneous sale of an equal quantity of OESX Puts at the same strike, combined with the sale of the underlying EURO STOXX 50® Index Future (FESX) at a price equivalent to that of the strike of the call and put options. The underlying will be the nearest expiration of the EURO STOXX 50® Index Future (FESX).

The determined forward basis will be based upon the price of the CNV-U option strategy for each expiration. The price will be determined upon the volume weighted average trade price within a specified trading window, or if no trades occur, then at mid-price of the bid-ask spread taken as a snapshot at a random time within the last 3 minutes of the specified trading window.

The determined forward point of each expiry for which a price can be determined from this methodology will be calculated as:

# EUREX

EURO STOXX 50® Index Future (FESX) Daily Settlement Price above plus the determined forward basis determined from the CNV-U option strategy price for each expiry divided by the discount factor relevant to that expiry.

For example: For the Dec-22 Expiry Date:

- i. EURO STOXX 50® Index Future (FESX) Daily Settlement Price for Jun-21 is determined by Eurex as 4066.0 index points
- ii. EURO STOXX 50® Index Options (OESX) CNV-U Strategy of the 4050 strike for Dec-22 expiry is determined by Eurex as -169.0
- iii. The discount factor (see 2.3 below) is 1.0087

The forward point for the Dec 22 Expiry can now be obtained by applying the following rationale. Relying on the CNV-U strategy being delta insensitive for short periods of time, i.e. between the specified trading window (see 3 below) and the official daily settlement price determination of FESX, along with employing put/call parity, provides the following CNV-U implied forward point:

$$= \frac{-169.0 + (4066.0 - 4050)}{1.0087} + 4050 = 3898.32$$

## 2.3. Determination of the applicable discount factors

Eurex will where possible use the prices in the order book of EURO STOXX 50® Index Options (OESX) for each relevant Expiration Date. Specifically, Eurex will use the prices of the Options Box Spread Strategy (BOX) for each available expiry matching those of the Total Return Futures (excluding the nearest expiration).

The BOX options volatility strategy comprises of four options legs. Specifically at Eurex this strategy, if bought, is a combination of the purchase of OESX Calls and sale of OESX Puts at the same strike, combined with the sale of OESX Calls and purchase of OESX Puts at a higher strike, all simultaneously and in the same quantity.

The determined discount factor will be based upon the price of the BOX option strategy for each expiration, in comparison to the payoff of that strategy determined as the difference between the two chosen strikes. The price of the BOX options spread will be determined upon the volume weighted average trade price, or if no trades occur, then at mid-price of the bid-ask spread, or where neither of these is available Eurex will source broker quotes in those expirations available.

For example: For the Dec-22 Expiry Date:

- i. EURO STOXX 50® Index Options Box Spread Strategy 1000/6000 i.e. where the lower strike is 1000 index points and the higher strike is 6000 index points has a pay-off profile of 5000 index points.
- ii. EURO STOXX 50® Index Options Box Spread Strategy 1000/6000 price is determined by Eurex as 5043.5 index points.

The determined discount factor for Dec-22 expiration is  $= (5043.5 / 5000) = 1.0087$

Where no BOX strategy prices are available – discount factors will be linearly interpolated by Eurex

## 2.4. Determination of the Forward Points where CNV-U strategy are not available.

For all available expiries of EURO STOXX 50® Index Options (OESX) the Daily Settlement Price of the OESX will be used to calculate the Put-Call Parity for each expiry i.e. the theoretical strike price where the Put and Call would have equal value interpolated from the two adjacent Strikes.

The Put-Call parity levels will determine theoretical forward points based the EURO STOXX 50® Index Options (OESX) closing values. This level will then be used in conjunction with those adjacent expiries from which a forward point can be determined using 2. above.

The difference between the determined forward points and the derived Put-Call parity prices will be interpolated to determine the missing forward point.

For Example: For the Mar-23 Expiry Date:

OESX Expiry	Forward Point Determined by OESX CNV-U Strategy	Put-Call Parity Derived from OESX Daily Settlement Prices
Dec-22	3898.45	3909.68
Mar-23	Not available	3894.10
Jun-23	3809.62	3824.16

Forward Point for Mar-23 will be calculated as:

$$= 3898.45 + (3809.62 - 3898.45) * \frac{(3894.10 - 3909.68)}{(3824.16 - 3909.68)} = 3882.27$$

## 2.5. Determination of the Forward Points where no OESX expiries are available.

For expiries of the EURO STOXX 50® Index Total Return Futures (TESX) but where a forward point cannot be determined by 2. or 4. above due to the absence of relevant expiries in the EURO STOXX 50® Index Options (OESX).

The adjacent points calculated from 2. above will be used as the primary source for interpolation of those missing expiries. The interpolation will be based upon the seasonal proportionality of the required expiry in the previously calculated annual period.

For Example: For the Mar-24 Expiry Date:

Expiry	Forward Point Determined by 2.2 – 2.5 above	Expiry	Forward Point Determined by 2.2 – 2.5 above
Dec-22	3898.45	Dec-23	3790.43
Mar-23	3882.27	Mar-24	Not Available
Jun-23	3809.62	Jun-24	3698.79

Forward Point for Mar-24 will be calculated as:

$$= 3790.43 + (3698.79 - 3790.43) * \frac{(3882.27 - 3898.45)}{(3809.62 - 3898.45)} = 3773.74$$



### **3. Trading Parameters and Specified Trading Window Timings.**

On the day to be determined Eurex will populate the T7 Order book with CNV-U strategies for each required expiry in the EURO STOXX 50® Index Options (OESX). There will be one official strategy for each Expiry. The strike price of the Call, the Put and the price of the Underlying Futures will be the same. The Strike price to be used will be determined by Eurex based upon the price of the nearest Expiry in the EURO STOXX 50® Index Futures (FESX).

The specified reference trading window will be for a period between 16:30 and 17:00 CET on the trading day nominated. The market phase will be maintained as continuous throughout the specified trading window (i.e. no auction phase will be initiated) and the outputs will be used for the determination for the conversion methodology only.

#### **4. Publication of the determined Forward Points.**

For expiries of the EURO STOXX 50® Index Total Return Futures (TESX), the forward points, once determined by the above methodology will be published via the Eurex Production Noticeboard.

Additionally, the discount factors used to determine the forward points will also be published for information.



## **EURO STOXX 50® Index Total Return Futures – Transition to €STR Flat Attachment 3 – Conversion Methodology**

Status Final  
Author Eurex Clearing | CCP Risk Management | Models & Analytics  
Classification Public

Release Date 2021/09/16

# EUREX

## Table of Content

- 1. Introduction ..... 3**
- 2. Formal Product Definition ..... 4**
- 3. Derivation of Conversion Methodology ..... 6**
  - 3.1. Assumptions ..... 6
  - 3.2. TRF Conversion Settlement Spread..... 6
  - 3.3. TRF Conversion Settlement Price ..... 7
  - 3.4. Conversion via Technical Trades ..... 7
- 4. References ..... 9**
- A. Appendix ..... 10**
  - A.1. Example Calculation of Conversion Settlement Prices ..... 10

## 1. Introduction

In September 2018, the European Central Bank (ECB) working group on euro risk-free rates recommended to replace the euro overnight index average (*EONIA*) by the euro short-term rate (*€STR*) as the new euro risk-free rate.

It was also determined to recalibrate *EONIA*'s methodology to effectively become *€STR* plus a fixed spread determined by the ECB. On 31 May 2019, ECB determined the one-off spread between *€STR* and *EONIA* as 0.085 % (i.e. 8.5 basis points) with the first *€STR* fixing being published by the ECB on 2 October 2019.

The ECB working group on euro risk-free rates also recommends that trading participants gradually replace *EONIA* with *€STR* for all products and contracts, establishing *€STR* as the standard reference rate.

In a first step and in line with ECB's recommendation, Eurex amended the Contract Specification of the EURO STOXX 50® Index Total Return Futures (TESX) on the transition on 2 October 2019, such that the referenced funding rate became *€STR* plus the ECB provided spread of 8.5 *bp*, see [3].

In a second step, on 18 October 2021, Eurex will amend the Contract Specifications of TESX once more to rebase the reference funding rate on *€STR* flat, i.e. removing ECB's legacy transitioning spread of 8.5 *bp* going forward. The amendment of Contract Specification shall go along with a conversion approach, such that holders of open positions in TESX contracts are not economically impacted by the contractual change of the reference funding rate from  $€STR + 8.5 \text{ bp}$  to *€STR* flat.

The purpose of this paper is to describe the methodology of the conversion approach with respect to TESX contracts having Open Interest, i.e. open positions.

For detailed product information regarding the EURO STOXX 50® Index Total Return Futures (TESX), please refer to the Eurex website and the references therein, i.e. [1] and [2].

A formal interpretation of the product definition is presented in chapter 2 providing the necessary toolset employed in chapter 3 presenting the derivation of the conversion approach. An example calculation is provided as part of the appendix.

## 2. Formal Product Definition

This chapter provides a brief formal introduction of the Total Return Futures (TRF) as required for the derivation of the conversion methodology in chapter 3. Since focus will be put on the dependency of the TRF on the funding rate, the latter is explicitly stated as an input parameter to foster transparency. As by the TRF product specification (cf. [2]), the daily settlement price in clearing notation in  $t$  is given by

$$TRF_t(T, L) := S_t + Accrual_t(L) + Basis_t(T, L)$$

with past accrued dividend- less funding income

$$Accrual_t(L) := \sum_{\tau \in \{\dots, t\}} \left( \underbrace{Div_{t,k} 1_{\{\tau_k^{ex} = \tau\}}}_{\text{distributions}} - \underbrace{S_{\tau-1} L(\tau-1, \tau) \Delta_{SSP}(\tau-1, \tau)}_{\text{funding}} \right),$$

TRF basis

$$Basis_t(T, L) := S_t Y_t(T, L) \Delta_{SSP}(t, T),$$

day count fraction  $\Delta_n(\cdot, \cdot)$  adjusted for  $n$ -day settlement period defined by

$$\Delta_n(t_0, t_1) := \frac{day(t_1, n, Cal) - day(t_0, n, Cal)}{DCB},$$

indicator function

$$1_{\{\text{boolean expression}\}} := \begin{cases} 1, & \text{if boolean expression} = \text{TRUE} \\ 0, & \text{else} \end{cases}$$

and

$day(t, n, Cal)$	Returns the day, $n$ -business days after $t$ according to calendar $Cal$ , the latter set to the calendar as specified in the product specification, i.e. <i>TARGET2</i>
$DCB$	Day Count Basis, i.e. 360
$Div_{t,k}$	Dividend payment of the $k$ -th dividend ( $k$ is employed to link the respective dividend amount with the relevant dates, i.e. cum-/ex-, record- and payment date) in $t$ according to the product specification
$L(t, t+1)$	(Forward) funding rate according to the product specification fixed in $t$ and applicable to the period $t$ to $t+1$
$SSP$	Standard settlement period of the respective asset $S$ , i.e. $SSP = 2$ business days
$S_t > 0$	Closing price of the underlying index
$\tau_k^{ex}$	Respective ex-date of the $k$ -th dividend
$T$	Maturity date of the respective series of the product
$Y_t(T, L)$	So-called TRF spread in $t$ with respect to TRF maturity date $T$ and (forward) funding rate $L$

The TRF spread  $Y_t(\cdot, \cdot)$  can inversely be inferred from the TRF basis by

$$Y_t(T, L) = \begin{cases} \frac{Basis_t(T, L)}{S_t \Delta_{SSP}(t, T)}, & \text{if } t < T \wedge S_t \neq 0 \\ 0, & \text{else} \end{cases}.$$

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The TRF trading notation corresponds to  $Y_t(\cdot, \cdot)$ <sup>1</sup>, the TRF clearing notation corresponds to  $TRF_t(\cdot, \cdot)$  and constitutes the basis for subsequent variation margins.

The clearing notation can also be expressed in terms of the TRF spread by

$$TRF_t(T, Y_t(T, L)) = Accrual_t + S_t(1 + Y_t(T, L)\Delta_{SSP}(t, T)).$$

The final settlement price of the TRF is determined as

$$TRF_T(T, L) = S_T + Accrual_T(L),$$

exhibiting a vanishing TRF basis as time approaches expiry. With the day count fraction becoming zero on expiry, the notion of the TRF spread also vanishes.

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<sup>1</sup> For notational simplicity, the conversion into basis points is omitted here. The actual figure traded in the orderbook is the basis point representation of  $Y_t(\cdot, \cdot)$ .

### 3. Derivation of Conversion Methodology

The derivation of the conversion adjustment adopts the general approach of considering the spread of 8.5 *bp* flat along the forward term structure.

For the derivation of the conversion methodology a clear differentiation between historic and forward funding on one hand and between two different forward funding regimes on the other hand is necessary, therefore the following notation is introduced:

Any contractual historical funding is referred to by  $H(\cdot, \cdot)$  and given by

$$H(\tau - 1, \tau) := L(\tau - 1, \tau) \text{ for } \tau \leq t.$$

Any contractual forward funding, i.e. the part of the funding that is still to be realized, is referred to by  $G(\cdot, \cdot)$  and given by

$$G(\tau - 1, \tau) := L(\tau - 1, \tau) \text{ for } \tau > t.$$

To further clearly differentiate between the two different forward funding regimes,  $G^+$  is introduced for  $\text{€STR} + 8.5 \text{ bp}$  and  $G$  for  $\text{€STR}$  flat. This yields the following relation  $G^+ = G + 8.5 \text{ bp}$ , which will be employed throughout this section.

As is apparent from the revised notation, the historically accrued component  $Accrual_t(H)$  of distributions less funding is not affected by the switch in (forward) funding from  $G^+$  to  $G$  and will remain unchanged.

Thus, the overall goal of this section is to derive the difference between the switch induced change in TRF spread from  $Y_t(T, G^+)$  to  $Y_t(T, G)$ , respectively the change in clearing notation from  $TRF_t(T, Y_t(T, G^+))$  to  $TRF_t(T, Y_t(T, G))$ . In order to adhere to trading conventions, results will be derived based on the TRF spread, rounded to multiples of 0.5 *bp*.

#### 3.1. Assumptions

The following assumptions are made to support the subsequent derivation of the conversion methodology:

- 1) The switch of TESX inherent (forward) funding from  $G^+$  to  $G$ , i.e. from  $\text{€STR} + 8.5 \text{ pb}$  to  $\text{€STR}$  flat, has no impact on the valuation of unrelated derivatives having EURO STOXX 50® Index (SX5E) as underlying such as options and/or forwards/futures. This is meaningful, since their valuation does not rely on any explicit funding assumption but is rather determined as the market's equilibrium funding expressed via market prices.

This assumption implies that there is also no change in the genuine market implied funding/lending/repo rate nor dividend expectations regarding unrelated derivatives having SX5E as underlying.

- 2) Based on a forward term structure of SX5E with tenor points aligned to TESX expiries, as provided by Eurex and described in [4], linear interpolation is suitable to obtain any missing tenor points. The provided forward term structure is referenced by  $fwd_t(T_i)$  and likewise denoted as  $fwd_t(\tau)$  for any  $\tau \geq t$ .

This assumption implies a viable evaluation of the conversion spread based on public data and without having to rely on model assumptions regarding valuation and/or valuation data.

#### 3.2. TRF Conversion Settlement Spread

Evaluating the TRF in  $t$  by taking today's expectation of the final payoff in  $T$  provides

$$\begin{aligned} TRF_t(T, G^+) &= E_t[TRF_T(T, G^+)] \\ &= E_t[S_T + Accrual_T]. \end{aligned}$$



By comparison with the product definition this yields the following view on the TRF basis

$$\begin{aligned} Basis_t(T, G^+) &= E_t[S_T + Accrual_T] - (S_t + Accrual_t) \\ &= \underbrace{E_t[S_T] - S_t + E_t \left[ \sum_{\tau \in (t, T]} Div_{t, k} 1_{\{\tau_k^{ex} = \tau\}} \right]}_{c:=} - \underbrace{E_t \left[ \sum_{\tau \in (t, T]} S_{\tau-1} G^+(\tau - 1, \tau) \Delta_{SSP}(\tau - 1, \tau) \right]}_{\text{future expected TRF funding}}. \end{aligned}$$

As by assumption 1), the first element is not impacted by the switch in funding – contrary to the second element. By definition and for the non-trivial case, the TRF basis translates into the TRF spread as

$$Y_t(T, G^+) = \frac{Basis_t(T, G^+)}{S_t \Delta_{SSP}(t, T)} = \frac{c - E_t \left[ \sum_{\tau \in (t, T)} S_{\tau-1} G^+(\tau - 1, \tau) \Delta_{SSP}(\tau - 1, \tau) \right]}{S_t \Delta_{SSP}(t, T)}.$$

Decomposition of  $G^+$  into  $G + 8.5 \text{ bp}$  along the whole term structure yields

$$Y_t(T, G^+) = \underbrace{\frac{c - E_t \left[ \sum_{\tau \in (t, T)} S_{\tau-1} G(\tau - 1, \tau) \Delta_{SSP}(\tau - 1, \tau) \right]}{S_t \Delta_{SSP}(t, T)}}_{Y_t(T, G)=} - \frac{8.5 \text{ bp} \cdot E_t \left[ \sum_{\tau \in (t, T)} S_{\tau-1} \Delta_{SSP}(\tau - 1, \tau) \right]}{S_t \Delta_{SSP}(t, T)}.$$

The first term can be identified as the genuine Conversion Settlement Spread  $Y_t(T, G)$ . Thus, it remains to obtain a suitable estimation of the second term, or rather the expectation therein, given the remainder is deterministic.

Applying assumption 2) yields

$$E_t \left[ \sum_{\tau \in (t, T)} S_{\tau-1} \Delta_{SSP}(\tau - 1, \tau) \right] = \sum_{\tau \in (t, T)} E_t[S_{\tau-1}] \Delta_{SSP}(\tau - 1, \tau) \cong \sum_{\tau \in (t, T)} fwd_t(\tau - 1) \Delta_{SSP}(\tau - 1, \tau),$$

which allows to obtain a reasonably accurate approximation of the spread, which is still straight forward to calculate, while not having to rely on any modelling assumptions, by

$$Y_t(T, G^+) \cong Y_t(T, G) - \frac{8.5 \text{ bp} \cdot \sum_{\tau \in (t, T)} fwd_t(\tau - 1) \Delta_{SSP}(\tau - 1, \tau)}{S_t \Delta_{SSP}(t, T)}.$$

The approximation of the Conversion Settlement Spread  $Y_t(T, G)$  is simply given by rearranging

$$Y_t(T, G) \cong Y_t(T, G^+) + \frac{8.5 \text{ bp} \cdot \sum_{\tau \in (t, T)} fwd_t(\tau - 1) \Delta_{SSP}(\tau - 1, \tau)}{S_t \Delta_{SSP}(t, T)}.$$

Note, the TRF Conversion Settlement Spread  $Y_t(T, G)$  is higher than the TRF daily settlement spread  $Y_t(T, G^+)$  observed before the switch in funding. This is an economically meaningful result, since the future funding cost expressed via the spread decrease ceteris paribus.

### 3.3. TRF Conversion Settlement Price

The TRF Conversion Settlement Price is simply given by the conversion of the TRF Conversion Settlement Spread into clearing notation, i.e. by  $TRF_t(T, Y_t(T, G))$ .

Since the TRF price is linear in the TRF spread, an increase in the TRF conversion spread directly implies and increase in the TRF conversion price ceteris paribus. This is an immediate consequence of the change in TRF Spread and noting that the conversion from TRF spread into TRF basis is nothing but a conversion from a rate into a monetary figure.

### 3.4. Conversion via Technical Trades

Any holder of an open position in a TESX contract shall be compensated for the amendment of the Contract Specifications, i.e. the switch in (forward) funding. Since the latter results in elevated TRF prices from a valuation point of view, as derived in 3.2 and 3.3, Eurex Clearing will process technical trades that re-establish open positions at compensation settlement prices. Thereby reference prices for determining variation margins on the next trading day are adjusted to effectively compensate for the funding switch. A summary of the operational process is given below.

At the end of day  $t$ , 15 October 2021, Eurex Clearing will:

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- 1) Calculate the Daily Settlement Price  $TRF_t(T_i, Y_t(T_i, G^+))$  for all expiries  $T_i$  and determine all margins payments as usual.
- 2) Calculate the Conversion Settlement Price  $TRF_t(T_i, Y_t(T_i, G))$  for each expiry  $T_i$ , based upon the derivations above, employing the Conversion Settlement Spread  $Y_t(T_i, G)$ , rounded to multiples of 0.5 basis points and otherwise unchanged values of Index Close  $S_t$ , Accrued Distributions and Accrued Funding  $Accrual_t(H)$  as employed for the calculation of the Daily Settlement Price in 1).
- 3) Re-establish all open positions via dedicated technical trades, prior to the start of trading on the next trading day (18 October 2021). More specifically all open positions are closed-out at previous day's Daily Settlement Prices  $TRF_t(T_i, Y_t(T_i, G^+))$  and re-opened at Conversion Settlement Prices  $TRF_t(T_i, Y_t(T_i, G))$ , ceteris paribus.

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## 4. References

- [1] [Eurex Website – Total Return Futures \(TRF\)](#)<sup>2</sup>
- [2] [Contract Specifications for Futures Contracts and Options Contracts at Eurex Deutschland](#)<sup>3</sup>
- [3] [Eurex Circular 087/19: EURO STOXX 50® Total Return Futures and EURO STOXX 50® Index Variance Futures: Amendments related to the introduction of the euro short-term rate \(€STR\)](#)<sup>4</sup>
- [4] Eurex, “EURO STOXX 50® Index Total Return Futures – Transition to €STR Flat. Attachment 2 – Determination of EURO STOXX 50® Index (SX5E) forward points for use in the conversion methodology”, 2021.

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<sup>2</sup> [www.eurex.com/ex-en/markets/idx/trf](http://www.eurex.com/ex-en/markets/idx/trf)

<sup>3</sup> [www.eurex.com/ex-en/rules-regs/eurex-rules-regulations/Contract-Specifications-53644](http://www.eurex.com/ex-en/rules-regs/eurex-rules-regulations/Contract-Specifications-53644)

<sup>4</sup> [www.eurex.com/ex-en/find/circulars/circular-1612326](http://www.eurex.com/ex-en/find/circulars/circular-1612326)

## A. Appendix

### A.1. Example Calculation of Conversion Settlement Prices

Assuming the conversion approach would have been applied on sample date of 2020/09/18, the following Conversion Settlement Prices would have been obtained.

The following data fed into daily settlement prices of TESX on the sample date. Values are rounded (if applicable) for ease of depiction.

Past Distributions	$Accrual_t(H)$	490.96
Index Close	$S_t$	3283.69

Contract	Expiry Date $T_i$	Daily Settlement Figures	
		Spread $Y_t(T_i, G^+)$	Price $TRF_t(T_i, Y_t(T_i, G^+))$
TESX DEC20	2020-12-18	-6.5	3774.11
TESX MAR21	2021-03-19	-0.5	3774.57
TESX JUN21	2021-06-18	25.0	3780.88
TESX SEP21	2021-09-17	21.0	3781.63
TESX DEC21	2021-12-17	23.0	3784.20
TESX MAR22	2022-03-18	26.5	3787.85
TESX JUN22	2022-06-17	34.5	3794.70
TESX SEP22	2022-09-16	32.5	3796.23
TESX DEC22	2022-12-16	35.0	3800.80
TESX MAR23	2023-03-17	41.0	3808.68
TESX JUN23	2023-06-16	46.0	3816.65
TESX SEP23	2023-09-15	47.0	3821.47
TESX DEC23	2023-12-15	46.0	3824.29
TESX MAR24	2024-03-15	50.0	3832.76
TESX JUN24	2024-06-21	54.0	3842.23
TESX SEP24	2024-09-20	51.0	3842.71
TESX DEC24	2024-12-20	55.0	3852.61
TESX MAR25	2025-03-21	60.0	3864.68
TESX JUN25	2025-06-20	59.0	3868.08
TESX SEP25	2025-09-19	61.0	3876.31
TESX DEC25	2025-12-19	63.0	3884.87
TESX DEC26	2026-12-18	70.0	3920.36
TESX DEC27	2027-12-17	79.5	3966.53
TESX DEC28	2028-12-15	83.5	4003.90
TESX DEC29	2029-12-21	90.5	4053.91

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The following implied index forwards were obtained for SX5E<sup>5</sup>.

Contract	Expiry Date $T_i$	Implied Index Forward $ fwd_t(T_i)$
SEP20	2020-09-18	3283.69
OCT20	2020-10-16	3287.23
NOV20	2020-11-20	3283.20
DEC20	2020-12-18	3280.00
JAN21	2021-01-15	3275.77
FEB21	2021-02-19	3269.36
MAR21	2021-03-19	3266.58
JUN21	2021-06-18	3215.75
SEP21	2021-09-17	3202.00
DEC21	2021-12-17	3188.78
MAR22	2022-03-18	3177.12
JUN22	2022-06-17	3124.19
SEP22	2022-09-16	3112.92
DEC22	2022-12-16	3097.77
JUN23	2023-06-16	3032.22
DEC23	2023-12-15	3011.93
DEC24	2024-12-20	2937.22
DEC25	2025-12-19	2868.04
DEC26	2026-12-18	2800.06
DEC27	2027-12-17	2735.21
DEC28	2028-12-15	2671.48
DEC29	2029-12-21	2610.74

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<sup>5</sup> The derivation of the forward curve was simplified for the example stated here by a straightforward put/call-parity regression on the basis of daily OESX settlement prices.

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Combining the results from above along with a suitable calendar, allows the computation of Conversion Settlement Spreads as well as Conversion Settlement Prices.

Contract	Expiry Date $T_i$	Conversion Settlement Figures	
		Spread $Y_t(T_i, G)$	Price $TRF_t(T_i, Y_t(T_i, G))$
TESX DEC20	2020-12-18	2.0	3774.82
TESX MAR21	2021-03-19	8.0	3775.98
TESX JUN21	2021-06-18	33.5	3782.99
TESX SEP21	2021-09-17	29.5	3784.45
TESX DEC21	2021-12-17	31.5	3787.73
TESX MAR22	2022-03-18	35.0	3792.08
TESX JUN22	2022-06-17	43.0	3799.64
TESX SEP22	2022-09-16	41.0	3801.88
TESX DEC22	2022-12-16	43.5	3807.15
TESX MAR23	2023-03-17	49.0	3815.33
TESX JUN23	2023-06-16	54.0	3823.96
TESX SEP23	2023-09-15	55.0	3829.44
TESX DEC23	2023-12-15	54.0	3832.92
TESX MAR24	2024-03-15	58.0	3842.05
TESX JUN24	2024-06-21	62.0	3852.24
TESX SEP24	2024-09-20	59.0	3853.39
TESX DEC24	2024-12-20	63.0	3863.95
TESX MAR25	2025-03-21	68.0	3876.68
TESX JUN25	2025-06-20	67.0	3880.75
TESX SEP25	2025-09-19	69.0	3889.64
TESX DEC25	2025-12-19	71.0	3898.87
TESX DEC26	2026-12-18	78.0	3937.01
TESX DEC27	2027-12-17	87.5	3985.84
TESX DEC28	2028-12-15	91.0	4024.50
TESX DEC29	2029-12-21	98.0	4077.06

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Figure 2 and Figure 1 depict the results from above and conclude the example.

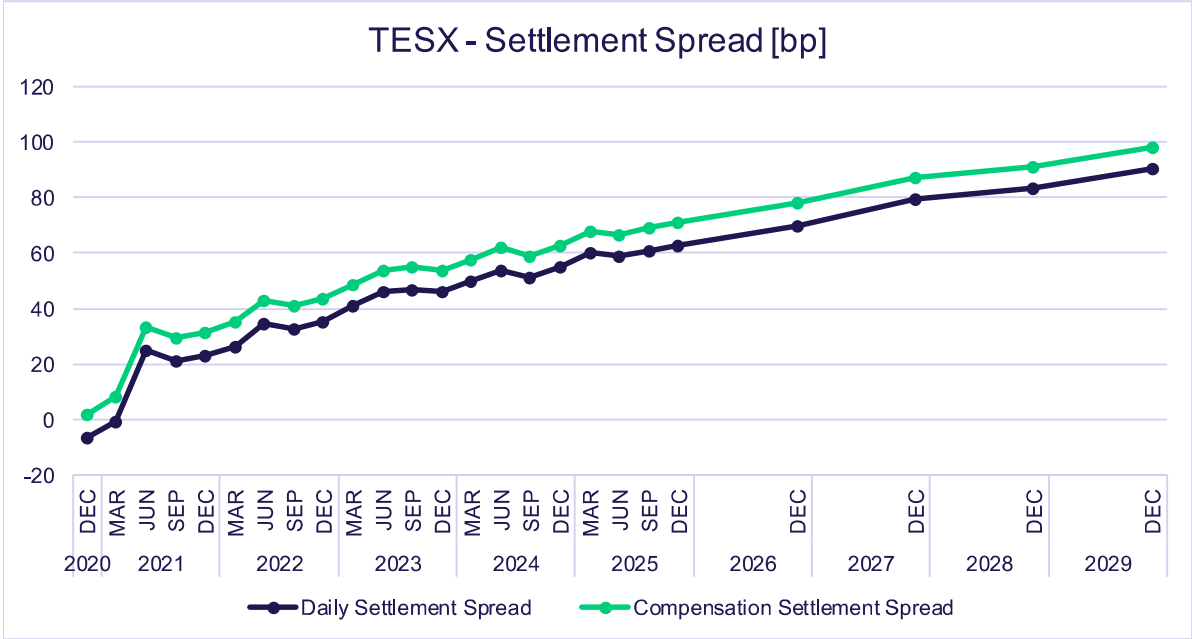


Figure 2 Comparison of Daily- and Conversion Settlement Spread

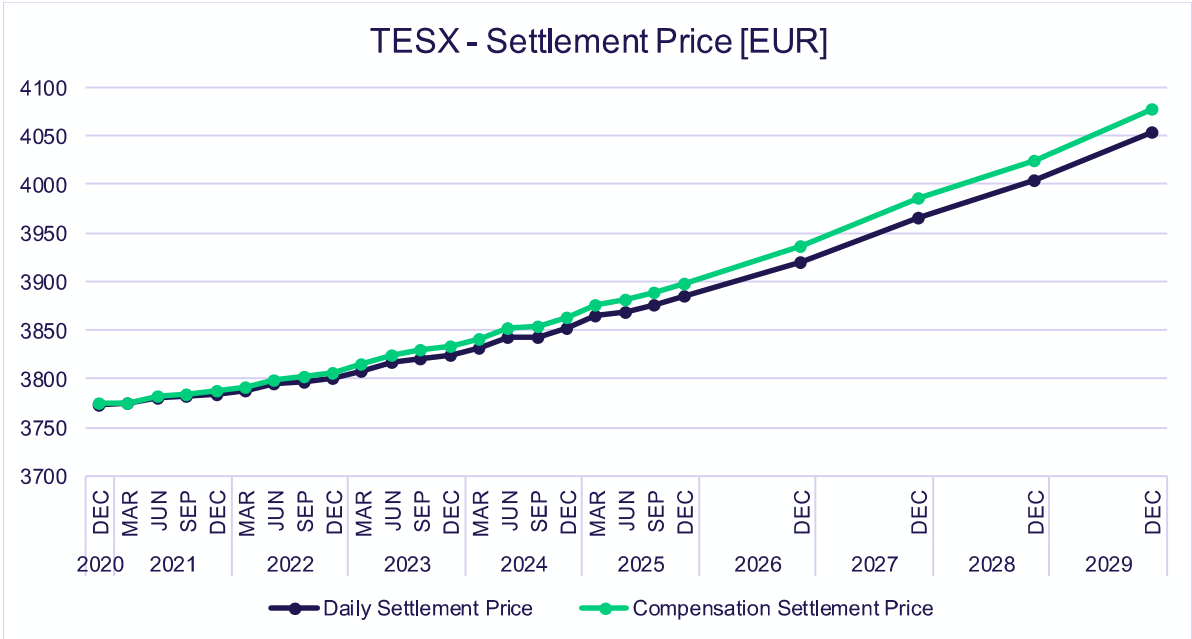


Figure 1 Comparison of Daily- and Conversion Settlement Price



## **EURO STOXX 50® Index Total Return Futures – Transition to €STR Flat**

**Attachment 4 – Conversion Procedure via Eurex Clearing Price Correction Service**

Status Final  
Author Eurex Clearing  
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# EUREX

## Table of Content

- 1. Introduction ..... 3
- 2. Application of the Conversion Methodology using Eurex Clearing’s Price Correction Service to implement Technical Trades ..... 4
- 3. Reporting and Technical Documentation ..... 7

## 1. Introduction

On 18<sup>th</sup> of October 2021, Eurex will implement the changes necessary for the EURO STOXX 50® Index Total Return Futures (TESX) to be amended to use €STR flat as the funding rate by application of the conversion methodology. This will be achieved by using the Eurex Clearing Price Correction Service.

The intention is that holders of open positions in a TESX contract have their open positions re-established at the calculated Conversion Adjusted Settlement Prices. A description of the operational process is given below.

## 2. Application of the Conversion Methodology using Eurex Clearing's Price Correction Service

The method envisaged to be used for the conversion procedure will be based on Technical Trades entered by Eurex Clearing in C7 clearing system via **Price Correction Service**.

Eurex will determine and publish on the trading day immediately preceding the changes i.e. Friday, 15 October 2021 ("**Calculation Date**") the Daily Settlement (Clearing) Price and Conversion Adjusted Settlement Price for each expiry.

On Monday, 18 October 2021 ("**€STR Transition Effective Date**"), the following shall apply **prior to the start of trading** in Eurex T7 trading system:

- The Start Of Day open positions held in C7 clearing system will be booked out at the previous Daily Settlement Price and will subsequently be booked back in prior to the market opening at the Conversion Adjusted Settlement Price, by means of technical trades at position account level.
- In case of position accounts held on gross (Long and Short), the technical trades will be performed for each side accordingly.
- The variation margin value (VM) will be calculated based on the difference between the Conversion Adjusted Settlement Price and the Daily Settlement Price determined on the Effective Date. More details on the specific calculation of the VM corresponding to the technical trades in the C7 clearing system are presented in the numerical illustration described below in this document.

As a result of the above, on the €STR Transition Effective Date and going forward, the **Funding Rate** used to determine Daily & Accrued Funding, will be **€STR flat**.

To be noted that in cases where the members will trigger on / after the €STR Transition Effective Date any Give-up of trades executed on / before the Calculation Date, the adjusted VM which is calculated on Monday, 18 October 2021 will be not be transferred together or additionally with the Give-up. Therefore, the cash amount which is calculated by C7 on the effective date based on the technical transactions will remain at the Give-up Member. The respective members (i.e. Give-up and Take-up member) would need to handle such situation bilaterally.

The same applies in cases of position transfers which will be processed against the previous day settlement price whereby the respective members would need to handle such situations bilaterally. In such cases, a possible approach could be for the members to use the existing "Position Transfer with Cash" functionality available to move cash between the members in either direction.

## 2.1 Example: TESX Dec-22 Expiry

		€STR Transition Effective Date			
<b>Date</b>	<b>Friday, 15 October 2021</b>	<b>Monday, 18 October 2021</b>			
<b>Funding Rate</b>	€STR + 8.5 bps	€STR flat			
<b>T7 Trading System Phase</b>	Close	Pre-Opening		Close	
<b>Status</b>	Position	Technical Trade Book Out	Technical Trade Book In	Position	
<b>Contracts</b>	1 Long	-1	+1	1 Long	
<b>Multiplier</b>	EUR 10	EUR 10	EUR 10	EUR 10	
<b>Daily Settlement TRF Spread (basis points)</b>	32.0			40.5	
<b>Daily Settlement (Clearing) Price (index points)</b>	4,068.53	4,068.53		4,068.19	
<b>Conversion Adjusted Spread (basis points)</b>	40.0				
<b>Conversion Adjusted Settlement Price (index points)</b>	4,074.29		4,074.29		
<b>Technical Trades Price in C7 (index points)</b>		<b>Sell-to-Close at 4,068.53</b> (Book Out Trade at previous day's settlement price)	<b>Buy-to-Open at 4,074.29</b> (Book In Trade at conversion adjusted settlement price)		
<b>Variation Margin Impact in C7</b>		<b>Book Out Trade:</b> VM = -1 contract * (EOD settlement price - Book Out Price) * EUR 10 VM = -1 contract * (4,083.19 - 4,068.53) * 10 = - EUR 146.60	<b>Book In Trade:</b> VM = +1 contract * (EOD settlement price - Book In Price) * EUR 10 VM = +1 contract * (4,083.19 - 4,074.29) * 10 = + EUR 89.00	<b>Long Position:</b> VM = +1 contract * (EOD settlement price - Prior day settlement price) * EUR 10 VM = +1 contract * (4,083.19 - 4,068.53) * 10 = + EUR 146.60	
		<b>Total Variation Margin Applied</b>		<b>- 146.60 + 89.00 + 146.60 = + EUR 89.00</b>	

Thereby, the Variation Margin (VM) calculations on the €STR Transition Effective Date will in effect reference the Conversion Adjusted Settlement Price instead of previous day's Daily Settlement Price. In the example above, the implementation of the switch in funding to €STR flat is done via the increase in TRF spread while ensuring neutrality at the same time (i.e. increase to 40 bps which is 8 bps higher than unadjusted settlement spread of 32 bps).

## 2.2 Example of impact on C7 clearing reports

In the table below we illustrate the main information from the CB012 Report (“Account Statement”) corresponding to the numerical example from section 2.1:

Report Effective Date	Clearing Member ID	Exchange Member ID	Account Name	Currency Code	Tick Size	Tick Value	Last Settlement Price	Current Settlement Price	Trading Unit	Total Long Position per contract	Total Short Position per contract	Position ID	Transaction Adjustment Date CET	Transaction Time CET	Buy/Sell	Open/Close Flag	Change in Long Quantity	Change in Short Quantity	Net Quantity	Transaction Price	Premium / Variance Balance	Transaction Type
	membId	exchId	accountName	currCode	ticSiz	ticVal	lastSettlePrice	currSettlePrice	tradingUnit	totalLongPos	totalShortPos	positionId	trnAdjDateCet	trnTimeCet	buySell	openCloseFlag	chngLongQty	chngShortQty	netQty	trnPrice	prmVmrAmt	trnType
15.03.2021	ABCFR	ABCFR	A1	EUR	0.01	0.1	4,068.53	4,083.19	1	1	0	2FC314					1	0	1		146.60	OPN
15.03.2021	ABCFR	ABCFR	A1	EUR	0.01	0.1	4,068.53	4,083.19	1	1	0	2FC314	15.03.2021	7:45:00 AM	B	O	1	0	1	4,074.29	89.00	131
15.03.2021	ABCFR	ABCFR	A1	EUR	0.01	0.1	4,068.53	4,083.19	1	1	0	2FC314	15.03.2021	7:45:00 AM	S	C	-1	0	-1	4,068.53	-146.60	131
15.03.2021	ABCFR	ABCFR	A1	EUR	0.01	0.1	4,068.53	4,083.19	1	1	0	2FC314					1	0	0			END

- The daily P/L (Variation Margin) impact is displayed in the column “Premium/Variation Balance”
  - On the Calculation Date (Friday, 15 October 2021) the member had a **long open position** of one contract
  - Variation Margin (VM) calculated by C7 clearing system is performed for each individual transaction and position as follows:
    - **Technical Trade “Book-Out” (Sell-to-Close)**  
 $VM = (\text{Current Settlement Price} - \text{“Book-Out” Transaction Price}) * (\text{Trading Unit}) * (\text{Tick Value} / \text{Tick Size}) * (\text{Net Quantity}) = (4,083.19 - 4,068.53) * 1 * (0.1 / 0.01) * (-1) = - 146.60$
    - **Technical Trade “Book-In” (Buy-to-Open)**  
 $VM = (\text{Current Settlement Price} - \text{“Book-In” Transaction Price}) * (\text{Trading Unit}) * (\text{Tick Value} / \text{Tick Size}) * (\text{Net Quantity}) = (4,083.19 - 4,074.29) * 1 * (0.1 / 0.01) * (1) = + 89.00$
    - **EOD Long Open Position**  
 $VM = (\text{Current Settlement Price} - \text{Last Settlement Price}) * (\text{Trading Unit}) * (\text{Tick Value} / \text{Tick Size}) * (\text{Net Quantity}) = (4,083.19 - 4,068.53) * 1 * (0.1 / 0.01) * (1) = + 146.60$
- ⇒ **TOTAL Variation Margin (Monday, 18 October 2021) = - 146.60 + 89.00 + 146.60 = + EUR 89.00** (same amount as in the first table presented above)

### 3. Reporting and Technical Documentation

The technical trades recorded in Eurex Clearing C7 system due to the conversion procedure will be reflected from a technical and reporting perspective as follows:

- C7 GUI will display the technical transactions with the following identifiers:
  - **“Orig Trade Type”** field value of **“D = Technical Transaction”**
  - **“Tran Type”** field value of **“131 = Technical Transaction”**
  - **“Tran Type Description”** field value of **“PRICE\_CORRECTION”**
  - **“Orig Trade Type”** field value of **“TECHNICAL”**
  - **“O/C”** field value of **“O”** for Book In Trade and **“C”** for Book Out Trade
- The **CB012** (“Account Statement”) report will reflect the technical trades with the following attributes:
  - **“trdTyp”** trade field value of **“D = Technical Transaction”**
  - **“trnTyp”** transaction type value of **“131 = Price Correction”**
- FIXML identifiers corresponding to the technical trades are:
  - **“TrdType”** (tag 828) with value **“63 = Technical Transaction”**
  - **“TransferReason”** (tag 830) with value of **“131 = Technical Transaction”**
- C7 technical documentation available on the Eurex website:
  - Description of the CB012 report is available in the **“Eurex Clearing XML Reports – Reference Manual”**.
  - Description of the relevant fields and identifiers is available **“Volume 3: Transaction & Position Confirmation”** of the Eurex Clearing C7 Interface Specification.
  - FIXML message samples for technical trades are available in the **“Volume 6: Message Samples”** of the Eurex Clearing C7 Interface Specification.