THE FOUNDATION FOR SECURE MARKETS

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January 22, 2021

VIA ELECTRONIC MAIL
Christopher J. Kirkpatrick
Office of the Secretariat
Commodity Futures Trading Commission
Three Lafayette Centre
1155 21st Street, N.W.
Washington, DC 20581

Re: Rule Filing SR-OCC-2020-016 Rule Certification

Dear Secretary Kirkpatrick:

Pursuant to Section 5c(c)(1) of the Commodity Exchange Act, as amended ("Act"), and Commodity Futures Trading Commission ("CFTC") Regulation 40.6, enclosed is a copy of the above-referenced rule filing submitted by The Options Clearing Corporation ("OCC"). The date of implementation of the rule is at least 10 business days following receipt of the rule filing by the CFTC or the date the proposed rule is approved by the Securities and Exchange Commission ("SEC") or otherwise becomes effective under the Securities Exchange Act of 1934 (the "Exchange Act"). This rule filing has been submitted to the SEC under the Exchange Act.

OCC has requested confidential treatment for Exhibits 3, 3A, 3B, 3C, 5A, 5B, and 5C to SR-OCC-2020-016 (contained in pages 123 - 725 of SR-OCC-2020-016).

In conformity with the requirements of Regulation 40.6(a)(7), OCC states the following:

Explanation and Analysis

The proposed rule change by OCC concerns the adoption of a new document describing OCC's System for Theoretical Analysis and Numerical Simulation ("STANS"), which OCC uses to calculate daily and intra-day margin requirements for its Clearing Members (such document being the "STANS Methodology Description"). OCC also proposes to make conforming and other non-substantive changes to its Margin Policy.

The proposed STANS Methodology Description is submitted without marking in confidential Exhibit 5A to SR-OCC-2020-016 because this document is being submitted in its entirety as new rule text. The proposed changes to OCC's current rule text related to the STANS methodology, known as the Margins Methodology, are contained in confidential Exhibit 5B to SR-OCC-2020-016. Material proposed to be added to the current rule text is marked by underlining and material proposed to be deleted is marked by strikethrough text. The proposed changes to the Margin Policy are contained in confidential Exhibit 5C to SR-OCC-2020-016.[1]

Background

The STANS methodology is OCC's proprietary risk management system for calculating Clearing Member margin requirements.[2] In general, STANS utilizes large-scale Monte Carlo simulations to forecast price and volatility movements in determining a Clearing Member's margin requirement.[3] The STANS margin requirement is calculated at the portfolio level of Clearing Member accounts with positions in marginable securities. The STANS margin requirement consists of an estimate of a 99% expected shortfall ("ES")[4] over a two-day time horizon with additional charges for model risk, stress tests, liquidation costs, and various add-ons. The STANS methodology is used to measure the exposure of portfolios of options, futures, and cash instruments cleared by OCC.[5]

OCC maintains technical documentation that describes in detail how the various quantitative components of STANS were developed and operate, including the various parameters and assumptions contained within those components[6] and the mathematical theories underlying the selection of those quantitative methods ("Model Whitepapers"). The Model Whitepapers are currently synthesized in a single document, the Margins Methodology, describing how STANS operates from end to end. The Margins Methodology includes material aspects of OCC's risk-based margin system but also includes information that would not be considered material aspects of OCC's methodology, such as internal procedural and administrative details, or details that could be reasonably and fairly implied by OCC's existing rules or other information contained in the document.

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1 OCC's By-Laws and Rules can be found on OCC's public website: https://www.theocc.com/Company-Information/Documents-and-Archives/By-Laws-and-Rules.

2 See Securities Exchange Act Release No. 53322 (February 15, 2006), 71 FR 9403 (February 23, 2006) (SR-OCC-2004-20).

3 See OCC Rule 601.

4 The ES component is established as the estimated average of potential losses higher than the value-at-risk ("VaR") threshold. VaR refers to a statistical technique that is used in risk management to measure the potential risk of loss for a given set of assets over a particular time horizon.

5 Pursuant to OCC Rule 601(e)(1), OCC also calculates initial margin requirements for segregated futures accounts on a gross basis using the Standard Portfolio Analysis of Risk Margin Calculation System ("SPAN"). SPAN is separate from STANS and is therefore not described in the STANS Methodology Description.

6 See Securities Exchange Act Release No. 82473 (January 9, 2018), 83 FR 2271 (January 16, 2018) (SR-OCC-2017-011), which describes how OCC periodically reviews the parameters and assumptions used by STANS pursuant to its Model Risk Management Policy and in accordance with 17 CFR 240.17Ad-22(e)(6).

Over time, OCC has filed sections of the Margins Methodology as proposed rule changes with the CFTC and SEC to effect changes to individual components of STANS.[7] Thus, those chapters of the Margins Methodology have become codified as OCC rule text. However, OCC now proposes to adopt a new STANS Methodology Description, which would replace the Margins Methodology document and codify the STANS methodology in its entirety. After adoption of the STANS Methodology Description, OCC would no longer maintain the Margins Methodology, neither as an OCC rule nor as an internal document.

In connection with this proposed rule change, OCC would also retire as rule text any chapters of the Margins Methodology previously filed with the CFTC and/or SEC, as the proposed STANS Methodology Description is intended to cover the material aspects of the STANS methodology. Those chapters of the Margins Methodology that OCC has previously filed[8] would be superseded in their entireties by new corresponding sections in the STANS Methodology Description, as described in further detail herein.

The current text of the Margins Methodology includes various details that would no longer be OCC rule text following the adoption of the proposed STANS Methodology Description. While the details that OCC proposes to remove are described in further detail herein, thematically, they consist of the following:

- Details on OCC's historical modeling practices and potential future enhancements, which do not describe how a model currently functions;
- Details on the exact set of current products applied to each STANS component, which will change from time to time as OCC-cleared products are listed and delisted;
- Various configuration choices made by OCC, such as data sources, model parameters, and model performance monitoring, that are not inherent to model selection or design and that do

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7 See Securities Exchange Act Release No. 74966 (May 14, 2015), 80 FR 29784 (May 22, 2015) (SR-OCC-2015-010); Securities Exchange Act Release No. 76128 (December 28, 2015), 81 FR 135 (January 4, 2016) (SR-OCC-2015-016); Securities Exchange Act Release No. 79818 (January 18, 2017), 82 FR 8455 (January 25, 2017) (SR-OCC-2017-001); Securities Exchange Act Release No. 82161 (November 28, 2017), 82 FR 57306 (December 4, 2017) (SR-OCC-2017-022); Securities Exchange Act Release No. 84524 (November 2, 2018), 83 FR 55918 (November 8, 2018) (SR-OCC-2018-014); Securities Exchange Act Release No. 85440 (March 28, 2019), 84 FR 13082 (April 3, 2019) (SR-OCC-2019-002); Securities Exchange Act Release No. 85755 (April 30, 2019), 87 FR 19815 (May 6, 2019) (SR-OCC-2019-004); Securities Exchange Act Release No. 86296 (July 3, 2019), 84 FR 32816 (July 9, 2019) (SR-OCC-2019-005); Securities Exchange Act Release No. 87387 (October 23, 2019), 84 FR 57890 (October 29, 2019) (SR-OCC-2019-010); Securities Exchange Act Release No. 89392 (July 24, 2020), 85 FR 45938 (July 30,2020) (SR-OCC-2020-007); Securities Exchange Act Release No. 90139 (October 8, 2020), 85 FR 65886 (October 16, 2020) (SR- OCC-2020-012).

8 Id.

not materially impact a model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices;

- Extensive, detailed testing results and explanatory rationale supporting a model;
- Recitations of standard mathematical and economic theories/techniques that are well-known in quantitative finance, readily found in public sources, and do not include OCC-specific modifications or applications;
- Redundant descriptions of a model component appearing in multiple chapters;
- Details on OCC's implementation of a model in its internal technology systems and application of model results in operational procedures that are not inherent to a model and that OCC could change from time to time without affecting a model's results; and
- Manual margin adjustments and add-ons OCC employs pursuant to OCC rules, policies, and/or procedures outside the STANS methodology.

The proposed STANS Methodology Description is intended to be a comprehensive description of STANS that is made available to Clearing Members and enable an informed reader to understand OCC's modeling choices and the interconnectedness of STANS model components in producing OCC margin requirements. Therefore, OCC believes the details summarized above and described herein are extraneous to this purpose. Rather, OCC believes these types of details are more appropriately covered – to the extent these details are specific to an OCC model – in other OCC rules and policies, Model Whitepapers, or other internal OCC documentation.

OCC also believes these details do not need to be maintained as OCC "rules" as these internal procedural and administrative details used by OCC's model developers and model validators would: (1) be reasonably and fairly implied by the proposed STANS Methodology Description, OCC's Margin Policy,[9] OCC's Model Risk Management Policy,[10] and other OCC rules; and/or (2) otherwise not be deemed to be material aspects of OCC's margin setting-related operations. While OCC would not maintain these details in the STANS Methodology Description, OCC would continue to maintain and update these details when necessary in the Model Whitepapers and other internal OCC documentation, where these details are also currently found.[11]

STANS Methodology Description

The proposed STANS Methodology Description would describe the material aspects of OCC's margin methodology. Specifically, the STANS Methodology Description would include (i) an executive summary; (ii) descriptions of the quantitative model components of STANS; and (iii)

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9 See Securities Exchange Act Release No. 82355 (December 19, 2017), 82 FR 61058 (December 26, 2017) (SR-OCC-2017-007).

10 See Securities Exchange Act Release No. 82473 (January 9, 2018), 83 FR 2271 (January 16, 2018) (SR-OCC-2017-011).

11 OCC's Model Risk Management Policy establishes detailed standards for Model Whitepapers and governance to adopt or make changes to a Model Whitepaper. See id.

"model utilities" intended to enhance the quality of model results. Each of these sections is described in further detail below.[12]

Executive Summary

The STANS Methodology Description would provide an executive summary of STANS. This executive summary would describe how the purpose of STANS is to determine margin requirements for OCC's Clearing Members (as described below), and in doing so meet various risk management goals and regulatory requirements for OCC. The executive summary would then describe the types of positions and collateral modeled through STANS, which include (i) valued securities and stock loans; (ii) equity, index, and futures options; (iii) Flexible Exchange ("FLEX") options; (iv) equity and index futures; (v) volatility futures; and (vi) commodity futures. The executive summary would then provide an overview of the STANS methodology, which includes (i) econometric calibration; (ii) copula estimation and Monte Carlo simulation; (iii) volatility forecasting; (iv) theoretical underlying price generation; (v) theoretical derivatives price generation; and (vi) aggregation and margin calculation. These components are described in further detail below. The executive summary would then describe OCC's model monitoring activities, which include (i) daily backtesting and (ii) ongoing parameter monitoring pursuant to monitoring plans established by OCC's Model Risk Working Group ("MRWG").[13] The executive summary would then describe that STANS relies on price feeds of real-time market data to generate theoretical values in calculating margin requirements, and how OCC staff may use price editing techniques to improve the quality of pricing data for input into STANS.[14] Lastly, the executive summary would briefly outline the organization of the sections of the STANS Methodology Description that substantively describe the core components of the STANS methodology and the related data processing utilities used by STANS.

The proposed text of this executive summary would replace current OCC rule text from the Margins Methodology's introductory section. The current text, in addition to summarizing the STANS methodology as would the proposed text described above, includes descriptions of the following:

- OCC's historical modeling practices: OCC does not believe this historical information is needed to understand how the model functions.

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12 The proposed STANS Methodology Description would also include the following non-substantive sections: (i) a table of contents; (ii) a list of references to academic and technical documents, both public and internal to OCC; and (iii) a table of defined terms used in the STANS Methodology Description.

13 OCC's Margin Policy and Model Risk Management Policy provide more detail on OCC's model monitoring activities. See supra notes 9 and 10.

14 OCC's Collateral Risk Management Policy and Margin Policy provide more detail on the function of OCC's Pricing & Margins department. See Securities Exchange Act Release No. 82009 (November 3, 2017), 82 FR 52079 (November 9, 2017) (SR-OCC-2017-008) and supra note 9.

- Redundant details of the STANS methodology also found in the main body of both the Margins Methodology and the proposed STANS Methodology Description: This information, would already be detailed in the main body of the STANS Methodology Description, and OCC does not believe repeating it here is needed to understand how STANS functions.
- A "documentation guide" describing what information can be found within various sections of the Margins Methodology: OCC does not believe this documentation guide is needed to understand how STANS functions, or to understand the organization of the proposed STANS Methodology Description.

For the reasons stated above, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

STANS Methodology Components

The STANS Methodology Description would next describe the components of OCC's risk-based margin methodology, which OCC uses to cover the credit exposures presented by Clearing Members in accordance with OCC's regulatory requirements. In particular, the STANS Methodology Description would describe the (i) calibration of various parameters and price data inputs used by OCC's econometric and pricing models to create risk factors; (ii) construction of a copula from the risk factors that identifies correlations among simulated changes in the various risk factors; (iii) application of the simulated risk factor changes and correlations to actual data through Monte Carlo simulations that estimate 10,000 possible scenarios for each risk factor, then estimation of theoretical prices for securities, derivatives, and futures using these theoretical scenarios; and (iv) application of the theoretical prices to actual Clearing Member positions to calculate margin requirements.

i. Model and Econometric Calibration

The STANS Methodology Description would describe how the quantitative models used by STANS incorporate various historical price data and econometric parameter inputs, which are used to estimate and simulate the risk for an associated product. These inputs consist of (i) returns on equity securities; (ii) implied volatilities; (iii) energy and commodity futures; (iv) treasury securities; (v) variance futures; and (vi) volatility futures. In total, there are currently approximately 40,000 of these inputs. The exact number of inputs is subject to change based on the types of products that OCC clears and OCC's research on what risk factors correlate with prices changes in these products. Historical price data comes from OCC's Pricing & Margins department, which obtains the data from external vendors and then validates it for use within STANS.[15] STANS uses several models, described below, to calibrate this historical data and then transform the historical data into theoretical values that, along with specialized volatility forecast and marginal distribution

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15 See id.

parameters constructed by other OCC models described below, are used to construct a copula, described in the next step.

Equity Returns

STANS uses returns on equity securities that are based on current market prices. STANS first calibrates this data by simply creating a time series of logarithmic returns based on the closing, and in some cases opening, prices. This transformation does not require a separate model. The data is used to create econometric parameters and for pricing as described further below.

Implied Volatility

STANS uses implied volatility risk factors to measure the expected future volatility of an option's underlying security at expiration, which is reflected in the current option premium in the market. To address variations in implied volatility, OCC models a volatility surface for options by incorporating into the econometric models underlying STANS certain risk factors called "pivot points." These pivot points are chosen such that their combination allows STANS to identify changes in the level, skew, convexity, and term structure of the implied volatility surface. STANS generates a value for each of the nine pivot points for each eligible underlying asset and for each business day in the historical data period. To calibrate this data, for each of the nine pivot points STANS performs a kernel smoothing technique[16] on the historical data. Application of these pivot points enables STANS to simulate implied volatility scenarios, which are then used to create the specialized volatility forecast and marginal distribution parameters described below, and in the pricing of options through OCC's option pricing models described further below.[17]

The proposed text would replace current OCC rule text from the Margins Methodology's section on implied volatility. The current rule text also includes other information related to the implied volatility model. Specifically, the current rule text includes descriptions of the following:

- Products eligible for implied volatility scenarios modeling in STANS: OCC does not believe the exact list of products to which this model is applied is needed to understand how the model functions, and this list may change from time to time as OCC-cleared products are listed and delisted.
- Data sources used by STANS to perform the kernel smoothing technique: These data sources are configuration choices made by OCC that are not inherent to the model's selection or design and that OCC could change from time to time without affecting the model's results.

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16 "Kernel smoothing" is a statistical process by which data points are better fitted to an expected function using weighted averages and a "smoothing parameter."

17 See Securities Exchange Act Release No. 76128 and Securities Exchange Act Release No. 84524 for more information on the function and application of the implied volatility model.

- Rationale for the assumptions underlying implied volatility modeling of longer-tenor options: OCC does not believe that the justification for these model assumptions is needed to understand how the model currently functions.
- Historical background on OCC's decision to incorporate implied volatility modeling into STANS: OCC does not believe that this historical information is needed to understand how the model currently functions.
- Model testing and validation results for the implied volatility model: OCC does not believe that the internal testing and validation performed to verify the model is fit for use is needed to understand how the model currently functions.

OCC believes that this information is more appropriately covered in the Implied Volatility Scenarios Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Treasury Securities

STANS prices treasury securities[18] using a Nelson-Siegel framework,[19] a commonly used polynomial model for constructing the term structure of an interest rate and modeling changes in a yield curve.[20] STANS constructs a theoretical yield curve using current and historical settlement prices for treasury securities.

STANS calibrates this data by transforming the market prices into a time series of unobservable factors that represents the yield curve. STANS fits these Nelson-Siegel parameters using observed bond prices. In simulation, STANS creates "shocks" on theoretical Nelson-Siegel parameters[21] to create theoretical interest rate curves, which are in turn used to price treasury securities.

The proposed text would replace current OCC rule text from the Margins Methodology's section on U.S. Treasury bills and fixed rate notes, bonds, and strips. The current rule text also

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18 While OCC does not clear treasury securities or derivatives on such products, OCC permits Clearing Members to deposit treasury securities as margin collateral.

19 See Nelson, C.R. and Siegel, A.F., "Parsimonious Modeling of Yield Curves," 60 The J. of Bus. 4, 473-489 (1987) (describing the Nelson-Siegel model).

20 In addition to pricing treasury securities, STANS uses a Nelson-Siegel framework to simulate potential changes in interest rates. Refer to the below description of the interest rate curve model utility.

21 STANS also introduces extra "noise" into the bond prices to account for the bonds' idiosyncratic behaviors and prevent the resulting treasury securities price movements from being perfectly correlated.

includes other information related to the treasury securities and interest rate model. Specifically, the current rule text includes the following:

- Summary and introduction sections that describe OCC's need to model treasury securities and interest rates and provide an overview of the U.S. Treasury securities market: OCC does not believe these background descriptions of the macroeconomic environment, found in public sources, are needed to understand how the model currently functions.
- Restatements of mathematical definitions and equations describing the relationship between the forward and yield curves, and the payoff function for bonds used to describe all interest rate curves: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic sources. To the extent the text does not describe OCC's application of these theories, OCC does not believe this information needs to be maintained in OCC's rules.
- Details on how OCC implemented the model in its technology systems: These implementation details relate to OCC's internal administration of its technology systems and are not needed to understand how the model currently functions. Because these details are not inherent to the model's selection or design, OCC could also change them from time to time without affecting the model's results.
- Redundant description of the copula constructed by STANS: This information, described further below, would already be detailed in the STANS Methodology Description section related to the construction of a copula, and OCC does not believe repeating it here is needed to understand how the model currently functions.

OCC believes that this information is more appropriately covered in the Nominal Treasury Securities Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Generic Futures

Relying on current futures prices and time series of spot prices as inputs, STANS uses a generic futures model to price linear derivatives with limited term structures. Using basic economic assumptions that the relationship of spot prices to forward prices does not allow for arbitrage and that futures prices equal forward prices, or that any deviations from this are adequately addressed through costs implicit in carrying such positions,[22] the model estimates and applies theoretical discount factors to the futures prices. These discount factors are based on a ratio of estimated spot prices on the underlying securities to the futures prices.

Variance Futures

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22 As described previously, pursuant to OCC's Model Risk Management Policy OCC periodically reviews all parameters and assumptions used in STANS and they are subject to change.

STANS uses a specialized factor model to price variance futures, which uses historical data for both variance futures products and the Standard and Poor's 500 Index ("SPX"). This model relies on basic assumptions that the short-term volatility of variance futures prices tends to revert towards a mean (i.e., volatility remains relatively close to an average value), but the long-term volatility is itself stochastic. Using these assumptions, STANS fits current values of the volatility and volatility mean reversion level, in addition to parameters describing the dynamics, to the current term structure of variance futures prices. Modeling variance futures prices based on these assumptions allows the theoretical prices to move in a realistic fashion.

The model is first calibrated with historical data on variance futures prices and their recent dynamics. It then simulates prices for variance futures using two sets of random variables: (i) SPX returns; and (ii) changes in the long-term volatility level, represented by normal random numbers that STANS generates daily for use only with variance futures and that have no correlation with other theoretical numbers generated by STANS. Both random variables are used to simulate scenarios for prices of the variance futures tenors.

Synthetic Futures

Using logarithmic daily returns of active futures and various other securities, STANS uses a "synthetic futures" model to estimate prices of certain products such as volatility index-based futures (e.g., VIX futures). In general, the synthetic futures model creates an artificial (or "synthetic") time series of price innovations for actual futures contracts with approximately the same tenor as the actively-traded futures.[23] This synthetic time series then serves as a uniform substitute for a time series of daily settlement prices for the actual futures contracts, which persists over many expiration cycles and thus can be used as a basis for econometric analysis. STANS performs this analysis by fitting the synthetic time series with associated volatility forecast and marginal distribution parameters, which are described below.

The traded futures contracts are then mapped to the simulated return scenarios of the corresponding synthetic contracts to produce theoretical prices. The first synthetic contract in the series contains returns of the front contract on any given day. STANS switches the front contract of the series to the next one out on the day following the expiration date of the front contract. While the synthetic time series contain returns from different contracts, a return on any given date is constructed from prices of the same contract. Using a synthetic time series allows STANS to better approximate correlations between futures contracts of different tenors by creating more price data points and their margin offsets. These synthetic time series are mapped to the underlying futures product they are intended to represent.

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23 See Securities Exchange Act Release No. 85440 for further information on OCC's synthetic futures model as applied to volatility index-based products. OCC notes that the synthetic futures model can also be used for other futures products, such as interest rate futures. See e.g., Securities Exchange Act Release No. 89392 and Securities Exchange Act Release No. 90139.

The proposed text would replace current OCC rule text from the Margins Methodology's section on synthetic futures. The current rule text also includes other information related to the synthetic futures model. Specifically, the current rule text includes descriptions of the following:

- Rationale for making changes to the model in 2019[24] and other historical information: OCC does not believe that this rationale and historical information is needed to understand how the model currently functions.
- Equations for standard GARCH provided for introductory purposes: A description of OCC's GARCH model, described further below, would already be detailed in the STANS Methodology Description section related to GARCH parameters, and OCC does not believe repeating it here is needed to understand how the model functions. Furthermore, the GARCH equations as implemented in STANS are modified from the standard GARCH equations provided here, and OCC believes this text could create confusion around the exact GARCH equations used in STANS.

OCC believes that this information is more appropriately covered in the Synthetic Futures Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

GARCH and NRIG Parameters

STANS utilizes econometric parameters related to volatility forecasts and marginal distributions, and calibrates these parameters using ten-year histories of the data inputs described above. For both volatility forecasts and marginal distributions, STANS utilizes a generalized autoregressive conditional heteroskedasticity ("GARCH") model. GARCH is a common statistical model for, in a time series of data, comparing the variance of one point in the time series to the previous point in the series rather than an arithmetic average of all the points in the series. This is particularly useful when the value of volatility at one point in a time series is known to be correlated with the volatility at previous points in the series. STANS estimates these GARCH parameters through a maximum likelihood estimation method. By fitting these GARCH parameters to a time series of risk factor innovations, STANS is able to remove the effects of volatility from – or "devolatilize" – the risk factor time series so that the copula described below can estimate the correlations among the risk factors irrespective of their individual volatilities.

To model volatility forecast parameters, STANS fits the time series of implied volatility pivot points (described above) into a Student's t-distribution, a continuous probability distribution that is commonly used to estimate the mean of a population with a relatively small sample size and unknown standard deviation. To determine the appropriate degrees of freedom for a particular distribution, STANS applies an Anderson-Darling test.

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24 See id.

To model marginal distribution parameters, STANS utilizes a normal reciprocal inverse Gaussian ("NRIG") distribution, a special case of the generalized hyperbolic distribution.[25] The returns[26] of each risk factor used in STANS are assumed to exhibit returns in the shape of a symmetric NRIG distribution.[27] Consequently, STANS calibrates NRIG parameters that are designed to describe the shape of every risk factor individually.

As described previously, STANS constructs these GARCH and NRIG parameters from the historical price data and econometric parameter inputs that are first calibrated by the models described above. These historical price data and econometric parameters, and the resulting GARCH and NRIG parameters, are the foundational data elements used by the copula and pricing models described in the proceeding steps.

The STANS Methodology Description would also describe the controls that may be placed on the GJR-GARCH parameters after their initial calibration. GARCH volatility forecasting models can be very reactive in certain market environments. As a result, OCC may implement parameter controls for risk factors and classes of risk factors, which are subject to periodic review and approval by the MRWG.

The proposed text would replace current OCC rule text from the Margins Methodology's section on GARCH forecasts. OCC notes that the current rule text describes the standard NRIG cumulative distribution function that is widely available in public academic texts. The proposed rule text would describe the same function in a re-parameterized form that is proprietary to OCC. While the two forms are mathematically equivalent, the re-parameterized form is used in the Econometric Model for Risk Factors in STANS Model Whitepaper and the proposed text would therefore be made consistent with the Model Whitepaper. The proposed rule text would also include a citation to an academic paper describing the rationale for the re-parameterization.

The current rule text also includes other information related to OCC's GARCH model. Specifically, the current rule text includes descriptions of the following:

- Introductory language describing the standard Glosten-Jagannathan-Runkle GARCH model and the use of a Student's t-distribution: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative

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25 The generalized hyperbolic distribution is a special type of continuous probability distribution. See Barndorff-Nielsen, O., "Exponentially decreasing distributions for the logarithm of particle size," 353 Proc. of the Royal Soc'y of London. Series A, Mathematical and Physical Sci. 1674, 401–419 (1977) (explaining the generalized hyperbolic distribution).

26 "Return" refers generally to changes in a risk factor's value over a time interval. Returns could take the form of simple differences, log returns, or other forms.

27 Except for (i) Chicago Volatility Index ("VIX") futures, which are assumed to follow an asymmetric NRIG distribution, and (ii) implied volatility, which is assumed to follow a Student's t-distribution.

finance and readily found in public academic sources. To the extent this text does not describe OCC's application of GARCH and the Student's t-distribution, OCC does not believe this information needs to be maintained in OCC's rules.

- Details on variance forecasting (i.e., considering how securities volatility tends to clusters during certain periods) as rationale for model selection: OCC believes this information is extraneous to understanding how the GARCH model currently functions in STANS.
- Variance forecasting as applied to the One-Day and Two-Day Scenarios model utility: This information, described further below, would already be detailed in the STANS Methodology Description section related to the One-Day and Two-Day Scenarios model utility, and OCC does not believe repeating it here is needed to understand how the model utility currently functions.
- Mathematical rationale for the cumulative distribution function,[28] inverse cumulative distribution function, and degrees of freedom for the Student's t-distribution used by the GARCH model for implied volatility risk factors: OCC believes this information is extraneous to understanding how the GARCH model currently functions in STANS. This information is also foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent this text does not describe OCC's application of these functions and the Student's t-distribution, OCC does not believe this information needs to be maintained in OCC's rules.
- Explanatory mathematical formulas for variance forecasting of implied volatility risk factors and a likelihood function[29] and equations related to the Anderson-Darling test,[30] including the Student's t cumulative distribution function for integer values of $\boldsymbol{\nu}$: These details relate to implementation of the GARCH model in OCC's internal technology systems, are not inherent to the model's selection or design, and are not needed to understand how the model currently functions.
- Expressions for the Gamma and Beta functions:[31] This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent the text does not describe OCC's application of Gamma and Beta functions in the model, OCC does not believe this information needs to be maintained in OCC's rules.

OCC believes that this information is more appropriately covered in the underlying GARCH Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons

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28 In probability theory, the cumulative distribution function of a random variable is the probability that the variable will be less than or equal to a set value.

29 A likelihood function is a tool used to measure the goodness of fit of a statistical model to sample data.

30 The Anderson–Darling test is a statistical test of whether a given sample of data is drawn from a population of data with a specific probability distribution.

31 Gamma and Beta functions, respectively, are related one and two-variable functions that serve as foundations for various mathematical applications.

listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

ii. Copula Construction

The STANS Methodology Description would describe how a copula is used to quantify the joint behavior and dependence structure of the risk factors used by STANS. A copula is a mathematical construct used in probability theory to calculate the cumulative distribution of a set of random variables. The fitted copula can then be used by STANS to perform Monte Carlo simulations of theoretical prices for underlying securities and associated derivatives, which will be used in the aggregation step during which margin requirements are calculated.

To estimate the copula, STANS first transforms two years of historical data for the risk factors produced by the models described above into a data set described by the Student's t-distribution with four degrees for freedom.[32] STANS then performs a singular value decomposition of this data set to obtain the eigenvector decomposition[33] of the correlation matrix. This means the resulting fitted copula is a Student's t copula with four degrees of freedom.

Before the copula is estimated, STANS performs an "alignment" step on the time series to identify and separately process risk factors with incomplete data sets that lack sufficient data to estimate the copula. Specifically, for pricing data/models for underlyings, OCC extracts data on the previous two years (i.e., 500 business days) and ensures (i) the data has no more than 100 missing returns as compared to baseline dates and (ii) the five latest returns are not missing as compared to baseline dates. If a risk factor's data set does not meet each of these three criteria, it is subject to a conditional or default simulation, described below.

To simulate price movements, STANS draws random samples from the multivariate Student's t-distribution described by the copula. These random draws are abstract values that correspond to correlated, uniform, normalized shocks in the risk factors. STANS then reincorporates the individual volatility and marginal distribution of the risk factors to create appropriate return scenarios. STANS next applies these theoretical returns to current market prices to generate potential price scenarios for underlying securities. STANS essentially performs the reverse of the function that was performed to fit the econometrics of the risk factors.

32 Based on OCC's research, four degrees of freedom is in the conservative end of a range of degrees of freedom that are generally suitable fits for univariate distributions and is therefore appropriate for use in constructing the copula.

33 In the context of linear transformations, an Eigenvector is a value that does not change direction when the transformation is applied to it, but rather changes in scale based on the application of a scalar factor, called an Eigenvalue. Eigenvectors and Eigenvalues are used to analyze the characteristics of linear transformations, including correlation/covariance matrices, and generate random variables with the equivalent correlation.

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Student-t Copula model. The current rule text also includes other information related to the construction and simulation of a copula in STANS. Specifically, the current rule text includes a mathematical justification for using a copula generally, and introductory text describing the general properties of a Student's t copula. OCC believes this information is extraneous to understanding how the Student-t Copula model currently functions in STANS. This information is also foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent this text does not describe OCC's application of a mathematical copula, OCC does not believe this information needs to be maintained in OCC's rules. Instead, OCC believes that this information is more appropriately covered in the underlying Student-t Copula Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Conditional and Default Simulations

For risk factors with data sets that have only recently become available, or that have experienced drastic changes in their return characteristics, and do not meet one or more of the criteria in the alignment step, there may be too small of a sample size to reliably estimate correlations among the data. In such cases, these risk factors are excluded from the copula simulation in STANS and OCC applies conditional or default simulation.

OCC applies a conditional simulation when it believes that a risk factor that has been identified during the alignment step does not meet the data quality criteria but has an appreciable correlation with another risk factor that has a more robust dataset. OCC uses that more robust risk factor's data as a proxy for the identified risk factor. The identified risk factor is assumed to exhibit simulated results that follow an NRIG distribution of specified mean, variance, and shape parameters, and any variation from the proxy data is assumed to be purely idiosyncratic. Pursuant to OCC's Margin Policy, OCC periodically reviews whether applying a conditional simulation to a particular risk factor continues to be appropriate.

OCC applies a default simulation when it does not believe an identified risk factor has any obvious proxy and has no view on its prospective volatility, or when a risk factor is identified by STANS during nightly margin processing and OCC has not already selected it to undergo a conditional simulation. In a default simulation, movements in the risk factor are assumed to be entirely idiosyncratic and have a volatility that is typical of highly volatile stocks.

The proposed text would replace current OCC rule text from the Margins Methodology's section on default, derived, and conditional factors. The current rule text also includes other information related to conditional and default simulations. Specifically, the current rule text includes the following:

- Introductory text restating the use of time series in STANS: This information would already be described elsewhere in the STANS Methodology Description where applicable, and OCC does not believe repeating it here is needed to understand how the model functions.
- A description of "derived scenarios," a special case of conditional simulations related to exchange rate risk factors: This special case is applied pursuant to internal OCC procedures, and occurs outside of the STANS methodology. Therefore, OCC does not believe this information is needed to understand how the model currently functions.
- A description of the how OCC operationally applies conditional simulations: These operational details relate to OCC's application of the model's results in operational procedures and are not inherent to the model's selection or design, and that OCC could change from time to time without affecting the model's results.
- Details on how OCC implemented default scenarios in its internal technology systems: These implementation details relate to OCC's internal administration of its technology systems and are not inherent to the model's selection or design, and that OCC could change from time-to-time without affecting the model's results.

OCC believes that this information is more appropriately covered in the Student-t Copula Model Whitepaper or other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

iii. Implied Volatility Smoothing and Options Pricing

The STANS Methodology Description would next describe how STANS utilizes the inputs and outputs described above to (i) perform implied volatility smoothing, (ii) price European and American options, (iii) price Asian FLEX options, and (iv) price Cliquet options.

Implied Volatility Smoothing

STANS employs an Implied Volatility Smoothing model to estimate fair prices of listed option contracts based on their bid and ask price quotes. This model supports pricing of the following types of options: (i) European and American options on equity products with a dividend yield or with discrete cash dividends; (ii) European and American options on futures on equity indices, currencies, and commodities; (iii) options on volatility indices for which volatility futures trade (e.g., VIX options[34]); (iv) forward start options; and (v) Asian FLEX options.

The model is essentially an advanced data filtering and pre-processing technique to improve data quality to support option pricing during the calibration and simulation phases of the STANS methodology. It makes use of the same theory that underpins OCC's Vanilla Options model, described below. The most important stages of the Implied Volatility Smoothing model are: (i) a

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34 VIX options are treated as options on VIX futures and thus represent a type of option on futures that is also supported by the implied volatility smoothing.

preprocessing procedure to filter out "bad" price quotes; (ii) an implied forward price calculation using prices from near-the-money options on the same securities at all tenors or expiration dates; (iii) the smoothing, in which prices are generated for all plain vanilla listed options at all strikes by using corresponding bid and ask price quotes and forward prices (from step two); and (iv) construction of a volatility surface based on linear interpolation of total variance among the smoothed prices and performing any necessary post-processing. When applied to prices estimated by the option pricing models described below, the model functions to (i) makes data points comprising the volatility surface more consistent with the actual bid-ask spreads found in current market prices and (ii) correct data that would create arbitrage opportunities by not having monotonicity and convexity with respect to the strike and/or not satisfying put-call parity.[35]

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Implied Volatility Smoothing model. The current rule text also includes other information related to the model. Specifically, the current rule text includes the following:

- A description of the use of target prices based on model parameters: This represents configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.
- Economic rationale for various features of the model: OCC does not believe that this economic rationale is needed to understand how the model currently functions.
- A discussion of the model's performance in deriving theoretical spot prices from underlying futures and indices, and specific "if/then" conditions the model applies to bid and ask prices to filter out poor quality data based on certain control parameters: These data filtering parameters are configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.
- Mathematical rationale for the method by which the smoothing algorithm calculates implied forward prices: OCC does not believe that the rationale for the model's configuration is needed to understand how the model currently functions.
- A detailed description of the Vega-weighted least squares calculation performed during the first round of optimization to produce arbitrage-free options prices for European options: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic sources. To the extent the text does not describe OCC's application of a Vega-weighted least squares calculation, OCC does not believe this information needs to be maintained in OCC's rules.

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35 See Securities Exchange Act Release No. 86296 for further information on the smoothing algorithm used in STANS.

- Operational details on (1) how the model's results are applied to other models for pricing European and American options, options on futures, and long-dated[36] volatilities; (2) price smoothing for contracts that are otherwise missing smoothed prices for various reasons, FLEX options, and over-the-counter options; and (3) detailed steps for a linear interpolation/extrapolation used to construct a volatility surface from smoothed volatilities: These details relate to configuration choices made by OCC to applying a model overlay in certain cases where there is insufficient data, that are not inherent to the model's selection or design, and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the Implied Volatility Smoothing Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

European and American Options

The Vanilla Options model is used by STANS to price European and American options. This model is comprised of several modules that (i) calculate theoretical option prices, (ii) calculate risk sensitivities of the option prices with respect to the market variables (the "Greeks"), and (iii) calculate implied volatilities from option prices. The model prices European options using a modified Black-Scholes formula and American options using a Leisen-Reimer binomial tree.[37]

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Vanilla Options model. The current rule text includes other information related to the model. Specifically, the current rule text includes the following:

- Rationale and testing to support the number of steps used in the Leisen-Reimer binomial tree: OCC does not believe the rationale to support this model choice is needed to understand how the model currently functions.
- Equations describing the calculation of various "Greeks" (i.e., Gamma, Vega, Theta, and Rho), restatements of standard Black's formulas, and a restatement of the standard Leisen-Reimer binomial tree: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent the text does not describe OCC's application of the "Greeks," Black's formulas, and the Leisen-Reimer binomial tree, OCC does not believe this information needs to be maintained in OCC's rules.

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[36] In the context of volatility smoothing, "long-dated" refers to expirations beyond the listed expiration date of standard exchange-traded options.

[37] See Securities Exchange Act Release No. 86296 for further information on OCC's Vanilla Options model, which prices American and European options and generic futures.

- A list of control parameters of the Newton-Raphson method used to calculate implied volatilities for vanilla options: These control parameters are configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the Vanilla Options Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Asian FLEX Options

Like European options, Asian FLEX options are priced based on a Black-Scholes formula.[38] Asian FLEX options are modeled with assumptions that volatility, interest rates and cost of carry remain constant across an option's tenor. Furthermore, implied volatility is determined from "terminal" option (i.e., the last option in a series) volatilities, which are obtained from prices of available regular options expiring at the same tenor or, in their absence, by interpolating terminal volatilities of existing tenor regular options using an internal calculator developed by OCC.

Cliquet Options

STANS also prices Cliquet options using a Black-Scholes model. Like Asian FLEX options, Cliquet options are modeled with assumptions that volatility, interest rates, and cost of carry remain constant across an option's tenor. STANS calculates options premiums based on the premiums of the individual forward starting options that comprise the Cliquet option. This valuation is then repeated for each "reset period" of the Cliquet option.

Forward Start Options

STANS can also be used to price forward start options. Forward start options are options for which the strike price in dollars is unknown prior to the determination date of the strike shortly before expiration.[39] Forward start option values depend on the same input model parameters as vanilla options and on the determination date of the strike. Using the Black-Scholes framework, the pricing problem of a forward-start option prior to strike determination can be transformed into the valuation of a plain vanilla option at determination time, after which the option can be priced using a standard application of Black's formula.

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[38] See Securities Exchange Act Release No. 74966 for further information on how STANS models Asian-style options.

[39] Instead, forward start options trade with strikes defined as a fraction α, known prior to expiration, of the underlying closing price on the determination date.

iv. Aggregation

The STANS Methodology Description would next describe how STANS applies the theoretical derivatives prices to actual positions in Clearing Members' accounts to calculate margin requirements. This is accomplished by aggregating (i) a base margin charge, which consists of an ES calculation with the addition of Extreme Value Theory ("EVT") loss modeling and a stress test component; (ii) an error compensation charge; (iii) a liquidation cost charge; (iv) a positive risk reversal charge; and (v) various add-on charges that are applied based on accounting principles.

Base Margin Charge

STANS first calculates the base margin charge. This is accomplished by identifying the positions present in a Clearing Member's account,[40] multiplying the values of those positions to each of the 10,000 theoretical values calculated in the above step, then adding the products' values together to obtain possible 10,000 net asset values ("NAVs") for the account. The account's actual NAV is then subtracted from each of these 10,000 possible NAVs to obtain 10,000 possible Profit and Loss ("P&L") statements. STANS then constructs a VaR line separating the 100 most extreme negative projected P&L statements over a two-day horizon from the remaining 9900 simulated outcomes, representing the worst 1% of the projected scenarios, and calculates the average of these 100 values to obtain a single ES value for the account. This is called the empirical ES because STANS uses actual historical prices in calibrating the simulation, which represents the historical dependence among the various risk factors.

In addition to calculating the empirical ES, STANS applies EVT to parametrically fit the largest losses and parametrically calculate ES. EVT is based on a tenet of probability theory that the distribution of extremes of a univariate random variable converge to a Generalized Pareto distribution.[41] The parametric EVT estimator can use a larger tail sample than the empirical estimator, which, for ES at the 99th percentile, is limited to 100 (i.e., 1% of 10,000) points. Empirical ES is used when there is indication that the tail is not well fit by EVT.

STANS next applies a stress test component to its base charge. This component includes additional calculations related to (i) concentration, which is intended to consider extreme idiosyncratic moves in concentrated positions and to counteract "survivor bias" in historical equity returns data (i.e., that historical data typically does not incorporate certain extreme movements in a firm's stock prices, such as when a firm declares bankruptcy or is subject to a rich takeover); and (ii) dependence, in which the ES calculations described above are performed twice again, once assuming perfect correlation among the various risk factors and once assuming no correlation among the various risk factors. After performing these concentration and dependence calculations, STANS

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40 The netting/offsetting of a Clearing Member's positions within an account pursuant to OCC's rules occurs outside STANS before the position data is brought into STANS for this step.

41 A Generalized Pareto distribution is a type of continuous probability distribution that can be used to model the distribution of the tail of another underlying distribution.

takes the higher of the two factors and combines it with the empirical ES to create a more conservative margin requirement for the account.

The proposed text would replace current OCC rule text from the Margins Methodology's chapter on the base charge, stress-test add-on charge, and total margin charge. The current rule text also includes a summary section summarizing historical changes OCC has made to the manner in which STANS calculates a total margin charge. OCC does not believe this information is needed to understand how STANS currently functions. OCC further believes that this information is more appropriately covered in the Portfolio Risk Measures Model Whitepaper or other internal OCC documentation rather than in OCC's rules for this reason. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Error Compensation

An inherent property of ES calculations is the existence of estimation error. To compensate for the potential risk that a STANS ES calculation includes such an error on the positive (lower loss) side, the ES value based on the simulated results is shifted through a compensation term to a more conservative level. Mathematically, the error compensator shifts ES to the left by 1.2 standard deviations of the loss tail, covering the 70% quantile of estimation error. The extent to which this alters the calculated ES in absolute varies based on the distribution's kurtosis (i.e., the shift is more significant for distributions with fatter tails).

Liquidation Cost Charge

The default of a Clearing Member requires OCC to close-out that Clearing Member's positions, which results in OCC incurring costs. Closing out positions in a defaulted portfolio may also entail selling long positions at the current bid price and covering short positions at the current ask price, which could create additional costs based on the bid-ask spread. To account for these costs, STANS calculates a daily liquidation cost charge based on a liquidation cost grid, calibrated with data from historical stressed periods, and applies this calculated cost as an add-on charge. In general, the Liquidation Charge model calculates two risk-based liquidation costs for a portfolio, Vega[42] liquidation cost ("Vega LC") and Delta liquidation cost ("Delta LC"), using "Liquidation Grids." More specifically, the model consists of: (1) the decomposition of the defaulter's portfolio into sub-portfolios by underlying security; (2) the creation and calibration of Liquidation Grids used to determine liquidation costs; (3) the calculation of the Vega LC (including a minimum Vega LC charge) for options products; (4) the calculation of Delta LCs for both options and Delta-one products; (5) the calculation of Vega and Delta concentration factors; and (6) the calculation of

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42 The Delta and Vega of an option represent the sensitivity of the option price with respect to the price and volatility of the underlying security, respectively.

volatility correlations for Vega LCs.[43] STANS applies both Vega and Delta LCs to options products, but only applies a Delta charge to Delta-one[44] products such as futures contracts, Treasury securities, and equity securities.

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Liquidation Charge model. The current rule text also includes other information related to the model. Specifically, the current rule text includes the following:

- Background historical information on adoption of the model: OCC does not believe this historical information is needed to understand how the model currently functions.
- Classifications OCC applies to an underlying equity security based on the security's liquidity level to determine which liquidation grid is most appropriate: These details represent configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.
- Intermediate equations used to define variables for calculating Vega LC: OCC does not believe these intermediate, explanatory equations are needed to understand how the model currently functions.
- Descriptions of the parameters used to calibrate liquidation grids: These calibration parameters represent configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the underlying Liquidation Charge Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Positive Risk Reversal

As an additional conservative measure, STANS applies a "positive risk reversal" charge to ensure that the total calculated margin requirement is at least equal to the estimated liquidation cost, even in the event a position is liquidated at the current market price (or a more favorable price). STANS incorporates the positive risk reversal charge by simply applying a minimum margin requirement to a position that is equal to the estimated liquidation cost charge.

Various Add-on Charges

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43 See Securities Exchange Act Release No. 85755 for more detail on the liquidation cost model used by STANS.

44 "Delta one products" refer to products for which a change in the value of the underlying asset results in a change of the same, or nearly the same, proportion in the value of the product.

In addition to the charges described above, OCC may, pursuant to its rules, elect to apply additional charges to a Clearing Member's margin requirements for various reasons; e.g., based on the Clearing Member's Watch Level status or to account for rebates, adjustments and add-ons related to stock loan positions.[45] These additional charges occur outside of STANS and are outside the scope of the STANS Methodology Description.

The proposed text would replace current OCC rule text from a section in the Margins Methodology's base charge, stress-test add-on charge, and total margin charge chapter covering add-on charges. The current rule text notes that OCC may apply various add-on charges to its margin requirements outside the STANS methodology, which could include additional margin charges related to (i) cross-margin accounts, established by OCC Rule 704; (ii) placement on a heightened Watch Level based on OCC's credit risk surveillance, established by OCC's Third-Party Risk Management Framework;[46] (iii) interest payments and adjustments to stock loan positions, established by OCC Rule 601, Interpretation & Policy .05; (iv) customer positions subject to certain margin requirements promulgated by the CFTC, established by OCC Rule 601, Interpretation & Policy .07; (v) concentration risk for equity securities exceeding an average daily trading volume threshold, established by OCC's Collateral Risk Management Policy;[47] and (vi) OCC's extended trading hours program, established generally by OCC's Margin Policy and specified in OCC's Extended Trading Hours Set-Up and Monitoring Procedure.[48]

As outlined above, these add-on charges are applied pursuant to other OCC rules, policies, and/or procedures, and are established outside of the STANS methodology. Therefore, OCC believes that they are more appropriately covered in the underlying OCC rules, policies, and procedures that establish them, and, accordingly, proposes to delete this text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Model Utilities

The STANS Methodology Description would next describe several "model utilities" that are applied at various points in the STANS methodology to incorporate various market and operational factors that affect options pricing and thereby produce model results which more accurately reflect current and potential market conditions.

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45 See Securities Exchange Act Release No. 82355, which states that OCC's Margin Policy establishes the application of add-on charges.

46 See Securities Exchange Act Release No. 90797 (December 23, 2020), 85 FR 86592 (December 30, 2020) (SR-OCC-2020-014) for more information on OCC's Watch Level framework.

47 See Securities Exchange Act Release No. 82009, which describes OCC's Collateral Risk Management Policy.

48 The specific margin add-on charges OCC may apply are subject to change in accordance with internal governance established by OCC's Margin Policy and supporting procedures.

i. Dividends

The STANS Methodology Description would describe how STANS incorporates expected cash dividends on a stock into options pricing.[49] STANS obtains daily information on general dividend yields and discrete dividends from pricing vendors, then applies a dividend growth rate to this information to forecast dividends (typically) 16 quarters into the future.

STANS accounts for the possibility that cash dividends may be paid on stocks, which would affect their pricing, through a dividend utility that interacts with the pricing models in STANS. Daily, STANS retrieves from an external vendor data on forecasted cash dividends and yield curves associated with the issuance of those dividends. STANS uses this data to forecast when a security may go ex-dividend, and accordingly incorporates this into pricing the associated equity security. STANS also accounts for the possibility that an option may be exercised early to obtain a cash dividend on the underlying security. Using the same external dividend data, STANS calculates when an option would likely be exercised early to receive the dividend and prices it accordingly.

ii. Interest Rate Curve

This model utility calculates the yield curve using (i) overnight, one-week, one-month, two-month, and three-month cash deposit interest rates; (ii) Eurodollar interest rate futures with three-month to two-year tenors; and (iii) interest rate swaps with three-year to 30-year tenors. The model utility calculates a discount factor from a given date to any future date along the curve. This discount factor is used as an input to pricing models to generate theoretical prices for instruments based on these rates.

iii. Overnight and Daily Returns

STANS calculates margin requirements on a daily basis, using prices from that day's market close. However, some positions may expire or be exercised during a business day and before the following day's margin settlement. Since OCC clears derivatives that are settled on both opening and closing prices, both types of events affect derivatives prices and their corresponding margin requirements. Therefore, the STANS Methodology Description would describe how STANS obtains relevant risk factors for both the most recent opening price and the most recent closing price. STANS includes within the copula it constructs, described previously, a joint distribution of both overnight and daily returns on relevant risk factors.

The proposed text would replace current OCC rule text from the Margins Methodology's section on overnight and daily innovations. The current rule text also includes other information on the overnight and daily returns model utility. Specifically, the current rule text includes the following:

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49 OCC considers the potential effects of stock dividends outside of STANS.

- Details on how OCC implemented the model utility in its technology systems: These implementation details relate to OCC's internal administration of its technology systems and are not needed to understand how the model currently functions. Because these details are not inherent to the model's selection or design, OCC could also change them from time to time without affecting the model's results.
- Redundant detail related to the copula constructed by STANS: These details, described above, would be described in the STANS Methodology Description's section on the Student-t Copula model, and OCC does not believe repeating it here is needed to understand how the model utility currently functions.

OCC believes that this information is more appropriately covered in the Daily and Overnight Theoretical Price Scenario Simulation Model Whitepaper or other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

iv. <u>One-Day and Two-Day Scenarios</u>

As noted previously, OCC has established margin levels to cover the costs of liquidating positions over a two-day margin period of risk. Furthermore, and as described above, during this interval expiring OCC-cleared or cross-margined positions may experience final settlement based on either the opening or closing price of the underlying security. Therefore, the STANS Methodology Description would describe how STANS calculates for each underlying price scenario simulated prices at four different points in time: (i) opening price on day one; (ii) closing price on day one; (iii) opening price on day two; and (iv) closing price on day two. STANS must account for these additional prices to avoid under-margining portfolios with both expiring and non-expiring positions in a risk group, and to reflect the prices of underlying securities and associated derivatives that are forecasted to go ex-dividend or ex-coupon on T+1 or T+2 (where T represents the activity date). To calculate the two additional prices that may be observed over the two-day margin period of risk, STANS applies a randomly generated permutation to the return scenarios. The second-day return scenarios and securities that go ex-dividend on T+2 are then applied scenario-by-scenario to the first-day results in the same fashion.

v. <u>Portfolio Specific Haircuts</u>

Some Clearing Members have deposited securities as margin collateral that are also used in STANS as risk factors, and therefore potential price movements in these securities are factored into margin requirement calculations. However, a Clearing Member may want – or be required – to withdraw or deposit such margin collateral intraday. This would change the concentration of the Clearing Member's collateral types and would also change the sensitivity of how the Clearing Member's portfolio responds to such changes. To account for these changes in concentration and sensitivity, the STANS Methodology description would describe how STANS utilizes a Portfolio

Specific Haircuts model. This model provides haircut values for withdrawals or deposits of collateral, which are then applied to the previous day's collateral values to arrive at the impact of the collateral movements on the margin requirement. These haircuts represent the sensitivity of that Clearing Member account's risk profile to its position in the collateral security being withdrawn or deposited. These haircuts are designed to provide an estimate of the resulting change in margin requirements if the entire margin calculation were re-run following the withdrawal or deposit. A different haircut is associated with each combination of Clearing Member account and security posted as margin collateral.

Margins Methodology Chapters Not Found in STANS Methodology Description

The current rule text from the Margins Methodology describes that STANS uses historical and current prices for listed tenors of energy and other commodity futures to simulate prices of energy and other commodity futures using two variants of a two-factor Schwartz and Smith's model:[50] one variant to incorporate the effects of seasonality[51] for pricing futures related to nonseasonal commodities such as crude oil and the other variant to incorporate the effects of seasonality and is used to price futures related to seasonal commodities such as natural gas, heating oil, gasoline, electricity, and petrochemicals. The products for which OCC previously used this model to calculate margin requirements are no longer listed, and therefore OCC has decommissioned this associated pricing model. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

The current text from the Margins Methodology also includes information on a model used to price European-style binary options. The products for which OCC used this model to calculate margin requirements are no longer listed, and OCC decommissioned the model. The current text also includes information on OCC's use of the Vanilla Options model to calculate margin requirements for Currency Options and Foreign Index Futures, both of which are products OCC no longer clears. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

The current rule text from the Margins Methodology also includes information on certain processes OCC uses to operationalize the STANS methodology in its systems. Specifically, these processes are (i) daily calibration and transfer, which describes implementation of the processes to daily obtain pricing data and calibrate pricing models; (ii) Monte Carlo marginals, which describes implementation of the processes that create price scenarios for underlying risk factors from either copula draws or (in the absence of a copula) conditional or default simulations; (iii) Monte Carlo

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50 The Schwartz and Smith's model is a two-factor model of commodity prices that allows for mean reversion in short-term prices and uncertainty in the long-term equilibrium level to which prices revert. See Schwartz, E. and Smith, E., "Short-Term Variations and Long-Term Dynamics in Commodity Prices," 46 Mgmt. Sci. 7, 893-911 (2000) (describing the Schwartz and Smith's model).

51 Seasonality is a characteristic of futures products that exhibit regular and predictable price changes that recur every calendar year.

theoreticals, which describes implementation of the processes that calculate theoretical values for futures and options; and (iv) monthly copula estimation and simulation, which describes implementation of the processes that generate copula scenarios for underlying risk factors based on calibrated parameters.

These chapters describe implementation details related to OCC's internal administration of its technology systems and are not needed to understand how the STANS models currently function. Because these details are not inherent to model selection or design, OCC could also change them from time to time without affecting model results. OCC believes that this information is more appropriately covered in the underlying Model Whitepapers and other internal OCC documentation rather than in OCC's rules for this reason. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Margin Policy

Lastly, OCC would make conforming changes to its Margin Policy to reflect the adoption of the STANS Methodology Description and the retirement of the Margins Methodology. OCC would also make other non-substantive changes to the Margin Policy to correct typographical errors, update references to other related internal OCC policies and procedures, and conform the policy to OCC's current internal policy template. The proposed changes are intended to promote the accuracy and clarity of OCC's Margin Policy and would not impact OCC's margin setting practices or processes.

OCC reviewed the derivatives clearing organization ("DCO") Core Principles as set forth in the Act. During this review, OCC identified the following Core Principles as potentially being impacted:

Risk management. OCC believes that implementing the proposed rule change will be aligned with the requirements of Core Principle D.[52] Core Principle D requires, in part, that each DCO limit, through the use of margin and other risk control mechanisms, its potential losses from defaults by members and participants of the DCO to ensure that its operations would not be disrupted and that its non-defaulting members or participants are not exposed to losses they cannot anticipate or control.[53] Core Principle D also requires that each DCO have margin requirements sufficient to cover potential exposures in normal market conditions and that such margin requirements be set using risk-based models and parameters.[54]

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52 7 U.S.C. 7a-1(c)(2)(D).

53 See 7 U.S.C. 7a-1(c)(2)(D)(iii).

54 See 7 U.S.C. 7a-1(c)(2)(D)(iv) - (v). CFTC Regulation 39.13(g)(2)(i) further implements Core Principle D by requiring that each DCO establish initial margin requirements that are commensurate with the risks of each product and portfolio, including any unusual characteristics of, or risks associated with, particular products or portfolios. See 17 CFR 39.13(g)(2)(i).

As described above, the proposed STANS Methodology Description would provide a comprehensive description of OCC's existing risk-based margin methodology, which OCC uses to measure its credit exposures to its participants on a daily basis and determine margin requirements based on such calculations. OCC believes that the proposed STANS Methodology Description would result in a more comprehensive and clearly understandable description of the methodology used to measure and mitigate credit exposures to OCC's Clearing Members, and that the proposed rule change is therefore designed to ensure that OCC sets margin requirements using risk-based models and parameters that would serve to limit OCC's exposures to potential losses from defaults by its participants so that the operations of OCC would not be disrupted, and non-defaulting participants would not be exposed to losses that they cannot anticipate or control. As a result, OCC believes the proposed rule change would promote compliance with the requirements of Core Principle D.

Opposing Views

No opposing views were expressed related to the rule amendments.

Notice of Pending Rule Certification

OCC hereby certifies that notice of this rule filing has been given to Clearing Members of OCC in compliance with Regulation 40.6(a)(2) by posting a copy of the submission on OCC's website concurrently with the filing of this submission.

<u>Certification</u>

OCC hereby certifies that the rule set forth at Item 1 of the enclosed filing complies with the Act and the CFTC's regulations thereunder.

Should you have any questions regarding this matter, please do not hesitate to contact me.

Sincerely,

Justin W. Byrne
Executive Director, Associate General Counsel

Enclosure(s)

OMB APPROVAL
OMB Number: 3235-0045 Estimated average burden hours per response............38

Required fields are shown with yellow backgrounds and asterisks.

SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549
Form 19b-4

File No.* SR - 2020 - * 016

Amendment No. (req. for Amendments *)

Filing by Options Clearing Corporation

Pursuant to Rule 19b-4 under the Securities Exchange Act of 1934

Initial *	Amendment *	Withdrawal	Section 19(b)(2) *	Section 19(b)(3)(A) *	Section 19(b)(3)(B) *
☑	☐	☐	☑	☐	☐

Rule: 19b-4(f)(1) ☐ 19b-4(f)(4) ☐ 19b-4(f)(2) ☐ 19b-4(f)(5) ☐ 19b-4(f)(3) ☐ 19b-4(f)(6) ☐

Pilot ☐

Extension of Time Period for Commission Action * ☐

Date Expires *

Notice of proposed change pursuant to the Payment, Clearing, and Settlement Act of 2010

Section 806(e)(1) * ☐

Section 806(e)(2) * ☐

Security-Based Swap Submission pursuant to the Securities Exchange Act of 1934

Section 3C(b)(2) * ☐

Exhibit 2 Sent As Paper Document ☐

Exhibit 3 Sent As Paper Document ☐

Description

Provide a brief description of the action (limit 250 characters, required when Initial is checked *).

Proposed rule change concerning The Options Clearing Corporation's System for Theoretical Analysis and Numerical Simulation ("STANS") Methodology Documentation.

Contact Information

Provide the name, telephone number, and e-mail address of the person on the staff of the self-regulatory organization prepared to respond to questions and comments on the action.

First Name * Justin Last Name * Byrne

Title * Executive Director, Associate General Counsel

E-mail * jbyrne@theocc.com

Telephone * (202) 971-7238 Fax (312) 322-6280

Signature

Pursuant to the requirements of the Securities Exchange Act of 1934,

has duly caused this filing to be signed on its behalf by the undersigned thereunto duly authorized.

Date 12/09/2020

By Justin W. Byrne

(Name *)

(Title *)

Executive Director, Associate General Counsel

NOTE: Clicking the button at right will digitally sign and lock this form. A digital signature is as legally binding as a physical signature, and once signed, this form cannot be changed.

Justin Byrne, jbyrne@theocc.com

Required fields are shown with yellow backgrounds and asterisks.

SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

For complete Form 19b-4 instructions please refer to the EFFS website.

Form 19b-4 Information * Add Remove View	The self-regulatory organization must provide all required information, presented in a clear and comprehensible manner, to enable the public to provide meaningful comment on the proposal and for the Commission to determine whether the proposal is consistent with the Act and applicable rules and regulations under the Act.
Exhibit 1 - Notice of Proposed Rule Change * Add Remove View	The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO] -xx-xx). A material failure to comply with these guidelines will result in the proposed rule change being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)
Exhibit 1A- Notice of Proposed Rule Change, Security-Based Swap Submission, or Advance Notice by Clearing Agencies * Add Remove View	The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO] -xx-xx). A material failure to comply with these guidelines will result in the proposed rule change, security-based swap submission, or advance notice being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)
Exhibit 2 - Notices, Written Comments, Transcripts, Other Communications Add Remove View Exhibit Sent As Paper Document ☐	Copies of notices, written comments, transcripts, other communications. If such documents cannot be filed electronically in accordance with Instruction F, they shall be filed in accordance with Instruction G.
Exhibit 3 - Form, Report, or Questionnaire Add Remove View Exhibit Sent As Paper Document ☐	Copies of any form, report, or questionnaire that the self-regulatory organization proposes to use to help implement or operate the proposed rule change, or that is referred to by the proposed rule change.
Exhibit 4 - Marked Copies Add Remove View	The full text shall be marked, in any convenient manner, to indicate additions to and deletions from the immediately preceding filing. The purpose of Exhibit 4 is to permit the staff to identify immediately the changes made from the text of the rule with which it has been working.
Exhibit 5 - Proposed Rule Text Add Remove View	The self-regulatory organization may choose to attach as Exhibit 5 proposed changes to rule text in place of providing it in Item I and which may otherwise be more easily readable if provided separately from Form 19b-4. Exhibit 5 shall be considered part of the proposed rule change.
Partial Amendment Add Remove View	If the self-regulatory organization is amending only part of the text of a lengthy proposed rule change, it may, with the Commission's permission, file only those portions of the text of the proposed rule change in which changes are being made if the filing (i.e. partial amendment) is clearly understandable on its face. Such partial amendment shall be clearly identified and marked to show deletions and additions.

SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

Form 19b-4

Proposed Rule Change
by

THE OPTIONS CLEARING CORPORATION

Pursuant to Rule 19b-4 under the
Securities Exchange Act of 1934

Item 1. <u>Text of the Proposed Rule Change</u>

Pursuant to the provisions of Section 19(b)(1) of the Securities Exchange Act of 1934 ("Exchange Act" or "Act"),[1] and Rule 19b-4 thereunder,[2] The Options Clearing Corporation ("OCC") is filing with the Securities and Exchange Commission ("SEC" or "Commission") a proposed rule change to adopt a new document describing OCC's System for Theoretical Analysis and Numerical Simulation ("STANS"), which OCC uses to calculate daily and intra-day margin requirements for its Clearing Members (such document being the "STANS Methodology Description"). OCC also proposes to make conforming and other non-substantive changes to its Margin Policy. The proposed changes are discussed in detail in Item 3 below.

The proposed STANS Methodology Description is submitted without marking in confidential Exhibit 5A to SR-OCC-2020-016 because this document is being submitted in its entirety as new rule text. The proposed changes to OCC's current rule text related to the STANS methodology, known as the Margins Methodology, are contained in confidential Exhibit 5B to SR-OCC-2020-016. Material proposed to be added to the current rule text is marked by underlining and material proposed to be deleted is marked by strikethrough text. The proposed changes to the Margin Policy are contained in confidential Exhibit 5C to SR-OCC-2020-016.[3]

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[1] 15 U.S.C. 78s(b)(1).

[2] 17 CFR 240.19b-4.

[3] OCC has filed a proposed rule change with the Commission to adopt a new Third-Party Risk Management Framework ("TPRMF"), which would replace the Counterparty Credit Risk Management Policy and provide an overview of OCC's approach to third-party risk management. That proposed rule change also includes conforming changes to OCC's Margin Policy. <u>See</u> Securities Exchange Act Release No. 90406 (November 12, 2020), 85 FR 73582 (November 18, 2020) (SR-OCC-2020-014). The proposed changes to the

Material proposed to be added to the Margin Policy is marked by underlining and material proposed to be deleted is marked by strikethrough text. The proposed rule change does not require any changes to the text of OCC's By-Laws or Rules. All terms with initial capitalization that are not otherwise defined herein have the same meaning as set forth in OCC's By-Laws and Rules.[4]

Item 2. Procedures of the Self-Regulatory Organization

The proposed rule change was approved for filing with the Commission by the Risk Committee at a meeting held on June 10, 2019 through authority delegated to it by the Board of Directors at a meeting held on April 25, 2019.

Questions should be addressed to Justin W. Byrne, Executive Director, Associate General Counsel, at (202) 971-7238.

Item 3. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

A. Purpose

Background

The STANS methodology is OCC's proprietary risk management system for calculating Clearing Member margin requirements.[5] In general, STANS utilizes large-scale Monte Carlo

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Margin Policy currently pending Commission review in SR-OCC-2020-014 are marked in double underlining and double strikethrough text.

4 OCC's By-Laws and Rules can be found on OCC's public website: https://www.theocc.com/Company-Information/Documents-and-Archives/By-Laws-and-Rules.

5 See Securities Exchange Act Release No. 53322 (February 15, 2006), 71 FR 9403 (February 23, 2006) (SR-OCC-2004-20).

simulations to forecast price and volatility movements in determining a Clearing Member's margin requirement.[6] The STANS margin requirement is calculated at the portfolio level of Clearing Member accounts with positions in marginable securities. The STANS margin requirement consists of an estimate of a 99% expected shortfall ("ES")[7] over a two-day time horizon with additional charges for model risk, stress tests, liquidation costs, and various add-ons. The STANS methodology is used to measure the exposure of portfolios of options, futures, and cash instruments cleared by OCC.[8]

OCC maintains technical documentation that describes in detail how the various quantitative components of STANS were developed and operate, including the various parameters and assumptions contained within those components[9] and the mathematical theories underlying the selection of those quantitative methods ("Model Whitepapers"). The Model Whitepapers are currently synthesized in a single document, the Margins Methodology, describing how STANS operates from end to end. The Margins Methodology includes material

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6 See OCC Rule 601.

7 The ES component is established as the estimated average of potential losses higher than the value-at-risk ("VaR") threshold. VaR refers to a statistical technique that is used in risk management to measure the potential risk of loss for a given set of assets over a particular time horizon.

8 Pursuant to OCC Rule 601(e)(1), OCC also calculates initial margin requirements for segregated futures accounts on a gross basis using the Standard Portfolio Analysis of Risk Margin Calculation System ("SPAN"). SPAN is separate from STANS and is therefore not described in the STANS Methodology Description.

9 See Securities Exchange Act Release No. 82473 (January 9, 2018), 83 FR 2271 (January 16, 2018) (SR-OCC-2017-011), which describes how OCC periodically reviews the parameters and assumptions used by STANS pursuant to its Model Risk Management Policy and in accordance with 17 CFR 240.17Ad-22(e)(6).

aspects of OCC's risk-based margin system, which OCC must establish as a covered clearing agency under the Exchange Act and the rules promulgated thereunder, and which must be reasonably designed to, in part "(i) [produce] margin levels commensurate with [the] risks and particular attributes of each relevant product, portfolio, and market; (ii) [mark] participant positions to market and [collect] margin, including variation margin or equivalent charges if relevant, at least daily . . . ; (iii) [calculate] margin 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; (iv) [use] reliable sources of timely price data and [use] procedures and sound valuation models for addressing circumstances in which pricing data are not readily available or reliable; [and] (v) [use] an appropriate method for measuring credit exposure that accounts for relevant product risk factors and portfolio effects across products . . ."[10] The Margins Methodology also includes information that would not be considered material aspects of OCC's methodology, such as internal procedural and administrative details, or details that could be reasonably and fairly implied by OCC's existing rules or other information contained in the document.

Over time, OCC has filed sections of the Margins Methodology with the Commission as proposed rule changes under Section 19(b)(1) of the Exchange Act and Rule 19b-4 thereunder to effect changes to individual components of STANS.[11] Thus, those chapters of the Margins

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10 17 CFR 240.17Ad-22(e)(6).

11 See Securities Exchange Act Release No. 74966 (May 14, 2015), 80 FR 29784 (May 22, 2015) (SR- OCC-2015-010); Securities Exchange Act Release No. 76128 (December 28, 2015), 81 FR 135 (January 4, 2016) (SR-OCC-2015-016); Securities Exchange Act

Methodology have become codified as OCC rule text under Section 19(b)(1) of the Exchange Act and Rule 19b-4. However, OCC now proposes to adopt a new STANS Methodology Description, which would replace the Margins Methodology document and codify the STANS methodology in its entirety under Section 19(b)(1) of the Exchange Act and Rule 19b-4. After adoption of the STANS Methodology Description, OCC would no longer maintain the Margins Methodology, neither as an OCC rule nor as an internal document.

In connection with this proposed rule change, OCC would also retire as rule text any chapters of the Margins Methodology previously filed with the Commission, as the proposed STANS Methodology Description is intended to cover the material aspects of the STANS methodology. Those chapters of the Margins Methodology that OCC has previously filed under Section 19(b)(1) of the Exchange Act and Rule 19b-4[12] would be superseded in their entireties by new corresponding sections in the STANS Methodology Description, as described in further detail herein.

The current text of the Margins Methodology includes various details that would no

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Release No. 79818 (January 18, 2017), 82 FR 8455 (January 25, 2017) (SR-OCC-2017-001); Securities Exchange Act Release No. 82161 (November 28, 2017), 82 FR 57306 (December 4, 2017) (SR-OCC-2017-022); Securities Exchange Act Release No. 84524 (November 2, 2018), 83 FR 55918 (November 8, 2018) (SR-OCC-2018-014); Securities Exchange Act Release No. 85440 (March 28, 2019), 84 FR 13082 (April 3, 2019) (SR-OCC-2019-002); Securities Exchange Act Release No. 85755 (April 30, 2019), 87 FR 19815 (May 6, 2019) (SR-OCC-2019-004); Securities Exchange Act Release No. 86296 (July 3, 2019), 84 FR 32816 (July 9, 2019) (SR-OCC-2019-005); Securities Exchange Act Release No. 87387 (October 23, 2019), 84 FR 57890 (October 29, 2019) (SR-OCC-2019-010); Securities Exchange Act Release No. 89392 (July 24, 2020), 85 FR 45938 (July 30,2020) (SR-OCC-2020-007); Securities Exchange Act Release No. 90139 (October 8, 2020), 85 FR 65886 (October 16, 2020) (SR- OCC-2020-012).

12 Id.

longer be OCC rule text following the adoption of the proposed STANS Methodology Description. While the details that OCC proposes to remove are described in further detail herein, thematically, they consist of the following:

- Details on OCC's historical modeling practices and potential future enhancements, which do not describe how a model currently functions;
- Details on the exact set of current products applied to each STANS component, which will change from time to time as OCC-cleared products are listed and delisted;
- Various configuration choices made by OCC, such as data sources, model parameters, and model performance monitoring, that are not inherent to model selection or design and that do not materially impact a model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices;
- Extensive, detailed testing results and explanatory rationale supporting a model;
- Recitations of standard mathematical and economic theories/techniques that are well-known in quantitative finance, readily found in public sources, and do not include OCC-specific modifications or applications;
- Redundant descriptions of a model component appearing in multiple chapters;
- Details on OCC's implementation of a model in its internal technology systems and application of model results in operational procedures that are not inherent to a model and that OCC could change from time to time without affecting a model's results; and
- Manual margin adjustments and add-ons OCC employs pursuant to OCC rules, policies, and/or procedures outside the STANS methodology.

The proposed STANS Methodology Description is intended to be a comprehensive description of STANS that is made available to Clearing Members and enable an informed reader to understand OCC's modeling choices and the interconnectedness of STANS model components in producing OCC margin requirements. Therefore, OCC believes the details summarized above and described herein are extraneous to this purpose. Rather, OCC believes these types of details are more appropriately covered – to the extent these details are specific to an OCC model – in other OCC rules and policies, Model Whitepapers, or other internal OCC documentation.

OCC also believes, as described in Item 3.B below, these details do not need to maintained as OCC "rules" as defined by Section 19(b)(1) of the Exchange Act and Rule 19b-4.[13] These internal procedural and administrative details used by OCC's model developers and model validators would: (1) be reasonably and fairly implied by the proposed STANS

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13 Section 19(b)(1) of the Exchange Act requires a self-regulatory organization ("SRO") such as OCC to file with the Commission any proposed rule or any proposed change in, addition to, or deletion from the rules of such SRO. See 15 U.S.C. 78s(b)(1). Section 3(a)(27) of the Exchange Act defines "rules of a clearing agency" to mean its (1) constitution, (2) articles of incorporation, (3) bylaws, (4) rules, (5) instruments corresponding to the foregoing and (6) such "stated policies, practices and interpretations" ("SPPI") as the Commission may determine by rule. See 15 U.S.C. 78c(a)(27). Exchange Act Rule 19b-4(a)(6) defines the term "SPPI" to include (i) any material aspect of the operation of the facilities of an SRO and (ii) statements made generally available to membership of, to all participants in, or to persons having or seeking access to facilities of an SRO that establishes or changes certain standards, limits, or guidelines. See 17 CFR 240.19b-4(a)(6). Rule 19b-4(c) provides, however, that an SPPI may not be deemed to be a proposed rule change if it is: (i) reasonably and fairly implied by an existing rule of the SRO or (ii) concerned solely with the administration of the SRO and is not an SPPI with respect to the meaning, administration, or enforcement of an existing rule the SRO. See 17 CFR 240.19b-4(c).

Methodology Description, OCC's Margin Policy,[14] OCC's Model Risk Management Policy,[15] and other OCC rules; and/or (2) otherwise not be deemed to be material aspects of OCC's margin setting-related operations. While OCC would not maintain these details in the STANS Methodology Description, OCC would continue to maintain and update these details when necessary in the Model Whitepapers and other internal OCC documentation, where these details are also currently found.[16]

STANS Methodology Description

The proposed STANS Methodology Description would describe the material aspects of OCC's margin methodology. Specifically, the STANS Methodology Description would include (i) an executive summary; (ii) descriptions of the quantitative model components of STANS; and (iii) "model utilities" intended to enhance the quality of model results. Each of these sections is described in further detail below.[17]

Executive Summary

The STANS Methodology Description would provide an executive summary of STANS. This executive summary would describe how the purpose of STANS is to determine margin

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14 See Securities Exchange Act Release No. 82355 (December 19, 2017), 82 FR 61058 (December 26, 2017) (SR-OCC-2017-007).

15 See Securities Exchange Act Release No. 82473 (January 9, 2018), 83 FR 2271 (January 16, 2018) (SR-OCC-2017-011).

16 OCC's Model Risk Management Policy establishes detailed standards for Model Whitepapers and governance to adopt or make changes to a Model Whitepaper. See id.

17 The proposed STANS Methodology Description would also include the following non-substantive sections: (i) a table of contents; (ii) a list of references to academic and technical documents, both public and internal to OCC; and (iii) a table of defined terms used in the STANS Methodology Description.

requirements for OCC's Clearing Members (as described below), and in doing so meet various risk management goals and regulatory requirements for OCC. The executive summary would then describe the types of positions and collateral modeled through STANS, which include (i) valued securities and stock loans; (ii) equity, index, and futures options; (iii) Flexible Exchange ("FLEX") options; (iv) equity and index futures; (v) volatility futures; and (vi) commodity futures. The executive summary would then provide an overview of the STANS methodology, which includes (i) econometric calibration; (ii) copula estimation and Monte Carlo simulation; (iii) volatility forecasting; (iv) theoretical underlying price generation; (v) theoretical derivatives price generation; and (vi) aggregation and margin calculation. These components are described in further detail below. The executive summary would then describe OCC's model monitoring activities, which include (i) daily backtesting and (ii) ongoing parameter monitoring pursuant to monitoring plans established by OCC's Model Risk Working Group ("MRWG").[18] The executive summary would then describe that STANS relies on price feeds of real-time market data to generate theoretical values in calculating margin requirements, and how OCC staff may use price editing techniques to improve the quality of pricing data for input into STANS.[19] Lastly, the executive summary would briefly outline the organization of the sections of the STANS Methodology Description that substantively describe the core components of the

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18 OCC's Margin Policy and Model Risk Management Policy provide more detail on OCC's model monitoring activities. See supra notes 14 and 15.

19 OCC's Collateral Risk Management Policy and Margin Policy provide more detail on the function of OCC's Pricing & Margins department. See Securities Exchange Act Release No. 82009 (November 3, 2017), 82 FR 52079 (November 9, 2017) (SR-OCC-2017-008) and supra note 14.

STANS methodology and the related data processing utilities used by STANS.

The proposed text of this executive summary would replace current OCC rule text from the Margins Methodology's introductory section. The current text, in addition to summarizing the STANS methodology as would the proposed text described above, includes descriptions of the following:

- OCC's historical modeling practices: OCC does not believe this historical information is needed to understand how the model functions.
- Redundant details of the STANS methodology also found in the main body of both the Margins Methodology and the proposed STANS Methodology Description: This information, would already be detailed in the main body of the STANS Methodology Description, and OCC does not believe repeating it here is needed to understand how STANS functions.
- A "documentation guide" describing what information can be found within various sections of the Margins Methodology: OCC does not believe this documentation guide is needed to understand how STANS functions, or to understand the organization of the proposed STANS Methodology Description.

For the reasons stated above, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

<u>STANS Methodology Components</u>

The STANS Methodology Description would next describe the components of OCC's risk-based margin methodology, which OCC uses to cover the credit exposures presented by

Clearing Members in accordance with Rule 17Ad-22(e)(6). In particular, the STANS Methodology Description would describe the (i) calibration of various parameters and price data inputs used by OCC's econometric and pricing models to create risk factors; (ii) construction of a copula from the risk factors that identifies correlations among simulated changes in the various risk factors; (iii) application of the simulated risk factor changes and correlations to actual data through Monte Carlo simulations that estimate 10,000 possible scenarios for each risk factor, then estimation of theoretical prices for securities, derivatives, and futures using these theoretical scenarios; and (iv) application of the theoretical prices to actual Clearing Member positions to calculate margin requirements.

i. Model and Econometric Calibration

The STANS Methodology Description would describe how the quantitative models used by STANS incorporate various historical price data and econometric parameter inputs, which are used to estimate and simulate the risk for an associated product. These inputs consist of (i) returns on equity securities; (ii) implied volatilities; (iii) energy and commodity futures; (iv) treasury securities; (v) variance futures; and (vi) volatility futures. In total, there are currently approximately 40,000 of these inputs. The exact number of inputs is subject to change based on the types of products that OCC clears and OCC's research on what risk factors correlate with prices changes in these products. Historical price data comes from OCC's Pricing & Margins department, which obtains the data from external vendors and then validates it for use within

STANS.[20] STANS uses several models, described below, to calibrate this historical data and then transform the historical data into theoretical values that, along with specialized volatility forecast and marginal distribution parameters constructed by other OCC models described below, are used to construct a copula, described in the next step.

Equity Returns

STANS uses returns on equity securities that are based on current market prices. STANS first calibrates this data by simply creating a time series of logarithmic returns based on the closing, and in some cases opening, prices. This transformation does not require a separate model. The data is used to create econometric parameters and for pricing as described further below.

Implied Volatility

STANS uses implied volatility risk factors to measure the expected future volatility of an option's underlying security at expiration, which is reflected in the current option premium in the market. To address variations in implied volatility, OCC models a volatility surface for options by incorporating into the econometric models underlying STANS certain risk factors called "pivot points." These pivot points are chosen such that their combination allows STANS to identify changes in the level, skew, convexity, and term structure of the implied volatility surface. STANS generates a value for each of the nine pivot points for each eligible underlying asset and for each business day in the historical data period. To calibrate this data, for each of the

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[20] See supra note 14.

nine pivot points STANS performs a kernel smoothing technique[21] on the historical data. Application of these pivot points enables STANS to simulate implied volatility scenarios, which are then used to create the specialized volatility forecast and marginal distribution parameters described below, and in the pricing of options through OCC's option pricing models described further below.[22]

The proposed text would replace current OCC rule text from the Margins Methodology's section on implied volatility. The current rule text also includes other information related to the implied volatility model. Specifically, the current rule text includes descriptions of the following:

- Products eligible for implied volatility scenarios modeling in STANS: OCC does not believe the exact list of products to which this model is applied is needed to understand how the model functions, and this list may change from time to time as OCC-cleared products are listed and delisted.
- Data sources used by STANS to perform the kernel smoothing technique: These data sources are configuration choices made by OCC that are not inherent to the model's selection or design and that OCC could change from time to time without affecting the model's results.

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21 "Kernel smoothing" is a statistical process by which data points are better fitted to an expected function using weighted averages and a "smoothing parameter."

22 See Securities Exchange Act Release No. 76128 and Securities Exchange Act Release No. 84524 for more information on the function and application of the implied volatility model.

- Rationale for the assumptions underlying implied volatility modeling of longer-tenor options: OCC does not believe that the justification for these model assumptions is needed to understand how the model currently functions.
- Historical background on OCC's decision to incorporate implied volatility modeling into STANS: OCC does not believe that this historical information is needed to understand how the model currently functions.
- Model testing and validation results for the implied volatility model: OCC does not believe that the internal testing and validation performed to verify the model is fit for use is needed to understand how the model currently functions.

OCC believes that this information is more appropriately covered in the Implied Volatility Scenarios Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Treasury Securities

STANS prices treasury securities[23] using a Nelson-Siegel framework,[24] a commonly used polynomial model for constructing the term structure of an interest rate and modeling changes in

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23 While OCC does not clear treasury securities or derivatives on such products, OCC permits Clearing Members to deposit treasury securities as margin collateral.

24 See Nelson, C.R. and Siegel, A.F., "Parsimonious Modeling of Yield Curves," 60 The J. of Bus. 4, 473-489 (1987) (describing the Nelson-Siegel model).

a yield curve.[25] STANS constructs a theoretical yield curve using current and historical settlement prices for treasury securities.

STANS calibrates this data by transforming the market prices into a time series of unobservable factors that represents the yield curve. STANS fits these Nelson-Siegel parameters using observed bond prices. In simulation, STANS creates "shocks" on theoretical Nelson-Siegel parameters[26] to create theoretical interest rate curves, which are in turn used to price treasury securities.

The proposed text would replace current OCC rule text from the Margins Methodology's section on U.S. Treasury bills and fixed rate notes, bonds, and strips. The current rule text also includes other information related to the treasury securities and interest rate model. Specifically, the current rule text includes the following:

- Summary and introduction sections that describe OCC's need to model treasury securities and interest rates and provide an overview of the U.S. Treasury securities market: OCC does not believe these background descriptions of the macroeconomic environment, found in public sources, are needed to understand how the model currently functions.
- Restatements of mathematical definitions and equations describing the relationship between the forward and yield curves, and the payoff function for bonds used to describe

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[25] In addition to pricing treasury securities, STANS uses a Nelson-Siegel framework to simulate potential changes in interest rates. Refer to the below description of the interest rate curve model utility.

[26] STANS also introduces extra "noise" into the bond prices to account for the bonds' idiosyncratic behaviors and prevent the resulting treasury securities price movements from being perfectly correlated.

all interest rate curves: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic sources. To the extent the text does not describe OCC's application of these theories, OCC does not believe this information needs to be maintained in OCC's rules.

- Details on how OCC implemented the model in its technology systems: These implementation details relate to OCC's internal administration of its technology systems and are not needed to understand how the model currently functions. Because these details are not inherent to the model's selection or design, OCC could also change them from time to time without affecting the model's results.
- Redundant description of the copula constructed by STANS: This information, described further below, would already be detailed in the STANS Methodology Description section related to the construction of a copula, and OCC does not believe repeating it here is needed to understand how the model currently functions.

OCC believes that this information is more appropriately covered in the Nominal Treasury Securities Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Generic Futures

Relying on current futures prices and time series of spot prices as inputs, STANS uses a generic futures model to price linear derivatives with limited term structures. Using basic economic assumptions that the relationship of spot prices to forward prices does not allow for arbitrage and that futures prices equal forward prices, or that any deviations from this are adequately addressed through costs implicit in carrying such positions,[27] the model estimates and applies theoretical discount factors to the futures prices. These discount factors are based on a ratio of estimated spot prices on the underlying securities to the futures prices.

Variance Futures

STANS uses a specialized factor model to price variance futures, which uses historical data for both variance futures products and the Standard and Poor's 500 Index ("SPX"). This model relies on basic assumptions that the short-term volatility of variance futures prices tends to revert towards a mean (i.e., volatility remains relatively close to an average value), but the long-term volatility is itself stochastic. Using these assumptions, STANS fits current values of the volatility and volatility mean reversion level, in addition to parameters describing the dynamics, to the current term structure of variance futures prices. Modeling variance futures prices based on these assumptions allows the theoretical prices to move in a realistic fashion.

The model is first calibrated with historical data on variance futures prices and their recent dynamics. It then simulates prices for variance futures using two sets of random variables: (i) SPX returns; and (ii) changes in the long-term volatility level, represented by normal random numbers that STANS generates daily for use only with variance futures and that have no correlation with other theoretical numbers generated by STANS. Both random variables

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27 As described previously, pursuant to OCC's Model Risk Management Policy OCC periodically reviews all parameters and assumptions used in STANS and they are subject to change.

are used to simulate scenarios for prices of the variance futures tenors.

Synthetic Futures

Using logarithmic daily returns of active futures and various other securities, STANS uses a "synthetic futures" model to estimate prices of certain products such as volatility index-based futures (e.g., VIX futures). In general, the synthetic futures model creates an artificial (or "synthetic") time series of price innovations for actual futures contracts with approximately the same tenor as the actively-traded futures.[28] This synthetic time series then serves as a uniform substitute for a time series of daily settlement prices for the actual futures contracts, which persists over many expiration cycles and thus can be used as a basis for econometric analysis. STANS performs this analysis by fitting the synthetic time series with associated volatility forecast and marginal distribution parameters, which are described below.

The traded futures contracts are then mapped to the simulated return scenarios of the corresponding synthetic contracts to produce theoretical prices. The first synthetic contract in the series contains returns of the front contract on any given day. STANS switches the front contract of the series to the next one out on the day following the expiration date of the front contract. While the synthetic time series contain returns from different contracts, a return on any given date is constructed from prices of the same contract. Using a synthetic time series allows STANS to better approximate correlations between futures contracts of different tenors by

28 See Securities Exchange Act Release No. 85440 for further information on OCC's synthetic futures model as applied to volatility index-based products. OCC notes that the synthetic futures model can also be used for other futures products, such as interest rate futures. See e.g., Securities Exchange Act Release No. 89392 and Securities Exchange Act Release No. 90139.

creating more price data points and their margin offsets. These synthetic time series are mapped to the underlying futures product they are intended to represent.

The proposed text would replace current OCC rule text from the Margins Methodology's section on synthetic futures. The current rule text also includes other information related to the synthetic futures model. Specifically, the current rule text includes descriptions of the following:

- Rationale for making changes to the model in 2019[29] and other historical information: OCC does not believe that this rationale and historical information is needed to understand how the model currently functions.
- Equations for standard GARCH provided for introductory purposes: A description of OCC's GARCH model, described further below, would already be detailed in the STANS Methodology Description section related to GARCH parameters, and OCC does not believe repeating it here is needed to understand how the model functions. Furthermore, the GARCH equations as implemented in STANS are modified from the standard GARCH equations provided here, and OCC believes this text could create confusion around the exact GARCH equations used in STANS.[30]

OCC believes that this information is more appropriately covered in the Synthetic Futures Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

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29 See id.

30 See infra note 36.

GARCH and NRIG Parameters

STANS utilizes econometric parameters related to volatility forecasts and marginal distributions, and calibrates these parameters using ten-year histories of the data inputs described above. For both volatility forecasts and marginal distributions, STANS utilizes a generalized autoregressive conditional heteroskedasticity ("GARCH") model. GARCH is a common statistical model for, in a time series of data, comparing the variance of one point in the time series to the previous point in the series rather than an arithmetic average of all the points in the series. This is particularly useful when the value of volatility at one point in a time series is known to be correlated with the volatility at previous points in the series. STANS estimates these GARCH parameters through a maximum likelihood estimation method. By fitting these GARCH parameters to a time series of risk factor innovations, STANS is able to remove the effects of volatility from – or "devolatilize" – the risk factor time series so that the copula described below can estimate the correlations among the risk factors irrespective of their individual volatilities.

To model volatility forecast parameters, STANS fits the time series of implied volatility pivot points (described above) into a Student's t-distribution, a continuous probability distribution that is commonly used to estimate the mean of a population with a relatively small sample size and unknown standard deviation. To determine the appropriate degrees of freedom for a particular distribution, STANS applies an Anderson-Darling test.

To model marginal distribution parameters, STANS utilizes a normal reciprocal inverse

Gaussian ("NRIG") distribution, a special case of the generalized hyperbolic distribution.[31] The returns[32] of each risk factor used in STANS are assumed to exhibit returns in the shape of a symmetric NRIG distribution.[33] Consequently, STANS calibrates NRIG parameters that are designed to describe the shape of every risk factor individually.

As described previously, STANS constructs these GARCH and NRIG parameters from the historical price data and econometric parameter inputs that are first calibrated by the models described above. These historical price data and econometric parameters, and the resulting GARCH and NRIG parameters, are the foundational data elements used by the copula and pricing models described in the proceeding steps.

The STANS Methodology Description would also describe the controls that may be placed on the GJR-GARCH parameters after their initial calibration. GARCH volatility forecasting models can be very reactive in certain market environments. As a result, OCC may implement parameter controls for risk factors and classes of risk factors, which are subject to periodic review and approval by the MRWG.

The proposed text would replace current OCC rule text from the Margins Methodology's

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31 The generalized hyperbolic distribution is a special type of continuous probability distribution. See Barndorff-Nielsen, O., "Exponentially decreasing distributions for the logarithm of particle size," 353 Proc. of the Royal Soc'y of London. Series A, Mathematical and Physical Sci. 1674, 401–419 (1977) (explaining the generalized hyperbolic distribution).

32 "Return" refers generally to changes in a risk factor's value over a time interval. Returns could take the form of simple differences, log returns, or other forms.

33 Except for (i) Chicago Volatility Index ("VIX") futures, which are assumed to follow an asymmetric NRIG distribution, and (ii) implied volatility, which is assumed to follow a Student's t-distribution.

section on GARCH forecasts. OCC notes that the current rule text describes the standard NRIG cumulative distribution function that is widely available in public academic texts. The proposed rule text would describe the same function in a re-parameterized form that is proprietary to OCC. While the two forms are mathematically equivalent, the re-parameterized form is used in the Econometric Model for Risk Factors in STANS Model Whitepaper and the proposed text would therefore be made consistent with the Model Whitepaper. The proposed rule text would also include a citation to an academic paper describing the rationale for the re-parameterization.

The current rule text also includes other information related to OCC's GARCH model. Specifically, the current rule text includes descriptions of the following:

- Introductory language describing the standard Glosten-Jagannathan-Runkle GARCH model and the use of a Student's t-distribution: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic sources. To the extent this text does not describe OCC's application of GARCH and the Student's t-distribution, OCC does not believe this information needs to be maintained in OCC's rules.
- Details on variance forecasting (i.e., considering how securities volatility tends to clusters during certain periods) as rationale for model selection: OCC believes this information is extraneous to understanding how the GARCH model currently functions in STANS.
- Variance forecasting as applied to the One-Day and Two-Day Scenarios model utility: This information, described further below, would already be detailed in the STANS

Methodology Description section related to the One-Day and Two-Day Scenarios model utility, and OCC does not believe repeating it here is needed to understand how the model utility currently functions.

- Mathematical rationale for the cumulative distribution function,[34] inverse cumulative distribution function, and degrees of freedom for the Student's t-distribution used by the GARCH model for implied volatility risk factors: OCC believes this information is extraneous to understanding how the GARCH model currently functions in STANS. This information is also foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent this text does not describe OCC's application of these functions and the Student's t-distribution, OCC does not believe this information needs to be maintained in OCC's rules.
- Explanatory mathematical formulas for variance forecasting of implied volatility risk factors and a likelihood function[35] and equations related to the Anderson-Darling test,[36] including the Student's t cumulative distribution function for integer values of $\boldsymbol{\nu}$: These details relate to implementation of the GARCH model in OCC's internal technology systems, are not inherent to the model's selection or design, and are not needed to understand how the model currently functions.

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34 In probability theory, the cumulative distribution function of a random variable is the probability that the variable will be less than or equal to a set value.

35 A likelihood function is a tool used to measure the goodness of fit of a statistical model to sample data.

36 The Anderson–Darling test is a statistical test of whether a given sample of data is drawn from a population of data with a specific probability distribution.

- Expressions for the Gamma and Beta functions:[37] This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent the text does not describe OCC's application of Gamma and Beta functions in the model, OCC does not believe this information needs to be maintained in OCC's rules.

OCC believes that this information is more appropriately covered in the underlying GARCH Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

ii. Copula Construction

The STANS Methodology Description would describe how a copula is used to quantify the joint behavior and dependence structure of the risk factors used by STANS. A copula is a mathematical construct used in probability theory to calculate the cumulative distribution of a set of random variables. The fitted copula can then be used by STANS to perform Monte Carlo simulations of theoretical prices for underlying securities and associated derivatives, which will be used in the aggregation step during which margin requirements are calculated.

To estimate the copula, STANS first transforms two years of historical data for the risk factors produced by the models described above into a data set described by the Student's t-

[37] Gamma and Beta functions, respectively, are related one and two-variable functions that serve as foundations for various mathematical applications.

distribution with four degrees for freedom.[38] STANS then performs a singular value decomposition of this data set to obtain the eigenvector decomposition[39] of the correlation matrix. This means the resulting fitted copula is a Student's t copula with four degrees of freedom.

Before the copula is estimated, STANS performs an "alignment" step on the time series to identify and separately process risk factors with incomplete data sets that lack sufficient data to estimate the copula. Specifically, for pricing data/models for underlyings OCC extracts data on the previous two years (i.e., 500 business days) and ensures (i) the data has no more than 100 missing returns as compared to baseline dates and (ii) the five latest returns are not missing as compared to baseline dates. If a risk factor's data set does not meet each of these three criteria, it is subject to a conditional or default simulation, described below.

To simulate price movements, STANS draws random samples from the multivariate Student's t-distribution described by the copula. These random draws are abstract values that correspond to correlated, uniform, normalized shocks in the risk factors. STANS then reincorporates the individual volatility and marginal distribution of the risk factors to create appropriate return scenarios. STANS next applies these theoretical returns to current market

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38 Based on OCC's research, four degrees of freedom is in the conservative end of a range of degrees of freedom that are generally suitable fits for univariate distributions and is therefore appropriate for use in constructing the copula.

39 In the context of linear transformations, an Eigenvector is a value that does not change direction when the transformation is applied to it, but rather changes in scale based on the application of a scalar factor, called an Eigenvalue. Eigenvectors and Eigenvalues are used to analyze the characteristics of linear transformations, including correlation/covariance matrices, and generate random variables with the equivalent correlation.

prices to generate potential price scenarios for underlying securities. STANS essentially performs the reverse of the function that was performed to fit the econometrics of the risk factors.

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Student-t Copula model. The current rule text also includes other information related to the construction and simulation of a copula in STANS. Specifically, the current rule text includes a mathematical justification for using a copula generally, and introductory text describing the general properties of a Student's t copula. OCC believes this information is extraneous to understanding how the Student-t Copula model currently functions in STANS. This information is also foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent this text does not describe OCC's application of a mathematical copula, OCC does not believe this information needs to be maintained in OCC's rules. Instead, OCC believes that this information is more appropriately covered in the underlying Student-t Copula Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Conditional and Default Simulations

For risk factors with data sets that have only recently become available, or that have experienced drastic changes in their return characteristics, and do not meet one or more of the criteria in the alignment step, there may be too small of a sample size to reliably estimate correlations among the data. In such cases, these risk factors are excluded from the copula simulation in STANS and OCC applies conditional or default simulation.

OCC applies a conditional simulation when it believes that a risk factor that has been identified during the alignment step does not meet the data quality criteria but has an appreciable correlation with another risk factor that has a more robust dataset. OCC uses that more robust risk factor's data as a proxy for the identified risk factor. The identified risk factor is assumed to exhibit simulated results that follow an NRIG distribution of specified mean, variance, and shape parameters, and any variation from the proxy data is assumed to be purely idiosyncratic. Pursuant to OCC's Margin Policy, OCC periodically reviews whether applying a conditional simulation to a particular risk factor continues to be appropriate.

OCC applies a default simulation when it does not believe an identified risk factor has any obvious proxy and has no view on its prospective volatility, or when a risk factor is identified by STANS during nightly margin processing and OCC has not already selected it to undergo a conditional simulation. In a default simulation, movements in the risk factor are assumed to be entirely idiosyncratic and have a volatility that is typical of highly volatile stocks.

The proposed text would replace current OCC rule text from the Margins Methodology's section on default, derived, and conditional factors. The current rule text also includes other information related to conditional and default simulations. Specifically, the current rule text includes the following:

- Introductory text restating the use of time series in STANS: This information would already be described elsewhere in the STANS Methodology Description where applicable, and OCC does not believe repeating it here is needed to understand how the model functions.

- A description of "derived scenarios," a special case of conditional simulations related to exchange rate risk factors: This special case is applied pursuant to internal OCC procedures, and occurs outside of the STANS methodology. Therefore, OCC does not believe this information is needed to understand how the model currently functions.
- A description of the how OCC operationally applies conditional simulations: These operational details relate to OCC's application of the model's results in operational procedures and are not inherent to the model's selection or design, and that OCC could change from time to time without affecting the model's results.
- Details on how OCC implemented default scenarios in its internal technology systems: These implementation details relate to OCC's internal administration of its technology systems and are not inherent to the model's selection or design, and that OCC could change from time-to-time without affecting the model's results.

OCC believes that this information is more appropriately covered in the Student-t Copula Model Whitepaper or other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

iii. <u>Implied Volatility Smoothing and Options Pricing</u>

The STANS Methodology Description would next describe how STANS utilizes the inputs and outputs described above to (i) perform implied volatility smoothing, (ii) price

European and American options, (iii) price Asian FLEX options, and (iv) price Cliquet options.

Implied Volatility Smoothing

STANS employs an Implied Volatility Smoothing model to estimate fair prices of listed option contracts based on their bid and ask price quotes. This model supports pricing of the following types of options: (i) European and American options on equity products with a dividend yield or with discrete cash dividends; (ii) European and American options on futures on equity indices, currencies, and commodities; (iii) options on volatility indices for which volatility futures trade (e.g., VIX options[40]); (iv) forward start options; and (v) Asian FLEX options.

The model is essentially an advanced data filtering and pre-processing technique to improve data quality to support option pricing during the calibration and simulation phases of the STANS methodology. It makes use of the same theory that underpins OCC's Vanilla Options model, described below. The most important stages of the Implied Volatility Smoothing model are: (i) a preprocessing procedure to filter out "bad" price quotes; (ii) an implied forward price calculation using prices from near-the-money options on the same securities at all tenors or expiration dates; (iii) the smoothing, in which prices are generated for all plain vanilla listed options at all strikes by using corresponding bid and ask price quotes and forward prices (from step two); and (iv) construction of a volatility surface based on linear interpolation of total variance among the smoothed prices and performing any necessary post-processing. When applied to prices estimated by the option pricing models described below, the model functions to

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40 VIX options are treated as options on VIX futures and thus represent a type of option on futures that is also supported by the implied volatility smoothing.

(i) makes data points comprising the volatility surface more consistent with the actual bid-ask spreads found in current market prices and (ii) correct data that would create arbitrage opportunities by not having monotonicity and convexity with respect to the strike and/or not satisfying put-call parity.[41]

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Implied Volatility Smoothing model. The current rule text also includes other information related to the model. Specifically, the current rule text includes the following:

- A description of the use of target prices based on model parameters: This represents configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.
- Economic rationale for various features of the model: OCC does not believe that this economic rationale is needed to understand how the model currently functions.
- A discussion of the model's performance in deriving theoretical spot prices from underlying futures and indices, and specific "if/then" conditions the model applies to bid and ask prices to filter out poor quality data based on certain control parameters: These data filtering parameters are configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results,

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[41] See Securities Exchange Act Release No. 86296 for further information on the smoothing algorithm used in STANS.

which OCC may from time to time determine it should modify based on current market conditions and business practices.

- Mathematical rationale for the method by which the smoothing algorithm calculates implied forward prices: OCC does not believe that the rationale for the model's configuration is needed to understand how the model currently functions.
- A detailed description of the Vega-weighted least squares calculation performed during the first round of optimization to produce arbitrage-free options prices for European options: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic sources. To the extent the text does not describe OCC's application of a Vega-weighted least squares calculation, OCC does not believe this information needs to be maintained in OCC's rules.
- Operational details on (1) how the model's results are applied to other models for pricing European and American options, options on futures, and long-dated[42] volatilities; (2) price smoothing for contracts that are otherwise missing smoothed prices for various reasons, FLEX options, and over-the-counter options; and (3) detailed steps for a linear interpolation/extrapolation used to construct a volatility surface from smoothed volatilities: These details relate to configuration choices made by OCC to applying a model overlay in certain cases where there is insufficient data, that are not inherent to the

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[42] In the context of volatility smoothing, "long-dated" refers to expirations beyond the listed expiration date of standard exchange-traded options.

model's selection or design, and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the Implied Volatility Smoothing Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

European and American Options

The Vanilla Options model is used by STANS to price European and American options. This model is comprised of several modules that (i) calculate theoretical option prices, (ii) calculate risk sensitivities of the option prices with respect to the market variables (the "Greeks"), and (iii) calculate implied volatilities from option prices. The model prices European options using a modified Black-Scholes formula and American options using a Leisen-Reimer binomial tree.[43]

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Vanilla Options model. The current rule text includes other information related to the model. Specifically, the current rule text includes the following:

- Rationale and testing to support the number of steps used in the Leisen-Reimer binomial tree: OCC does not believe the rationale to support this model choice is needed to

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43 See Securities Exchange Act Release No. 86296 for further information on OCC's Vanilla Options model, which prices American and European options and generic futures.

understand how the model currently functions.

- Equations describing the calculation of various "Greeks" (i.e., Gamma, Vega, Theta, and Rho), restatements of standard Black's formulas, and a restatement of the standard Leisen-Reimer binomial tree: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent the text does not describe OCC's application of the "Greeks," Black's formulas, and the Leisen-Reimer binomial tree, OCC does not believe this information needs to be maintained in OCC's rules.
- A list of control parameters of the Newton-Raphson method used to calculate implied volatilities for vanilla options: These control parameters are configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the Vanilla Options Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Asian FLEX Options

Like European options, Asian FLEX options are priced based on a Black-Scholes formula.[44] Asian FLEX options are modeled with assumptions that volatility, interest rates and cost of carry remain constant across an option's tenor. Furthermore, implied volatility is determined from "terminal" option (i.e., the last option in a series) volatilities, which are obtained from prices of available regular options expiring at the same tenor or, in their absence, by interpolating terminal volatilities of existing tenor regular options using an internal calculator developed by OCC.

Cliquet Options

STANS also prices Cliquet options using a Black-Scholes model. Like Asian FLEX options, Cliquet options are modeled with assumptions that volatility, interest rates, and cost of carry remain constant across an option's tenor. STANS calculates options premiums based on the premiums of the individual forward starting options that comprise the Cliquet option. This valuation is then repeated for each "reset period" of the Cliquet option.

Forward Start Options

STANS can also be used to price forward start options. Forward start options are options for which the strike price in dollars is unknown prior to the determination date of the strike shortly before expiration.[45] Forward start option values depend on the same input model parameters as vanilla options and on the determination date of the strike. Using the Black-Scholes framework, the pricing problem of a forward-start option prior to strike determination

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44 See Securities Exchange Act Release No. 74966 for further information on how STANS models Asian-style options.

45 Instead, forward start options trade with strikes defined as a fraction α, known prior to expiration, of the underlying closing price on the determination date.

can be transformed into the valuation of a plain vanilla option at determination time, after which the option can be priced using a standard application of Black's formula.

iv. <u>Aggregation</u>

The STANS Methodology Description would next describe how STANS applies the theoretical derivatives prices to actual positions in Clearing Members' accounts to calculate margin requirements. This is accomplished by aggregating (i) a base margin charge, which consists of an ES calculation with the addition of Extreme Value Theory ("EVT") loss modeling and a stress test component; (ii) an error compensation charge; (iii) a liquidation cost charge; (iv) a positive risk reversal charge; and (v) various add-on charges that are applied based on accounting principles.

Base Margin Charge

STANS first calculates the base margin charge. This is accomplished by identifying the positions present in a Clearing Member's account,[46] multiplying the values of those positions to each of the 10,000 theoretical values calculated in the above step, then adding the products' values together to obtain possible 10,000 net asset values ("NAVs") for the account. The account's actual NAV is then subtracted from each of these 10,000 possible NAVs to obtain 10,000 possible Profit and Loss ("P&L") statements. STANS then constructs a VaR line separating the 100 most extreme negative projected P&L statements over a two-day horizon from the remaining 9900 simulated outcomes, representing the worst 1% of the projected

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[46] The netting/offsetting of a Clearing Member's positions within an account pursuant to OCC's rules occurs outside STANS before the position data is brought into STANS for this step.

scenarios, and calculates the average of these 100 values to obtain a single ES value for the account. This is called the empirical ES because STANS uses actual historical prices in calibrating the simulation, which represents the historical dependence among the various risk factors.

In addition to calculating the empirical ES, STANS applies EVT to parametrically fit the largest losses and parametrically calculate ES. EVT is based on a tenet of probability theory that the distribution of extremes of a univariate random variable converge to a Generalized Pareto distribution.[47] The parametric EVT estimator can use a larger tail sample than the empirical estimator, which, for ES at the 99th percentile, is limited to 100 (i.e., 1% of 10,000) points. Empirical ES is used when there is indication that the tail is not well fit by EVT.

STANS next applies a stress test component to its base charge. This component includes additional calculations related to (i) concentration, which is intended to consider extreme idiosyncratic moves in concentrated positions and to counteract "survivor bias" in historical equity returns data (i.e., that historical data typically does not incorporate certain extreme movements in a firm's stock prices, such as when a firm declares bankruptcy or is subject to a rich takeover); and (ii) dependence, in which the ES calculations described above are performed twice again, once assuming perfect correlation among the various risk factors and once assuming no correlation among the various risk factors. After performing these concentration and dependence calculations, STANS takes the higher of the two factors and combines it with the

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47 A Generalized Pareto distribution is a type of continuous probability distribution that can be used to model the distribution of the tail of another underlying distribution.

empirical ES to create a more conservative margin requirement for the account.

The proposed text would replace current OCC rule text from the Margins Methodology's chapter on the base charge, stress-test add-on charge, and total margin charge. The current rule text also includes a summary section summarizing historical changes OCC has made to the manner in which STANS calculates a total margin charge. OCC does not believe this information is needed to understand how STANS currently functions. OCC further believes that this information is more appropriately covered in the Portfolio Risk Measures Model Whitepaper or other internal OCC documentation rather than in OCC's rules for this reason. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Error Compensation

An inherent property of ES calculations is the existence of estimation error. To compensate for the potential risk that a STANS ES calculation includes such an error on the positive (lower loss) side, the ES value based on the simulated results is shifted through a compensation term to a more conservative level. Mathematically, the error compensator shifts ES to the left by 1.2 standard deviations of the loss tail, covering the 70% quantile of estimation error. The extent to which this alters the calculated ES in absolute varies based on the distribution's kurtosis (i.e., the shift is more significant for distributions with fatter tails).

Liquidation Cost Charge

The default of a Clearing Member requires OCC to close-out that Clearing Member's positions, which results in OCC incurring costs. Closing out positions in a defaulted portfolio may also entail selling long positions at the current bid price and covering short positions at the current ask price, which could create additional costs based on the bid-ask spread. To account for these costs, STANS calculates a daily liquidation cost charge based on a liquidation cost grid, calibrated with data from historical stressed periods, and applies this calculated cost as an add-on charge. In general, the Liquidation Charge model calculates two risk-based liquidation costs for a portfolio, Vega[48] liquidation cost ("Vega LC") and Delta liquidation cost ("Delta LC"), using "Liquidation Grids." More specifically, the model consists of: (1) the decomposition of the defaulter's portfolio into sub-portfolios by underlying security; (2) the creation and calibration of Liquidation Grids used to determine liquidation costs; (3) the calculation of the Vega LC (including a minimum Vega LC charge) for options products; (4) the calculation of Delta LCs for both options and Delta-one products; (5) the calculation of Vega and Delta concentration factors; and (6) the calculation of volatility correlations for Vega LCs.[49] STANS applies both Vega and Delta LCs to options products, but only applies a Delta charge to Delta-one[50] products such as futures contracts, Treasury securities, and equity securities.

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Liquidation Charge model. The current rule text also includes other information

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48 The Delta and Vega of an option represent the sensitivity of the option price with respect to the price and volatility of the underlying security, respectively.

49 See Securities Exchange Act Release No. 85755 for more detail on the liquidation cost model used by STANS.

50 "Delta one products" refer to products for which a change in the value of the underlying asset results in a change of the same, or nearly the same, proportion in the value of the product.

related to the model. Specifically, the current rule text includes the following:

- Background historical information on adoption of the model: OCC does not believe this historical information is needed to understand how the model currently functions.
- Classifications OCC applies to an underlying equity security based on the security's liquidity level to determine which liquidation grid is most appropriate: These details represent configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.
- Intermediate equations used to define variables for calculating Vega LC: OCC does not believe these intermediate, explanatory equations are needed to understand how the model currently functions.
- Descriptions of the parameters used to calibrate liquidation grids: These calibration parameters represent configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the underlying Liquidation Charge Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Positive Risk Reversal

As an additional conservative measure, STANS applies a "positive risk reversal" charge to ensure that the total calculated margin requirement is at least equal to the estimated liquidation cost, even in the event a position is liquidated at the current market price (or a more favorable price). STANS incorporates the positive risk reversal charge by simply applying a minimum margin requirement to a position that is equal to the estimated liquidation cost charge.

Various Add-on Charges

In addition to the charges described above, OCC may, pursuant to its rules, elect to apply additional charges to a Clearing Member's margin requirements for various reasons; e.g., based on the Clearing Member's Watch Level status or to account for rebates, adjustments and add-ons related to stock loan positions.[51] These additional charges occur outside of STANS and are outside the scope of the STANS Methodology Description.

The proposed text would replace current OCC rule text from a section in the Margins Methodology's base charge, stress-test add-on charge, and total margin charge chapter covering add-on charges. The current rule text notes that OCC may apply various add-on charges to its margin requirements outside the STANS methodology, which could include additional margin charges related to (i) cross-margin accounts, established by OCC Rule 704; (ii) placement on a heightened Watch Level based on OCC's credit risk surveillance, established by OCC's

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[51] See Securities Exchange Act Release No. 82355, which states that OCC's Margin Policy establishes the application of add-on charges.

Counterparty Credit Risk Management Policy;[52] (iii) interest payments and adjustments to stock loan positions, established by OCC Rule 601, Interpretation & Policy .05; (iv) customer positions subject to certain margin requirements promulgated by the U.S. Commodity Futures Trading Commission, established by OCC Rule 601, Interpretation & Policy .07; (v) concentration risk for equity securities exceeding an average daily trading volume threshold, established by OCC's Collateral Risk Management Policy;[53] and (vi) OCC's extended trading hours program, established generally by OCC's Margin Policy and specified in OCC's Extended Trading Hours Set-Up and Monitoring Procedure.[54]

As outlined above, these add-on charges are applied pursuant to other OCC rules, policies, and/or procedures, and are established outside of the STANS methodology. Therefore, OCC believes that they are more appropriately covered in the underlying OCC rules, policies, and procedures that establish them, and, accordingly, proposes to delete this text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

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52 See Securities Exchange Act Release No. 81949 (October 26, 2017), 82 FR 50719 (November 1, 2017) (SR-OCC-2017-009) for more information on OCC's Watch Level framework. OCC has filed a proposed rule change with the Commission to adopt a new TPRMF, which would replace the Counterparty Credit Risk Management Policy and provide an overview of OCC's overall approach to third-party risk management. See supra note 3.

53 See Securities Exchange Act Release No. 82009, which describes OCC's Collateral Risk Management Policy.

54 The specific margin add-on charges OCC may apply are subject to change in accordance with internal governance established by OCC's Margin Policy and supporting procedures.

<u>Model Utilities</u>

The STANS Methodology Description would next describe several "model utilities" that are applied at various points in the STANS methodology, to incorporate various market and operational factors that affect options pricing and thereby produce model results which more accurately reflect current and potential market conditions.

i. <u>Dividends</u>

The STANS Methodology Description would describe how STANS incorporates expected cash dividends on a stock into options pricing.[55] STANS obtains daily information on general dividend yields and discrete dividends from pricing vendors, then applies a dividend growth rate to this information to forecast dividends (typically) 16 quarters into the future.

STANS accounts for the possibility that cash dividends may be paid on stocks, which would affect their pricing, through a dividend utility that interacts with the pricing models in STANS. Daily, STANS retrieves from an external vendor data on forecasted cash dividends and yield curves associated with the issuance of those dividends. STANS uses this data to forecast when a security may go ex-dividend, and accordingly incorporates this into pricing the associated equity security. STANS also accounts for the possibility that an option may be exercised early to obtain a cash dividend on the underlying security. Using the same external dividend data, STANS calculates when an option would likely be exercised early to receive the dividend and prices it accordingly.

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[55] OCC considers the potential effects of stock dividends outside of STANS.

ii. Interest Rate Curve

This model utility calculates the yield curve using (i) overnight, one-week, one-month, two-month, and three-month cash deposit interest rates; (ii) Eurodollar interest rate futures with three-month to two-year tenors; and (iii) interest rate swaps with three-year to 30-year tenors. The model utility calculates a discount factor from a given date to any future date along the curve. This discount factor is used as an input to pricing models to generate theoretical prices for instruments based on these rates.

iii. Overnight and Daily Returns

STANS calculates margin requirements on a daily basis, using prices from that day's market close. However, some positions may expire or be exercised during a business day and before the following day's margin settlement. Since OCC clears derivatives that are settled on both opening and closing prices, both types of events affect derivatives prices and their corresponding margin requirements. Therefore, the STANS Methodology Description would describe how STANS obtains relevant risk factors for both the most recent opening price and the most recent closing price. STANS includes within the copula it constructs, described previously, a joint distribution of both overnight and daily returns on relevant risk factors.

The proposed text would replace current OCC rule text from the Margins Methodology's section on overnight and daily innovations. The current rule text also includes other information on the overnight and daily returns model utility. Specifically, the current rule text includes the following:

- Details on how OCC implemented the model utility in its technology systems: These implementation details relate to OCC's internal administration of its technology systems and are not needed to understand how the model currently functions. Because these details are not inherent to the model's selection or design, OCC could also change them from time to time without affecting the model's results.

- Redundant detail related to the copula constructed by STANS: These details, described above, would be described in the STANS Methodology Description's section on the Student-t Copula model, and OCC does not believe repeating it here is needed to understand how the model utility currently functions.

OCC believes that this information is more appropriately covered in the Daily and Overnight Theoretical Price Scenario Simulation Model Whitepaper or other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

iv. <u>One-Day and Two-Day Scenarios</u>

As noted previously, OCC has established margin levels to cover the costs of liquidating positions over a two-day margin period of risk. Furthermore, and as described above, during this interval expiring OCC-cleared or cross-margined positions may experience final settlement based on either the opening or closing price of the underlying security. Therefore, the STANS Methodology Description would describe how STANS calculates for each underlying price scenario simulated prices at four different points in time: (i) opening price on day one; (ii) closing price on day one; (iii) opening price on day two; and (iv) closing price on day two.

STANS must account for these additional prices to avoid under-margining portfolios with both expiring and non-expiring positions in a risk group, and to reflect the prices of underlying securities and associated derivatives that are forecasted to go ex-dividend or ex-coupon on T+1 or T+2 (where T represents the activity date). To calculate the two additional prices that may be observed over the two-day margin period of risk, STANS applies a randomly generated permutation to the return scenarios. The second-day return scenarios and securities that go ex-dividend on T+2 are then applied scenario-by-scenario to the first-day results in the same fashion.

v. Portfolio Specific Haircuts

Some Clearing Members have deposited securities as margin collateral that are also used in STANS as risk factors, and therefore potential price movements in these securities are factored into margin requirement calculations. However, a Clearing Member may want – or be required – to withdraw or deposit such margin collateral intraday. This would change the concentration of the Clearing Member's collateral types and would also change the sensitivity of how the Clearing Member's portfolio responds to such changes. To account for these changes in concentration and sensitivity, the STANS Methodology description would describe how STANS utilizes a Portfolio Specific Haircuts model. This model provides haircut values for withdrawals or deposits of collateral, which are then applied to the previous day's collateral values to arrive at the impact of the collateral movements on the margin requirement. These haircuts represent the sensitivity of that Clearing Member account's risk profile to its position in the collateral security being withdrawn or deposited. These haircuts are designed to provide an estimate of the resulting change in margin requirements if the entire margin calculation were re-run following the withdrawal or deposit. A different haircut is associated with each combination of Clearing Member account and security posted as margin collateral.

Margins Methodology Chapters Not Found in STANS Methodology Description

The current rule text from the Margins Methodology describes that STANS uses historical and current prices for listed tenors of energy and other commodity futures to simulate prices of energy and other commodity futures using two variants of a two-factor Schwartz and Smith's model:[56] one variant to incorporate the effects of seasonality[57] for pricing futures related to nonseasonal commodities such as crude oil and the other variant to incorporate the effects of seasonality and is used to price futures related to seasonal commodities such as natural gas, heating oil, gasoline, electricity, and petrochemicals. The products for which OCC previously used this model to calculate margin requirements are no longer listed, and therefore OCC has decommissioned this associated pricing model. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

The current text from the Margins Methodology also includes information on a model used to price European-style binary options. The products for which OCC used this model to

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56 The Schwartz and Smith's model is a two-factor model of commodity prices that allows for mean reversion in short-term prices and uncertainty in the long-term equilibrium level to which prices revert. See Schwartz, E. and Smith, E., "Short-Term Variations and Long-Term Dynamics in Commodity Prices," 46 Mgmt. Sci. 7, 893-911 (2000) (describing the Schwartz and Smith's model).

57 Seasonality is a characteristic of futures products that exhibit regular and predictable price changes that recur every calendar year.

calculate margin requirements are no longer listed, and OCC decommissioned the model. The current text also includes information on OCC's use of the Vanilla Options model to calculate margin requirements for Currency Options and Foreign Index Futures, both of which are products OCC no longer clears. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

The current rule text from the Margins Methodology also includes information on certain processes OCC uses to operationalize the STANS methodology in its systems. Specifically, these processes are (i) daily calibration and transfer, which describes implementation of the processes to daily obtain pricing data and calibrate pricing models; (ii) Monte Carlo marginals, which describes implementation of the processes that create price scenarios for underlying risk factors from either copula draws or (in the absence of a copula) conditional or default simulations; (iii) Monte Carlo theoreticals, which describes implementation of the processes that calculate theoretical values for futures and options; and (iv) monthly copula estimation and simulation, which describes implementation of the processes that generate copula scenarios for underlying risk factors based on calibrated parameters.

These chapters describe implementation details related to OCC's internal administration of its technology systems and are not needed to understand how the STANS models currently function. Because these details are not inherent to model selection or design, OCC could also change them from time to time without affecting model results. OCC believes that this information is more appropriately covered in the underlying Model Whitepapers and other internal OCC documentation rather than in OCC's rules for this reason. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Margin Policy

Lastly, OCC would make conforming changes to its Margin Policy to reflect the adoption of the STANS Methodology Description and the retirement of the Margins Methodology. OCC would also make other non-substantive changes to the Margin Policy to correct typographical errors, update references to other related internal OCC policies and procedures, and conform the policy to OCC's current internal policy template. The proposed changes are intended to promote the accuracy and clarity of OCC's Margin Policy and would not impact OCC's margin setting practices or processes.

B. Statutory Basis

OCC believes that the proposed rule change is consistent with Section 17A of the Act[58] and the rules thereunder applicable to OCC. Section 17A(b)(3)(F) of Act[59] requires, among other things, that the rules of a clearing agency be designed to promote the prompt and accurate clearance and settlement of securities transactions and derivative agreements, contracts, and transactions. The purpose of the proposed rule change is to adopt a STANS Methodology Description document to clearly and concisely describe the material aspects of OCC's quantitative methodology for calculating Clearing Member margin requirements. OCC uses the margin it collects to limit its credit exposures to participants and to protect other Clearing

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58 15 U.S.C. 78q-1.

59 15 U.S.C. 78q-1(b)(3)(F).

Members from losses that may arise as a result of a default and ensure that OCC is able to continue the prompt and accurate clearance and settlement of its cleared products. As a result, OCC believes the proposed STANS Methodology Description is designed to promote the prompt and accurate clearance and settlement of securities transactions and derivative agreements, contracts, and transactions in accordance with Section 17A(b)(3)(F) of the Act.[60]

Rule 17Ad-22(b)(1)[61] requires that a registered clearing agency that performs central counterparty services establish, implement, maintain and enforce written policies and procedures reasonably designed to measure its credit exposures to its participants at least once a day and limit its exposures to potential losses from defaults by its participants under normal market conditions so that the operations of the clearing agency would not be disrupted and non-defaulting participants would not be exposed to losses that they cannot anticipate or control. As described above, the proposed STANS Methodology Description described herein details the risk-based margin methodology by which OCC measures its credit exposures to its participants on a daily basis and determines margin requirements based on such calculations. OCC believes that the proposed STANS Methodology Description would result in a more transparent and clearly understandable description of the methodology used to measure and mitigate credit exposures to OCC's Clearing Members, and that the proposed rule change is therefore designed to ensure that OCC sets margin requirements that would serve to limit OCC's exposures to potential losses from defaults by its participants under normal market conditions so that the

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60 Id.

61 17 CFR 240.17Ad-22(b)(1).

operations of OCC would not be disrupted, and non-defaulting participants would not be exposed to losses that they cannot anticipate or control. Accordingly, OCC believes the proposed rule change is consistent with Rule 17Ad-22(b)(1).[62]

Rule 17Ad-22(b)(2)[63] further requires, in part, that a registered clearing agency that performs central counterparty services establish, implement, maintain and enforce written policies and procedures reasonably designed to use margin requirements to limit its credit exposures to participants under normal market conditions and use risk-based models and parameters to set margin requirements. The STANS Methodology Description is intended to better describe how the STANS methodology is designed to limit OCC's credit exposures to participants under normal market conditions in a manner consistent with Rule 17Ad-22(b)(2).[64]

Rules 17Ad-22(e)(6)(i), (iii), and (v)[65] further require that a covered clearing agency establish, implement, maintain and enforce written policies and procedures reasonably designed to cover its credit exposures to its participants by establishing a risk-based margin system that, among other things: (1) considers, and produces margin levels commensurate with, the risks and particular attributes of each relevant product, portfolio, and market; (2) calculates margin 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; and (3) uses an appropriate method for measuring credit exposure that accounts for relevant product risk factors

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62 Id.

63 17 CFR 240.17Ad-22(b)(2).

64 Id.

65 17 CFR 240.17Ad-22(e)(6)(i), (iii), and (v).

and portfolio effects across products. As described in detail above, OCC believes that the proposed STANS Methodology Description would result in a clearer, more transparent document describing OCC's risk-based margin system that, among other things: (1) considers, and produces margin levels commensurate with, the risks and particular attributes of each relevant product, portfolio, and market; (2) calculates margin 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; and (3) uses an appropriate method for measuring credit exposure that accounts for relevant product risk factors and portfolio effects across products. OCC therefore believes the proposed STANS Methodology Description is reasonably designed to consider and produce margin levels commensurate with the risks and particular attributes of products cleared by OCC, calculate margin 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, and apply an appropriate method for measuring credit exposure that accounts for risk factors and portfolio effects of products cleared by OCC in a manner consistent with Rules 17Ad-22(e)(6)(i), (iii), and (v).[66]

Rule 17Ad-22(e)(23)[67] further requires, in part, that a covered clearing agency establish, implement, maintain, and enforce written policies and procedures reasonably designed to provide sufficient information to enable participants to identify and evaluate the risks, fees, and other material costs they incur by participating in the covered clearing agency. The STANS

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66 Id.

67 17 CFR 240.17Ad-22(e)(23).

Methodology Description is designed to provide Clearing Members with greater transparency into the STANS Methodology than the current rule text of the Margins Methodology, which OCC does not make generally available to participants and includes various details that, as described herein, OCC does not believe constitute material aspects of the STANS methodology. In addition, OCC has organized and written the STANS Methodology Description in a way that would more clearly identify for Clearing Members the material aspects of the STANS methodology. Specifically, OCC has organized the STANS Methodology Description in a way that enables a reader to better understand how the various quantitative model components of STANS function in concert to produce OCC margin requirements, rather than organizing the document in a way that would serve OCC's internal purposes but not facilitate comprehension of the STANS methodology by a third party. Furthermore, by including in the STANS Methodology Description only the OCC rule text covering the material, quantitative aspects of the STANS methodology, and either not describing extraneous or immaterial aspects of the STANS methodology in the STANS Methodology Description or referring the reader to other OCC or external sources where appropriate,[68] the proposed STANS Methodology Description would more clearly identify for an informed reader how the STANS methodology's quantitative model components form OCC's basis for calculating margin requirements, and what aspects of the STANS methodology OCC may adjust in the course of its business pursuant to its other rules

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68 For example, the STANS Methodology Description would refer to other OCC rules to establish manual, non-modeled margin components or adjustments made by OCC, and would refer to public academic sources for descriptions of common mathematical theories and methods that do not represent OCC-specific applications or modifications of those theories and methods.

and internal policies and procedures. OCC believes that this additional clarity, transparency, and enhanced readability regarding the material quantitative model components of the STANS methodology promote the requirements of Rule 17Ad-22(e)(23).

Finally, Section 19(b)(1) of the Act and Rule 19b-4 thereunder set forth the requirements for SRO proposed rule changes, including the regulatory filing requirements for "stated policies, practices and interpretations."[69] OCC proposes to retire its existing Margins Methodology, which was, in part, previously filed as an OCC "rule" with the Commission, as the STANS Methodology Description would supersede the Margins Methodology in its entirety. Under the proposal, the material aspects of the STANS methodology would be contained in the proposed STANS Methodology Description described herein.

As described in detail herein, various details in the current Margins Methodology would no longer be OCC rule text following adoption of the STANS Methodology Description. These internal procedural and administrative details used by OCC's model developers and model validators would: (1) be reasonably and fairly implied by the proposed STANS Methodology Description, OCC's Margin Policy,[70] OCC's Model Risk Management Policy,[71] and other OCC rules; and/or (2) otherwise not be deemed to be material aspects of OCC's risk-based margin

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69 See supra note 13.

See Securities Exchange Act Release No. 82355 (December 19, 2017), 82 FR 61058 (December 26, 2017) (SR-OCC-2017-007).

71 See Securities Exchange Act Release No. 82473 (January 9, 2018), 83 FR 2271 (January 16, 2018) (SR-OCC-2017-011).

system. Specifically, OCC believes the details it proposes to remove from OCC's rule text are consistent with Section 19(b)(1) of the Act and Rule 19b-4 thereunder for the following reasons:

- To the extent the current rule text includes details on OCC's historical modeling practices and potential future enhancements, OCC does not believe such text constitutes an SPPI of OCC because it does not describe OCC's current practices;
- To the extent the current rule text includes details on the exact set of current products applied to each STANS component, which will change from time to time as OCC-cleared products are listed and delisted, OCC believes such text is reasonably and fairly implied by the proposed rule text establishing the scope of instruments for which the STANS methodology calculates margin requirements;
- To the extent the current rule text includes details on various configuration choices made by OCC, such as data sources, model parameters, and model performance monitoring, that are not inherent to model selection or design and that do not materially impact a model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices, OCC does not believe such text constitutes an SPPI because it does not describe a material aspect of the operation of the facilities of OCC;
- To the extent the current rule text includes details on testing results and explanatory rationale supporting a model, OCC does not believe such text constitutes an SPPI because it does not describe an OCC policy, practice, or interpretation;
- To the extent the current rule text includes recitations of standard mathematical and

economic theories/techniques that are well-known in quantitative finance, readily found in public sources, and do not include OCC-specific modifications or applications, OCC believes such text is reasonably and fairly implied by the rule text establishing the theories/techniques selected by OCC if OCC has not applied such theories/techniques in a modified or idiosyncratic manner;

- To the extent the current rule text includes redundant descriptions of a model component appearing in multiple chapters, the rule text has been consolidated to describe the model component in the single location;
- To the extent the current rule text includes details on OCC's implementation of a model in its internal technology systems and application of model results in operational procedures that are not inherent to a model and that OCC could change them from time to time without affecting a model's results, OCC does not believe such text constitutes an SPPI because (1) it does not describe a material aspect of the operation of the facilities of OCC and (2) it is reasonably and fairly implied that the calculations described in the STANS Methodology Description must be implemented in some manner through internal OCC's systems and processes. For example, current chapters of the Margins Methodology describe the processes run by internal OCC systems to execute the calculations described in the proposed STANS Methodology Description. These chapters do not describe material aspects of OCC's models or methodology. Rather, these chapters describe, for example, the timing and sequencing of various processes and the code libraries maintained by OCC to support the STANS methodology. Changes in such

processes would not be considered changes to OCC's models/methodology and would not materially impact OCC's margin requirements. Moreover, Clearing Members and market participants can reasonably and fairly infer that OCC maintains such systems and processes to effectuate the daily calculation of margin requirements using the models and methodology described herein; and

- To the extent the current rule text includes manual margin adjustments and add-ons OCC employs pursuant to OCC rules, policies, and/or procedures outside the STANS methodology, OCC does not believe such text constitutes an SPPI because it is reasonably and fairly implied by other existing rules of OCC.

Accordingly, OCC believes the proposed changes would be consistent with the requirements of Section 19(b)(1) of the Act and Rule 19b-4 thereunder.[72]

Item 4. Self-Regulatory Organization's Statement on Burden on Competition

Section 17A(b)(3)(I) of the Act requires that the rules of a clearing agency do not impose any burden on competition not necessary or appropriate in furtherance of the purposes of Act.[73] OCC does not believe that the proposed rule change would impact or impose any burden on competition. The proposed STANS Methodology Description describes OCC's STANS margin setting methodology that currently applies to all Clearing Members. Therefore, the proposal has no impact on Clearing Members, and OCC does not believe that the proposed rule change would unfairly inhibit access to OCC's services or disadvantage or favor any particular user in

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72 See 15 U.S.C. 78s(b)(1) and 17 CFR 240.19b-4.

73 15 U.S.C. 78q-1(b)(3)(I).

relationship to another user. In addition, the proposal currently applies uniformly to all Clearing Members in establishing their margin requirements.

For the foregoing reasons, OCC believes that the proposed rule change is in the public interest, would be consistent with the requirements of the Act applicable to clearing agencies, and would not impact or impose a burden on competition.

Item 5. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants or Others

Written comments were not and are not intended to be solicited with respect to the proposed rule change and none have been received.

Item 6. Extension of Time Period for Commission Action

Not applicable.

Item 7. Basis for Summary Effectiveness Pursuant to Section 19(b)(3) or for Accelerated Effectiveness Pursuant to Section 19(b)(2) or Section 19(b)(7)(D)

Not applicable.

Item 8. Proposed Rule Change Based on Rule of Another Self-Regulatory Organization or of the Commission

Not applicable.

Item 9. Security-Based Swap Submissions Filed Pursuant to Section 3C of the Act

Not applicable.

Item 10. Advance Notices Filed Pursuant to Section 806(e) of the Payment, Clearing and Settlement Supervision Act

Not applicable.

Item 11. Exhibits

Exhibit 1A. Completed Notice of Proposed Rule Change for publication in the Federal Register.

Exhibit 3. Confidential Mapping and Comparisons of the Margins Methodology to the STANS Methodology Description.

Exhibit 5A. STANS Methodology Description.

Exhibit 5B. Margins Methodology.

Exhibit 5C. Margin Policy.

Exhibits 3 and 5A - 5C have been omitted and filed separately with the Commission. Confidential treatment of Exhibits 3 and 5A - 5C is requested pursuant to SEC Rule 24b-2 (17 CFR 240.24b-2).

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, The Options Clearing Corporation has caused this filing to be signed on its behalf by the undersigned hereunto duly authorized.

THE OPTIONS CLEARING CORPORATION

By:_____________________________________
Justin W. Byrne
Executive Director, Associate General Counsel

EXHIBIT 1A

SECURITIES AND EXCHANGE COMMISSION
(Release No. 34-[_______________]; File No. SR-OCC-2020-016)

December __, 2020

Self-Regulatory Organizations; The Options Clearing Corporation; Notice of Filing of Proposed Rule Change Concerning The Options Clearing Corporation's System for Theoretical Analysis and Numerical Simulation ("STANS") Methodology Documentation

Pursuant to Section 19(b)(1) of the Securities Exchange Act of 1934 ("Exchange Act" or "Act"),[1] and Rule 19b-4 thereunder,[2] notice is hereby given that on December 9, 2020, The Options Clearing Corporation ("OCC") filed with the Securities and Exchange Commission ("Commission") the proposed rule change as described in Items I, II, and III below, which Items have been prepared primarily by OCC. The Commission is publishing this notice to solicit comments on the proposed rule change from interested persons.

I. <u>Clearing Agency's Statement of the Terms of Substance of the Proposed Rule Change</u>

This proposed rule change by OCC would adopt a new document describing OCC's System for Theoretical Analysis and Numerical Simulation ("STANS"), which OCC uses to calculate daily and intra-day margin requirements for its Clearing Members (such document being the "STANS Methodology Description"). OCC also proposes to make conforming and other non-substantive changes to its Margin Policy.

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[1] 15 U.S.C. 78s(b)(1).

[2] 17 CFR 240.19b-4.

The proposed STANS Methodology Description is submitted without marking in confidential Exhibit 5A to SR-OCC-2020-016 because this document is being submitted in its entirety as new rule text. The proposed changes to OCC's current rule text related to the STANS methodology, known as the Margins Methodology, are contained in confidential Exhibit 5B to SR-OCC-2020-016. Material proposed to be added to the current rule text is marked by underlining and material proposed to be deleted is marked by strikethrough text. The proposed changes to the Margin Policy are contained in confidential Exhibit 5C to SR-OCC-2020-016.[3] Material proposed to be added to the Margin Policy is marked by underlining and material proposed to be deleted is marked by strikethrough text. The proposed rule change does not require any changes to the text of OCC's By-Laws or Rules. All terms with initial capitalization that are not otherwise defined herein have the same meaning as set forth in OCC's By-Laws and Rules.[4]

II. Clearing Agency's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

In its filing with the Commission, OCC included statements concerning the purpose of and basis for the proposed rule change and discussed any comments it

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3 OCC has filed a proposed rule change with the Commission to adopt a new Third-Party Risk Management Framework ("TPRMF"), which would replace the Counterparty Credit Risk Management Policy and provide an overview of OCC's approach to third-party risk management. That proposed rule change also includes conforming changes to OCC's Margin Policy. See Securities Exchange Act Release No. 90406 (November 12, 2020), 85 FR 73582 (November 18, 2020) (SR-OCC-2020-014). The proposed changes to the Margin Policy currently pending Commission review in SR-OCC-2020-014 are marked in double underlining and double strikethrough text.

4 OCC's By-Laws and Rules can be found on OCC's public website: https://www.theocc.com/Company-Information/Documents-and-Archives/By-Laws-and-Rules.

received on the proposed rule change. The text of these statements may be examined at the places specified in Item IV below. OCC has prepared summaries, set forth in sections (A), (B), and (C) below, of the most significant aspects of these statements.

(A) Clearing Agency's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

(1) Purpose

Background

The STANS methodology is OCC's proprietary risk management system for calculating Clearing Member margin requirements.[5] In general, STANS utilizes large-scale Monte Carlo simulations to forecast price and volatility movements in determining a Clearing Member's margin requirement.[6] The STANS margin requirement is calculated at the portfolio level of Clearing Member accounts with positions in marginable securities. The STANS margin requirement consists of an estimate of a 99% expected shortfall ("ES")[7] over a two-day time horizon with additional charges for model risk, stress tests, liquidation costs, and various add-ons. The STANS methodology is used to measure the exposure of portfolios of options, futures, and cash instruments cleared by OCC.[8]

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5 See Securities Exchange Act Release No. 53322 (February 15, 2006), 71 FR 9403 (February 23, 2006) (SR-OCC-2004-20).

6 See OCC Rule 601.

7 The ES component is established as the estimated average of potential losses higher than the value-at-risk ("VaR") threshold. VaR refers to a statistical technique that is used in risk management to measure the potential risk of loss for a given set of assets over a particular time horizon.

8 Pursuant to OCC Rule 601(e)(1), OCC also calculates initial margin requirements for segregated futures accounts on a gross basis using the Standard Portfolio

OCC maintains technical documentation that describes in detail how the various quantitative components of STANS were developed and operate, including the various parameters and assumptions contained within those components[9] and the mathematical theories underlying the selection of those quantitative methods ("Model Whitepapers"). The Model Whitepapers are currently synthesized in a single document, the Margins Methodology, describing how STANS operates from end to end. The Margins Methodology includes material aspects of OCC's risk-based margin system, which OCC must establish as a covered clearing agency under the Exchange Act and the rules promulgated thereunder, and which must be reasonably designed to, in part "(i) [produce] margin levels commensurate with [the] risks and particular attributes of each relevant product, portfolio, and market; (ii) [mark] participant positions to market and [collect] margin, including variation margin or equivalent charges if relevant, at least daily . . . ; (iii) [calculate] margin 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; (iv) [use] reliable sources of timely price data and [use] procedures and sound valuation models for addressing circumstances in which pricing data are not readily available or reliable; [and] (v) [use] an appropriate method for measuring credit exposure that accounts for relevant product risk factors and portfolio effects across

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Analysis of Risk Margin Calculation System ("SPAN"). SPAN is separate from STANS and is therefore not described in the STANS Methodology Description.

9 See Securities Exchange Act Release No. 82473 (January 9, 2018), 83 FR 2271 (January 16, 2018) (SR-OCC-2017-011), which describes how OCC periodically reviews the parameters and assumptions used by STANS pursuant to its Model Risk Management Policy and in accordance with 17 CFR 240.17Ad-22(e)(6).

products . . ."[10] The Margins Methodology also includes information that would not be considered material aspects of OCC's methodology, such as internal procedural and administrative details, or details that could be reasonably and fairly implied by OCC's existing rules or other information contained in the document.

Over time, OCC has filed sections of the Margins Methodology with the Commission as proposed rule changes under Section 19(b)(1) of the Exchange Act and Rule 19b-4 thereunder to effect changes to individual components of STANS.[11] Thus, those chapters of the Margins Methodology have become codified as OCC rule text under Section 19(b)(1) of the Exchange Act and Rule 19b-4. However, OCC now proposes to adopt a new STANS Methodology Description, which would replace the Margins Methodology document and codify the STANS methodology in its entirety under Section 19(b)(1) of the Exchange Act and Rule 19b-4. After adoption of the STANS

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[10] 17 CFR 240.17Ad-22(e)(6).

[11] See Securities Exchange Act Release No. 74966 (May 14, 2015), 80 FR 29784 (May 22, 2015) (SR- OCC-2015-010); Securities Exchange Act Release No. 76128 (December 28, 2015), 81 FR 135 (January 4, 2016) (SR-OCC-2015-016); Securities Exchange Act Release No. 79818 (January 18, 2017), 82 FR 8455 (January 25, 2017) (SR-OCC-2017-001); Securities Exchange Act Release No. 82161 (November 28, 2017), 82 FR 57306 (December 4, 2017) (SR-OCC-2017-022); Securities Exchange Act Release No. 84524 (November 2, 2018), 83 FR 55918 (November 8, 2018) (SR-OCC-2018-014); Securities Exchange Act Release No. 85440 (March 28, 2019), 84 FR 13082 (April 3, 2019) (SR-OCC-2019-002); Securities Exchange Act Release No. 85755 (April 30, 2019), 87 FR 19815 (May 6, 2019) (SR-OCC-2019-004); Securities Exchange Act Release No. 86296 (July 3, 2019), 84 FR 32816 (July 9, 2019) (SR-OCC-2019-005); Securities Exchange Act Release No. 87387 (October 23, 2019), 84 FR 57890 (October 29, 2019) (SR-OCC-2019-010); Securities Exchange Act Release No. 89392 (July 24, 2020), 85 FR 45938 (July 30,2020) (SR-OCC-2020-007); Securities Exchange Act Release No. 90139 (October 8, 2020), 85 FR 65886 (October 16, 2020) (SR- OCC-2020-012).

Methodology Description, OCC would no longer maintain the Margins Methodology, neither as an OCC rule nor as an internal document.

In connection with this proposed rule change, OCC would also retire as rule text any chapters of the Margins Methodology previously filed with the Commission, as the proposed STANS Methodology Description is intended to cover the material aspects of the STANS methodology. Those chapters of the Margins Methodology that OCC has previously filed under Section 19(b)(1) of the Exchange Act and Rule 19b-4[12] would be superseded in their entireties by new corresponding sections in the STANS Methodology Description, as described in further detail herein.

The current text of the Margins Methodology includes various details that would no longer be OCC rule text following the adoption of the proposed STANS Methodology Description. While the details that OCC proposes to remove are described in further detail herein, thematically, they consist of the following:

- Details on OCC's historical modeling practices and potential future enhancements, which do not describe how a model currently functions;
- Details on the exact set of current products applied to each STANS component, which will change from time to time as OCC-cleared products are listed and delisted;
- Various configuration choices made by OCC, such as data sources, model parameters, and model performance monitoring, that are not inherent to model selection or design and that do not materially impact a model's results, which

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12 Id.

OCC may from time to time determine it should modify based on current market conditions and business practices;

- Extensive, detailed testing results and explanatory rationale supporting a model;
- Recitations of standard mathematical and economic theories/techniques that are well-known in quantitative finance, readily found in public sources, and do not include OCC-specific modifications or applications;
- Redundant descriptions of a model component appearing in multiple chapters;
- Details on OCC's implementation of a model in its internal technology systems and application of model results in operational procedures that are not inherent to a model and that OCC could change from time to time without affecting a model's results; and
- Manual margin adjustments and add-ons OCC employs pursuant to OCC rules, policies, and/or procedures outside the STANS methodology.

The proposed STANS Methodology Description is intended to be a comprehensive description of STANS that is made available to Clearing Members and enable an informed reader to understand OCC's modeling choices and the interconnectedness of STANS model components in producing OCC margin requirements. Therefore, OCC believes the details summarized above and described herein are extraneous to this purpose. Rather, OCC believes these types of details are more appropriately covered – to the extent these details are specific to an OCC model –

in other OCC rules and policies, Model Whitepapers, or other internal OCC documentation.

OCC also believes, as described in Item II.A.2 below, these details do not need to maintained as OCC "rules" as defined by Section 19(b)(1) of the Exchange Act and Rule 19b-4.[13] These internal procedural and administrative details used by OCC's model developers and model validators would: (1) be reasonably and fairly implied by the proposed STANS Methodology Description, OCC's Margin Policy,[14] OCC's Model Risk Management Policy,[15] and other OCC rules; and/or (2) otherwise not be deemed to be material aspects of OCC's margin setting-related operations. While OCC would not maintain these details in the STANS Methodology Description, OCC would continue to

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13 Section 19(b)(1) of the Exchange Act requires a self-regulatory organization ("SRO") such as OCC to file with the Commission any proposed rule or any proposed change in, addition to, or deletion from the rules of such SRO. See 15 U.S.C. 78s(b)(1). Section 3(a)(27) of the Exchange Act defines "rules of a clearing agency" to mean its (1) constitution, (2) articles of incorporation, (3) bylaws, (4) rules, (5) instruments corresponding to the foregoing and (6) such "stated policies, practices and interpretations" ("SPPI") as the Commission may determine by rule. See 15 U.S.C. 78c(a)(27). Exchange Act Rule 19b-4(a)(6) defines the term "SPPI" to include (i) any material aspect of the operation of the facilities of an SRO and (ii) statements made generally available to membership of, to all participants in, or to persons having or seeking access to facilities of an SRO that establishes or changes certain standards, limits, or guidelines. See 17 CFR 240.19b-4(a)(6). Rule 19b-4(c) provides, however, that an SPPI may not be deemed to be a proposed rule change if it is: (i) reasonably and fairly implied by an existing rule of the SRO or (ii) concerned solely with the administration of the SRO and is not an SPPI with respect to the meaning, administration, or enforcement of an existing rule the SRO. See 17 CFR 240.19b-4(c).

14 See Securities Exchange Act Release No. 82355 (December 19, 2017), 82 FR 61058 (December 26, 2017) (SR-OCC-2017-007).

15 See Securities Exchange Act Release No. 82473 (January 9, 2018), 83 FR 2271 (January 16, 2018) (SR-OCC-2017-011).

maintain and update these details when necessary in the Model Whitepapers and other internal OCC documentation, where these details are also currently found.[16]

STANS Methodology Description

The proposed STANS Methodology Description would describe the material aspects of OCC's margin methodology. Specifically, the STANS Methodology Description would include (i) an executive summary; (ii) descriptions of the quantitative model components of STANS; and (iii) "model utilities" intended to enhance the quality of model results. Each of these sections is described in further detail below.[17]

Executive Summary

The STANS Methodology Description would provide an executive summary of STANS. This executive summary would describe how the purpose of STANS is to determine margin requirements for OCC's Clearing Members (as described below), and in doing so meet various risk management goals and regulatory requirements for OCC. The executive summary would then describe the types of positions and collateral modeled through STANS, which include (i) valued securities and stock loans; (ii) equity, index, and futures options; (iii) Flexible Exchange ("FLEX") options; (iv) equity and index futures; (v) volatility futures; and (vi) commodity futures. The executive summary would then provide an overview of the STANS methodology, which includes (i)

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16 OCC's Model Risk Management Policy establishes detailed standards for Model Whitepapers and governance to adopt or make changes to a Model Whitepaper. See id.

17 The proposed STANS Methodology Description would also include the following non-substantive sections: (i) a table of contents; (ii) a list of references to academic and technical documents, both public and internal to OCC; and (iii) a table of defined terms used in the STANS Methodology Description.

econometric calibration; (ii) copula estimation and Monte Carlo simulation; (iii) volatility forecasting; (iv) theoretical underlying price generation; (v) theoretical derivatives price generation; and (vi) aggregation and margin calculation. These components are described in further detail below. The executive summary would then describe OCC's model monitoring activities, which include (i) daily backtesting and (ii) ongoing parameter monitoring pursuant to monitoring plans established by OCC's Model Risk Working Group ("MRWG").[18] The executive summary would then describe that STANS relies on price feeds of real-time market data to generate theoretical values in calculating margin requirements, and how OCC staff may use price editing techniques to improve the quality of pricing data for input into STANS.[19] Lastly, the executive summary would briefly outline the organization of the sections of the STANS Methodology Description that substantively describe the core components of the STANS methodology and the related data processing utilities used by STANS.

The proposed text of this executive summary would replace current OCC rule text from the Margins Methodology's introductory section. The current text, in addition to summarizing the STANS methodology as would the proposed text described above, includes descriptions of the following:

- OCC's historical modeling practices: OCC does not believe this historical information is needed to understand how the model functions.

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[18] OCC's Margin Policy and Model Risk Management Policy provide more detail on OCC's model monitoring activities. See supra notes 14 and 15.

[19] OCC's Collateral Risk Management Policy and Margin Policy provide more detail on the function of OCC's Pricing & Margins department. See Securities Exchange Act Release No. 82009 (November 3, 2017), 82 FR 52079 (November 9, 2017) (SR-OCC-2017-008) and supra note 14.

- Redundant details of the STANS methodology also found in the main body of both the Margins Methodology and the proposed STANS Methodology Description: This information, would already be detailed in the main body of the STANS Methodology Description, and OCC does not believe repeating it here is needed to understand how STANS functions.
- A “documentation guide” describing what information can be found within various sections of the Margins Methodology: OCC does not believe this documentation guide is needed to understand how STANS functions, or to understand the organization of the proposed STANS Methodology Description.

For the reasons stated above, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

STANS Methodology Components

The STANS Methodology Description would next describe the components of OCC’s risk-based margin methodology, which OCC uses to cover the credit exposures presented by Clearing Members in accordance with Rule 17Ad-22(e)(6). In particular, the STANS Methodology Description would describe the (i) calibration of various parameters and price data inputs used by OCC’s econometric and pricing models to create risk factors; (ii) construction of a copula from the risk factors that identifies correlations among simulated changes in the various risk factors; (iii) application of the simulated risk factor changes and correlations to actual data through Monte Carlo simulations that estimate 10,000 possible scenarios for each risk factor, then estimation of theoretical prices for securities, derivatives, and futures using these theoretical scenarios;

and (iv) application of the theoretical prices to actual Clearing Member positions to calculate margin requirements.

i. Model and Econometric Calibration

The STANS Methodology Description would describe how the quantitative models used by STANS incorporate various historical price data and econometric parameter inputs, which are used to estimate and simulate the risk for an associated product. These inputs consist of (i) returns on equity securities; (ii) implied volatilities; (iii) energy and commodity futures; (iv) treasury securities; (v) variance futures; and (vi) volatility futures. In total, there are currently approximately 40,000 of these inputs. The exact number of inputs is subject to change based on the types of products that OCC clears and OCC's research on what risk factors correlate with prices changes in these products. Historical price data comes from OCC's Pricing & Margins department, which obtains the data from external vendors and then validates it for use within STANS.[20] STANS uses several models, described below, to calibrate this historical data and then transform the historical data into theoretical values that, along with specialized volatility forecast and marginal distribution parameters constructed by other OCC models described below, are used to construct a copula, described in the next step.

Equity Returns

STANS uses returns on equity securities that are based on current market prices. STANS first calibrates this data by simply creating a time series of logarithmic returns based on the closing, and in some cases opening, prices. This transformation does not

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20 See supra note 14.

require a separate model. The data is used to create econometric parameters and for pricing as described further below.

Implied Volatility

STANS uses implied volatility risk factors to measure the expected future volatility of an option's underlying security at expiration, which is reflected in the current option premium in the market. To address variations in implied volatility, OCC models a volatility surface for options by incorporating into the econometric models underlying STANS certain risk factors called "pivot points." These pivot points are chosen such that their combination allows STANS to identify changes in the level, skew, convexity, and term structure of the implied volatility surface. STANS generates a value for each of the nine pivot points for each eligible underlying asset and for each business day in the historical data period. To calibrate this data, for each of the nine pivot points STANS performs a kernel smoothing technique[21] on the historical data. Application of these pivot points enables STANS to simulate implied volatility scenarios, which are then used to create the specialized volatility forecast and marginal distribution parameters described below, and in the pricing of options through OCC's option pricing models described further below.[22]

The proposed text would replace current OCC rule text from the Margins Methodology's section on implied volatility. The current rule text also includes other

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21 "Kernel smoothing" is a statistical process by which data points are better fitted to an expected function using weighted averages and a "smoothing parameter."

22 See Securities Exchange Act Release No. 76128 and Securities Exchange Act Release No. 84524 for more information on the function and application of the implied volatility model.

information related to the implied volatility model. Specifically, the current rule text includes descriptions of the following:

- Products eligible for implied volatility scenarios modeling in STANS: OCC does not believe the exact list of products to which this model is applied is needed to understand how the model functions, and this list may change from time to time as OCC-cleared products are listed and delisted.
- Data sources used by STANS to perform the kernel smoothing technique: These data sources are configuration choices made by OCC that are not inherent to the model's selection or design and that OCC could change from time to time without affecting the model's results.
- Rationale for the assumptions underlying implied volatility modeling of longer-tenor options: OCC does not believe that the justification for these model assumptions is needed to understand how the model currently functions.
- Historical background on OCC's decision to incorporate implied volatility modeling into STANS: OCC does not believe that this historical information is needed to understand how the model currently functions.
- Model testing and validation results for the implied volatility model: OCC does not believe that the internal testing and validation performed to verify the model is fit for use is needed to understand how the model currently functions.

OCC believes that this information is more appropriately covered in the Implied Volatility Scenarios Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Treasury Securities

STANS prices treasury securities[23] using a Nelson-Siegel framework,[24] a commonly used polynomial model for constructing the term structure of an interest rate and modeling changes in a yield curve.[25] STANS constructs a theoretical yield curve using current and historical settlement prices for treasury securities.

STANS calibrates this data by transforming the market prices into a time series of unobservable factors that represents the yield curve. STANS fits these Nelson-Siegel parameters using observed bond prices. In simulation, STANS creates "shocks" on theoretical Nelson-Siegel parameters[26] to create theoretical interest rate curves, which are in turn used to price treasury securities.

The proposed text would replace current OCC rule text from the Margins Methodology's section on U.S. Treasury bills and fixed rate notes, bonds, and strips. The current rule text also includes other information related to the treasury securities and interest rate model. Specifically, the current rule text includes the following:

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23 While OCC does not clear treasury securities or derivatives on such products, OCC permits Clearing Members to deposit treasury securities as margin collateral.

24 See Nelson, C.R. and Siegel, A.F., "Parsimonious Modeling of Yield Curves," 60 The J. of Bus. 4, 473-489 (1987) (describing the Nelson-Siegel model).

25 In addition to pricing treasury securities, STANS uses a Nelson-Siegel framework to simulate potential changes in interest rates. Refer to the below description of the interest rate curve model utility.

26 STANS also introduces extra "noise" into the bond prices to account for the bonds' idiosyncratic behaviors and prevent the resulting treasury securities price movements from being perfectly correlated.

- Summary and introduction sections that describe OCC's need to model treasury securities and interest rates and provide an overview of the U.S. Treasury securities market: OCC does not believe these background descriptions of the macroeconomic environment, found in public sources, are needed to understand how the model currently functions.
- Restatements of mathematical definitions and equations describing the relationship between the forward and yield curves, and the payoff function for bonds used to describe all interest rate curves: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic sources. To the extent the text does not describe OCC's application of these theories, OCC does not believe this information needs to be maintained in OCC's rules.
- Details on how OCC implemented the model in its technology systems: These implementation details relate to OCC's internal administration of its technology systems and are not needed to understand how the model currently functions. Because these details are not inherent to the model's selection or design, OCC could also change them from time to time without affecting the model's results.
- Redundant description of the copula constructed by STANS: This information, described further below, would already be detailed in the STANS Methodology Description section related to the construction of a copula, and OCC does not believe repeating it here is needed to understand how the model currently functions.

OCC believes that this information is more appropriately covered in the Nominal Treasury Securities Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Generic Futures

Relying on current futures prices and time series of spot prices as inputs, STANS uses a generic futures model to price linear derivatives with limited term structures. Using basic economic assumptions that the relationship of spot prices to forward prices does not allow for arbitrage and that futures prices equal forward prices, or that any deviations from this are adequately addressed through costs implicit in carrying such positions,[27] the model estimates and applies theoretical discount factors to the futures prices. These discount factors are based on a ratio of estimated spot prices on the underlying securities to the futures prices.

Variance Futures

STANS uses a specialized factor model to price variance futures, which uses historical data for both variance futures products and the Standard and Poor's 500 Index ("SPX"). This model relies on basic assumptions that the short-term volatility of variance futures prices tends to revert towards a mean (i.e., volatility remains relatively close to an average value), but the long-term volatility is itself stochastic. Using these assumptions, STANS fits current values of the volatility and volatility mean reversion

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27 As described previously, pursuant to OCC's Model Risk Management Policy OCC periodically reviews all parameters and assumptions used in STANS and they are subject to change.

level, in addition to parameters describing the dynamics, to the current term structure of variance futures prices. Modeling variance futures prices based on these assumptions allows the theoretical prices to move in a realistic fashion.

The model is first calibrated with historical data on variance futures prices and their recent dynamics. It then simulates prices for variance futures using two sets of random variables: (i) SPX returns; and (ii) changes in the long-term volatility level, represented by normal random numbers that STANS generates daily for use only with variance futures and that have no correlation with other theoretical numbers generated by STANS. Both random variables are used to simulate scenarios for prices of the variance futures tenors.

Synthetic Futures

Using logarithmic daily returns of active futures and various other securities, STANS uses a "synthetic futures" model to estimate prices of certain products such as volatility index-based futures (e.g., VIX futures). In general, the synthetic futures model creates an artificial (or "synthetic") time series of price innovations for actual futures contracts with approximately the same tenor as the actively-traded futures.[28] This synthetic time series then serves as a uniform substitute for a time series of daily settlement prices for the actual futures contracts, which persists over many expiration cycles and thus can be used as a basis for econometric analysis. STANS performs this

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[28] See Securities Exchange Act Release No. 85440 for further information on OCC's synthetic futures model as applied to volatility index-based products. OCC notes that the synthetic futures model can also be used for other futures products, such as interest rate futures. See e.g., Securities Exchange Act Release No. 89392 and Securities Exchange Act Release No. 90139.

analysis by fitting the synthetic time series with associated volatility forecast and marginal distribution parameters, which are described below.

The traded futures contracts are then mapped to the simulated return scenarios of the corresponding synthetic contracts to produce theoretical prices. The first synthetic contract in the series contains returns of the front contract on any given day. STANS switches the front contract of the series to the next one out on the day following the expiration date of the front contract. While the synthetic time series contain returns from different contracts, a return on any given date is constructed from prices of the same contract. Using a synthetic time series allows STANS to better approximate correlations between futures contracts of different tenors by creating more price data points and their margin offsets. These synthetic time series are mapped to the underlying futures product they are intended to represent.

The proposed text would replace current OCC rule text from the Margins Methodology's section on synthetic futures. The current rule text also includes other information related to the synthetic futures model. Specifically, the current rule text includes descriptions of the following:

- Rationale for making changes to the model in 2019[29] and other historical information: OCC does not believe that this rationale and historical information is needed to understand how the model currently functions.
- Equations for standard GARCH provided for introductory purposes: A description of OCC's GARCH model, described further below, would already be detailed in the STANS Methodology Description section related to GARCH parameters, and

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29 See id.

> OCC does not believe repeating it here is needed to understand how the model functions. Furthermore, the GARCH equations as implemented in STANS are modified from the standard GARCH equations provided here, and OCC believes this text could create confusion around the exact GARCH equations used in STANS.[30]

OCC believes that this information is more appropriately covered in the Synthetic Futures Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

GARCH and NRIG Parameters

STANS utilizes econometric parameters related to volatility forecasts and marginal distributions, and calibrates these parameters using ten-year histories of the data inputs described above. For both volatility forecasts and marginal distributions, STANS utilizes a generalized autoregressive conditional heteroskedasticity ("GARCH") model. GARCH is a common statistical model for, in a time series of data, comparing the variance of one point in the time series to the previous point in the series rather than an arithmetic average of all the points in the series. This is particularly useful when the value of volatility at one point in a time series is known to be correlated with the volatility at previous points in the series. STANS estimates these GARCH parameters through a maximum likelihood estimation method. By fitting these GARCH parameters to a time series of risk factor innovations, STANS is able to remove the effects of

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30 See infra note 36.

volatility from – or "devolatilize" – the risk factor time series so that the copula described below can estimate the correlations among the risk factors irrespective of their individual volatilities.

To model volatility forecast parameters, STANS fits the time series of implied volatility pivot points (described above) into a Student's t-distribution, a continuous probability distribution that is commonly used to estimate the mean of a population with a relatively small sample size and unknown standard deviation. To determine the appropriate degrees of freedom for a particular distribution, STANS applies an Anderson-Darling test.

To model marginal distribution parameters, STANS utilizes a normal reciprocal inverse Gaussian ("NRIG") distribution, a special case of the generalized hyperbolic distribution.[31] The returns[32] of each risk factor used in STANS are assumed to exhibit returns in the shape of a symmetric NRIG distribution.[33] Consequently, STANS calibrates NRIG parameters that are designed to describe the shape of every risk factor individually.

As described previously, STANS constructs these GARCH and NRIG parameters from the historical price data and econometric parameter inputs that are first calibrated by

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31 The generalized hyperbolic distribution is a special type of continuous probability distribution. See Barndorff-Nielsen, O., "Exponentially decreasing distributions for the logarithm of particle size," 353 Proc. of the Royal Soc'y of London. Series A, Mathematical and Physical Sci. 1674, 401–419 (1977) (explaining the generalized hyperbolic distribution).

32 "Return" refers generally to changes in a risk factor's value over a time interval. Returns could take the form of simple differences, log returns, or other forms.

33 Except for (i) Chicago Volatility Index ("VIX") futures, which are assumed to follow an asymmetric NRIG distribution, and (ii) implied volatility, which is assumed to follow a Student's t-distribution.

the models described above. These historical price data and econometric parameters, and the resulting GARCH and NRIG parameters, are the foundational data elements used by the copula and pricing models described in the proceeding steps.

The STANS Methodology Description would also describe the controls that may be placed on the GJR-GARCH parameters after their initial calibration. GARCH volatility forecasting models can be very reactive in certain market environments. As a result, OCC may implement parameter controls for risk factors and classes of risk factors, which are subject to periodic review and approval by the MRWG.

The proposed text would replace current OCC rule text from the Margins Methodology's section on GARCH forecasts. OCC notes that the current rule text describes the standard NRIG cumulative distribution function that is widely available in public academic texts. The proposed rule text would describe the same function in a re-parameterized form that is proprietary to OCC. While the two forms are mathematically equivalent, the re-parameterized form is used in the Econometric Model for Risk Factors in STANS Model Whitepaper and the proposed text would therefore be made consistent with the Model Whitepaper. The proposed rule text would also include a citation to an academic paper describing the rationale for the re-parameterization.

The current rule text also includes other information related to OCC's GARCH model. Specifically, the current rule text includes descriptions of the following:

- Introductory language describing the standard Glosten-Jagannathan-Runkle GARCH model and the use of a Student's t-distribution: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic sources. To the extent this text does not describe OCC's application of GARCH and the Student's t-distribution, OCC does not believe this information needs to be maintained in OCC's rules.

- Details on variance forecasting (i.e., considering how securities volatility tends to clusters during certain periods) as rationale for model selection: OCC believes this information is extraneous to understanding how the GARCH model currently functions in STANS.
- Variance forecasting as applied to the One-Day and Two-Day Scenarios model utility: This information, described further below, would already be detailed in the STANS Methodology Description section related to the One-Day and Two-Day Scenarios model utility, and OCC does not believe repeating it here is needed to understand how the model utility currently functions.
- Mathematical rationale for the cumulative distribution function,[34] inverse cumulative distribution function, and degrees of freedom for the Student's t-distribution used by the GARCH model for implied volatility risk factors: OCC believes this information is extraneous to understanding how the GARCH model currently functions in STANS. This information is also foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent this text does not describe OCC's application of these functions and the Student's t-distribution, OCC does not believe this information needs to be maintained in OCC's rules.

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[34] In probability theory, the cumulative distribution function of a random variable is the probability that the variable will be less than or equal to a set value.

- Explanatory mathematical formulas for variance forecasting of implied volatility risk factors and a likelihood function[35] and equations related to the Anderson-Darling test,[36] including the Student's t cumulative distribution function for integer values of $\boldsymbol{\nu}$: These details relate to implementation of the GARCH model in OCC's internal technology systems, are not inherent to the model's selection or design, and are not needed to understand how the model currently functions.
- Expressions for the Gamma and Beta functions:[37] This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent the text does not describe OCC's application of Gamma and Beta functions in the model, OCC does not believe this information needs to be maintained in OCC's rules.

OCC believes that this information is more appropriately covered in the underlying GARCH Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

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35 A likelihood function is a tool used to measure the goodness of fit of a statistical model to sample data.

36 The Anderson–Darling test is a statistical test of whether a given sample of data is drawn from a population of data with a specific probability distribution.

37 Gamma and Beta functions, respectively, are related one and two-variable functions that serve as foundations for various mathematical applications.

ii. Copula Construction

The STANS Methodology Description would describe how a copula is used to quantify the joint behavior and dependence structure of the risk factors used by STANS. A copula is a mathematical construct used in probability theory to calculate the cumulative distribution of a set of random variables. The fitted copula can then be used by STANS to perform Monte Carlo simulations of theoretical prices for underlying securities and associated derivatives, which will be used in the aggregation step during which margin requirements are calculated.

To estimate the copula, STANS first transforms two years of historical data for the risk factors produced by the models described above into a data set described by the Student's t-distribution with four degrees for freedom.[38] STANS then performs a singular value decomposition of this data set to obtain the eigenvector decomposition[39] of the correlation matrix. This means the resulting fitted copula is a Student's t copula with four degrees of freedom.

Before the copula is estimated, STANS performs an "alignment" step on the time series to identify and separately process risk factors with incomplete data sets that lack sufficient data to estimate the copula. Specifically, for pricing data/models for

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38 Based on OCC's research, four degrees of freedom is in the conservative end of a range of degrees of freedom that are generally suitable fits for univariate distributions and is therefore appropriate for use in constructing the copula.

39 In the context of linear transformations, an Eigenvector is a value that does not change direction when the transformation is applied to it, but rather changes in scale based on the application of a scalar factor, called an Eigenvalue. Eigenvectors and Eigenvalues are used to analyze the characteristics of linear transformations, including correlation/covariance matrices, and generate random variables with the equivalent correlation.

underlyings OCC extracts data on the previous two years (i.e., 500 business days) and ensures (i) the data has no more than 100 missing returns as compared to baseline dates and (ii) the five latest returns are not missing as compared to baseline dates. If a risk factor's data set does not meet each of these three criteria, it is subject to a conditional or default simulation, described below.

To simulate price movements, STANS draws random samples from the multivariate Student's t-distribution described by the copula. These random draws are abstract values that correspond to correlated, uniform, normalized shocks in the risk factors. STANS then reincorporates the individual volatility and marginal distribution of the risk factors to create appropriate return scenarios. STANS next applies these theoretical returns to current market prices to generate potential price scenarios for underlying securities. STANS essentially performs the reverse of the function that was performed to fit the econometrics of the risk factors.

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Student-t Copula model. The current rule text also includes other information related to the construction and simulation of a copula in STANS. Specifically, the current rule text includes a mathematical justification for using a copula generally, and introductory text describing the general properties of a Student's t copula. OCC believes this information is extraneous to understanding how the Student-t Copula model currently functions in STANS. This information is also foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent this text does not describe OCC's application of a mathematical copula, OCC does not believe this information needs to be maintained in

OCC's rules. Instead, OCC believes that this information is more appropriately covered in the underlying Student-t Copula Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Conditional and Default Simulations

For risk factors with data sets that have only recently become available, or that have experienced drastic changes in their return characteristics, and do not meet one or more of the criteria in the alignment step, there may be too small of a sample size to reliably estimate correlations among the data. In such cases, these risk factors are excluded from the copula simulation in STANS and OCC applies conditional or default simulation.

OCC applies a conditional simulation when it believes that a risk factor that has been identified during the alignment step does not meet the data quality criteria but has an appreciable correlation with another risk factor that has a more robust dataset. OCC uses that more robust risk factor's data as a proxy for the identified risk factor. The identified risk factor is assumed to exhibit simulated results that follow an NRIG distribution of specified mean, variance, and shape parameters, and any variation from the proxy data is assumed to be purely idiosyncratic. Pursuant to OCC's Margin Policy, OCC periodically reviews whether applying a conditional simulation to a particular risk factor continues to be appropriate.

OCC applies a default simulation when it does not believe an identified risk factor has any obvious proxy and has no view on its prospective volatility, or when a risk factor is identified by STANS during nightly margin processing and OCC has not already selected it to undergo a conditional simulation. In a default simulation, movements in the risk factor are assumed to be entirely idiosyncratic and have a volatility that is typical of highly volatile stocks.

The proposed text would replace current OCC rule text from the Margins Methodology's section on default, derived, and conditional factors. The current rule text also includes other information related to conditional and default simulations. Specifically, the current rule text includes the following:

- Introductory text restating the use of time series in STANS: This information would already be described elsewhere in the STANS Methodology Description where applicable, and OCC does not believe repeating it here is needed to understand how the model functions.
- A description of "derived scenarios," a special case of conditional simulations related to exchange rate risk factors: This special case is applied pursuant to internal OCC procedures, and occurs outside of the STANS methodology. Therefore, OCC does not believe this information is needed to understand how the model currently functions.
- A description of the how OCC operationally applies conditional simulations: These operational details relate to OCC's application of the model's results in operational procedures and are not inherent to the model's selection or design, and that OCC could change from time to time without affecting the model's results.
- Details on how OCC implemented default scenarios in its internal technology

systems: These implementation details relate to OCC's internal administration of its technology systems and are not inherent to the model's selection or design, and that OCC could change from time-to-time without affecting the model's results.

OCC believes that this information is more appropriately covered in the Student-t Copula Model Whitepaper or other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

iii. Implied Volatility Smoothing and Options Pricing

The STANS Methodology Description would next describe how STANS utilizes the inputs and outputs described above to (i) perform implied volatility smoothing, (ii) price European and American options, (iii) price Asian FLEX options, and (iv) price Cliquet options.

Implied Volatility Smoothing

STANS employs an Implied Volatility Smoothing model to estimate fair prices of listed option contracts based on their bid and ask price quotes. This model supports pricing of the following types of options: (i) European and American options on equity products with a dividend yield or with discrete cash dividends; (ii) European and American options on futures on equity indices, currencies, and commodities; (iii) options on volatility indices for which volatility futures trade (e.g., VIX options[40]); (iv) forward start options; and (v) Asian FLEX options.

40 VIX options are treated as options on VIX futures and thus represent a type of option on futures that is also supported by the implied volatility smoothing.

The model is essentially an advanced data filtering and pre-processing technique to improve data quality to support option pricing during the calibration and simulation phases of the STANS methodology. It makes use of the same theory that underpins OCC's Vanilla Options model, described below. The most important stages of the Implied Volatility Smoothing model are: (i) a preprocessing procedure, to filter out "bad" price quotes; (ii) an implied forward price calculation using prices from near-the-money options on the same securities at all tenors or expiration dates; (iii) the smoothing, in which prices are generated for all plain vanilla listed options at all strikes by using corresponding bid and ask price quotes and forward prices (from step two); and (iv) construction of a volatility surface based on linear interpolation of total variance among the smoothed prices and performing any necessary post-processing. When applied to prices estimated by the option pricing models described below, the model functions to (i) makes data points comprising the volatility surface more consistent with the actual bid-ask spreads found in current market prices and (ii) correct data that would create arbitrage opportunities by not having monotonicity and convexity with respect to the strike and/or not satisfying put-call parity.[41]

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Implied Volatility Smoothing model. The current rule text also includes other information related to the model. Specifically, the current rule text includes the following:

- A description of the use of target prices based on model parameters: This

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[41] See Securities Exchange Act Release No. 86296 for further information on the smoothing algorithm used in STANS.

represents configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

- Economic rationale for various features of the model: OCC does not believe that this economic rationale is needed to understand how the model currently functions.
- A discussion of the model's performance in deriving theoretical spot prices from underlying futures and indices, and specific "if/then" conditions the model applies to bid and ask prices to filter out poor quality data based on certain control parameters: These data filtering parameters are configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.
- Mathematical rationale for the method by which the smoothing algorithm calculates implied forward prices: OCC does not believe that the rationale for the model's configuration is needed to understand how the model currently functions.
- A detailed description of the Vega-weighted least squares calculation performed during the first round of optimization to produce arbitrage-free options prices for European options: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic sources. To the extent

the text does not describe OCC's application of a Vega-weighted least squares calculation, OCC does not believe this information needs to be maintained in OCC's rules.

- Operational details on (1) how the model's results are applied to other models for pricing European and American options, options on futures, and long-dated[42] volatilities; (2) price smoothing for contracts that are otherwise missing smoothed prices for various reasons, FLEX options, and over-the-counter options; and (3) detailed steps for a linear interpolation/extrapolation used to construct a volatility surface from smoothed volatilities: These details relate to configuration choices made by OCC to applying a model overlay in certain cases where there is insufficient data, that are not inherent to the model's selection or design, and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the Implied Volatility Smoothing Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

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42 In the context of volatility smoothing, "long-dated" refers to expirations beyond the listed expiration date of standard exchange-traded options.

European and American Options

The Vanilla Options model is used by STANS to price European and American options. This model is comprised of several modules that (i) calculate theoretical option prices, (ii) calculate risk sensitivities of the option prices with respect to the market variables (the "Greeks"), and (iii) calculate implied volatilities from option prices. The model prices European options using a modified Black-Scholes formula and American options using a Leisen-Reimer binomial tree.[43]

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Vanilla Options model. The current rule text includes other information related to the model. Specifically, the current rule text includes the following:

- Rationale and testing to support the number of steps used in the Leisen-Reimer binomial tree: OCC does not believe the rationale to support this model choice is needed to understand how the model currently functions.
- Equations describing the calculation of various "Greeks" (i.e., Gamma, Vega, Theta, and Rho), restatements of standard Black's formulas, and a restatement of the standard Leisen-Reimer binomial tree: This information, while relevant to understanding how the model functions, is foundational information commonly understood in quantitative finance and readily found in public academic literature. To the extent the text does not describe OCC's application of the "Greeks," Black's formulas, and the Leisen-Reimer binomial tree, OCC does not believe

[43] See Securities Exchange Act Release No. 86296 for further information on OCC's Vanilla Options model, which prices American and European options and generic futures.

this information needs to be maintained in OCC's rules.

- A list of control parameters of the Newton-Raphson method used to calculate implied volatilities for vanilla options: These control parameters are configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the Vanilla Options Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Asian FLEX Options

Like European options, Asian FLEX options are priced based on a Black-Scholes formula.[44] Asian FLEX options are modeled with assumptions that volatility, interest rates and cost of carry remain constant across an option's tenor. Furthermore, implied volatility is determined from "terminal" option (i.e., the last option in a series) volatilities, which are obtained from prices of available regular options expiring at the same tenor or, in their absence, by interpolating terminal volatilities of existing tenor regular options using an internal calculator developed by OCC.

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44 See Securities Exchange Act Release No. 74966 for further information on how STANS models Asian-style options.

Cliquet Options

STANS also prices Cliquet options using a Black-Scholes model. Like Asian FLEX options, Cliquet options are modeled with assumptions that volatility, interest rates, and cost of carry remain constant across an option's tenor. STANS calculates options premiums based on the premiums of the individual forward starting options that comprise the Cliquet option. This valuation is then repeated for each "reset period" of the Cliquet option.

Forward Start Options

STANS can also be used to price forward start options. Forward start options are options for which the strike price in dollars is unknown prior to the determination date of the strike shortly before expiration.[45] Forward start option values depend on the same input model parameters as vanilla options and on the determination date of the strike. Using the Black-Scholes framework, the pricing problem of a forward-start option prior to strike determination can be transformed into the valuation of a plain vanilla option at determination time, after which the option can be priced using a standard application of Black's formula.

iv. Aggregation

The STANS Methodology Description would next describe how STANS applies the theoretical derivatives prices to actual positions in Clearing Members' accounts to calculate margin requirements. This is accomplished by aggregating (i) a base margin charge, which consists of an ES calculation with the addition of Extreme Value Theory

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45 Instead, forward start options trade with strikes defined as a fraction α, known prior to expiration, of the underlying closing price on the determination date.

(“EVT”) loss modeling and a stress test component; (ii) an error compensation charge; (iii) a liquidation cost charge; (iv) a positive risk reversal charge; and (v) various add-on charges that are applied based on accounting principles.

Base Margin Charge

STANS first calculates the base margin charge. This is accomplished by identifying the positions present in a Clearing Member’s account,[46] multiplying the values of those positions to each of the 10,000 theoretical values calculated in the above step, then adding the products’ values together to obtain possible 10,000 net asset values (“NAVs”) for the account. The account’s actual NAV is then subtracted from each of these 10,000 possible NAVs to obtain 10,000 possible Profit and Loss (“P&L”) statements. STANS then constructs a VaR line separating the 100 most extreme negative projected P&L statements over a two-day horizon from the remaining 9900 simulated outcomes, representing the worst 1% of the projected scenarios, and calculates the average of these 100 values to obtain a single ES value for the account. This is called the empirical ES because STANS uses actual historical prices in calibrating the simulation, which represents the historical dependence among the various risk factors.

In addition to calculating the empirical ES, STANS applies EVT to parametrically fit the largest losses and parametrically calculate ES. EVT is based on a tenet of probability theory that the distribution of extremes of a univariate random variable

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[46] The netting/offsetting of a Clearing Member’s positions within an account pursuant to OCC’s rules occurs outside STANS before the position data is brought into STANS for this step.

converge to a Generalized Pareto distribution.[47] The parametric EVT estimator can use a larger tail sample than the empirical estimator, which, for ES at the 99th percentile, is limited to 100 (i.e., 1% of 10,000) points. Empirical ES is used when there is indication that the tail is not well fit by EVT.

STANS next applies a stress test component to its base charge. This component includes additional calculations related to (i) concentration, which is intended to consider extreme idiosyncratic moves in concentrated positions and to counteract "survivor bias" in historical equity returns data (i.e., that historical data typically does not incorporate certain extreme movements in a firm's stock prices, such as when a firm declares bankruptcy or is subject to a rich takeover); and (ii) dependence, in which the ES calculations described above are performed twice again, once assuming perfect correlation among the various risk factors and once assuming no correlation among the various risk factors. After performing these concentration and dependence calculations, STANS takes the higher of the two factors and combines it with the empirical ES to create a more conservative margin requirement for the account.

The proposed text would replace current OCC rule text from the Margins Methodology's chapter on the base charge, stress-test add-on charge, and total margin charge. The current rule text also includes a summary section summarizing historical changes OCC has made to the manner in which STANS calculates a total margin charge. OCC does not believe this information is needed to understand how STANS currently functions. OCC further believes that this information is more appropriately covered in

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47 A Generalized Pareto distribution is a type of continuous probability distribution that can be used to model the distribution of the tail of another underlying distribution.

the Portfolio Risk Measures Model Whitepaper or other internal OCC documentation rather than in OCC's rules for this reason. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Error Compensation

An inherent property of ES calculations is the existence of estimation error. To compensate for the potential risk that a STANS ES calculation includes such an error on the positive (lower loss) side, the ES value based on the simulated results is shifted through a compensation term to a more conservative level. Mathematically, the error compensator shifts ES to the left by 1.2 standard deviations of the loss tail, covering the 70% quantile of estimation error. The extent to which this alters the calculated ES in absolute varies based on the distribution's kurtosis (i.e., the shift is more significant for distributions with fatter tails).

Liquidation Cost Charge

The default of a Clearing Member requires OCC to close-out that Clearing Member's positions, which results in OCC incurring costs. Closing out positions in a defaulted portfolio may also entail selling long positions at the current bid price and covering short positions at the current ask price, which could create additional costs based on the bid-ask spread. To account for these costs, STANS calculates a daily liquidation cost charge based on a liquidation cost grid, calibrated with data from historical stressed periods, and applies this calculated cost as an add-on charge. In general, the Liquidation Charge model calculates two risk-based liquidation costs for a portfolio, Vega[48] liquidation cost ("Vega LC") and Delta liquidation cost ("Delta LC"), using "Liquidation Grids." More specifically, the model consists of: (1) the decomposition of the defaulter's portfolio into sub-portfolios by underlying security; (2) the creation and calibration of Liquidation Grids used to determine liquidation costs; (3) the calculation of the Vega LC (including a minimum Vega LC charge) for options products; (4) the calculation of Delta LCs for both options and Delta-one products; (5) the calculation of Vega and Delta concentration factors; and (6) the calculation of volatility correlations for Vega LCs.[49] STANS applies both Vega and Delta LCs to options products, but only applies a Delta charge to Delta-one[50] products such as futures contracts, Treasury securities, and equity securities.

The proposed text would replace current OCC rule text from the Margins Methodology's section on the Liquidation Charge model. The current rule text also includes other information related to the model. Specifically, the current rule text includes the following:

- Background historical information on adoption of the model: OCC does not believe this historical information is needed to understand how the model currently functions.
- Classifications OCC applies to an underlying equity security based on the

48 The Delta and Vega of an option represent the sensitivity of the option price with respect to the price and volatility of the underlying security, respectively.

49 See Securities Exchange Act Release No. 85755 for more detail on the liquidation cost model used by STANS.

50 "Delta one products" refer to products for which a change in the value of the underlying asset results in a change of the same, or nearly the same, proportion in the value of the product.

security's liquidity level to determine which liquidation grid is most appropriate: These details represent configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

- Intermediate equations used to define variables for calculating Vega LC: OCC does not believe these intermediate, explanatory equations are needed to understand how the model currently functions.
- Descriptions of the parameters used to calibrate liquidation grids: These calibration parameters represent configuration choices made by OCC that are not inherent to the model's selection or design and that do not materially impact the model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices.

OCC believes that this information is more appropriately covered in the underlying Liquidation Charge Model Whitepaper and other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Positive Risk Reversal

As an additional conservative measure, STANS applies a "positive risk reversal" charge to ensure that the total calculated margin requirement is at least equal to the estimated liquidation cost, even in the event a position is liquidated at the current market price (or a more favorable price). STANS incorporates the positive risk reversal charge by simply applying a minimum margin requirement to a position that is equal to the estimated liquidation cost charge.

Various Add-on Charges

In addition to the charges described above, OCC may, pursuant to its rules, elect to apply additional charges to a Clearing Member's margin requirements for various reasons; e.g., based on the Clearing Member's Watch Level status or to account for rebates, adjustments and add-ons related to stock loan positions.[51] These additional charges occur outside of STANS and are outside the scope of the STANS Methodology Description.

The proposed text would replace current OCC rule text from a section in the Margins Methodology's base charge, stress-test add-on charge, and total margin charge chapter covering add-on charges. The current rule text notes that OCC may apply various add-on charges to its margin requirements outside the STANS methodology, which could include additional margin charges related to (i) cross-margin accounts, established by OCC Rule 704; (ii) placement on a heightened Watch Level based on OCC's credit risk surveillance, established by OCC's Counterparty Credit Risk Management Policy;[52] (iii) interest payments and adjustments to stock loan positions, established by OCC Rule 601, Interpretation & Policy .05; (iv) customer positions subject

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[51] See Securities Exchange Act Release No. 82355, which states that OCC's Margin Policy establishes the application of add-on charges.

[52] See Securities Exchange Act Release No. 81949 (October 26, 2017), 82 FR 50719 (November 1, 2017) (SR-OCC-2017-009) for more information on OCC's Watch Level framework. OCC has filed a proposed rule change with the Commission to adopt a new TPRMF, which would replace the Counterparty Credit Risk Management Policy and provide an overview of OCC's overall approach to third-party risk management. See supra note 3.

to certain margin requirements promulgated by the U.S. Commodity Futures Trading Commission, established by OCC Rule 601, Interpretation & Policy .07; (v) concentration risk for equity securities exceeding an average daily trading volume threshold, established by OCC's Collateral Risk Management Policy;[53] and (vi) OCC's extended trading hours program, established generally by OCC's Margin Policy and specified in OCC's Extended Trading Hours Set-Up and Monitoring Procedure.[54]

As outlined above, these add-on charges are applied pursuant to other OCC rules, policies, and/or procedures, and are established outside of the STANS methodology. Therefore, OCC believes that they are more appropriately covered in the underlying OCC rules, policies, and procedures that establish them, and, accordingly, proposes to delete this text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Model Utilities

The STANS Methodology Description would next describe several "model utilities" that are applied at various points in the STANS methodology, to incorporate various market and operational factors that affect options pricing and thereby produce model results which more accurately reflect current and potential market conditions.

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53 See Securities Exchange Act Release No. 82009, which describes OCC's Collateral Risk Management Policy.

54 The specific margin add-on charges OCC may apply are subject to change in accordance with internal governance established by OCC's Margin Policy and supporting procedures.

i. Dividends

The STANS Methodology Description would describe how STANS incorporates expected cash dividends on a stock into options pricing.[55] STANS obtains daily information on general dividend yields and discrete dividends from pricing vendors, then applies a dividend growth rate to this information to forecast dividends (typically) 16 quarters into the future.

STANS accounts for the possibility that cash dividends may be paid on stocks, which would affect their pricing, through a dividend utility that interacts with the pricing models in STANS. Daily, STANS retrieves from an external vendor data on forecasted cash dividends and yield curves associated with the issuance of those dividends. STANS uses this data to forecast when a security may go ex-dividend, and accordingly incorporates this into pricing the associated equity security. STANS also accounts for the possibility that an option may be exercised early to obtain a cash dividend on the underlying security. Using the same external dividend data, STANS calculates when an option would likely be exercised early to receive the dividend and prices it accordingly.

ii. Interest Rate Curve

This model utility calculates the yield curve using (i) overnight, one-week, one-month, two-month, and three-month cash deposit interest rates; (ii) Eurodollar interest rate futures with three-month to two-year tenors; and (iii) interest rate swaps with three-year to 30-year tenors. The model utility calculates a discount factor from a given date to any future date along the curve. This discount factor is used as an input to pricing models to generate theoretical prices for instruments based on these rates.

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[55] OCC considers the potential effects of stock dividends outside of STANS.

iii. <u>Overnight and Daily Returns</u>

STANS calculates margin requirements on a daily basis, using prices from that day's market close. However, some positions may expire or be exercised during a business day and before the following day's margin settlement. Since OCC clears derivatives that are settled on both opening and closing prices, both types of events affect derivatives prices and their corresponding margin requirements. Therefore, the STANS Methodology Description would describe how STANS obtains relevant risk factors for both the most recent opening price and the most recent closing price. STANS includes within the copula it constructs, described previously, a joint distribution of both overnight and daily returns on relevant risk factors.

The proposed text would replace current OCC rule text from the Margins Methodology's section on overnight and daily innovations. The current rule text also includes other information on the overnight and daily returns model utility. Specifically, the current rule text includes the following:

- Details on how OCC implemented the model utility in its technology systems: These implementation details relate to OCC's internal administration of its technology systems and are not needed to understand how the model currently functions. Because these details are not inherent to the model's selection or design, OCC could also change them from time to time without affecting the model's results.
- Redundant detail related to the copula constructed by STANS: These details, described above, would be described in the STANS Methodology Description's section on the Student-t Copula model, and OCC does not believe repeating it

here is needed to understand how the model utility currently functions.

OCC believes that this information is more appropriately covered in the Daily and Overnight Theoretical Price Scenario Simulation Model Whitepaper or other internal OCC documentation rather than in OCC's rules for the reasons listed above. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

iv. <u>One-Day and Two-Day Scenarios</u>

As noted previously, OCC has established margin levels to cover the costs of liquidating positions over a two-day margin period of risk. Furthermore, and as described above, during this interval expiring OCC-cleared or cross-margined positions may experience final settlement based on either the opening or closing price of the underlying security. Therefore, the STANS Methodology Description would describe how STANS calculates for each underlying price scenario simulated prices at four different points in time: (i) opening price on day one; (ii) closing price on day one; (iii) opening price on day two; and (iv) closing price on day two. STANS must account for these additional prices to avoid under-margining portfolios with both expiring and non-expiring positions in a risk group, and to reflect the prices of underlying securities and associated derivatives that are forecasted to go ex-dividend or ex-coupon on T+1 or T+2 (where T represents the activity date). To calculate the two additional prices that may be observed over the two-day margin period of risk, STANS applies a randomly generated permutation to the return scenarios. The second-day return scenarios and securities that go ex-dividend on T+2 are then applied scenario-by-scenario to the first-day results in the same fashion.

v. Portfolio Specific Haircuts

Some Clearing Members have deposited securities as margin collateral that are also used in STANS as risk factors, and therefore potential price movements in these securities are factored into margin requirement calculations. However, a Clearing Member may want – or be required – to withdraw or deposit such margin collateral intraday. This would change the concentration of the Clearing Member's collateral types and would also change the sensitivity of how the Clearing Member's portfolio responds to such changes. To account for these changes in concentration and sensitivity, the STANS Methodology description would describe how STANS utilizes a Portfolio Specific Haircuts model. This model provides haircut values for withdrawals or deposits of collateral, which are then applied to the previous day's collateral values to arrive at the impact of the collateral movements on the margin requirement. These haircuts represent the sensitivity of that Clearing Member account's risk profile to its position in the collateral security being withdrawn or deposited. These haircuts are designed to provide an estimate of the resulting change in margin requirements if the entire margin calculation were re-run following the withdrawal or deposit. A different haircut is associated with each combination of Clearing Member account and security posted as margin collateral.

Margins Methodology Chapters Not Found in STANS Methodology Description

The current rule text from the Margins Methodology describes that STANS uses historical and current prices for listed tenors of energy and other commodity futures to simulate prices of energy and other commodity futures using two variants of a two-factor

Schwartz and Smith's model:[56] one variant to incorporate the effects of seasonality[57] for pricing futures related to nonseasonal commodities such as crude oil and the other variant to incorporate the effects of seasonality and is used to price futures related to seasonal commodities such as natural gas, heating oil, gasoline, electricity, and petrochemicals. The products for which OCC previously used this model to calculate margin requirements are no longer listed, and therefore OCC has decommissioned this associated pricing model. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

The current text from the Margins Methodology also includes information on a model used to price European-style binary options. The products for which OCC used this model to calculate margin requirements are no longer listed, and OCC decommissioned the model. The current text also includes information on OCC's use of the Vanilla Options model to calculate margin requirements for Currency Options and Foreign Index Futures, both of which are products OCC no longer clears. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

The current rule text from the Margins Methodology also includes information on certain processes OCC uses to operationalize the STANS methodology in its systems.

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[56] The Schwartz and Smith's model is a two-factor model of commodity prices that allows for mean reversion in short-term prices and uncertainty in the long-term equilibrium level to which prices revert. See Schwartz, E. and Smith, E., "Short-Term Variations and Long-Term Dynamics in Commodity Prices," 46 Mgmt. Sci. 7, 893-911 (2000) (describing the Schwartz and Smith's model).

[57] Seasonality is a characteristic of futures products that exhibit regular and predictable price changes that recur every calendar year.

Specifically, these processes are (i) daily calibration and transfer, which describes implementation of the processes to daily obtain pricing data and calibrate pricing models; (ii) Monte Carlo marginals, which describes implementation of the processes that create price scenarios for underlying risk factors from either copula draws or (in the absence of a copula) conditional or default simulations; (iii) Monte Carlo theoreticals, which describes implementation of the processes that calculate theoretical values for futures and options; and (iv) monthly copula estimation and simulation, which describes implementation of the processes that generate copula scenarios for underlying risk factors based on calibrated parameters.

These chapters describe implementation details related to OCC's internal administration of its technology systems and are not needed to understand how the STANS models currently function. Because these details are not inherent to model selection or design, OCC could also change them from time to time without affecting model results. OCC believes that this information is more appropriately covered in the underlying Model Whitepapers and other internal OCC documentation rather than in OCC's rules for this reason. Therefore, OCC proposes to delete this rule text in its entirety without adding new, corresponding rule text in the STANS Methodology Description.

Margin Policy

Lastly, OCC would make conforming changes to its Margin Policy to reflect the adoption of the STANS Methodology Description and the retirement of the Margins Methodology. OCC would also make other non-substantive changes to the Margin Policy to correct typographical errors, update references to other related internal OCC policies and procedures, and conform the policy to OCC's current internal policy template. The proposed changes are intended to promote the accuracy and clarity of OCC's Margin Policy and would not impact OCC's margin setting practices or processes.

(2) Statutory Basis

OCC believes that the proposed rule change is consistent with Section 17A of the Act[58] and the rules thereunder applicable to OCC. Section 17A(b)(3)(F) of Act[59] requires, among other things, that the rules of a clearing agency be designed to promote the prompt and accurate clearance and settlement of securities transactions and derivative agreements, contracts, and transactions. The purpose of the proposed rule change is to adopt a STANS Methodology Description document to clearly and concisely describe the material aspects of OCC's quantitative methodology for calculating Clearing Member margin requirements. OCC uses the margin it collects to limit its credit exposures to participants and to protect other Clearing Members from losses that may arise as a result of a default and ensure that OCC is able to continue the prompt and accurate clearance and settlement of its cleared products. As a result, OCC believes the proposed STANS Methodology Description is designed to promote the prompt and accurate clearance and settlement of securities transactions and derivative agreements, contracts, and transactions in accordance with Section 17A(b)(3)(F) of the Act.[60]

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58 15 U.S.C. 78q-1.

59 15 U.S.C. 78q-1(b)(3)(F).

60 Id.

Rule 17Ad-22(b)(1)[61] requires that a registered clearing agency that performs central counterparty services establish, implement, maintain and enforce written policies and procedures reasonably designed to measure its credit exposures to its participants at least once a day and limit its exposures to potential losses from defaults by its participants under normal market conditions so that the operations of the clearing agency would not be disrupted and non-defaulting participants would not be exposed to losses that they cannot anticipate or control. As described above, the proposed STANS Methodology Description described herein details the risk-based margin methodology by which OCC measures its credit exposures to its participants on a daily basis and determines margin requirements based on such calculations. OCC believes that the proposed STANS Methodology Description would result in a more transparent and clearly understandable description of the methodology used to measure and mitigate credit exposures to OCC's Clearing Members, and that the proposed rule change is therefore designed to ensure that OCC sets margin requirements that would serve to limit OCC's exposures to potential losses from defaults by its participants under normal market conditions so that the operations of OCC would not be disrupted, and non-defaulting participants would not be exposed to losses that they cannot anticipate or control. Accordingly, OCC believes the proposed rule change is consistent with Rule 17Ad-22(b)(1).[62]

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[61] 17 CFR 240.17Ad-22(b)(1).

[62] Id.

Rule 17Ad-22(b)(2)[63] further requires, in part, that a registered clearing agency that performs central counterparty services establish, implement, maintain and enforce written policies and procedures reasonably designed to use margin requirements to limit its credit exposures to participants under normal market conditions and use risk-based models and parameters to set margin requirements. The STANS Methodology Description is intended to better describe how the STANS methodology is designed to limit OCC's credit exposures to participants under normal market conditions in a manner consistent with Rule 17Ad-22(b)(2).[64]

Rules 17Ad-22(e)(6)(i), (iii), and (v)[65] further require that a covered clearing agency establish, implement, maintain and enforce written policies and procedures reasonably designed to cover its credit exposures to its participants by establishing a risk-based margin system that, among other things: (1) considers, and produces margin levels commensurate with, the risks and particular attributes of each relevant product, portfolio, and market; (2) calculates margin 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; and (3) uses an appropriate method for measuring credit exposure that accounts for relevant product risk factors and portfolio effects across products. As described in detail above, OCC believes that the proposed STANS Methodology Description would result in a clearer, more transparent document describing OCC's risk-based margin system that, among other things: (1) considers, and

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63 17 CFR 240.17Ad-22(b)(2).

64 Id.

65 17 CFR 240.17Ad-22(e)(6)(i), (iii), and (v).

produces margin levels commensurate with, the risks and particular attributes of each relevant product, portfolio, and market; (2) calculates margin 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; and (3) uses an appropriate method for measuring credit exposure that accounts for relevant product risk factors and portfolio effects across products. OCC therefore believes the proposed STANS Methodology Description is reasonably designed to consider and produce margin levels commensurate with the risks and particular attributes of products cleared by OCC, calculate margin 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, and apply an appropriate method for measuring credit exposure that accounts for risk factors and portfolio effects of products cleared by OCC in a manner consistent with Rules 17Ad-22(e)(6)(i), (iii), and (v).[66]

Rule 17Ad-22(e)(23)[67] further requires, in part, that a covered clearing agency establish, implement, maintain, and enforce written policies and procedures reasonably designed to provide sufficient information to enable participants to identify and evaluate the risks, fees, and other material costs they incur by participating in the covered clearing agency. The STANS Methodology Description is designed to provide Clearing Members with greater transparency into the STANS Methodology than the current rule text of the Margins Methodology, which OCC does not make generally available to participants and includes various details that, as described herein, OCC does not believe constitute

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66 Id.

67 17 CFR 240.17Ad-22(e)(23).

material aspects of the STANS methodology. In addition, OCC has organized and written the STANS Methodology Description in a way that would more clearly identify for Clearing Members the material aspects of the STANS methodology. Specifically, OCC has organized the STANS Methodology Description in a way that enables a reader to better understand how the various quantitative model components of STANS function in concert to produce OCC margin requirements, rather than organizing the document in a way that would serve OCC's internal purposes but not facilitate comprehension of the STANS methodology by a third party. Furthermore, by including in the STANS Methodology Description only the OCC rule text covering the material, quantitative aspects of the STANS methodology, and either not describing extraneous or immaterial aspects of the STANS methodology in the STANS Methodology Description or referring the reader to other OCC or external sources where appropriate,[68] the proposed STANS Methodology Description would more clearly identify for an informed reader how the STANS methodology's quantitative model components form OCC's basis for calculating margin requirements, and what aspects of the STANS methodology OCC may adjust in the course of its business pursuant to its other rules and internal policies and procedures. OCC believes that this additional clarity, transparency, and enhanced readability regarding the material quantitative model components of the STANS methodology promote the requirements of Rule 17Ad-22(e)(23).

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68 For example, the STANS Methodology Description would refer to other OCC rules to establish manual, non-modeled margin components or adjustments made by OCC, and would refer to public academic sources for descriptions of common mathematical theories and methods that do not represent OCC-specific applications or modifications of those theories and methods.

Finally, Section 19(b)(1) of the Act and Rule 19b-4 thereunder set forth the requirements for SRO proposed rule changes, including the regulatory filing requirements for "stated policies, practices and interpretations."[69] OCC proposes to retire its existing Margins Methodology, which was, in part, previously filed as an OCC "rule" with the Commission, as the STANS Methodology Description would supersede the Margins Methodology in its entirety. Under the proposal, the material aspects of the STANS methodology would be contained in the proposed STANS Methodology Description described herein.

As described in detail herein, various details in the current Margins Methodology would no longer be OCC rule text following adoption of the STANS Methodology Description. These internal procedural and administrative details used by OCC's model developers and model validators would: (1) be reasonably and fairly implied by the proposed STANS Methodology Description, OCC's Margin Policy,[70] OCC's Model Risk Management Policy,[71] and other OCC rules; and/or (2) otherwise not be deemed to be material aspects of OCC's risk-based margin system. Specifically, OCC believes the details it proposes to remove from OCC's rule text are consistent with Section 19(b)(1) of the Act and Rule 19b-4 thereunder for the following reasons:

- To the extent the current rule text includes details on OCC's historical modeling practices and potential future enhancements, OCC does not believe such text

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69 See supra note 13.

See Securities Exchange Act Release No. 82355 (December 19, 2017), 82 FR 61058 (December 26, 2017) (SR-OCC-2017-007).

71 See Securities Exchange Act Release No. 82473 (January 9, 2018), 83 FR 2271 (January 16, 2018) (SR-OCC-2017-011).

constitutes an SPPI of OCC because it does not describe OCC's current practices;

- To the extent the current rule text includes details on the exact set of current products applied to each STANS component, which will change from time to time as OCC-cleared products are listed and delisted, OCC believes such text is reasonably and fairly implied by the proposed rule text establishing the scope of instruments for which the STANS methodology calculates margin requirements;
- To the extent the current rule text includes details on various configuration choices made by OCC, such as data sources, model parameters, and model performance monitoring, that are not inherent to model selection or design and that do not materially impact a model's results, which OCC may from time to time determine it should modify based on current market conditions and business practices, OCC does not believe such text constitutes an SPPI because it does not describe a <u>material</u> aspect of the operation of the facilities of OCC;
- To the extent the current rule text includes details on testing results and explanatory rationale supporting a model, OCC does not believe such text constitutes an SPPI because it does not describe an OCC policy, practice, or interpretation;
- To the extent the current rule text includes recitations of standard mathematical and economic theories/techniques that are well-known in quantitative finance, readily found in public sources, and do not include OCC-specific modifications or applications, OCC believes such text is reasonably and fairly implied by the rule text establishing the theories/techniques selected by OCC if OCC has not applied such theories/techniques in a modified or idiosyncratic manner;

- To the extent the current rule text includes redundant descriptions of a model component appearing in multiple chapters, the rule text has been consolidated to describe the model component in the single location;
- To the extent the current rule text includes details on OCC's implementation of a model in its internal technology systems and application of model results in operational procedures that are not inherent to a model and that OCC could change them from time to time without affecting a model's results, OCC does not believe such text constitutes an SPPI because (1) it does not describe a material aspect of the operation of the facilities of OCC and (2) it is reasonably and fairly implied that the calculations described in the STANS Methodology Description must be implemented in some manner through internal OCC's systems and processes. For example, current chapters of the Margins Methodology describe the processes run by internal OCC systems to execute the calculations described in the proposed STANS Methodology Description. These chapters do not describe material aspects of OCC's models or methodology. Rather, these chapters describe, for example, the timing and sequencing of various processes and the code libraries maintained by OCC to support the STANS methodology. Changes in such processes would not be considered changes to OCC's models/methodology and would not materially impact OCC's margin requirements. Moreover, Clearing Members and market participants can reasonably and fairly infer that OCC maintains such systems and processes to effectuate the daily calculation of margin requirements using the models and methodology described herein; and

- To the extent the current rule text includes manual margin adjustments and add-ons OCC employs pursuant to OCC rules, policies, and/or procedures outside the STANS methodology, OCC does not believe such text constitutes an SPPI because it is reasonably and fairly implied by other existing rules of OCC.

Accordingly, OCC believes the proposed changes would be consistent with the requirements of Section 19(b)(1) of the Act and Rule 19b-4 thereunder.[72]

(B) Clearing Agency's Statement on Burden on Competition

Section 17A(b)(3)(I) of the Act requires that the rules of a clearing agency do not impose any burden on competition not necessary or appropriate in furtherance of the purposes of Act.[73] OCC does not believe that the proposed rule change would impact or impose any burden on competition. The proposed STANS Methodology Description describes OCC's STANS margin setting methodology that currently applies to all Clearing Members. Therefore, the proposal has no impact on Clearing Members, and OCC does not believe that the proposed rule change would unfairly inhibit access to OCC's services or disadvantage or favor any particular user in relationship to another user. In addition, the proposal currently applies uniformly to all Clearing Members in establishing their margin requirements.

For the foregoing reasons, OCC believes that the proposed rule change is in the public interest, would be consistent with the requirements of the Act applicable to clearing agencies, and would not impact or impose a burden on competition.

(C) Clearing Agency's Statement on Comments on the Proposed Rule Change Received from Members, Participants or Others

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72 See 15 U.S.C. 78s(b)(1) and 17 CFR 240.19b-4.

73 15 U.S.C. 78q-1(b)(3)(I).

Written comments on the proposed rule change were not and are not intended to be solicited with respect to the proposed rule change and none have been received.

III. Date of Effectiveness of the Proposed Rule Change and Timing for Commission Action

Within 45 days of the date of publication of this notice in the Federal Register or within such longer period up to 90 days (i) as the Commission may designate if it finds such longer period to be appropriate and publishes its reasons for so finding or (ii) as to which the self- regulatory organization consents, the Commission will:

(A) by order approve or disapprove the proposed rule change, or

(B) institute proceedings to determine whether the proposed rule change should be disapproved.

IV. Solicitation of Comments

Interested persons are invited to submit written data, views and arguments concerning the foregoing, including whether the proposed rule change is consistent with the Act. Comments may be submitted by any of the following methods:

Electronic Comments:

- Use the Commission's Internet comment form (http://www.sec.gov/rules/sro.shtml); or
- Send an e-mail to rule-comments@sec.gov. Please include File Number SR-OCC-2020-016 on the subject line.

Paper Comments:

- Send paper comments in triplicate to Secretary, Securities and Exchange Commission, 100 F Street, NE, Washington, DC 20549-1090.

All submissions should refer to File Number SR-OCC-2020-016. This file number should be included on the subject line if e-mail is used. To help the Commission process and review your comments more efficiently, please use only one method. The Commission will post all comments on the Commission's Internet website (http://www.sec.gov/rules/sro.shtml). Copies of the submission, all subsequent amendments, all written statements with respect to the proposed rule change that are filed with the Commission, and all written communications relating to the proposed rule change between the Commission and any person, other than those that may be withheld from the public in accordance with the provisions of 5 U.S.C. 552, will be available for website viewing and printing in the Commission's Public Reference Room, 100 F Street, NE, Washington, DC 20549, on official business days between the hours of 10:00 a.m. and 3:00 p.m. Copies of such filing also will be available for inspection and copying at the principal office of OCC and on OCC's website at https://www.theocc.com/Company-Information/Documents-and-Archives/By-Laws-and-Rules.

All comments received will be posted without change. Persons submitting comments are cautioned that we do not redact or edit personal identifying information from comment submissions. You should submit only information that you wish to make available publicly.

All submissions should refer to File Number SR-OCC-2020-016 and should be submitted on or before [insert date 21 days from publication in the Federal Register].

For the Commission, by the Division of Trading and Markets, pursuant to delegated authority.[74]

Secretary

[74] 17 CFR 200.30-3(a)(12).