NOTICE TO MEMBERS

N° 2021 - 082

May 25, 2021

REQUEST FOR COMMENTS

AMENDMENTS TO THE RISK MANUAL OF THE CANADIAN DERIVATIVES CLEARING CORPORATION INITIAL MARGIN MODEL CHANGE FOR BOND DERIVATIVES

On May 6, 2021, the Board of Directors of Canadian Derivatives Clearing Corporation ("CDCC") approved certain amendments to the Risk Manual of CDCC in connection with the initial margin model change for bond derivatives.

Please find enclosed an analysis document as well as the proposed amendments.

Process for Changes to the Rules

CDCC is recognized as a clearing house under section 12 of the *Derivatives Act* (Québec) by the Autorité des marchés financiers ("AMF") and as a recognized clearing agency under section 21.2 of the *Securities Act* (Ontario) by the Ontario Securities Commission ("OSC").

The Board of Directors of CDCC has the power to approve the adoption or amendment of the Manuals of CDCC. Amendments are submitted to the AMF in accordance with the self-certification process and to the OSC in accordance with the process provided in the Recognition Order.

Comments on the proposed amendments must be submitted before **June 25, 2021**. Please submit your comments to:

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A copy of these comments shall also be forwarded to the AMF and to the OSC to:

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For any question or clarification, Clearing Members may contact Sophie Brault at 514-268-0591 or at sophie.brault@tmx.com.

George Kormas
President

AMENDMENTS TO THE RISK MANUAL OF THE CANADIAN DERIVATIVES CLEARING CORPORATION INITIAL MARGIN MODEL CHANGE FOR BOND DERIVATIVES

TABLE OF CONTENTS

I. DESCRIPTION

As a response to the impacts of the COVID-19 market events on its Base Initial Margin ("**Base IM**"), the Canadian Clearing Derivatives Corporation ("**CDCC**" or "the **Corporation**") proposed (Notice to Members 020-21) on February 2, 2021 a permanent model change targeting a subset of the Exchange Traded Derivatives (ETD) it clears (the "**Model Change on Equity Derivatives**"). The Corporation is now disposed to propose a permanent model change for another subset of ETD it clears, the second and last product group on which a remediation action is still being used (the "**Model Change on Bond Derivatives**")[1].

Under the Model Change on Equity Derivatives, CDCC proposed amending its Risk Manual with regard to the Base IM methodology for Options, Futures and Unsettled Items. These amendments intended to clarify the major components which currently constitute the Margin Interval (MI) in its calculation (the Historical Risk component and the volatility floor), and to integrate the Stress Risk component as an additional measure to mitigate the procyclicality of margins.

Under the Model Change on Bond Derivatives, CDCC is now proposing to extend the application of the Stress Risk component to all the Government of Canada Bond Futures and Options on Government of Canada Bond Futures (hereafter, the "**Bond Derivatives**"), but since the proposed amendments to the Model Change on Equity Derivatives have not yet been approved, CDCC will be presenting two versions of its proposed amendments. The first version will take into consideration the current state of the Rules which does not include the proposed amendments related to the Model Change on Equity Derivatives. The second version will incorporate the proposed amendments after CDCC obtains regulatory approvals for the Model Change on Equity Derivatives.

CDCC also wishes to provide clarification related to the new risk model recalibration process (Notice to Members 032-21) published on February 23, 2021 ("**Recalibration Process**"**)**:

In a scenario where the Recalibration Process would be in effect, CDCC wanted to illustrate that the proposed Model Change on Equity Derivatives, as well as the proposed Model Change on Bond Derivatives amendments would not fall under a "risk model recalibration event". These would be qualified as material model changes as the proposed amendments are going beyond the concept of "key risk parameters''. As such, CDCC would abide to the same process of as it currently follows for a "rule change" or a "significant change" and would be submitted the file to CDCC's board of directors and, subsequently to CDCC's regulators and, when applicable, to the Clearing Members (or the public).

Unless otherwise defined herein, any defined term used in this analysis will have the meaning described in the CDCC Rules and Manuals (hereinafter the "**Rules**").

[1] No remediation action was applied on the remaining ETD (i.e. Short Term Interest Rate Futures).

II. PROPOSED AMENDMENTS

As CDCC believes that the proposed amendments regarding the Model Change on Equity Derivatives will not yet be approved by the time the Model Change on Bond Derivatives proposed amendments are submitted, CDCC is proposing all the same amendments it has already submitted regarding the Model Change on Equity Derivatives to the Bond Derivatives. As such, all the changes from the Model Change on Equity Derivatives file (Sections 1.1, 6.1 and 6.5 of the Risk Manual) will be applicable to the Government of Canada Bond Futures and Options on Government of Canada Bond Futures.

In the event that the proposed amendments to Equity Derivatives Model Change would have been approved prior to the currently proposed changes, CDCC wishes to draw attention to the fact that it would have only needed to propose changes to the Section 6.5 of the Risk Manual by adding "as well as all Government of Canada bond futures contracts and options on Government of Canada bond futures contracts" to the list of products for which the Stress Risk component is applicable.

For convenience, CDCC will also present what would the Risk Manual resemble once CDCC has received all regulatory approvals regarding all the proposed changes to the Model Change on Equity and Bond Derivatives.

The proposed amendments are attached hereto.

III. ANALYSIS

a. Background

Following CDCC's proposal to replace the temporary remediation action into a permanent solution with the introduction of a stress risk component for "**Equity Derivatives**" (as defined in the Model Change on Equity Derivatives), the Corporation is now disposed to propose a permanent solution for Bond Derivatives (under the Model Change on Bond Derivatives), the second and last product group of the line of Exchange Traded Derivatives (ETD) it clears on which a remediation action is still being used, including the following products:

- The 2-year Government of Canada Bond Futures (CGZ)
- The 5-year Government of Canada Bond Futures (CGF)
- The 10-year Government of Canada Bond Futures (CGB)
- The 30-year Government of Canada Bond Futures (LGB)
- Any Options contracts on the above Futures

Risk analysis

The risk model and temporary remediation that were discussed in the Model Change on Equity Derivatives are identical for Bond Derivatives. Additionally, the proposed model revision for Bond Derivatives is fully aligned with the recent proposition for Equity Derivatives, and the general structure of the model change can therefore be seen as common for the two product groups.

Please refer to section 1 for a brief review of the "*Common proposition for Equity and Bond Derivatives*".

Nevertheless, the Corporation wished to propose its risk analysis in two parts to allow for the consideration of assumptions specific to interest rate products which required an additional attention for the calibration of the SVaR for Bond Derivatives. More specifically, it is for the selection of the fixed stressed period that CDCC is proposing to rely on an additional assumption: the effect of interest rate regimes. Please refer to section 2 for the "*Details specific to the calibration of the SVaR for Bond Derivatives*".

Section 1 - Common proposition for Equity and Bond Derivatives

<u>Risk Model:</u> Base IM requirements for ETD are derived from the SPAN-based methodology, where the Margin Interval (MI) parameter is calculated using a (i) Historical Risk component and (ii) measures to mitigate the procyclicality of margins ("**Anti-Procyclicality**" or "**APC**" measures). The Historical Risk component is calculated with a daily volatility estimator using a parametric assumption. On the other side, the volatility floor serves as an APC measure and takes the form of a 10-year average of the daily volatility estimator. The temporary remediation, as well as the proposed model change are directly addressing APC measures.

<u>Temporary Remediation:</u> The remediation that is currently in force for Equity Derivatives takes the form of a 25% buffer on the level of the volatility floor (the "**Buffered Floor**"), which corresponds to another one of the three APC measures recommended by the ESMA regulatory body[2]. By doing so, the Corporation provided a targeted response to address the performance of its model without adversely impacting its Clearing Members in times of stress.

<u>Proposed Model Revision:</u> Replacement of the temporary remediation by the introduction of a Stress Risk component based on the Stressed Value-at-Risk (SVaR) methodology, which again, corresponds to another one of the three APC measures. CDCC considers the introduction of the Stress Risk component as a refinement of the generalized Buffered Floor into a more comprehensive approach that allows for a better complementarity with the volatility floor (independent use of a *fixed* Stressed period in parallel to the *rolling* 10-year lookback window), therefore improving the overall performance of the model. More specifically, the SVaR will be integrated alongside the parametric component of the MI (i.e. the Historical Risk component) as a weighted proportion, and the parametric volatility floor will continue to apply as the last step of the calculation.

Section 2 - Details specific to the calibration of the SVaR for Bond Derivatives

<u>Interest Rate Regimes Assumption</u>

The Corporation considers that the level of interest rates may have an effect on the dynamic of their return distribution over time. CDCC's interest rate zoning methodology, currently used for the calibration of stress test scenarios, suggests the identification of three distinct levels of interest rates: low, medium and high (the "**Zoning methodology**"). In line with this assumption,

[2] "Guidelines on EMIR Anti-Procyclicality Margin Measures for Central Counterparties". ESMA 28 May 2018. ESMA70-151-1293

interest rate regimes determined under the Zoning methodology will also be used for the calibration of the SVaR for Bond Derivatives.

Proposed Calibration

The Zoning methodology will be introduced for the selection of the fixed stressed period, leaving all other calibration common for both Equity and Bond Derivatives (i.e. the SVaR will be obtained by taking the 99th percentile of the 260-day return distribution of each underlying risk factor).

Consequently, a fixed stressed period will be selected for each of the three interest rate regimes, which will result in the calibration of three levels of SVaR. Once calibrated, the three levels of SVaR will be appropriately smoothed to alleviate the step effect between regimes and control for procyclicality. Finally, the applicable SVaR will be determined by the daily level of interest rates, appropriately smoothed too, in order to control for rate jumps and ensure a stable daily measure.

Moreover, the selection of the fixed stressed period will also be determined on a per product basis to accommodate for the various effects of interest rate regimes on the different tenors of the Government of Canada curve. Given the added complexity, the Corporation is proposing to rely on an internal quantitative methodology to select the multiple fixed stressed periods (i.e. for each of the four products, and each of the three regimes), by selecting the periods that return the highest SVaR on theoretical underlying bonds evaluated using the Government of Canada Zero-Coupon curve, and over the period used for the Zoning methodology.

b. Objectives

The proposed amendments are motivated by CDCC's governance process around the reaction of its IM models to the COVID-19 outbreak on financial markets. After proposing a targeted model change for Equity Derivatives, the Corporation is now disposed to extend the proposed model change to include Bond Derivatives, both considered as the appropriate response for the permanent solution.

c. Comparative Analysis

A comparative analysis of publicly available information from different clearing houses such as ASX Clear, CME Clearing, Eurex Clearing, ICE Clear US and LCH SA was performed by CDCC on the usage of APC measures in the equity derivatives clearing market (detailed results in the Model Change on Equity Derivatives). This analysis can be broadened to include the bond derivatives clearing market as both product groups fall under the same Exchange Traded Derivatives (ETD) line of products for which no clear distinction is made in the PFMI Disclosure documents where the clearing houses mentioned above only describe their margin process at a very general level.

Conclusions remain, every clearing house mentioned above uses some form of floor level, as it has historically been the case at CDCC. Most clearing houses make use of another APC measure, either by using stress scenarios or buffers of some sorts. These facts lead CDCC to understand that from the sample of major global clearing houses for ETD, the 10-year floor seems to be used as the core APC measure while only one of the other two measures applies in complement to the floor.

d. Analysis of Impacts

i. Impacts on Market

Given CDCC's proposition to replace the emergency APC measure that was better fit for a rapid remediation (i.e. the Buffered Floor), with another one that is more appropriate for a long term solution (i.e. the Stress Risk component), the risk analysis suggests that no significant impact is expected on the Margin and Clearing Funds requirements[3].

Moreover, when compared with the additive effect of the Buffered Floor, the Stress Risk component proves to work in better complementarity with the volatility floor. Indeed, in times of low volatility, margin levels would go below the level of margins that would be generated by the Buffered Floor, equivalent but more reactive when market fluctuations rise, and with a greater persistence in times of stress. In other words, major differences between the two measures occur in periods when the Buffered Floor is fully activated, which corresponds to periods with market volatilities at exceptionally low levels.

Although sharing the above mentioned observations, the expected market impact for Equity and Bond Derivatives may differ depending on the timing of the implementation. Indeed, with volatility dynamics that generally revert faster to their long term average, Bond Derivatives are already converging to margin levels that are driven by the volatility floor. Consequently, unlike Equity Derivatives where the Buffered Floor is still considered as fully exhausted (thus ineffective), the Buffered Floor for Bond Derivatives is already partially active. As long as current volatility dynamics are maintained, the Corporation therefore expects a decrease of the Margin Fund would the Stress Risk component be implemented for Bond Derivatives (whereas an increase of the Margin Fund has been projected for the Equity Derivatives implementation).

With opposite impacts on the level of the Margin Fund, and provided that the both model changes are approved, CDCC proposes to target a single implementation date for Equity and Bond Derivatives toward the end of July 2021. By doing so, the aggregated market impact would be offsetted, and any remaining collateral movement that would be required at the Clearing Member level would be fully optimized. Should the above impact assessment evolve due to changing market conditions or any other exceptional event in the months prior to implementation, the Corporation will be in the capacity to structure its single date strategy into a gradual activation (e.g. over a week's time) to control for procyclicality and foster Clearing Member readiness.

ii. Impacts on Technology

The proposed amendments have no impact on the clearing system (SOLA) or the risk system. Indeed, both the clearing and risk systems make external use of the information to be processed (the calculation of the MI).

Regarding the end-user-computing-system, CDCC expects a medium impact as new developments will be required to integrate the proposed model change to the existing process

[3] Given that the proposed model does not affect the methodology of the Clearing Fund and that the impact on the level of the Base IM (which is an input parameter to calibrate the Clearing Fund) is considered low, consequently no significant impact on the level of the Clearing Fund is also expected by the Corporation.

for the calculation of the MI. However, the Corporation has established that new developments for both the Model Change for Equity Derivatives and the Model Change for Bond Derivatives would be treated together as the model structure is identical and the current process for the calculation of the MI regroups all ETD.

More specifically, the Stress Risk component will be integrated alongside the current calculation of the MI using a configurable switch to allow for its activation at the defined product group level. Allowing for strong development and testing synergies, this strategy will also provide added flexibility to activate the model change in sequence, should the targeted timeline require an adaptation with regards to regulatory approvals, changes in the expected market impacts, or any other exceptional event. User Acceptance Testing (UAT) for any new developments with regards to the end-user-computing-system is planned prior to implementation.

iii. Impacts on trading functions

The proposed amendments will have no impact on MX trading systems or rules.

iv. Public Interest

CDCC is of the view that the proposed amendments are not contrary to the public interest. In fact, the public and Clearing Members are generally requesting clear rules that are consistent with the best practices of other clearinghouses and are PFMI compliant.

Moreover, CDCC considers these amendments to be in the interest of the public as the Corporation is improving the performance of its IM models without adversely impacting its Clearing Members in times of stress, which should benefit and strengthen the entire marketplace.

IV. PROCESS

The proposed amendments, including this analysis, must be approved by CDCC’s board of directors and submitted to the Autorité des marchés financiers, in accordance with the regulatory self-certification process, and to the Ontario Securities Commission in accordance with the rules stated in Appendix “A” of Schedule “C” of CDCC Recognition Order dated April 8, 2014 (as amended from time to time). The proposed amendments and analysis will also be submitted to the Bank of Canada in accordance with the Regulatory Oversight Agreement. The proposed amendments are expected to take effect on or about July 2021.

V. ATTACHED DOCUMENTS

- Appendix 1: Amended Risk Manual

APPENDIX 1: AMENDED RISK MANUAL

AMENDED VERSION

RISK MANUAL

~~FEBRUARY 2~~, 2021

Section 1: Margin Deposits

As set out in the Rules, every Clearing Member shall be obligated to deposit Margin with the Corporation, as determined by the Corporation. Deposits must be made in the form of eligible collateral, as specified in Section 2 of this Risk Manual, in an amount sufficient, taking into account the market value and applicable Haircuts.

The Corporation requires Margin Deposits to cover two types of requirements, namely:

- Margin requirement; and
- Clearing Fund Requirement.

1.1 MARGIN REQUIREMENT

The Margin requirement is composed of the Initial Margin and the Variation Margin.

1.1.1 Initial Margin

The Initial Margin is composed of the Base Initial Margin (or Adjusted Base Initial Margin, as the case may be) and the Additional Margins. In order to cover the Initial Margin described below, Clearing Members shall deliver to CDCC an acceptable form of Deposits in accordance with Section 2 of this Risk Manual.

1.1.1.1 Base Initial Margin

The Base Initial Margin requirement covers the potential losses and market risk that may occur as a result of future adverse price and/or Risk Factors across the portfolio of each Clearing Member under normal market conditions.

The risk methodology for the Options, Futures and Unsettled Items incorporates the historical volatility of the daily price returns of the Underlying Interests for Options, Unsettled Items and Share Futures and the daily price returns of the Futures prices for Futures (excluding Share Futures). In addition, as part of the methodology, the Corporation uses a volatility estimator, a confidence level over 99% under the normal distribution or the student's t-distribution assumption and a variable number of days as the MPOR. The Corporation also considers various measures to mitigate the procyclicality of margins:

- A Stress Risk component, calculated with a Stress Value at Risk (SVaR) and a weighting factor of 25%.

- A volatility floor, calculated as an average of the daily volatility estimator observed over the last 10 years.

The risk methodology for Fixed Income Transactions is the Value at Risk methodology (VaR)[1]. This methodology considers a full revaluation method and it is based on Zero Curves. In addition, as part of the methodology, the Corporation uses a volatility estimator, a Margin Buffer Multiplier to prevent a large decrease in Margin requirements during periods of low volatility, a confidence level over 99% and a variable number of days as the MPOR.

Please refer to Sections 6.1 and 6.2 for additional details on the Base Initial Margin calculation.

With respect to the Limited Clearing Members, the Base Initial Margin is multiplied by the Effective Ratio to calculate the Adjusted Base Initial Margin. Please refer to Section 6.3 for additional details on Effective Ratio Recalibration.

[…]

1 The same methodology used for Fixed Income Transactions is applied for physical delivery of Government of Canada Bond Futures.

Section 6: Appendix

6.1 BASE INITIAL MARGIN CALCULATION FOR OPTIONS, FUTURES AND UNSETTLED ITEMS[2]

For greater certainty, this sections only applies to Options, Futures and Unsettled Items.

To calculate the Base Initial Margin the risk methodology is based on the PSR and the VSR which are then converted into the Scanning Risk parameter. The Scanning Risk parameter represents the difference between the most unfavourable projected liquidation value and the initial reference price[3]. The most unfavourable projected liquidation value amongst the Risk Array is obtained by varying the values of the Underlying Interest and implied volatility according to several scenarios representing adverse changes in normal market conditions. The projected liquidation values are obtained using specific valuation models such as Black 76, Black-Scholes, Binomial and others.

The Scanning Risk is calculated at the Combined Commodity level and is denominated in the same currency as the contract. For contracts belonging to the same Combined Commodity, the Risk Array results are added up for all contracts under the same scenario. The highest loss represents the Scanning Risk.

The other variables influencing the value of the Base Initial Margin are the Intra-Commodity, the Inter-Commodity and the Short Option Minimum. The following table summarizes the variables used in the calculation.

Input variables to calculate the Base Initial Margin	Options	Futures	Unsettled Items
Scanning Risk	●	●	●
Intra-Commodity		●	
Inter-Commodity[4]		●	
Short Option Minimum	●		

2 Unsettled Items resulting of a physical delivery of Government of Canada Bond Futures are margined under the VaR methodology.

3 The initial reference price is the market price or the theoretical price derived from market observations.

4 Not applicable for Share Futures.

6.1.1 Scanning Risk

The Scanning Risk parameter represents the difference between the most unfavourable projected liquidation value and the initial reference price. The most unfavourable projected liquidation value amongst the Risk Array is obtained by varying the values of the Underlying Interest and implied volatility according to several scenarios representing adverse changes in normal market conditions. The table at the end of this section shows all the risk scenarios. The projected liquidation values are obtained using specific valuation models such as Black 76, Black-Scholes, Binomial and others. If the largest loss is negative, the Scanning Risk is set to zero. The Scanning Risk is then compared to the Short Option Minimum. This amount is required if the Short Option Minimum is higher than the result of the Risk Arrays.

6.1.1.1 Price Scan Range

The term PSR represents the potential variation of the contract value and it is calculated through the following formula:

$$PSR = \ Price \ \times MI \ \times Contract\ Size$$

The methodology for the MI is detailed in Section 6.5.

6.1.1.2 Volatility Scan Range

The term VSR represents the potential variation of the implied volatility and it is calculated through the following formula:

$$VSR = \ Volatility\ Shock \ \times \sqrt{n}$$

Where ‘n’ is the MPOR, and ‘Volatility Shock’ represents the 95% confidence level of the historical daily fluctuations for the series volatility over a one year look-back period. The daily fluctuations are scaled up with the use of MPOR. VSR values are subject to a floor value and a cap value.

Risk Scenarios	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Underlying Price Variation *	0	0	1/3	1/3	-1/3	-1/3	2/3	2/3	-2/3	-2/3	1	1	-1	-1	2	-2
Volatility Variation *	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	0	0
Weight Fraction Considered	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	35%	35%

* Expressed in scan range

The MI, MPOR and Volatility Shocks values are updated by the Corporation from time to time.

6.1.2 Intra-Commodity

Long positions on Futures maturing in one month are automatically matched with short positions on Futures maturing in another month. The resulting Base Initial Margin on these two Futures belonging to the same Combined Commodity, could be lower than the real risk associated with the combination of the two contracts. In order to cover this inter-month spread risk, a charge is included in the Base Initial Margin.

For the Futures, the Intra-Commodity which is an additional dollar amount charge applied to each combination of a minimum of two different Futures, is determined ~~as follows~~ by applying the MI methodology on the Futures combination's daily profit and loss over the reference period. The methodology for the MI is detailed in Section 6.5~~:~~

~~$$Intra-Commodity = \alpha \times \sqrt{n} \times \sigma$$~~

~~Where 'n' is the number of MPOR, $'\alpha'$ is equal to the confidence value equivalent to 99.87% (three standard deviations) of the cumulative normal distribution (applicable to all products except for the Three-Month Canadian Bankers' Acceptance Futures (BAX), the CORRA Futures (COA & CRA)) and the S&P/TSX 60 Dividend Index Futures) or equal to the confidence value equivalent to 99% of the cumulative student's t-distribution with 4 degrees of freedom (applicable to the BAX, CORRA Futures and the S&P/TSX 60 Dividend Index Futures). 'σ' is the volatility estimator of the Futures combination's daily profit and loss over the~~

~~reference period and is computed using the EWMA approach. Further details on the EWMA are described in Appendix 6.5.~~

~~In addition, CDCC considers a floor for the EWMA volatility estimator. The level of such floor is calculated as an average of daily EWMA volatility estimator observed over the last 10 years. The EWMA volatility estimator that will be used to calculate the Intra-Commodity cannot be lower than the calculated floor.~~

With respect to the BAX, the CORRA Futures (COA & CRA), the S&P/TSX 60 Index Standard Futures (SXF) and the S&P/TSX 60 Dividend Index Futures, CDCC calculates the Intra-Commodity for combinations of spreads and/or butterfly strategies and applies a same charge for a same group of combinations with close maturities. If multiple Intra-Commodity are defined, the Corporation will prioritize the ones providing the lowest Base Initial Margin.

The combinations and the spread priorities for the Intra-Commodity are updated by CDCC from time to time.

6.1.3 Inter-Commodity

The Corporation may consider the correlation that exists between different Futures when calculating the Base Initial Margin. The Corporation will grant a credit according to the historical correlation of the returns of the two Futures. If multiple Inter-Commodity are defined, the Corporation will prioritize the ones with the highest correlation.

The Inter-Commodity and the spread priorities are updated by CDCC from time to time.

[…]

6.5 MARGIN INTERVAL

The MI is calculated using the following formula for the Historical Risk:

$$\text{MI}\,Historical\ Risk = \sigma_t \times \alpha \times \sqrt{n} \times \sigma$$

Where ‘n’ is the MPOR, $'\alpha'$ is equal to the confidence level equivalent to 99.87% (three standard deviations) of the cumulative normal distribution (applicable to all products except for the BAX, the CORRA Futures, the S&P/MX International Cannabis Index Futures and the S&P/TSX 60 Dividend Index Futures) or equal to the confidence value equivalent to 99% of the cumulative student’s t-distribution with 4 degrees of freedom (applicable to the BAX, the CORRA Futures, the S&P/MX International Cannabis Index Futures and the S&P/TSX 60 Dividend Index Futures). ‘σ’ is the volatility estimator of the contract’s returns and is computed using an exponentially weighted moving average (EWMA) approach.

The implemented formula for the estimator at any time t is:

$$IM = \alpha \times \sqrt{n} \times \sigma$$

$$\sigma_t = \sqrt{\frac{(1-\lambda)\sum_{i=1}^{260}\lambda^{i-1}(R_{t-i}-\bar{R})^2}{(1-\lambda^{260})}}$$

Where R is the daily price returns of the Underlying Interests for Options and Share Futures and the daily price returns of the Futures prices for Futures (excluding Share Futures), $\bar{R}$ is the mean return over the specified period and λ is the decay factor. CDCC uses λ = 0.99 (applicable to all products except for the S&P/TSX 60 Dividend Index Futures) or λ = 0.98 (applicable to the S&P/TSX 60 Dividend Index Futures).

In addition, CDCC considers a floor for the EWMA volatility estimator defined above. The level of such floor is calculated as an average of daily EWMA volatility estimator observed over the last 10 years. CDCC also considers a cap for products whose decay factor used by CDCC is below 0.99. The level of such cap is calculated using the distribution of historical daily price returns over a minimum of 10 years. The volatility estimator that will be used to calculate the MI cannot be lower than the calculated floor floor, or higher than the calculated cap.

In addition, CDCC considers the following measures to mitigate the procyclicality of margins:

- A Stress Risk component, calculated using a Stress Value at Risk (SVaR):

$$MI^{*} = (1 - w) \times Historical\ Risk + w \times Stress\ Risk$$

Where the *Stress Risk* component is equal to a confidence level equivalent to a minimum of 99% of the ranked distribution of the absolute price return of the Underlying Interest or an equivalent Risk Factor over a fixed period of a minimum of 260 days with a high market volatility, a variable number of days as MPOR and a weighting factor of 25% ('w').

The SVaR is applicable to Government of Canada Bond Futures and Options on Government of Canada Bond Futures For all other products (all Index and Share Futures and Options, as well as all short term Interest Rate Futures), the weighting factor is set to zero and only the Historical Risk component is applicable[5].

IF THE PROPOSED AMENDMENTS OF THE INITIAL MARGIN MODEL CHANGE FOR EQUITY DERIVATIVES (NOTICE TO MEMBERS 2021-020) IS APPROVED :

The SVaR is applicable to all Index and Share Futures and Options[6], as well as all Government of Canada Bond Futures and Options on Government of Canada Bond Futures. For all other products (all short term Interest Rate Futures), the weighting factor is set to zero and only the Historical Risk component is applicable[7].

[6]CDCC sets the weighting factor to zero and uses a 25% buffer on the volatility floor as an alternative method in specific cases where a Stress Risk component is not available.

[7]Also true for the calculation of the Intra-Commodity.

[5] Also true for the calculation of the Intra-Commodity.

- A volatility floor, calculated using the EWMA approach:

$$MI^{**} = \max(MI^{*}, Volatility\ floor)$$

Where the volatility floor is calculated as an average of the daily volatility estimator observed over the last 10 years.

The volatility floor is applicable to all Options, Futures and Unsettled Items.

APPENDIX 1: AMENDED RISK MANUAL

CLEAN VERSION

RISK MANUAL

, 2021

Section 1: Margin Deposits

As set out in the Rules, every Clearing Member shall be obligated to deposit Margin with the Corporation, as determined by the Corporation. Deposits must be made in the form of eligible collateral, as specified in Section 2 of this Risk Manual, in an amount sufficient, taking into account the market value and applicable Haircuts.

The Corporation requires Margin Deposits to cover two types of requirements, namely:

- Margin requirement; and
- Clearing Fund Requirement.

1.1 MARGIN REQUIREMENT

The Margin requirement is composed of the Initial Margin and the Variation Margin.

1.1.1 Initial Margin

The Initial Margin is composed of the Base Initial Margin (or Adjusted Base Initial Margin, as the case may be) and the Additional Margins. In order to cover the Initial Margin described below, Clearing Members shall deliver to CDCC an acceptable form of Deposits in accordance with Section 2 of this Risk Manual.

1.1.1.1 Base Initial Margin

The Base Initial Margin requirement covers the potential losses and market risk that may occur as a result of future adverse price and/or Risk Factors across the portfolio of each Clearing Member under normal market conditions.

The risk methodology for the Options, Futures and Unsettled Items incorporates the historical volatility of the daily price returns of the Underlying Interests for Options, Unsettled Items and Share Futures and the daily price returns of the Futures prices for Futures (excluding Share Futures). In addition, as part of the methodology, the Corporation uses a volatility estimator, a confidence level over 99% under the normal distribution or the student's t-distribution assumption and a variable number of days as the MPOR. The Corporation also considers various measures to mitigate the procyclicality of margins:

- A Stress Risk component, calculated with a Stress Value at Risk (SVaR) and a weighting factor of 25%.

- A volatility floor, calculated as an average of the daily volatility estimator observed over the last 10 years.

The risk methodology for Fixed Income Transactions is the Value at Risk methodology (VaR)[1]. This methodology considers a full revaluation method and it is based on Zero Curves. In addition, as part of the methodology, the Corporation uses a volatility estimator, a Margin Buffer Multiplier to prevent a large decrease in Margin requirements during periods of low volatility, a confidence level over 99% and a variable number of days as the MPOR.

Please refer to Sections 6.1 and 6.2 for additional details on the Base Initial Margin calculation.

With respect to the Limited Clearing Members, the Base Initial Margin is multiplied by the Effective Ratio to calculate the Adjusted Base Initial Margin. Please refer to Section 6.3 for additional details on Effective Ratio Recalibration.

[…]

[1] The same methodology used for Fixed Income Transactions is applied for physical delivery of Government of Canada Bond Futures.

Section 6: Appendix

6.1 BASE INITIAL MARGIN CALCULATION FOR OPTIONS, FUTURES AND UNSETTLED ITEMS[2]

For greater certainty, this sections only applies to Options, Futures and Unsettled Items.

To calculate the Base Initial Margin the risk methodology is based on the PSR and the VSR which are then converted into the Scanning Risk parameter. The Scanning Risk parameter represents the difference between the most unfavourable projected liquidation value and the initial reference price[3]. The most unfavourable projected liquidation value amongst the Risk Array is obtained by varying the values of the Underlying Interest and implied volatility according to several scenarios representing adverse changes in normal market conditions. The projected liquidation values are obtained using specific valuation models such as Black 76, Black-Scholes, Binomial and others.

The Scanning Risk is calculated at the Combined Commodity level and is denominated in the same currency as the contract. For contracts belonging to the same Combined Commodity, the Risk Array results are added up for all contracts under the same scenario. The highest loss represents the Scanning Risk.

The other variables influencing the value of the Base Initial Margin are the Intra-Commodity, the Inter-Commodity and the Short Option Minimum. The following table summarizes the variables used in the calculation.

Input variables to calculate the Base Initial Margin	Options	Futures	Unsettled Items
Scanning Risk	●	●	●
Intra-Commodity		●	
Inter-Commodity[4]		●	
Short Option Minimum	●		

2 Unsettled Items resulting of a physical delivery of Government of Canada Bond Futures are margined under the VaR methodology.

3 The initial reference price is the market price or the theoretical price derived from market observations.

4 Not applicable for Share Futures.

6.1.1 Scanning Risk

The Scanning Risk parameter represents the difference between the most unfavourable projected liquidation value and the initial reference price. The most unfavourable projected liquidation value amongst the Risk Array is obtained by varying the values of the Underlying Interest and implied volatility according to several scenarios representing adverse changes in normal market conditions. The table at the end of this section shows all the risk scenarios. The projected liquidation values are obtained using specific valuation models such as Black 76, Black-Scholes, Binomial and others. If the largest loss is negative, the Scanning Risk is set to zero. The Scanning Risk is then compared to the Short Option Minimum. This amount is required if the Short Option Minimum is higher than the result of the Risk Arrays.

6.1.1.1 Price Scan Range

The term PSR represents the potential variation of the contract value and it is calculated through the following formula:

$$PSR = \ Price \ \times MI \ \times Contract\ Size$$

The methodology for the MI is detailed in Section 6.5.

6.1.1.2 Volatility Scan Range

The term VSR represents the potential variation of the implied volatility and it is calculated through the following formula:

$$VSR = \ Volatility\ Shock \ \times \sqrt{n}$$

Where 'n' is the MPOR, and 'Volatility Shock' represents the 95% confidence level of the historical daily fluctuations for the series volatility over a one year look-back period. The daily fluctuations are scaled up with the use of MPOR. VSR values are subject to a floor value and a cap value.

Risk Scenarios	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Underlying Price Variation *	0	0	1/3	1/3	-1/3	-1/3	2/3	2/3	-2/3	-2/3	1	1	-1	-1	2	-2
Volatility Variation *	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	0	0
Weight Fraction Considered	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	35%	35%

* Expressed in scan range

The MI, MPOR and Volatility Shocks values are updated by the Corporation from time to time.

6.1.2 Intra-Commodity

Long positions on Futures maturing in one month are automatically matched with short positions on Futures maturing in another month. The resulting Base Initial Margin on these two Futures belonging to the same Combined Commodity, could be lower than the real risk associated with the combination of the two contracts. In order to cover this inter-month spread risk, a charge is included in the Base Initial Margin.

For the Futures, the Intra-Commodity which is an additional dollar amount charge applied to each combination of a minimum of two different Futures, is determined by applying the MI methodology on the Futures combination’s daily profit and loss over the reference period. The methodology for the MI is detailed in Section 6.5

With respect to the BAX, the CORRA Futures (COA & CRA), the S&P/TSX 60 Index Standard Futures (SXF) and the S&P/TSX 60 Dividend Index Futures, CDCC calculates the Intra-Commodity for combinations of spreads and/or butterfly strategies and applies a same charge for a same group of combinations with close maturities. If multiple Intra-Commodity are defined, the Corporation will prioritize the ones providing the lowest Base Initial Margin.

The combinations and the spread priorities for the Intra-Commodity are updated by CDCC from time to time.

6.1.3 Inter-Commodity

The Corporation may consider the correlation that exists between different Futures when calculating the Base Initial Margin. The Corporation will grant a credit according to the historical correlation of the returns of the two Futures. If multiple Inter-Commodity are defined, the Corporation will prioritize the ones with the highest correlation.

The Inter-Commodity and the spread priorities are updated by CDCC from time to time.

[…]

6.5 MARGIN INTERVAL

The MI is calculated using the following formula for the Historical Risk:

$$Historical\ Risk = \sigma_t \times \alpha \times \sqrt{n}$$

Where 'n' is the MPOR, $'\alpha'$ is equal to the confidence level equivalent to 99.87% (three standard deviations) of the cumulative normal distribution (applicable to all products except for the BAX, the CORRA Futures, the S&P/MX International Cannabis Index Futures and the S&P/TSX 60 Dividend Index Futures) or equal to the confidence value equivalent to 99% of the cumulative student's t-distribution with 4 degrees of freedom (applicable to the BAX, the CORRA Futures, the S&P/MX International Cannabis Index Futures and the S&P/TSX 60 Dividend Index Futures). 'σ' is the volatility estimator of the contract's returns and is computed using an exponentially weighted moving average (EWMA) approach.

The implemented formula for the estimator at any time t is:

$$\sigma_t = \sqrt{\frac{(1-\lambda)\sum_{i=1}^{260}\lambda^{i-1}(R_{t-i}-\bar{R})^2}{(1-\lambda^{260})}}$$

Where R is the daily price returns of the Underlying Interests for Options and Share Futures and the daily price returns of the Futures prices for Futures (excluding Share Futures), $\overline{R}$ is the mean return over the specified period and λ is the decay factor. CDCC uses λ = 0.99 (applicable to all products except for the S&P/TSX 60 Dividend Index Futures) or λ = 0.98 (applicable to the S&P/TSX 60 Dividend Index Futures).

In addition, CDCC considers the following measures to mitigate the procyclicality of margins:

- A Stress Risk component, calculated using a Stress Value at Risk (SVaR):

$$MI^* = (1-w) \times Historical\ Risk + w \times Stress\ Risk$$

Where the *Stress Risk* component is equal to a confidence level equivalent to a minimum of 99% of the ranked distribution of the absolute price return of the Underlying Interest or an equivalent Risk Factor over a fixed period of a minimum of 260 days with a high market volatility, a variable number of days as MPOR and a weighting factor of 25% ('w').

The SVaR is applicable to Government of Canada Bond Futures and Options on Government of Canada Bond Futures For all other products (all Index and Share Futures and Options, as well as all short term Interest Rate Futures), the weighting factor is set to zero and only the Historical Risk component is applicable[5].

IF THE PROPOSED AMENDMENTS OF THE INITIAL MARGIN MODEL CHANGE FOR EQUITY DERIVATIVES (NOTICE TO MEMBERS 2021-020) IS APPROVED :

The SVaR is applicable to all Index and Share Futures and Options[6], as well as all Government of Canada Bond Futures and Options on Government of Canada Bond Futures. For all other products (all short term Interest Rate Futures), the weighting factor is set to zero and only the Historical Risk component is applicable[7].

[6]CDCC sets the weighting factor to zero and uses a 25% buffer on the volatility floor as an alternative method in specific cases where a Stress Risk component is not available.

[7]Also true for the calculation of the Intra-Commodity.

- A volatility floor, calculated using the EWMA approach:

$$MI^{**} = \max(MI^{*}, Volatility\ floor)$$

Where the volatility floor is calculated as an average of the daily volatility estimator observed over the last 10 years.

The volatility floor is applicable to all Options, Futures and Unsettled Items.

[5] Also true for the calculation of the Intra-Commodity.