NOTICE TO MEMBERS

No. 2021-148

October 19, 2021

SELF-CERTIFICATION

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 the Canadian Derivatives Clearing Corporation ("CDCC") approved certain amendments to Risk Manual in connection with the initial margin model change for bond derivatives.

CDCC wishes to inform the Clearing Members that these amendments have been self-certified pursuant to the self-certification process set forth in the *Derivatives Act* (C.Q.L.R., c I-14.01) and submitted to the Ontario Securities Commission in accordance with the "Rule Change Requiring Approval in Ontario" process.

You will find attached hereto the amendments set to come into force and to be incorporated into the version of the Risk Manual of CDCC that will be made available on the CDCC website at www.cdcc.ca on **OCTOBER 28, 2021**.

The amendments described in the present notice were published for public comment by CDCC on May 25, 2021 (see Notice 082-21). Further to the publication of this notice, CDCC received no formal comment.

If you have any questions or concerns regarding this notice, please contact Sophie Brault at 514-268-0591 or at Sophie.brault@tmx.com.

George Kormas
President

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:

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

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:

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

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

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.

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RISK MANUAL

, 2021

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Weight Fraction Considered	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	35%	35%

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