NSCC Risk Management

NSCC RISK MARGIN COMPONENT GUIDE

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INTRODUCTION

On a daily basis NSCC calculates a Clearing Fund requirement for each Member based upon their unsettled and pending transactions for CNS®, guaranteed balance orders (Balance Orders) and Securities Financing Transaction (SFT) Clearing[1] Service, using the prior day's securities closing market price. SFT Clearing Service transactions are margined in the same manner as CNS transactions and Balance Order transactions, unless otherwise noted. The formula uses a risk-based methodology and includes several components.

Some of these components are described in this document, including the volatility charges, mark-to-market charges, fail charges (for CNS transactions), Non-Returned SFT Premium charges (for SFT Clearing Service transactions), a charge for Family-Issued Securities to mitigate specific wrong way risk, a charge for Illiquid Securities, a charge to mitigate day over day margin differentials, a coverage component, a margin liquidity adjustment component, a Backtesting Charge, and an Independent Amount SFT Cash Deposit Requirement. In addition, NSCC may impose a premium charge when a Member's Required Fund Deposit exceeds its excess net capital.

Not all required components to the Clearing Fund or other Clearing Fund deposit requirements are described in this document; NSCC may require additional deposits to a Member's Required Fund Deposit, as described in the NSCC Rules.

1 VOLATILITY COMPONENT

1.1 Overview of Methodology

The volatility component of each Member's Required Fund Deposit is designed to measure market price volatility and is calculated for Members' Net Unsettled Positions.[2] The volatility component is designed to capture the market price risk associated with each Member's portfolio at a 99th percentile level of confidence.

The volatility component applicable to most Net Unsettled Positions is calculated utilizing a parametric Value-at-Risk (VaR) model and is referred to as the VaR Charge. Net Unsettled Positions in certain securities are excluded from this calculation and are instead charged a haircut-based charge as the volatility component.

The volatility component usually comprises the largest portion of a Member's Required Fund Deposit. The volatility component is described in Procedure XV, I(A)(1)(a) and I(A)(2)(a) of the NSCC Rules.

1 Described under Rule 56 of NSCC Rules and Procedures.

2 Net Unsettled Positions and Net Balance Order Unsettled Positions refer to net positions that have not yet passed their settlement date or did not settle on their settlement date and are referred to collectively in this document as "Net Unsettled Positions."

1.2 In-Scope Products and Process

Securities that are eligible to be cleared at NSCC can generally be classified into two broad categories: equity and fixed income instruments. Equity securities can be considered either liquid or illiquid, which include, for example, OTC stocks, IPOs, and some microcap stocks. Fixed income securities can include, for example, corporate bonds, municipal bonds, and other types of securities that are non-corporate/non-municipal securities. Examples are unit investment trusts or other fixed income securities that are amenable to generally accepted statistical analysis only in a complex manner.

Generally, liquid equity securities are subject to the VaR Charge, which uses a parametric VaR approach with a number of flooring mechanisms which each targets a specific risk driver; and both illiquid equity securities as well as fixed income securities are subject to a haircut-based volatility charge.

The eligible securities for the SFT Clearing Service are a subset of the eligible securities for CNS. More specifically all equity securities (excluding rights, warrants, and unit investment trusts) that are CNS eligible and have an end of day closing price that equals or is greater than USD $5.00 are eligible for new SFT Clearing Service activity. However, daily rolls of existing SFTs are accepted even if the current price is below USD $5.00.

1.2.1 Equity Margining

All equities, other than those that are “Illiquid Securities,” as defined in the NSCC Rules, or those whose volatility is less amenable to statistical analysis (see Section 1.3.7 below), are classified as liquid securities (subject to further segmentation, see below). In general, liquid securities include securities that are traded on the national securities exchanges with their first available price more than 30 business days ago in the FAME historical price file over the past 153 business days. Liquid securities are subject to the VaR Charge, which utilizes a parametric method with additional components of a volatility floor, a portfolio margin floor, and an additive gap risk calculation, if applicable.

A haircut-based charge is applied as the volatility component for equities that are not considered liquid securities such as Illiquid Securities or securities whose volatility is less amenable to statistical analysis.

The following securities are considered Illiquid Securities and subject to a haircut rather than the VaR Charge:

- In general, equity securities traded on a national securities exchange that do not meet the available pricing criteria and are classified as an Initial Public Offering (IPO).
- Securities for which there is no price data from the FAME historical price file for the day.
- Securities that are not listed on a national securities exchange and are traded in over-the-counter marketplaces.
- Securities traded on a national securities exchange that are considered Microcap Stocks (see segmentation below) and ADRs will be subject to an illiquidity ratio test such that if the securities’ illiquidity ratio is over a pre-defined threshold the securities will be considered Illiquid Securities.

Securities with exposure to cryptocurrencies (“Cryptocurrencies”) are deemed to be securities whose volatility is less amenable to statistical analysis. Similar to Illiquid Securities, certain Cryptocurrencies are not considered liquid securities and are subject to a haircut (see Section 1.3.10 below).

1.2.2 Equity Segmentation Logic

As mentioned above certain equity securities traded on a national securities exchange are subject to an illiquidity ratio test and may not be considered liquid securities. This is determined in the following two steps.

1.2.2.1 Market Capitalization Tier

A security's market capitalization is calculated as the product of its shares outstanding and its closing market price. All liquid securities as defined above are grouped into four tiers as follows:

1. Large Cap and Mid Cap Stocks: Average Market Cap >= $2 billion
2. Small Cap Stocks: $300 million <= Average Market Cap < $2 billion
3. Microcap Stocks: Average Market Cap < $300 million or unavailable
4. Exchange-Traded Products (ETPs)[3]

where the 'Average Market Cap' is the month average as of close of business on the last business day of the previous month.

1.2.2.2 Illiquidity Ratio Test

Microcap Stocks and ADRs are subject to illiquidity ratio test specified below and considered Illiquid Securities if the illiquidity ratio is over a pre-defined threshold. In addition, Cryptocurrencies that are Microcap Stocks and whose shares are priced > $5 per share are subject to the illiquidity ratio test and are not considered liquid securities if the illiquidity ratio is over a pre-defined threshold.

The illiquidity ratio[4] is a liquidity indicator by measuring the security's price impact from trading, defined as the following:

$$DailyIlliquidityRatio = abs(DailyLogReturn)/AverageDailyTradingAmount$$

The *AverageDailyTradingAmount* is calculated as the average of the previous 20 days' trading volume. In actual usage, the illiquidity ratio is scaled up by a factor of 10^6. In case there is missing information for the daily illiquidity ratio calculation, its *DailyIliquidityRatio* for that day will be defaulted to a conservative level of 100.

Any security with 6 months' median illiquidity ratio over a pre-defined threshold (other than a Cryptocurrency) is re-classified as an Illiquid Security. Any Cryptocurrency with 6 months' median illiquidity ratio over a pre-defined threshold is classified as a non-liquid security. The classification is then carried through the following month.

For CUSIP changes that occur intra-month, such as if the market cap and illiquidity ratio were unavailable for the new CUSIP at the previous month end, however the current daily market cap is available, then the liquid/ illiquid classification for the outgoing old CUSIP, where available, is carried over for the new CUSIP for the remaining of the month.

1.2.3 Fixed Income Margining

There are generally three categories of fixed income securities that are eligible to be cleared at NSCC: (1) corporate bonds, (2) municipal bonds, and (3) other fixed income securities (non-corporate/non-municipal securities). A haircut-based volatility charge is applied to all fixed income securities. Specific haircut rates depend on the category of the security.

The haircut rates for corporate bonds are derived from the maturity/credit rating category into which that bond is classified. For municipal bonds, the haircut rates depend on bond maturity, credit rating and the bond's sector. All other non-corporate/non-municipal bond fixed income securities are subject to a single haircut rate.

[3] The Bid-Ask Spread Charge for ETPs is split by asset classes and market capitalizations to account for differences in liquidity and bid-ask spread haircuts across different ETPs. ETPs will be segregated as such: 1. Large and Mid Cap Equity, 2. Small and Microcap equity, 3. Crypto, 4. Fixed Income, and 5. Other.

[4] Amihud, Yakov 'Illiquidity and Stock Returns: Cross-Section and Time-Series Effects.' J. Financial Markets 5 (January 2002)

1.3 Equity Volatility Component Calculations

1.3.1 VaR Charge

NSCC uses a parametric VaR methodology (Parametric VaR) to calculate the VaR Charge for liquid equity[5] positions. Parametric VaR is assessed by simultaneously calculating three separate VaR types – (i) an exponentially-weighted moving average (EWMA) volatility estimation, (ii) an evenly-weighted volatility estimation (Volatility Floor), and (iii) a portfolio margin floor (Margin Floor). The highest resultant value among all of the Parametric VaR calculations becomes the surviving Parametric VaR that is applied to the start-of-day liquid equity position. The Gap Risk calculation, if applicable, is additive to the Parametric VaR calculation.

Parametric VaR Calculation

The parametric VaR for a given Member's liquid security portfolio, VaR_P, is calculated as follows:

$$VaR_P = f_{fat-tail} \times 2.327 \times \sqrt{3} \times \sqrt{Variance(P)}$$

where 2.327 represents the 99th percentile of the Normal distribution, $\sqrt{3}$ is a time scaling factor for the 3-day risk horizon, and $f_{fat-tail}$ is an adjustment factor from Normal distribution to corresponding Student's t distribution. The adjustment factor is subject to quarterly review and update. The adjustment factor is calibrated using each Member's portfolio residuals.

Note: The variance is calculated with a decay factor and a lookback period, as follows:

$$Variance = \frac{1}{\Theta}\sum_{k=0}^{\omega-1}\lambda^k\left(\sum_{i=1}^{N}(v_i \times r_i(k))\right)^2$$

where

λ: decay factor

ω: look-back window size for EWMA decay factor

$r_i(k)$: the 1-day return of the *i*th equity in the portfolio on the *k*th day counting backward, based on FAME corporate action adjusted historical prices

v_i: the position value of the *i*th equity in the portfolio

and

$$\Theta = \sum_{k=0}^{\omega-1}\lambda^k$$

The core parametric VaR is the larger of the base VaR and the Volatility Floor, where

5. the base VaR is calculated with $\lambda = 0.97$ and $\omega = 152$
6. the Volatility Floor is calculated with $\lambda = 1$ and $\omega = 252$

[5] In this document, the concept of liquid/illiquid is for equity securities only. Therefore, the terms "liquid (illiquid) equity" and "liquid (illiquid) security" are interchangeable.

1.3.2 Bid-Ask Spread

A bid-ask spread is explicitly assessed for both EWMA and Volatility Floor. This is achieved by adding a bid-ask cost equal to the gross un-settled position, multiplied by a bid-ask haircut equivalent to half of a bid-ask spread estimation.

More specifically, the bid-ask charge is calculated based on the gross market value of a portfolio's position in each of the four asset tiers as defined in 1.2.2.1.

The bid-ask spread charge is calculated as:

$$Bid - Ask\ Spread\ Charge = \sum_{i=1}^{4} Gross\ Market\ Value_i \times BidAsk\ haircut_i$$

For the bid-ask spreads that are used, see Appendix D.

1.3.3 Gap Risk

Gap Risk is designed to ensure that NSCC collects enough margin to cover the idiosyncratic price movement of top two concentrated non-diversified[6] positions in the guaranteed portfolio. The Gap Risk calculation, if applicable, is additive to the Parametric VaR calculation.

The Gap Risk Charge calculation accounts for both direct and indirect equity exposures arising from certain exchange traded funds ("ETFs"). Eligible ETFs that allow in-kind creation or redemption are decomposed into their underlying components, which are then netted with direct exposures to those underlying components within the portfolio to provide a consolidated view of Gap Risk. The calculation accounts for indirect equity security exposures arising from single-stock ETFs by mapping selected leveraged or inverse ETFs that track major market indices and have large assets under management (AUM) or large trading or clearing volumes.

NSCC defines the gap risk as follows:

$$gap\ risk(c,g) = \begin{cases} g_1 \times |MV_1| + g_2 \times |MV_2|, & when\ \dfrac{|MV_1| + |MV_2|}{\sum_i |MV_i|} > c \\ 0, & otherwise \end{cases}$$

where

c = concentration level, which is the % threshold of the top non-diversified concentrated position in the portfolio, beyond which Gap Risk would be assessed. Currently, it is set to 10%. If the absolute market value of the top two non-diversified concentrated positions summed together is greater than the 10% threshold, the charge will be additive to the Parametric VaR.

g = gap size, which is the haircut applied to the top concentrated position in the portfolio. Currently, g_1 is set to 10% for the largest position and g_2 is set to 5% for the second largest position[7].

MV_1 = market value of the largest non-diversified position.

MV_2 = market value of the second largest non-diversified position.

6 Non-diversified positions include single name equities and ETFs that are determined to be more prone to idiosyncratic events, including ETFs that do not have broad based baskets or are leveraged.

7 Both the gap threshold and the gap size (haircut) are subject to annual review.

1.3.4 Margin Floor

To address the remaining idiosyncratic and other risk factors in the portfolio not accounted for in the other VaR calculations, NSCC utilizes a portfolio-level Margin Floor, parameterized as a combined margin haircut on the value of net directional market exposure and the value of balanced market exposures, respectively. These margin haircuts are equivalent to the reciprocal of the directional or balanced Leverage Ratios.

First, the net directional market value of the portfolio is calculated by taking the absolute difference between the market value of the long Net Unsettled Positions and the market value of the short Net Unsettled Positions in the portfolio and then multiplying that amount by a percentage.[8]

Second, NSCC calculates the balanced market value of the portfolio by taking the lowest absolute market value of long Net Unsettled Positions and short Net Unsettled Positions in the portfolio and then multiplying that value by a percentage.[9]

More specifically,

$$margin\ floor(HC_d, HC_b) = GMV_d \times HC_d + GMV_b \times HC_b = \frac{GMV_d}{LV_d} + \frac{GMV_b}{LV_b}$$

where

HC_d[10]: haircut rate on directional market value[11], currently set at 3.0%

HC_b: haircut rate on balanced market value, currently set at 0.35%

GMV_d: directional gross market value, $||GMV_{long}| - |GMV_{short}||$

GMV_b: balanced gross market value, $min(|GMV_{long}|, |GMV_{short}|)$

1.3.5 Final Parametric VaR

NSCC takes the highest result of the calculation of the EWMA, the Volatility Floor and the Margin Floor as the final parametric VaR Charge. The Gap Risk calculation, if applicable, is additive to the Parametric VaR calculation.

NSCC calculates the Parametric VaR at the individual account level and sums up to the Member level.

8 NSCC determines the applicable percentage by examining the annual historical volatility levels of benchmark indices over a historical look-back period.

9 NSCC determines the applicable percentage to be an amount that covers the transaction costs and other relevant risks associated with the positions in the portfolio.

10 Haircuts are equivalent to the reciprocal of Leverage Ratios (LV).

11 Margin floor haircut rates are subject to annual review.

1.3.6 Missing Security Return Filing

In calculating the VaR Charge, if the price return cannot be computed for a security due to inaccurate or incomplete data, the following procedure is followed:

Calculate the front weighted correlations of this CUSIP with the list of indexing CUSIPs in the table below as follows:

1. Exclude any index Exchange Traded Fund (ETF) CUSIPs with less than n days of price history from FAME, where n is the length of the estimation window.
2. Calculate 1-day log returns for each CUSIP as well as the index ETF for each historical business day

$$r_t = \ln(\frac{p_{t+1}}{p_t}) \qquad \text{(Eqn. 1.3.1)}$$

where P_t represents the historical price on business date t.

3. For each CUSIP and index ETF pair (*i, I*), calculate the correlation:
   a. Calculate the front-weighted mean of each CUSIP and index ETF pair

$$\overline{r_i}(T_0) = \frac{1}{\sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1}} \sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1} \times r_{i,T_0-k} \qquad \text{(Eqn. 1.3.2)}$$

$$\overline{r_I}(T_0) = \frac{1}{\sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1}} \sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1} \times r_{I,T_0-k} \qquad \text{(Eqn. 1.3.3)}$$

where *i* represents CUSIP and I represents index ETF, T_0 stands for date of the calculation, and N is the number of days between the earliest date when a return was calculation in step 2 and $T_0 - 1$ for CUSIP. And I_{T_0-k} is the indicator function and

$$I_{T_0-k} = \begin{cases} 0, when\ r_{i,T_0-k}\ is\ missing \\ 1, \qquad\qquad otherwise \end{cases} \qquad \text{(Eqn. 1.3.4)}$$

As any missing return will have no contribution to the mean calculation, any missing return in the mean calculation can be simply filled with zero. θ is default to the same decay factor as the VaR Charge.

Note:

The same indicator function is used in both (Eqn. 1.3.2) and (Eqn. 1.3.3).

   b. Calculate the front-weighted standard deviation and covariance

$$\sigma_i(T_0) = \sqrt{\frac{1}{\sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1}} \sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1} \times \left(r_{i,T_0-k} - \overline{r_i}(T_0)\right)^2} \qquad \text{(Eqn. 1.3.5)}$$

$$\sigma_I(T_0) = \sqrt{\frac{1}{\sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1}} \sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1} \times \left(r_{I,T_0-k} - \overline{r_I}(T_0)\right)^2} \qquad \text{(Eqn. 1.3.6)}$$

$$\sigma_{i,I}(T_0) = \frac{1}{\sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1}} \sum_{k=1}^{N} I_{T_0-k} \times \theta^{k-1} \times \left(r_{i,T_0-k} - \overline{r_i}(T_0)\right) \times \left(r_{I,T_0-k} - \overline{r_I}(T_0)\right) \qquad \text{(Eqn. 1.3.7)}$$

where $\overline{r_i}(T_0)$ and $\overline{r_I}(T_0)$ are calculated in (Eqn. 1.3.2) and (Eqn. 1.3.3) separately, and I_{T_0-k} is specified in (Eqn. 1.3.4). As mentioned, that there is no impact on the variance or covariance, the missing return can be simply filled with zero. $\sigma_I(T_0)$ is calculated differently for different r_i series when having less than n returns. The r_{I,T_0-k} terms in $\sigma_I(T_0)$ calculation must matchr_{i,T_0-k_i}. In other words, I_{T_0-k} is determined by if $r_i$is missing and shared across Eqn. 1.3.5, Eqn. 1.3.6, and Eqn. 1.3.7 above.

c. Calculate the correlation:

$$Corr_{i,j}(T_0) = \frac{\sigma_{i,j(T_0)}}{\sigma_{i(T_0)} \times \sigma_{j(T_0)}} \text{ (Eqn. 1.3.8)}$$

where i represents the i-th CUSIP, j represents the j-th index ETF.

Table 1: Index ETF for Return Filling

CUSIP	Type of CUSIP	SYMBOL	DESCRIPTION
46090E103	Liquid	QQQ	PowerShares QQQ Trust, Series 1 (ETF)
78467X109	Liquid	DIA	SPDR Dow Jones Industrial Average ETF
78462F103	Liquid	SPY	SPDR S&P 500 ETF
81369Y605	Liquid	XLF	Financial Select Sector SPDR (ETF)
81369Y506	Liquid	XLE	Energy Select Sector SPDR (ETF)
464287655	Liquid	IWM	iShares Russell 2000 Index (ETF)
74347G440	Liquid	BITO	ProShares Bitcoin Strategy ETF

- Select the index ETF CUSIP with the maximum correlation. For example, $max(abs(correlations))$
- If this indexing CUSIP has a correlation value greater or equal to the value of the CutoffCorrelation parameter, then replace the missing return with the return of the index times the SIGN of the correlation between the index and the individual CUSIP. The initial value of the CutoffCorrelation is set to 0.3. If this indexing CUSIP has a correlation value of less than the value of CutoffCorrelation parameter, then replace the missing return with a zero. This can be expressed as:

  if max(abs(correlation)) >= CutOffCorrelation
  then if correlation>=0, then replace it with indexing-CUSIP-return
  else replace it with (-1 * indexing-CUSIP-return)
  else replace it with 0

1.3.7 Securities Less Amenable to Statistical Analysis

Securities that are not Illiquid Securities whose volatility is less amenable to statistical analysis are subject to a haircut percentage designated by NSCC, which is not less than 10% (NSCC Rules, Section I.(A)(1)(a)(ii)(A)(I) of Procedure XV). These include Cryptocurrencies discussed below.

1.3.8 Illiquid Securities

Illiquid Securities are margined with a haircut approach. While the price of a sub-penny stock cannot drop more than 100%, the price for a sub-penny stock frequently moves up over 100%. Thus, NSCC further segments the direction of the transaction (long vs. short) for sub-penny stocks.

For each participant, the Illiquid Security margin charge is calculated as:

$$Illiquid\ Security\ Charge = \sum_{illiquid\ equity\ i} Haircut(i) \times ABS(Market\ Amount(i))$$

For an example of the Illiquid Security haircut schedule, see Appendix A.

1.3.9 SFT Security Priced Below $5

An SFT Security that becomes an Ineligible SFT Security because the current market price of the SFT Security falls below $5, is subject to a 100% haircut of the current market price until such time as the per share price of the underlying SFT Security equals or exceeds $5.

1.3.10 Securities With Exposure to Cryptocurrencies

Cryptocurrencies are treated as securities whose volatility is less amenable to statistical analysis and may be subject to a haircut. The following Cryptocurrencies are not considered liquid securities and are subject to a haircut rather than the VaR Charge:

- In general, Cryptocurrencies traded on a national securities exchange that do not meet the available pricing criteria and are classified as an Initial Public Offering (IPO).
- Cryptocurrencies for which there is no price data from the FAME historical price file for the day.
- Cryptocurrencies that are not listed on a national securities exchange and are traded in over the counter (OTC) marketplaces.
- Cryptocurrencies traded on a national securities exchange with a share price <= $5 per share
- Cryptocurrencies traded on a national securities exchange with a share price > $5 per share that are considered Microcap Stocks (see segmentation above) will be subject to an illiquidity ratio test such that if the securities' illiquidity ratio is over a pre-defined threshold the securities will not be considered liquid securities.

Cryptocurrencies that are traded on a national securities exchange with a share price > $5 per share and that are not considered Microcap Stocks are deemed to be liquid securities. In addition, Cryptocurrencies that are traded on a national securities exchange with a share price > $5 per share and that are considered Microcap Stocks but that have an illiquidity ratio below a pre-determined threshold are considered liquid securities. Such Cryptocurrencies are subject to the VaR Charge, which utilizes a parametric method with additional components of a volatility floor, a portfolio margin floor, and an additive gap risk calculation, if applicable.

Cryptocurrencies that are not deemed to be liquid securities are subject to a haircut charge. This haircut charge is determined based on the last available closing price for the security. Cryptocurrencies with a share price <= $5 per share are charged a haircut equal to the greater of (i) a haircut that would be applied to such security if it were an Illiquid Security (see Appendix A) or (ii) 100%. Cryptocurrencies that are traded on the OTC or classified as IPO that have a share price >$5 per share are charged a haircut of 35%. Cryptocurrencies that have a share price >$5 per share, that trade on a national securities exchange, are Microcap Stocks and have an illiquidity ratio above a pre-determined threshold are charged a haircut of 35%.

1.4 Fixed Income Volatility Component Calculations

NSCC calculates the haircut-based volatility charge on fixed income securities at the individual account level and sums up to the Member level.

1.4.1 Calculation Methodology for Corporate Bonds

Corporate bonds are categorized according to their time to maturity as of the latest trading date[12] and credit rating. See Appendix B for a detailed breakdown of the indices and haircut rates that are currently utilized, as of the publication date of this document[13].

The total volatility charge for positions in corporate bonds is equal to the sum of charges for each category, as described below:

$$chrg(corporate\ bonds) = \sum_{i=1}^{36} \left(hr_{long}(i) \times \left| v_{long}(i) \right| + hr_{short}(i) \times \left| v_{short}(i) \right| \right),$$

where $v_{long}(i)$ and $v_{short}(i)$ are respectively the total market values of long and short positions in bucket i.

1.4.2 Calculation Methodology for Municipal Bonds

Municipal bonds are grouped according to credit rating, remaining time to maturity as of the latest trading date and separately categorized by municipal sector.

The charge for a Member is obtained by aggregating the CUSIP-level charge contributions:

$$Muni\ Bond\ Chrg = \sum_{muni\ bonds\ b\ in\ part.portfolio} hrc(b)\ \times ABS\big(Market\ Amount(b)\big)$$

See Appendix C for details.

If the maturity date is unavailable, the haircut rate is set to that of longest tenor category.

1.4.3 Calculation Methodology for Other Fixed Income Securities

All fixed-income securities that are not classified as corporate bonds or municipal bonds are subject to a haircut as follows:

$$Non\ Corp/Non\ Muni\ Chrg\ \ = haircut \times \sum_{non-corp\ non-muni\ bond\ i} ABS(USD\ Position\ Amount(i))$$

Currently, the haircut rate is 5.0%, but the value is updated annually.

[12] The time to maturity is calculated as of the latest trading date. For example, at the end of day on Sept 1, 2020, the latest trading date is Sept 1, 2020; at the start of day on Sept 2, 2020, the latest trading date is also Sept 1, 2020.

[13] Corporate bond and MUNI bond haircut rates are reviewed and updated on a quarterly basis.

1.5 Family-Issued Securities Volatility Component Calculation

NSCC assesses a haircut-based volatility charge of no less than 80.0% on long Net Unsettled Positions in fixed income held in a Member's Family-Issued Securities (or "FIS") and 100% for long Net Unsettled Positions in equity securities that are Family-Issued Securities. The Family-Issued Securities charge is calculated to mitigate specific wrong-way risk to securities issued by Members or their affiliates.

NSCC removes all long Net Unsettled Positions in FIS from the VaR Charge calculation and assesses a haircut-based volatility charge on these positions based on the asset class of the security.

	Fixed Income Family-Issued Securities	Equity Family-Issued Securities
Long Positions	80.0% haircut	100.0% haircut
Short Positions	Not subject to this separate volatility charge.	Not subject to this separate volatility charge.

1.6 Margin Liquidity Adjustment

NSCC uses a base-line Margin Liquidity Adjustment (MLA) model to account for the potential additional market impact costs associated with liquidating a portfolio that is relatively large in size with respect to available market-wide liquidity.

For Members who are subscribed to both CNS and SFT Clearing Service, the calculation takes the maximum of the MLA charge based on the services independently, and the MLA charge based on the Member's position netted between the CNS and SFT Clearing Service.

The MLA charge is applicable on the Member level, however, is allocated to the service level given different collateral deposit requirements for each service. The following considerations are accounted for when conducting the allocation:

- If both the CNS and SFT Clearing Service had an MLA charge, the final charge is allocated proportionally based on their independent MLA charge.
- If only one of the services had an MLA charge, the final MLA charge is allocated to the service that had an MLA charge.
- If neither service had an independent MLA charge, but the netted positions had an MLA charge, the MLA charge is allocated proportionally based on the gross market value of positions in each service.

1.6.1 Portfolio Segmentation

To calculate MLA, a member's portfolio is first segmented into the following tiers.

Note:

There are additional tiers here in comparison to segmentations used in earlier sections such as 1.2.2.1 and 1.3.2):

Tier 1 – Liquid Equity and Equity based ETP with market capitalization >= $10 billion

Tier 2 – Liquid Equity and Equity based ETP with market capitalization >= $2 billion and < $10 billion

Tier 3 – Liquid Equity and Equity based ETP with market capitalization >= $300 million and < $2 billion

Tier 4 – Liquid Equity and Equity based ETP with market capitalization < $300 million

Tier 5 – Treasury based ETP

Tier 6 – All ETP not in tiers 1-5, 10 and 71 & 81

Tier 71– MUNI bond based ETP

Tier 81– Corp. bond based ETP

Tier 7– Corp. bonds

Tier 8 – MUNI bonds

Tier 9 – Non-Corp/Non-Muni

Tier 10 – Illiquid Equity

1.6.2 MLA Calculation

For all liquid equity tiers (tiers 1-6, 71 and 81), the impact cost is calculated at the security level based on portfolio (P) composition and the impact cost for liquid equity segments is the sum of the impact cost at the security level, i.e.,

$IC^{Liquid\ Equity} = \sum_{g\in\{Liquid\ Equity\ segments\}} c^g \sum_{s\in P^g} \left(\frac{GMV_s^3}{\theta^g \times ADV_s}\right)^{1/2}$ where:

c^g is a coefficient associates the impact cost calculation which is a multiple of the typical 1-day volatility of the segment

GMV_s represents the gross market value of any given security.

P^g represents the sub-portfolio contains positions for one of the liquid segments.

ADV_s represent the average daily trading volume for any given security.

θ^g represent a fraction of the available market volume for each security.

Furthermore, for portfolios that contain equity ETFs, latent liquidity is considered where the lower of either the standalone ETF or its decomposed basket is used to calculate the impact cost. However, if certain data inputs needed to determine ETF decomposition for the create/redeem calculation are unavailable or unreliable, NSCC may use the baseline or standalone calculation for purposes of calculating the MLA charge for ETFs.

The Liquid Equity MLA is defined as:

$$MLA_{liquid} = 0.7 \times max\left(\frac{IC}{V} - 0.4, 0\right) \times V$$

For non-liquid equity tiers (tiers 7-10), the MLA charge is calculated at the tier level and can be expressed as the following formula:

$$MLA\ Adj_g = B_g \times max\left(\frac{\sigma_{1g}}{h_{1g}}\left(\frac{GMV_p}{\Theta_g * ADV_g}\right)^{\alpha} - 1,0\right)$$

where

$MLA\ Adj_g$: also expressed as f_g, this is the adjustment factor to be multiplied by the member tier 1-day VaR.

B_g: asset tier coefficient to be provided by NSCC.

σ_{1g}: 1-day volatility for each asset class

h_{1p}: 1-day effective haircut, this value is calculated as $\frac{VaR_{1g}}{GMV_g}$, $VaR_{1g}$is the allocated 1-day member tier VaR as calculated per VaR Allocation in the previous section.

α = 0.5, this is a fixed parameter.

GMV_p represents the gross market value for the member tier.

Θ_g: represents the % of assumed ADV to be liquidated.

ADV_g represent the aggregated average trading volume for the asset class group.

And finally, the combined MLA charge for a member is calculated as:

$$MLA_{NSCC} = MLA_{liquid} + f_{Corp} * HC_{Corp} + f_{Muni} * HC_{Muni} + f_{Illiquid} * HC_{Illiquid} + f_{UIT} * HC_{UIT}$$

where v_g is the 1-day VaR for each asset member tier, f_g is the same as MLA_Adj calculated per the previous section, and HC represents the haircut, or VaR for haircut assets.

Special Handling for IPO

When calculating the MLA charge for the Illiquid Equity tier, note that GMV ($GMV_{illiquid}$) is calculated excluding IPO securities. Similarly, VaR_{10} is calculated as a haircut on pure illiquid positions, excluding IPO.

1.6.3 Kappa Adjustment

The MLA charge is further refined by introducing a Kappa adjustment factor. The Kappa adjustment is conditional on the $(I/V)^*$ on the member tier level.

The value $(I/V)^*$ ratio for kappa adjustment application is calculated by first calculating I_g^*, which then is divided by the tier 1-day VaR.

1. The estimated value I_g^* of market impact is calculated differently for liquid equity tiers and other tiers:

   For non-liquid equity tiers (tiers 7-10) we calculate

   $$I_g^* = 0.4\,\sigma_{1g} GMV_p \left(\frac{GMV_p}{\Theta_g * ADV_g}\right)^{1/2}$$

   For liquid equity tiers (tiers 1-6, 71 and 81) we calculate the impact cost as described in 1.6.2.

Note that (I/V)* = (I*/V)

2. The sums are taken across all tiers as in 1.6.1. Use the ratio $k^* = \frac{\sum_g I_g^*}{\sum_g VaR_g}$ to choose a value for kappa adjustment from the table.

   In the following table: e.g., if (I/V)* = 0.6, then Kappa = 93%

Lower Bound and Upper Bound (Left inclusive) of I/V		κ
0.0	0.5	100%
0.5	0.7	93%
0.7	1.2	86%
1.2	1.8	79%
1.8	2.8	71%
2.8	4.2	64%
4.2	6.5	57%
6.5	10.3	50%
10.3	17	43%
17	30	36%
30+		29%

The member's final MLA charge then becomes:

$$MLA\ Charge = MLA\ charge\ without\ kappa\ adjustment\ \times k$$

2 MARK TO MARKET COMPONENT

The mark-to-market (MTM) component measures the unrealized profit or loss using the contract price versus the current market price (that is, the price for a security determined daily for purposes of the CNS system; generally, that is the prior day's closing price). The MTM component is described in Procedure XV, I(A)(1)(b) and I(A)(2)(b) of the NSCC Rules.

The MTM charge is assessed on each Member's net unsettled positions, including positions that fail in the CNS system. The charge is calculated by taking the difference between the contract value of each position in the portfolio and the market value based on the prior day's closing market price.

CUSIP MTM credits and debits are first aggregated at the linked family account level. MTM credits do not offset the total MTM charge; in the event the Member has an MTM credit when aggregated at the main account level, the MTM charge will be zero.

SFT MTM charge is assessed on the account level for each Member's net unsettled SFT positions. Due to the nature of SFT Clearing Service, the SFT MTM charge calculation takes the difference between the contract value of each SFT position in the portfolio and the market value based off the prior day's closing price, as well as the interest amount and cash component.

SFT MTM credits and debits are aggregated for each portfolio and then the aggregated values which result in a debit amount across all portfolios will be summed up to a total SFT MTM charge at the member level.

The main account total MTM charge is equal to the sum of the MTM debits across link accounts. For CNS transactions, MTM is separated into two MTM transaction types: Regular Way and When-Issued.

3 SPECIAL CHARGE

NSCC may require an additional payment, or "Special Charge," from Members in view of price fluctuations in or volatility or lack of liquidity of any security. NSCC shall make such determination based on the Member, the security type and concentration, CRRM or third-party credit ratings, or other factors. The Special Charge is described in Procedure XV, Section I(A)(1)(c) and I(A)(2)(c) of the NSCC Rules.

4 CNS FAILS CHARGE COMPONENT

NSCC may be exposed to market risk when a Member fails in the delivery of securities on settlement date. To mitigate NSCC's exposure to CNS fails positions, NSCC assesses the CNS Fails Charge. The CNS Fails Charge applies to failed-to-deliver positions to CNS and is described in Procedure XV, Section I(A)(1)(d) of the NSCC Rules.

The CNS Fails Charge is calculated by multiplying the current market value of a Member's aggregate CNS failed-to-deliver positions by a percent based on how many consecutive days a Member has failed-to-deliver a specific CUSIP to CNS, as described below. The CNS Fails Charge also accounts for deliveries of failed securities in the night cycle following the original settlement date of those securities, and non-fail related buy activity for a failing CUSIP that may reduce the positions' overall net delivery obligation to CNS.

Fail Duration	CNS Fails Charge Haircut Rate
1-4 Days	5.0% of the Member's aggregate CNS failed-to-deliver positions
5-10 Days	15.0% of the Member's aggregate CNS failed-to-deliver positions
11-20 Days	20.0% of the Member's aggregate CNS failed-to-deliver positions
>20 Days	100% of the Member's aggregate CNS failed-to-deliver positions

5 NON-RETURNED SFT PREMIUM CHARGE

To account for NSCC's exposure to Non-Returned SFT[14] which could be correlated to a Member's creditworthiness and incentivize Members to satisfy their obligations on Settlement Date, NSCC assesses the Non-Returned SFT premium charge. The Non-Returned SFT premium charge is calculated by multiplying the current market value of the Member's aggregate Non-Returned SFT positions by 5% for Members CRRM rated 1 through 4; 10% for Members CRRM rated 5 or 6, and 20% for Members CRRM rated 7.

6 INDEPENDENT AMOUNT SFT CASH DEPOSIT REQUIREMENT

To address regulatory and investment guideline requirements applicable to certain institutional firms, a Member is permitted to transfer an additional cash haircut above 100% (e.g., 102%) to such institutional firms. A Member that receives the Independent Amount SFT Cash in the Initial Settlement[15] also receives a commensurate Clearing Fund call. The Independent Amount SFT Cash Deposit Requirement is recalculated and collected on a daily basis at approximately 4:00 p.m. for any Member. There are no credit offsets being provided at the time of collection, while credit offsets will be provided against the following business start of day Required SFT Deposit.

[14] Defined under Rule 56 of NSCC Rules and Procedures.

[15] Defined under Rule 56 of NSCC Rules and Procedures.

7 MARGIN REQUIREMENT DIFFERENTIAL (MRD) COMPONENT

NSCC may be exposed to market risk based on potential portfolio fluctuation as a Member executes trades throughout the day. Pursuant to Addendum K of the NSCC Rules, NSCC's general counterparty trade guaranty generally attaches immediately upon trade validation and before NSCC has collected the Member's required deposit. As a result, NSCC may be exposed to large un-margined intraday portfolio fluctuations before NSCC has collected the Member's clearing fund requirement the following morning.

The margin requirement differential (MRD) charge is designed to help mitigate the risks posed to NSCC by day-over-day fluctuations in a Member's portfolio by forecasting future changes in a Member's portfolio based on a historical look-back at each Member's portfolio over a given time period. The MRD charge is described in Procedure XV, Section I(A)(1)(e) and 1(A)(2)(d) of the NSCC Rules.

The MRD charge is calculated based on the day-over-day positive changes in the Member's start of day[16] (SOD) volatility charge and MTM charge components, which are calculated based on the overnight or end of day (EOD) positions. For example, the position referred to by NSCC's system's SOD label on July 1, 2020, refers to the EOD position on June 30, 2020.

For any given calculation date, *t*, the MRD charge is calculated as follows:

1. Calculate the MRD_{VaR} and MRD_{MTM} sub-components,

$$MRD_{VaR}(t) = \frac{\sum_{i=0}^{99} \theta^i \times \max\{VaR(t-i, SOD) - VaR(t-(i+1), SOD), 0\}}{\sum_{i=0}^{99} \theta^i}$$

$$MRD_{MTM}(t) = \frac{\sum_{i=0}^{99} \theta^i \times \max\{CHRG_{MTM}(t-i, SOD) - CHRG_{MTM}(t-(i+1), SOD), 0\}}{\sum_{i=0}^{99} \theta^i} \quad \text{(Eqn. 5.1)}$$

where

- *i* represents the number of business days look back relative to the calculation date, currently 100 days; For example, when $i = 0$, $VaR(t-i, SOD)$ represents the SOD Volatility charge as of the calculation date; when $i = 1$, $VaR(t-i, SOD)$ represents the SOD volatility charge one business day before the calculation date; etc.
- θ is equal to 0.97 as default.
- $VaR(d, SOD)$ is the SOD volatility charge as of business date *d*.
- $CHRG_{MTM}(d, SOD)$ is the SOD MTM charge as of business date *d*.

2. Calculate the MRD charge by multiplying the sum of MRD_{VaR} and MRD_{MTM} sub-components with an MRD coefficient, which is 1.5 currently.

$$MRD(t) = Coefficient \times [\, MRD_{VaR}(t) + MRD_{MTM}(t) \,]$$

The MRD charge is calculated at the Member level. There are four special treatments in this calculation.

On the first day of membership, the differences $VaR(t-i, SOD) - VaR(t-(i+1), SOD)$ and $CHRG_{MTM}(t-i, SOD) - CHRG_{MTM}(t-(i+1), SOD)$ in Eqns. 5.1 are replaced with zeros.

[16] Using the NSCC risk system convention.

Apart from treatment above, if a member has less than 101 business days of MTM and Volatility charges, the missing values $VaR(t)$ and $MTM(t)$ in Eqns. 5.1 are replaced with zeros.

8 COVERAGE COMPONENT (CC) CHARGE

NSCC is exposed to a Member's un-margined portfolio as a result of the timing when NSCC's trade guaranty attaches to positions, which is immediately upon trade validation and prior to the collection of margins. Therefore, the coverage component (CC) charge is designed to mitigate the risks associated with a Member's Required Fund Deposit being insufficient to cover projected liquidation losses to the coverage target, currently a 99 percent confidence level, by adjusting a Member's Required Fund Deposit towards the target. The CC charge is described in Procedure XV, Section I(A)(1)(f) and I(A)(2)(e) of the NSCC Rules.

The CC charge supplements the MRD charge by preemptively increasing a Member's Required Fund Deposit in an amount calculated to forecast potential deficiencies in the margin coverage of a Member's guaranteed portfolio.

The CC charge is calculated by comparing the simulated liquidation profit and loss of a Member's portfolio, using the actual positions and the actual historical returns on the positions, against the sum of each of the following Clearing Fund components: (i) volatility charge; and (ii) MRD charge. For a given business day, NSCC determines a daily peak deficiency amount for each Member equal to the maximum observed deficiency over any of the prior 10 business days. The CC charge is equal to the front-weighted average of the peak deficiencies over the prior 100 business days.

The CC charge is calculated as follows:

1. For any given business day *t*, calculate the Peak Deficiency:

$$PeakDeficiency(t) = MAX_{0\le i\le 9}\{-\min[VaR(t-4-i,SOD) + MRD(t-4-i) + P\&L(t-3-i), 0]\} \quad \text{Eqn. 6.1}$$

where

- *i* represents the number of business days look back; For example, when *i*=0, $VaR(t-4-i,SOD)$ represents the SOD Volatility charge as of the business day of *t* - 4; when *i*=1, $VaR(t-4-i,SOD)$ represents the SOD Volatility charge as of the business day *t* – 5; etc.
- $VaR(d,SOD)$ is the SOD Volatility charge as of the business day *d.*
- $MRD(d)$ is the MRD charge as of the business day d.
- $P\&L(d)$ is the three-day liquidation profit or loss of the SOD position as of the business day *d*.

2. Calculate the CC charge

$$CC(t) = \frac{\sum_{i=0}^{99} \theta^i \times \text{PeakDeficiency}(t-i)}{\sum_{i=0}^{99} \theta^i}$$

where

- *i* represents the number of business days look back as of the calculation day t. For example, when *i*=0, $PeakDeficiency(t-i)$ represents Peak Deficiency as of the calculation day t; when *i*=1, $PeakDeficiency(t-i)$ represents the Peak Deficiency as of the business day before the calculation day; and etc.
- θ is equal to 0.97 as default.

The CC charge is calculated at the NSCC Member level only. The P&L and relevant charges in the above calculation are the sum of the Member's subaccounts. The following special treatment is applied:

When there is less than 10 days of history for the Peak Deficiency calculation in Eqn. 6.1, actual number of history observations is used.

In case the history of peak deficiencies is shorter than 100 days for any Member, all the missing peak deficiencies are default to zeros.

9 EXCESS CAPITAL PREMIUM (CF PREMIUM) CHARGE

NSCC assesses a CF Premium charge to mitigate risk presented by highly leveraged Members. The charge is imposed when a Member's start of day volatility component exceeds their Net Capital for broker-dealers, or Equity Capital for bank Members. The CF Premium charge is described in Procedure XV, Section I(B)(2).

The CF Premium charge is assessed based on the amount by which a Member's start of day volatility component exceeds its most recently reported regulatory capital balance (Net Capital or Equity Capital).

If the ratio of the start of day volatility component over the Member's capital balance exceeds 1.00 (the "excess capital ratio" or "ECR"), a CF Premium charge is calculated by multiplying the excess capital ratio by the amount by which the start of day volatility component exceeds the capital balance. For purposes of calculating the CF Premium, the ECR is capped at 2.00.

NSCC may, in its sole discretion, accept an updated Net Capital or Equity Capital amount provided by a Member prior to the issuance of its next applicable financial report for purposes of calculating the CF Premium.

10 BACKTESTING CHARGE

NSCC may require a Member to make an additional deposit in the form of a Backtesting Charge to mitigate exposures that may not be adequately captured by the volatility model as needed to achieve a 99 percent backtesting coverage target. The charge may be assessed at the start of the day, as needed. The Backtesting Charge is described in Procedure XV, Section I(B)(3) of the NSCC Rules.

NSCC incorporates daily backtesting to ensure that the calculated Required Fund Deposit is sufficient to cover the potential loss NSCC may be subject to in the event of a Member default. To calculate this charge, NSCC takes an end-of-day portfolio snapshot, then compares the Member's Required Fund Deposit to the profit and loss over a simulated three-day liquidation horizon; a deficiency occurs when a Member's Required Fund Deposit does not sufficiently cover the simulated loss on a portfolio.

NSCC routinely calculates the rolling 12-month coverage ratio of the Member for end-of-day backtest deficiencies. Coverage is calculated as the percentage of non-deficiency backtest observations out of the number of backtest observations the Member has during the period. NSCC seeks to maintain 99.0% coverage at the Member-level.

Should the coverage ratio decline below 99.0%, NSCC may assess a backtest charge component such that, if applied retroactively, the Member would not have incurred enough deficiencies for the coverage ratio to decline below the 99.0% coverage target. Typically, the amount of the backtest charge component will be equal to the Member's third-largest end-of-day backtest deficiency during the rolling twelve-month period. When calculating a Member's backtesting coverage for purposes of the Backtesting Charge and when calculating any applicable Backtesting Charge, NSCC does not include amounts already collected from that Member as a Backtesting Charge. As described above, the objective of the Backtesting Charge is to increase Required Fund Deposits for Members that are likely to experience backtesting deficiencies by an amount sufficient to maintain such Member's backtesting coverage above the 99 percent confidence threshold.

NSCC may adjust the calculation and/or application of the charge to achieve its backtesting coverage target.

11 BANK HOLIDAY CHARGE

NSCC does not collect margin or settle securities on a bank holiday, such as Columbus Day and Veterans Day, when the equities markets are open for trading, but the Board of Governors of the Federal Reserve observes a holiday, and banks are closed. To address exposure from Members' trading activity on a bank holiday, NSCC may require its Members to make an additional Clearing Fund deposit (the "Bank Holiday Charge"). The Bank Holiday Charge is based on NSCC's assessment of market conditions at the time the charge is calculated and is assessed on the business day immediately prior to the bank holiday. NSCC communicates in advance to Members, through an Important Notice, the day on which the charge will apply, including the methodology[17] it will use to calculate the Bank Holiday Charge. The Bank Holiday Charge is described in Procedure XV, Section I(B)(4) of the NSCC Rules.

12 INTRADAY MARGIN CHARGES

12.1 General Approach

NSCC may require an additional margin intraday, in addition to the start of day (SOD) margin requirements. The general purpose of this additional intraday margin is to ensure that a Member's Required Fund Deposit is sufficient to cover material increases in risk that arise after the SOD calculation. The two intraday margin components are Intraday Volatility Charges (iVaR) and Intraday MTM Charges (iMTM).

The SOD margin requirements are designed to cover individual member's risk in normal markets with normal member activity. However, large changes in that activity, such as significant changes in a Member's volume or portfolio composition, as captured by iVaR, or large changes in value of guaranteed positions, as captured by iMTM, may expose NSCC to additional risks intraday. The intraday margin charges are designed to account for and lessen this additional risk.

12.2 Intraday Timing and Schedules

NSCC risk systems monitor Intraday Volatility and MTM exposures on a 15-minute basis between 6:00 AM and 11:00 PM Eastern Time (ET). NSCC generally conducts intraday monitoring of its exposures for the purpose of assessing intraday margin charges at 15-minute intervals (or 'slices') between the hours of 10:00 AM to 4:30 PM ET.

Generally, an iMTM charge can occur on any of the intraday monitored slices between 10:00 AM and 4:00 PM ET where an iMTM margin call threshold is breached. This is detailed below. Members will be notified by email and will have 60 minutes to meet the margin call.

Generally, large changes to iVaR are assessed based on the 4:15 PM slice each day. Where a member's VaR has changed by more than the defined threshold, an iVaR margin call is made against the member. This is detailed below. Members will be notified by email and will have 60 minutes to meet the margin call.

However, NSCC maintains authority and operational capacity to collect intraday margin charges at any time during the system monitoring window if circumstances warrant.

[17] A methodology might include time scaling of the volatility charge or a using a stress scenario that reflects potential market price volatility on that holiday.

12.3 Volatile Market Conditions

NSCC retains discretion to lower applicable margin call thresholds when it determines such action is necessary to mitigate risks, such as during periods of increased market volatility, specific market events, elevated trading volumes, or when specific Member portfolios present heightened overnight exposure.

NSCC will issue communications to members to inform them that the threshold has been lowered and to monitor closely for potential intraday margin charges.

Examples of potential volatile markets include but are not limited to:

- Large price changes in a benchmark equity index
- ETF Index rebalancing
- Triple witching days

12.4 Intraday Volatility Charges

The Intraday Volatility Charge is calculated[18] with respect to (1) Net Unsettled Positions in CNS Transactions and Balance Order Transactions, and (2) SFT Positions independently. SFT Positions are not netted with CNS Transactions and Balance Order Transactions in connection with the calculation of this charge.

The Intraday Volatility Charges apply to both CNS and SFT Clearing Service transactions independently, with no position netting provided between the two services. NSCC calculates iVAR throughout the day, with charges generally being assessed soon after the close of U.S. exchange trading to account for position allocations due to settle on that day and new trades. This is usually the 4:15 PM slice but if the 4:30 PM slice shows a significantly different value, this later value may be taken instead.

An iVAR Charge is usually collected if the calculation of intraday volatility exceeds the SOD volatility calculation by a predetermined threshold, ("Intraday Volatility Threshold"). Members can view and track their intraday volatility in the UX Client Portal.

The current thresholds are when the difference between the intraday volatility calculation and the SOD volatility calculation exceed both (1) a 100% increase, and (2) the $250,000 after being reduced by the volatility portion of the SOD MRD charge. NSCC may reduce the Intraday Volatility Threshold, for example during volatile market conditions or market events that cause increases in trading volumes, when appropriate to mitigate risk. The new reduced threshold will be communicated to clients.

Examples of market conditions that NSCC may consider with respect to reducing the Intraday Volatility Threshold include, but are not limited to, ETF index rebalancing periods or the occurrence of large price changes in a major benchmark equity index. NSCC may also reduce the Intraday Volatility Threshold for an individual Member or group of Members if NSCC determines it to be necessary to protect itself and its Members in response to factors such as market conditions or financial or operational capabilities specifically affecting such Members.

iVaR calls, at the NSCC's discretion, may be reduced or not charged if the NSCC believes the heightened VaR does not represent substantially larger exposure to SOD VaR charges. Reasons for this discretion include, but are not limited to:

- Member has a pattern of trading or business that suggests the account's VaR will come back down with EOD trades.
- Member evidence planned EOD trades that will reduce the present heightened VaR.
- Breach is due to erroneous trades or data feed.

NSCC may also reduce the Intraday Volatility Threshold for an individual Member or group of Members if NSCC determines it to be necessary to protect itself and its Members in response to factors such as market conditions or financial or operational capabilities specifically affecting such Member(s).

[18] The Intraday Volatility charge is described in Procedure XV, Section I.(B)(5) of the NSCC Rules.

NSCC may also waive or reduce the collection of an Intraday Volatility Charge in exigent circumstances if it determines (i) that such a waiver is necessary to protect NSCC, its participants, investors, and the public interest or (ii) it can effectively address the risk exposure presented by the Member without the collection of the Intraday Volatility Charge.

NSCC provides tools (UX Client Portal), as discussed in the section below, to allow a member to hypothesize EOD trades to demonstrate the offset and drop in VaR. The UX Client Portal can also be used by the members to track and understand any intraday iVaR calls.

12.5 Intraday Mark-to-Market Charges

The Intraday Mark to Market charges apply to both CNS and SFT Clearing Service transactions independently, with no position netting provided between the two services. Intraday market moves and positions are tracked in fifteen-minute intervals. iMTM Charges are generally taken after the equity market opens, when NSCC starts to receive intraday prices. If an iMTM call is made, members will be notified and have 60 minutes to satisfy the margin call. iMTM calls are made at the time of identification, and not at the end of day, as they represent current potential losses in the event of a Member default, as opposed to iVaR, which represents the possibility of a loss.

An iMTM charge may be collected if the difference between the most recent mark-to-market price of a Member's Net Unsettled Positions and the most recent observed market price exceeds a predetermined threshold ("Intraday MTM Threshold"), which is currently set at 80% of the Member's volatility charge[19], and if the collective difference exceeds $1,000,000. Members can view and track their intraday MTM in the UX Client Portal.

NSCC may reduce the Intraday MTM Threshold during volatile market conditions if it determines that a reduction of the threshold is appropriate to mitigate risk. Examples of market conditions that NSCC may consider with respect to reducing the Intraday MTM Threshold include, but are not limited to, the occurrence of large price changes in a major benchmark equity index. NSCC may also reduce the Intraday MTM Threshold for an individual Member or group of Members if NSCC determines it to be necessary to protect itself and its Members in response to factors such as market conditions or financial or operational capabilities specifically affecting such Member(s). If thresholds are reduced, the new threshold will be communicated as part of the corporate communication sent to Members for Volatile Market Conditions.

An iMTM charge, at the NSCC's discretion, may be reduced or not charged if the NSCC believes the heightened exposure does not represent a substantially larger MTM exposure. Reasons for this discretion include, but are not limited to:

- Breach is due to erroneous trades.
- Breach is due to an erroneous price or data feed or corporate action.

[19] The Intraday MTM Charge is described in Procedure XV, Section I.(B)(5) of the NSCC Rules.

13 MEMBER TOOLS AND GUIDES

DTCC provides Members with a suite of Risk Management tools that you can use to understand margin requirements and monitor intraday exposures. These tools include:

- Reports in the Risk Reporting portal that you can use to monitor market risk exposures. Access the reports from the MyDTCC portal.
- Risk calculators to estimate potential obligations.

For more resources, see the DTCC Learning Center.

14 APPENDICES

The information provided in these Appendices is current as of the publication date of this document. This information may change periodically following publication, without notice and without updates to this document. Notwithstanding anything stated in this document, NSCC retains any discretion provided to it in the NSCC Rules in calculating the charges described therein.

Appendix A: Illiquid Security Haircut Schedule[20]

Price Range	Haircut Rate
<= $0.01, Long	68%
<= $0.01, Short	136%
$0.01 - $1.00	53%
$1.00 - $5.00	42%
> $5.00	22%
UIT	4%

Appendix B: Corporate Bond Mapping and Haircut Table[21]

Illiquid Security Group Code	Merrill Lynch Index	Description	Positive Haircut Rate	Negative Haircut Rate
1	C1A1	0-1 year/AAA/Aaa	2.0%	2.0%
2	C1A2	0-1 year/AA+/AA/AA-/Aa1/Aa2/Aa3	2.0%	2.0%
3	C1A3	0-1 year/A+/A/A-/A1/A2/A3	2.0%	2.0%
4	C1A4	0-1 year/BBB+/BBB/BBB-/Baa1/Baa2/Baa3	2.0%	2.0%
5	H0A0	0-1 year/BB & Lower	6.3%	7.8%
6	C1A1	1-3 years/AAA/Aaa	2.0%	2.0%
7	C1A2	1-3 years/AA+/AA/AA-/Aa1/Aa2/Aa3	2.0%	2.0%
8	C1A3	1-3 years/A+/A/A-/A1/A2/A3	2.0%	2.0%
9	C1A4	1-3 years/BBB+/BBB/BBB-/Baa1/Baa2/Baa3	2.0%	2.0%
10	H0A0	1-3 years/BB & Lower	6.3%	7.8%
11	C2A1	3-5 years/AAA/Aaa	2.0%	2.0%
12	C2A2	3-5 years/AA+/AA/AA-/Aa1/Aa2/Aa3	2.0%	2.0%
13	C2A3	3-5 years/A+/A/A-/A1/A2/A3	2.0%	2.3%

[20] Updated March 3, 2026.
[21] Updated Feb 1, 2026.

Illiquid Security Group Code	Merrill Lynch Index	Description	Positive Haircut Rate	Negative Haircut Rate
14	C2A4	3-5 years/BBB+/BBB/BBB-/Baa1/Baa2/Baa3	2.0%	2.0%
15	H0A0	3-5 years/BB & Lower	6.3%	7.8%
16	C3A1	5-7 years/AAA/Aaa	2.6%	2.1%
17	C3A2	5-7 years/AA+/AA/AA-/Aa1/Aa2/Aa3	2.0%	2.4%
18	C3A3	5-7 years/A+/A/A-/A1/A2/A3	2.3%	2.9%
19	C3A4	5-7 years/BBB+/BBB/BBB-/Baa1/Baa2/Baa3	2.1%	2.8%
20	H0A0	5-7 years/BB & Lower	6.3%	7.8%
21	C4A1	7-10 years/AAA/Aaa	2.9%	3.2%
22	C4A2	7-10 years/AA+/AA/AA-/Aa1/Aa2/Aa3	2.7%	3.3%
23	C4A3	7-10 years/A+/A/A-/A1/A2/A3	2.8%	3.7%
24	C4A4	7-10 years/BBB+/BBB/BBB-/Baa1/Baa2/Baa3	2.6%	3.5%
25	H0A0	7-10 years/BB & Lower	6.3%	7.8%
26	C7A1	10-15 years/AAA/Aaa	4.5%	3.8%
27	C7A2	10-15 years/AA+/AA/AA-/Aa1/Aa2/Aa3	2.9%	3.4%
28	C7A3	10-15 years/A+/A/A-/A1/A2/A3	2.8%	2.8%
29	C7A4	10-15 years/BBB+/BBB/BBB-/Baa1/Baa2/Baa3	3.0%	4.2%
30	H0A0	10-15 years/BB & Lower	6.3%	7.8%
31	C8A1	15+ years/AAA/Aaa	5.1%	5.5%
32	C8A2	15+ years/AA+/AA/AA-/Aa1/Aa2/Aa3	4.4%	4.5%
33	C8A3	15+ years/A+/A/A-/A1/A2/A3	4.3%	4.6%
34	C8A4	15+ years/BBB+/BBB/BBB-/Baa1/Baa2/Baa3	4.5%	4.7%
35	H0A0	15+ years/BB & Lower	6.3%	7.8%
36	H0A0	All others/Not Rated	6.3%	7.8%

Appendix C: Municipal Bond Haircut Table[22]

Rating	Maturity	Sector	Haircut Rate
Above BBB+	1-3 Yrs		2.00%
Above BBB+	3-7 Yrs		2.00%
Above BBB+	7-12 Yrs		2.16%
Above BBB+	12-22 Yrs		3.27%
Above BBB+	22+ Yrs		4.38%
BBB+ and below	1-3 Yrs	General Obligation	6.11%
BBB+ and below	1-3 Yrs	Health Care	6.11%
BBB+ and below	1-3 Yrs	High Yield	6.11%
BBB+ and below	1-3 Yrs	Higher Education	6.11%
BBB+ and below	1-3 Yrs	Housing	6.52%
BBB+ and below	1-3 Yrs	Land Backed	6.11%
BBB+ and below	1-3 Yrs	OTHER	6.11%
BBB+ and below	1-3 Yrs	Tobacco	6.11%
BBB+ and below	1-3 Yrs	Transportation	6.11%
BBB+ and below	1-3 Yrs	Utility	6.11%
BBB+ and below	3-7 Yrs	General Obligation	6.11%
BBB+ and below	3-7 Yrs	Health Care	6.11%
BBB+ and below	3-7 Yrs	High Yield	6.11%
BBB+ and below	3-7 Yrs	Higher Education	6.11%
BBB+ and below	3-7 Yrs	Housing	6.52%
BBB+ and below	3-7 Yrs	Land Backed	6.11%
BBB+ and below	3-7 Yrs	OTHER	6.11%
BBB+ and below	3-7 Yrs	Tobacco	6.11%
BBB+ and below	3-7 Yrs	Transportation	6.11%
BBB+ and below	3-7 Yrs	Utility	6.11%
BBB+ and below	7-12 Yrs	General Obligation	6.11%
BBB+ and below	7-12 Yrs	Health Care	6.11%
BBB+ and below	7-12 Yrs	High Yield	6.11%

[22] Updated Feb 1, 2026.

Rating	Maturity	Sector	Haircut Rate
BBB+ and below	7-12 Yrs	Higher Education	6.11%
BBB+ and below	7-12 Yrs	Housing	6.52%
BBB+ and below	7-12 Yrs	Land Backed	6.11%
BBB+ and below	7-12 Yrs	OTHER	6.11%
BBB+ and below	7-12 Yrs	Tobacco	6.11%
BBB+ and below	7-12 Yrs	Transportation	6.11%
BBB+ and below	7-12 Yrs	Utility	6.11%
BBB+ and below	12-22 Yrs	General Obligation	7.30%
BBB+ and below	12-22 Yrs	Health Care	7.30%
BBB+ and below	12-22 Yrs	High Yield	7.30%
BBB+ and below	12-22 Yrs	Higher Education	7.30%
BBB+ and below	12-22 Yrs	Housing	7.30%
BBB+ and below	12-22 Yrs	Land Backed	7.30%
BBB+ and below	12-22 Yrs	OTHER	7.30%
BBB+ and below	12-22 Yrs	Tobacco	7.30%
BBB+ and below	12-22 Yrs	Transportation	7.30%
BBB+ and below	12-22 Yrs	Utility	7.30%
BBB+ and below	22+ Yrs	General Obligation	9.26%
BBB+ and below	22+ Yrs	Health Care	9.26%
BBB+ and below	22+ Yrs	High Yield	9.26%
BBB+ and below	22+ Yrs	Higher Education	9.26%
BBB+ and below	22+ Yrs	Housing	9.26%
BBB+ and below	22+ Yrs	Land Backed	9.26%
BBB+ and below	22+ Yrs	OTHER	9.26%
BBB+ and below	22+ Yrs	Tobacco	9.26%
BBB+ and below	22+ Yrs	Transportation	9.26%
BBB+ and below	22+ Yrs	Utility	9.26%

Appendix D: Bid-Ask Spread Table[23]

Asset	Bucket	Spread
Liquid Equity	Large/Medium capitalization equities	0.0253%
Liquid Equity	Small capitalization equities	0.1125%
Liquid Equity	Micro capitalization equities	0.4119%
Liquid Equity	ETP	0.0155%
Illiquid Equity / IPO	Price <= $0.01	27%
Illiquid Equity / IPO	$0.01 < Price < $1	14%
Illiquid Equity / IPO	$1 <= Price < $5	5%
Illiquid Equity / IPO	Price >= $5	2%
Corporate Bond	All Corporate Bond securities	0.2574%
Municipal Bond	All Municipal Bond securities	0.2392%

[23] Updated Mar 11, 2026.

Appendix E: Other Transaction Codes

Code	Data Group	Description
1	DTC Settlement	DTC BROAD MONEY SETTLEMENT
2	Clearance Cash Adjustment	CLEARANCE CASH ADJUSTMENT
5	ACATS	ACATS INTERFACE REJECTS
8	ACATS	ACATS NEXT DAY SETTLEMENT
11	Envelope	DIVIDEND SETTLEMENT SERV.
12	Envelope	FUNDS ONLY SETTLEMENT
13	Envelope	DSS RECLAMATIONS
16	CNS Reorganizations	CNS REORG MARK - DEBIT
17	CNS Reorganizations	CNS REORG MARK - CREDIT
20	OW	RECAPS CASH ADJUSTMENTS
30	CDS Dividends	DTC CANADIAN DIVIDENDS
31	CDS Dividends	CNS CANADIAN DIVIDENDS
32	CDS Dividends	DSS CANADIAN DIVIDENDS
35	OTHER	OCC COLLATERAL PLEDGE
45	Fees	NASDAQ BX TRAN FEES
46	Fees	NASD REG-FEES
47	Fees	PSA REGULATORY FEES
48	Fees	NSE TRANSACTION FEES
49	Fees	CSE REGULATORY FEES
50	Fees	NYSE REGULATORY FEES
51	Fees	AMEX REGULATORY FEES
52	Fees	NASD REGULATORY FEES
53	Fees	PSE REGULATORY FEES
68	Tax	NYS TRANSFER TAX
70	Tax	NYS QUARTERLY TAX
71	Tax	NYS QUARTERLY TAX REFUND
74	OTHER	CLEARING FUND COUPON INT
80	Fees	NSCC MONTHLY BILLING
81	Floor Broker	NYSE COMMISSION BILLS
83	Fully Paid	FULLY PAID DEBITS

Code	Data Group	Description
84	Fully Paid	FULLY PAID CREDITS
85	Floor Broker	AMEX COMMISSION BILLS
91	OTHER	GCN CHARGES
96	OTHER	OPTIONAL SETTL SERVICE
97	OTHER	SUSPENSE
98	OTHER	PAYMENTS (FUNDS TRANSFER)
101	OTHER	RIO-DTC INTERFACE
111	Insurance	INSURANCE COMMISSIONS
112	Insurance	INSURANCE PREMIUMS
113	Insurance	LICENSING & APPT DETAIL
181	Floor Broker	NYSE COMM BILL CHARGES
185	Floor Broker	AMEX COMM BILL CHARGES
198	OTHER	DTC/CNS CREDITS

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