

APPROVED

by Management Board of NBCI NCC (JSC)
Minutes No. 42 dated 13 September 2018

Chairman of Management Board
of NBCI NCC (JSC)

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**METHODOLOGY FOR CALCULATION
OF STRESS COLLATERAL OF NBCI NCC (JSC)**

**Moscow
2018**

The Methodology describes the procedure for the calculation of the minimum Stress Collateral amount based on the evaluation of Clearing Member's potential losses should possible stress scenarios materialize. Moreover, this document contains the Methodology application regulations, including the time frames and rules for the calculation of Stress Collateral and the procedures for the calculation of risk parameters for accepting assets as Stress Collateral.

Part I. General Provisions

Document Structure

Section 1 of Part II of the Methodology for Calculation of Stress Collateral (hereinafter, the 'Methodology') contains the algorithm for the calculation of the minimum amount of Stress Collateral (hereinafter, 'Stress Collateral amount'). Sub-section 1.2 describes the calculation of the parameter of Clearing member's potential losses should possible stress scenarios materialise.

Section 2 of Part II contains the Methodology application procedure: time frames for the calculation and information disclosure procedures of NBCI NCC (JSC) (hereinafter, the 'Clearing Centre').

Section 3 of Part II describes the calculation of risk parameters for the evaluation of assets accepted as Stress collateral.

Parts III to V of the Methodology contain methods for the calculation of potential losses for the FX and precious metals markets (Part III), derivatives (Part IV) and securities (Part V) markets.

Stress Collateral is not calculated for the commodities and standardised OTC derivatives markets. The Methodology for Calculation of Stress Collateral in the commodities and/or standardised OTC derivatives markets is amended in cases specified in Section 2 of Part II.

Appendix 1 of the Methodology contains a list of variables and designations used.

Terms that are used but not specifically defined in the Methodology have the meaning specified in Clearing Rules and other internal documents of the Clearing Centre.

Abbreviations

CR means Clearing Rules;
Member means Clearing Member;
CC means Clearing Centre.

Part II. General Stress Collateral Calculation Principles

1. The Procedure for the Calculation of Member's Stress Collateral Amount

Member's Stress Collateral amount (FloatREQ) is calculated as the amount of potential losses (ExcessRisk) upon the occurrence of dramatic market fluctuations (sharp price movements) exceeding the amount of the CC's dedicated capital and the amount of the Guarantee Fund in the exchange market (see the flow chart below).

$$\textit{Stress Collateral} = \textit{Potential losses} -$$

$$\begin{aligned} & \text{Member's Guarantee Fund contribution} \\ & \text{CC's dedicated capital} \\ & \text{Guarantee Fund (less Member's contribution)} \end{aligned}$$

1.1. The Algorithm of Stress Collateral Calculation

Step 1. At the end of Settlement Day i , the $ExcessRisk_{i,m}$ parameter is calculated for each Member in accordance with Sub-section 1.2 of the Methodology.

Step 2. The Member's Stress Collateral amount in exchange market m for the period T is calculated using the following formula:

$$FloatREQ_m = MAX \left[0; CVAR_{50\%}^T \left(-ExcessRisk_{i,m} \right) - FixREQ_m - MutBuffer_m \right],$$

and is rounded down with precision $MinStep$, where

$CVAR_{50\%}^T(x_i)$	Function calculating the average over 50% of the highest values of series $x_i, i=1, \dots, T$
$FixREQ_m$	Minimum amount of Member's Guarantee Fund contribution in the respective exchange market as per CR
$MinStep$	Minimum Stress Collateral amount adjustment

while the $MutBuffer_m$ parameter determines the amount of CC and Guarantee Fund resources used for a Defaulting Clearing Member. $MutBuffer_m$ parameter is calculated as follows:

$$MutBuffer_m = \frac{Alfa_m \times (CCPcap_m + FundSize_m - Def_m * FixREQ_m)}{Def_m},$$

where

$Alfa$	Resource usage coefficient
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<i>FundSize</i>	Aggregate amount of the Guarantee Fund in the exchange market, including the maximum aggregate Exchange contribution to the Guarantee Fund that is accounted for each market in proportion to the size of the Guarantee Fund for that market, unless otherwise specified by the Clearing Centre.
<i>FixREQ</i>	Member's Guarantee Fund contribution in the respective exchange market
<i>m</i>	Market designation that takes the following values: 'FX and precious metals markets', 'derivatives market', 'securities and deposit markets'
<i>CCPcap</i>	Dedicated capital of the Clearing Centre for the respective exchange market, including the additional dedicated capital that is accounted for each market in proportion to the size of the dedicated capital for that market, unless otherwise specified by the Clearing Centre.

1.2. Calculation of the *ExcessRisk* Parameter

The calculation of the *ExcessRisk* parameter for each exchange market at the Member level (see the flow chart below) allows identifying potential losses that are uncovered/partially covered by Collateral if stress scenarios S + SCEN materialise. The parameter's general idea is aggregating Member's potential losses (*MtM* parameter) evaluated for the worst scenario (using the re-evaluation vector; see below) and its current Collateral amount (*RiskREQ* parameter).

$$\text{Potential losses (ExcessRisk)} = \text{Losses at position closure (MtM)} - \text{Collateral (RiskREQ)}$$

Besides, the *ExcessRisk* parameter calculation takes into account the specifics of use of assets that are accounted for Member's clients.

1.2.1. General Structure of Recognition of Member's Positions and Collateral

For the purpose of this Methodology, all instruments/claims/liabilities are divided into risk groups (e.g., the same risk group can include RTS index and MOEX index derivatives, US dollar-denominated claims and liabilities with different maturities, etc.). Each position of the Member contains a number of risk groups (RG). The Clearing Centre calculates the *RiskREQ* parameter for each risk group (see Section 1.2.2). The position and corresponding risk groups are identified by the Position Account (PA).

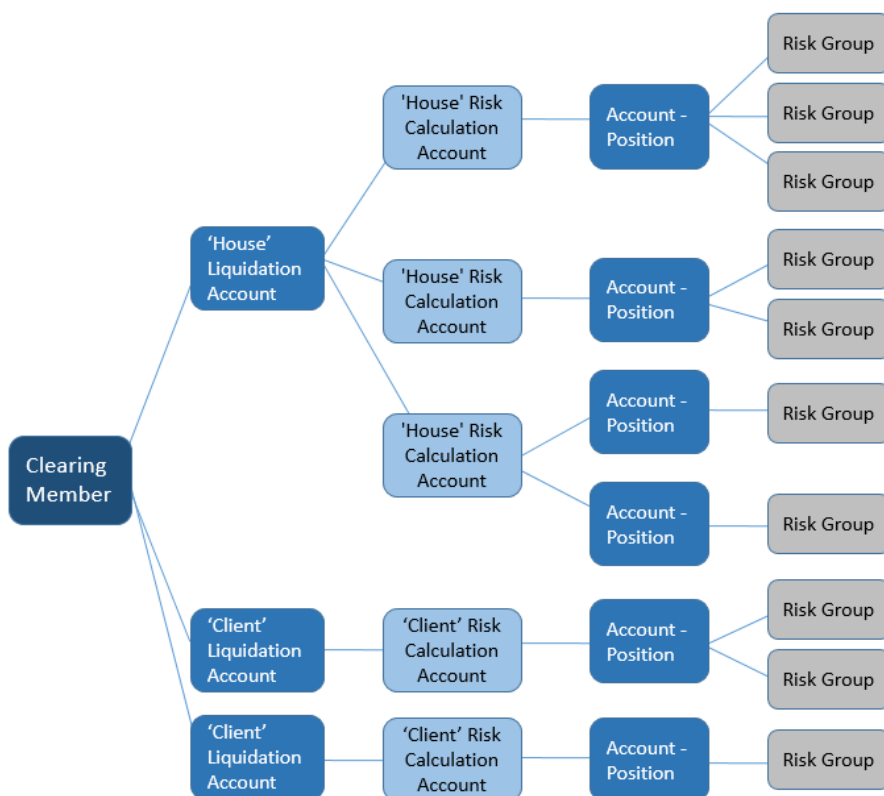
Several Position Accounts are aggregated into a Risk Calculation Account (RCA) for the separate monitoring of adequacy of Collateral over Member’s own positions (‘House’) and its clients’ positions (‘Client’).

This Methodology uses the term Liquidation Account (LA) to denote the aggregate Risk Calculation Accounts.

A single ‘House’ Liquidation Account aggregates all proprietary Risk Calculation Accounts of the Member.

Each ‘Client’ Liquidation Account corresponds to a single client Risk Calculation Account.

For instance, a Member can have the following account structure:



A more detailed description of position and Collateral accounting structure for each exchange market is provided in Parts III to V.

1.2.2. Calculation of the *RiskREQ* Parameter

For each risk group included in the Member’s position, for S scenarios (collateral rates determined in accordance with the Methodology for the Calculation of Risk Parameters for the Securities and Deposit Markets, the Methodology for the Calculation of Risk Parameters for the FX and Precious Metals Markets, and the Methodology for the Calculation of Risk Parameters for the Derivatives Market) the Collateral amount required as per CR

(parameter $RiskREQ(S,PA,RG)$) is determined and recognised at the Position Account level.

The required Collateral amount is aggregated at the Liquidation Account level broken down by risk groups (parameter $RiskREQ(S,LA,RG)$) using a simple summation of Position Accounts comprising the Liquidation Account.

$$RiskREQ(S, LA, RG) = \sum_{PA \in LA} RiskREQ(S, PA, RG) ,$$

where

S	Collateral rates
$RiskREQ(S,PA, RG)$	Collateral amount for the risk group RG recognised in the Position Account PA
$RiskREQ(S,LA, RG)$	Collateral amount for the risk group RG recognised in the Liquidation Account LA

1.2.3. Determining Potential Losses at Position Closure

For the purpose of this clause, an instrument means a derivative contract or a claim/liability under an asset. At the Liquidation Account level, the net position for each instrument ($RiskPOS(LA)$) is determined.

Afterwards, the potential re-evaluation vector ($MtM(S+SCEN,LA, RG)$) is determined for the corresponding set of scenarios $s \in S + SCEN$ at the Liquidation Account level broken down by risk groups

$$MtM(s, LA, RG) = \sum_{Instr \in RG} \Delta P(s, Instr) * RiskPOS(LA, Instr) ,$$

where

$\Delta P(s, Instr)$	Change in price of instrument $Instr$ from risk group RG upon occurrence of scenario $s \in S + SCEN$
$RiskPOS(LA, Instr)$	Net position in instrument $Instr$ at the Liquidation Account level (including covered sales in the FX and precious metals markets as well as in the securities and deposit markets)

For each risk group, the worst scenario (Worst(RG)) is identified

$$Worst = \arg \min_{s \in S + SCEN} \left[\begin{array}{l} MtM(s, Own, RG) + RiskREQ(S, Own, RG) \\ + \sum_{LA=Client} (MtM(s, LA, RG) + RiskREQ(S, LA, RG))^- \end{array} \right],$$

where

$\arg \min_x [f(x)]$	Function selecting the worst scenario depending on CC's potential losses
$(x)^-$	Short notation for function $\min[0, x]$

The expression in square brackets determines the amount of CC's potential losses not counting the Collateral of Member's clients that will not suffer losses if the stress scenario materialises. The Collateral of such clients is not used by the CC to cover losses in proprietary Member's accounts and in other client accounts.

1.2.4. Aggregation of Collateral and Potential Losses

To calculate *ExcessRisk*, potential losses under the worst scenario for each risk group are aggregated

$$ExcessRisk = \sum_{RG} \left[\begin{array}{l} MtM(Worst, Own, RG) + RiskREQ(S, Own, RG) \\ + \sum_{LA=Client} (MtM(Worst, LA, RG) + RiskREQ(S, LA, RG))^- \end{array} \right],$$

where

$MtM(Worst, LA, RG)$	Potential losses under the worst scenario for risk group (see 2.2.3) as per Liquidation Account.
$RiskREQ(S, LA, RG)$	Collateral amount (see 2.2.2) as per Liquidation Account

2. Methodology Application Procedure

In accordance with the Methodology, on every Settlement Day the CC calculates *ExcessRisk* for each Member in each exchange market.

Standard dates, for which the amount of Stress Collateral is calculated for maintaining claims, are defined as each Tuesday or the nearest Settlement Day after Tuesday, if that Tuesday is not a Settlement Day.

The CC can decide to change the standard date or to settle on the date which is not standard.

The period for Stress Collateral calculation (parameter *T*) is equal to the number of Settlement Days from the day when the Collateral amount was last calculated, but must not be shorter than three Settlement Days.

If the total amount of deals in the commodities market in the ruble equivalent at the end of the calendar year exceeds one trillion Russian rubles, the CC will make amendments to the Methodology for Calculation of Stress Collateral in the commodities market during the next calendar year.

If the total amount of deals in the standardised OTC derivatives market in the ruble equivalent at the end of the calendar year exceeds one trillion Russian rubles, the CC will make amendments to the Methodology for Calculation of Stress Collateral in the Standardised OTC Derivatives Market during the next calendar year.

3. Calculation of Risk Parameters to Accept Assets as Stress Collateral

In accordance with the Methodology for the Calculation of Risk Parameters for the Securities and Deposit Markets and the Methodology for the Calculation of Risk Parameters for the FX and Precious Metals Markets, on every Settlement Day the CC calculates the Lower limits of market risk value range for each asset accepted as Stress Collateral. Lower limits of market risk value range are applied to evaluate assets accepted as Stress Collateral in line with the CR.

For each asset, instead of Collateral Rates, level 1, 2 and 3 Stress Collateral Rates (*S1_stress*, *S2_stress*, *S3_stress*) are used, which are determined for each level *i* using the following formula:

$$S_{i_stress} = S_{i} + Stress_asset$$

where *S_i* is level *i* Stress Collateral Rate (*i*=1,2,3). The *Stress_asset* parameter is set by decision of the CC for each asset accepted as Stress Collateral and is published on the CC's website.

Part III. The Procedure for the Calculation of Excess Risk for the FX and Precious Metals Markets

For each Member, the *ExcessRisk* parameter is calculated at the end of Settlement Day *i* using the following algorithm:

Step 1. For each Settlement Code (Position Account) for each asset the following value is calculated:

$$RiskPOS^{PK}_{instr} = 3HAK(POS_{PK}) * MAX[POS_{PK}; 0; -(POS_{PK} + DEPO_{PK})],$$

where

POS_{PK} is net obligation and/or net claim for asset *instr* under Settlement Code (taking the sign into account) with provision for the value of POS(Market, Account) determined in accordance with Appendix 2.

DEPO_{PK} is Collateral for asset *instr* under Settlement Code with provision for the value of COL(Market, Account) determined in accordance with Appendix 2.

Note: From here on, sub- and super-indices are omitted for shortness.

Step 2. S(Val) is calculated for each asset under each Settlement Code.

S(Val) for Val>0 takes the following form:

$$S(Val) = \frac{1}{Val} \times \left(\begin{array}{l} MIN[LK1; Val] \times S_{-1} + \\ + MIN[LK2 - LK1; MAX[Val - LK1; 0]] \times S_{-2} + \\ + MAX[Val - LK2; 0] \times S_{-3} \end{array} \right),$$

where

S₋₁, S₋₂, S₋₃ are level 1, 2 and 3 Market Risk Rates;

LK1, LK2 are level 1 and 2 Concentration Limits.

For Val=0, S(Val) equals 0. For Val<0, S(Val) equals S(-Val).

Step 3. The value of parameter *RiskREQ(S, PA, RG)* is calculated:

1) For a risk group consisting of a single asset, using the following formula:

$$RiskREQ(S, PA, RG) = abs(RiskPOS) \times S(RiskPOS) \times P$$

where P is the calculated asset price.

2) For a risk group consisting of N assets A1, ..., AN, using the following algorithm:

Note: A risk group can be represented as a K-level tree with J(k) nodes at each level with $J(1) \geq J(2) \geq \dots \geq J(K) = 1$. For each tree level there is a group/supergroup of interproduct spread and parameter Skidka(j,k) (k=1,...,K, j=1,...,J(k)).

Afterwards, the algorithm calculates the final discount of interproduct spread for the risk group starting from the lowest tree level (k=1). We denote the link between k-1 level nodes with k level nodes as $j(k-1) \subset j(k)$. We consider assets A1, ..., AN as zero level nodes j(0) with J(0)=N.

a. We calculate auxiliary values for level 0:

$$\begin{aligned} Risk(n,0) &= \\ &= abs(RiskPOS(An) \times S(RiskPOS(An)) \times P(An)), \\ Sign(n,0) &= 3HAK(RiskPOS(An)), n = 1, \dots, J(0), \\ RiskSkidka(n,0) &= 0. \end{aligned}$$

b. The loop on k (tree levels) starting from k=1 (tree level 2):

c. The loop on j(k) – k level nodes:

d. The loop on j(k-1) – k-1 level nodes:

i. We calculate auxiliary values for the j(k) node if $j(k-1) \subset j(k)$:

If $Sign(j, k-1) \geq 0$, then

$$RiskLong(j, k) = RiskLong(j, k) + Risk(j, k-1).$$

Otherwise

$$RiskShort(j, k) = RiskShort(j, k) + Risk(j, k-1).$$

ii. We aggregate discounts from the previous tree level:

$$RiskSkidka(j, k) = RiskSkidka(j, k) + RiskSkidka(j, k-1)$$

e. End of j(k-1) loop.

f. We calculate auxiliary values for the j(k) node:

$$Risk(j, k) = abs(RiskLong(j, k) - RiskShort(j, k)),$$

$$Sign(j, k) = 3HAK(RiskLong(j, k) - RiskShort(j, k)),$$

$$\begin{aligned} RiskSkidka(j, k) &= RiskSkidka(j, k) + \\ &+ 2 \times Skidka(j, k) \times MIN(RiskLong(j, k), RiskShort(j, k)). \end{aligned}$$

g. End of j(k) loop.

h. End of k loop.

- i. The final value of $RiskREQ(S, PA, RG)$ for the risk group is the total of values $Risk(n, 0)$ less the value of $RiskSkidk(j, k)$ for the single node (j=1) at the top level (k=K).

Step 4. The value of parameter $RiskREQ(S, LA, RG)$ is calculated using the following formula:

$$RiskREQ(S, LA, RG) = \sum_{PA \in LA} RiskREQ(S, PA, RG)$$

Note: The 'House' Liquidation Account aggregates all proprietary Settlement Codes of the Member. Each 'Client' Liquidation Account corresponds to a single client Settlement Code or Trust Settlement Code of the Member.

Step 5. To calculate the components of vector $MtM(S+SCEN, LA, RG)$ for each asset:

- 1) We calculate the auxiliary value:

$$Exposure = \sum_{LA=Own} RiskPOS(LA) + \sum_{LA=Client} RiskPOS(LA), \text{ where}$$

RiskPOS(LA) is net obligation and/or net claim for the asset under the liquidation account (with the provision for covered sales as per the formula in Step 1).

- 2) We calculate values of the main stress scenarios:

$$UP = SCEN(-abs(Exposure)),$$

$$DOWN = SCEN(abs(Exposure)).$$

SCEN(Val) for Val>0 takes the following form:

$$SCEN(Val) = \frac{1}{Val} \times \left(\begin{array}{l} MIN[LK1; Val] \times (S_1 + Scen_DOWN) + \\ MIN[LK2 - LK1; MAX[Val - LK1; 0]] \times (S_2 + Scen_DOWN) + \\ MAX[Val - LK2; 0] \times (S_3 + Scen_DOWN) \end{array} \right)$$

where Scen_DOWN is the excess over Collateral Rates that defines stress scenarios.

For Val=0, SCEN(Val) equals 0. For Val<0, SCEN(Val) is considered equal to SCEN(-Val) with Scen_DOWN changed to Scen_UP.

Step 6. Vector $MtM(S+SCEN, LA, RG)$ in the FX and precious metals markets is calculated as follows:

- 1) For each risk group that consists of a single asset, for each Liquidation Account the vector comprises two components (scenarios):

$$\left. \begin{array}{l} \{DownScenario\} \\ \{UpScenario\} \end{array} \right\} = \left. \begin{array}{l} \{-RiskPOS(LA) \times MIN(100\%;DOWN) \times P\} \\ \{RiskPOS(LA) \times UP \times P\} \end{array} \right\} .$$

2) For each risk group consisting of N assets A1, ..., AN, using the following algorithm:

Note: The hierarchy and its designations similar to those in Step 3 are used.

- a. We further assume that the discount for the risk group $Skidka(RG)$ is equal to the value of parameter $Skidka(1, K)$.
- b. Assets for which the Exposure parameter is positive are further considered assets of type Long while other assets are considered those of type Short.
- c. For assets of types Long and Short, we calculate auxiliary values using formulas specified in Part III Step 6 (clause 2.a) for assets, respectively, A1 and A2 (Long->A1, Short->A2).
- d. Vector $MtM(S+SCEN, LA, RG)$ is calculated as follows:

$$\left. \begin{array}{l} \{DownDownScenario\} \\ \{UpDownScenario\} \\ \{DownUpScenario\} \\ \{UpUpScenario\} \end{array} \right\} = \left. \begin{array}{l} \left[\sum_{A \in Long} DD(A) + \sum_{A \in Short} DD(A) \right] \\ \left[\sum_{A \in Long} UD(A) + \sum_{A \in Short} UD(A) \right] \\ \left[\sum_{A \in Long} DU(A) + \sum_{A \in Short} DU(A) \right] \\ \left[\sum_{A \in Long} UU(A) + \sum_{A \in Short} UU(A) \right] \end{array} \right\}$$

Step 7. To each component of vector $MtM(S + SCEN, LA, RG)$ we add value $Risk(S, LA, RG)$ (calculated during Step 4) and use the formulae from section 1.2.4 of the Methodology to calculate the *ExcessRisk* value.

Part IV. The Procedure for the Calculation of Excess Risk for the Derivatives Market

For each Member, the *ExcessRisk* parameter is calculated at the end of Settlement Day i using the following algorithm:

$RiskREQ(S, PA, RG)$ is calculated for each Settlement Code (Risk Calculation Account) for each risk group (instruments based on the same underlying asset and/or instruments comprising spread groups) in accordance with the Collateral Calculation Principles.

Collateral Rates S for the underlying asset in the derivatives market are represented by level 1, 2 and 3 Minimum Restriction Levels of Collateral Rates MR1, MR2 MR3.

The value $RiskREQ(S, PA, RG)$ for each risk group using settlement codes of the Unified Pool is calculated with the provision for covered sales using the values determined as per Appendix 2.

Step 1. For each Liquidation Account, we calculate $RiskREQ(S, LA, RG)$ for each risk group:

$$RiskREQ(S, LA, RG) = \sum_{PA \in LA} RiskREQ(S, PA, RG)$$

Note: The ‘House’ Liquidation Account aggregates all proprietary Settlement Codes of the Member. Each ‘Client’ Liquidation Account corresponds to a single Settlement Code (Risk Calculation Account) with associated Client Sub-accounts Clusters, or a Segregated Sub-accounts Cluster, or a Trust Sub-accounts Cluster of the Member.

Step 2. For each Liquidation Account, we calculate the net position Val for each instrument in each risk group.

Step 3. Potential losses vector $MtM(S + SCEN, LA, RG)$ for scenarios $S + SCEN$ for each Liquidation Account and each group is calculated for *RiskPOS* positions.

It should be noted that, to calculate vector's components, instead of S (Collateral Rate) for each underlying asset we use $MR1+SCEN=[S-Scen_DOWN, \dots, S+Scen_UP]$, where $Scen_UP/Scen_DOWN$ is the excess over Collateral Rates when the price moves up/down defining stress scenarios, as well as $MR2D+SCEN$, $MR3D+SCEN$, $MR2U+SCEN$, $MR3U+SCEN$.

Step 4. To each component of vector $MtM(S + SCEN, LA, RG)$ we add value $RiskREQ(S, LA, RG)$ and use the formulae from section 1.2.4 of the Methodology to calculate the *ExcessRisk* value.

Part V. The Procedure for the Calculation of ExcessRisk for the Securities Market

For each Member, the *ExcessRisk* parameter is calculated at the end of Settlement Day *i* using the following algorithm:

Step 1. For each Position Account (Collateral Accounts in each foreign currency and Securities Sub-accounts) for each risk group (foreign currency or security) we calculate the following value:

$$RiskPOS^{PA} = 3HAK(POS_{PA}) * MAX[POS_{PA}; 0; -(POS_{PA} + DEPO_{PA})],$$

where

POS_{PA} is net obligation and/or net claim for asset under Position Account (taking the sign into account) with provision for the value of POS(Market, Account) determined in accordance with Appendix 2.

$DEPO_{PA}$ is Collateral for asset under Position Account with provision for the value of COL(Market, Account) determined in accordance with Appendix 2.

Note: From here on, sub- and super-indices are omitted for shortness.

Step 2. $S(Val)$ is calculated for each asset under each position account.

$S(Val)$ for $Val > 0$ takes the following form:

$$S(Val) = \frac{1}{Val} \times \left(\begin{array}{l} MIN[LK1; Val] \times S_{-1} + \\ + MIN[LK2 - LK1; MAX[Val - LK1; 0]] \times S_{-2} + \\ + MAX[Val - LK2; 0] \times S_{-3} \end{array} \right),$$

where S_{-1} , S_{-2} , S_{-3} are level 1, 2 and 3 Market Risk Rates;

$LK1$, $LK2$ are level 1 and 2 Concentration Limits.

For $Val=0$, $S(Val)$ equals 0. For $Val < 0$, $S(Val)$ equals $S(-Val)$.

Step 3. The value of parameter $RiskREQ(S, PA, RG)$ is calculated:

3) For a risk group consisting of a single asset, using the following formula:

$$RiskREQ(S, PA, RG) = abs(RiskPOS) \times S(RiskPOS) \times P$$

where P is the calculated asset price.

4) For a risk group consisting of N assets $A1, \dots, AN$, using the following algorithm:

Note: A risk group can be represented as a K-level tree with $J(k)$ nodes at each level with $J(1) \geq J(2) \geq \dots \geq J(K) = 1$. For each tree level there is a group/supergroup of interproduct spread and parameter $Skidka(j,k)$ ($k=1, \dots, K, j=1, \dots, J(k)$).

Afterwards, the algorithm calculates the final discount of interproduct spread for the risk group starting from the lowest tree level ($k=1$). We denote the link between $k-1$ level nodes with k level nodes as $j^{(k-1)} \subset j^{(k)}$. We consider assets $A1, \dots, AN$ as zero level nodes $j(0)$ with $J(0)=N$.

j. We calculate auxiliary values for level 0:

$$\begin{aligned} Risk(n,0) &= \\ &= abs(RiskPOS(An)) \times S(RiskPOS(An)) \times P(An), \\ Sign(n,0) &= 3HAK(RiskPOS(An)), n = 1, \dots, J(0), \\ RiskSkidka(n,0) &= 0. \end{aligned}$$

k. The loop on k (tree levels) starting from $k=1$ (tree level 2):

l. The loop on $j(k) - k$ level nodes:

m. The loop on $j(k-1) - k-1$ level nodes:

iii. We calculate auxiliary values for the $j(k)$ node if $j^{(k-1)} \subset j^{(k)}$:

If $Sign(j, k-1) \geq 0$, then

$$RiskLong(j, k) = RiskLong(j, k) + Risk(j, k-1).$$

Otherwise

$$RiskShort(j, k) = RiskShort(j, k) + Risk(j, k-1).$$

iv. We aggregate discounts from the previous tree level:

$$RiskSkidka(j, k) = RiskSkidka(j, k) + RiskSkidka(j, k-1)$$

n. End of $j(k-1)$ loop.

o. We calculate auxiliary values for the $j(k)$ node:

$$Risk(j, k) = abs(RiskLong(j, k) - RiskShort(j, k)),$$

$$Sign(j, k) = 3HAK(RiskLong(j, k) - RiskShort(j, k)),$$

$$\begin{aligned} RiskSkidka(j, k) &= RiskSkidka(j, k) + \\ &+ 2 \times Skidka(j, k) \times MIN(RiskLong(j, k), RiskShort(j, k)). \end{aligned}$$

- p. End of j(k) loop.
- q. End of k loop.
- r. The final value of $RiskREQ(S, PA, RG)$ for the risk group is the total of values $Risk(n,0)$ less the value of $RiskSkidka(j,k)$ for the single node (j=1) at the top level (k=K).

Step 4. The value of parameter $RiskREQ(S, LA, RG)$ is calculated using the following formula:

$$RiskREQ(S, LA, RG) = \sum_{PA \in LA} RiskREQ(S, PA, RG)$$

Note: The 'House' Liquidation Account aggregates all proprietary Settlement Codes of the Member and all associated Sub-accounts. Each 'Client' Liquidation Account corresponds to a single client Settlement Code or Trust Settlement Code of the Member and all associated Sub-accounts.

Step 5. To calculate the components of vector MtM(S+SCEN,LA, RG) for each asset the following values are calculated:

- 1) We calculate the auxiliary value:

$$Exposure = \sum_{LA=Own} RiskPOS(LA) + \sum_{LA=Client} RiskPOS(LA),$$

where

RiskPOS(LA) is net obligation and/or net claim for the asset under the liquidation account (with the provision for covered sales as per the formula in Step 1).

- 2) We calculate values of the main stress scenarios:

$$UP = SCEN(-abs(Exposure)),$$

$$DOWN = SCEN(abs(Exposure)).$$

SCEN(Val) for Val>0 takes the following form:

$$SCEN(Val) = \frac{1}{Val} \times \left(\begin{array}{l} MIN[LK1;Val] \times (S_1 + Scen_DOWN) + \\ MIN[LK2 - LK1; MAX[Val - LK1; 0]] \times (S_2 + Scen_DOWN) + \\ MAX[Val - LK2; 0] \times (S_3 + Scen_DOWN) \end{array} \right)$$

where Scen_DOWN is the excess over Collateral Rates that defines stress scenarios.

For Val=0, SCEN(Val) equals 0. For Val<0, SCEN(Val) is considered equal to SCEN(-Val) with Scen_DOWN changed to Scen_UP.

Step 6. Vector $MtM(S+SCEN,LA, RG)$ in the securities market is calculated as follows:

- 1) For each risk group that consists of a single asset, for each Liquidation Account the vector comprises two components (scenarios):

$$\left\{ \begin{array}{l} DownScenario \\ UpScenario \end{array} \right\} = \left\{ \begin{array}{l} -RiskPOS(LA) \times MIN(100\%; DOWN) \times P \\ RiskPOS(LA) \times UP \times P \end{array} \right\} .$$

- 2) For each risk group consisting of N assets $A1, \dots, AN$, using the following algorithm:

Note: The hierarchy and its designations similar to those in Step 3 are used.

- e. We further assume that the discount for the risk group $Skidka(RG)$ is equal to the value of parameter $Skidka(1, K)$.
- f. Assets for which the Exposure parameter is positive are further considered assets of type Long while other assets are considered those of type Short.
- g. For assets of types Long and Short, we calculate auxiliary values using formulas specified in Part III Step 6 (clause 2.a) for assets, respectively, $A1$ and $A2$ (Long-> $A1$, Short-> $A2$).
- h. Vector $MtM(S+SCEN,LA, RG)$ is calculated as follows:

$$\left\{ \begin{array}{l} DownDownScenario \\ UpDownScenario \\ DownUpScenario \\ UpUpScenario \end{array} \right\} = \left\{ \begin{array}{l} \left[\sum_{A \in Long} DD(A) + \sum_{A \in Short} DD(A) \right] \\ \left[\sum_{A \in Long} UD(A) + \sum_{A \in Short} UD(A) \right] \\ \left[\sum_{A \in Long} DU(A) + \sum_{A \in Short} DU(A) \right] \\ \left[\sum_{A \in Long} UU(A) + \sum_{A \in Short} UU(A) \right] \end{array} \right\}$$

Step 7. To each component of vector $MtM(S + SCEN, LA, RG)$ we add value $RiskREQ(S, LA, RG)$ and use the formulae from section 1.2.4 of the Methodology to calculate the *ExcessRisk* value.

List of Parameters

Values of the following parameters are set by the Clearing Centre for each exchange market, disclosed on the Clearing Centre's website and reviewed at least on a quarterly basis:

Parameters	Designation
The number of Clearing Members who simultaneously (on the same Settlement Day) default on their Margin Calls and/or Stress Collateral Margin Calls and/or Funds Margin Calls when a stress scenario materialises	<i>Def</i>
Parameters defining the set of stress scenarios for the asset <i>instr</i>	<i>Scen _ UP_{instr}</i> , <i>Scen _ DOWN_{instr}</i>
Guarantee Fund usage coefficient	<i>Alfa</i>
Minimum Stress Collateral amount adjustment	<i>MinStep</i>

Parameters calculated based on values specified in the Clearing Rules:

Parameters	Designation
The amount of Clearing Centre's funds dedicated for the corresponding exchange market. Includes the dedicated capital of the Clearing Centre for the respective exchange market and the additional dedicated capital that is accounted for each market in proportion to the size of the dedicated capital for that market.	<i>CCPcap</i>
The minimum amount of Clearing Member's contribution to the Guarantee Fund as set in the Clearing Rules for the respective exchange market	<i>FixREQ</i>

The Algorithm for the Recognition of Asset Profiles for Settlement Codes of the Unified Pool for the Purpose of Stress Collateral Calculation

For each Settlement Code of the Unified Pool for each asset where the transfer of asset profile is available, position and collateral adjustments on markets included in the Unified Pool’s scope of application are performed in accordance with the following algorithm:

Step 1. In order to describe the algorithm, we introduce the following terms:

$Profile(In, Out, Account)$ is the amount of the asset profile transferred from the Out market to the In market (with the provision for the sign) recognised in the Account included in the Settlement Code of the Unified Pool.

Note: in the derivatives market, the asset profile transfer is recognised as a position in a technical instrument similar to a futures contract with the ‘today’ maturity date. In the FX market, the profile transfer is recognised as collateral. In the securities market, the profile transfer is recognised separately from positions and collateral in the context of In markets. The Out market for the derivatives and FX markets can only be equal to the securities market: FX ↔ Securities ↔ Derivatives.

$COL(In, Account)$ is collateral amount in the In market recognised in the Account included in the Settlement Code of the Unified Pool. This value is always 0 for the accounts in the derivatives and FX markets.

$COL(Market, Account)$ is the position in the asset on the account and the partial position in the asset profile transfer that will be recognised as collateral upon the algorithm completion.

$POS(Market, Account)$ is the position in the asset on the account and the partial position in the asset profile transfer that will be recognised as position upon the algorithm completion.

Step 2. We calculate auxiliary values required to determine the asset amount that can be transferred between markets.

- 1) Accounts where the below two conditions are fulfilled are designated ‘asset donor accounts’:

$$COL(In, Account) > 0;$$

$$\sum_{Out} Profile(In, Out, Account) < 0$$

Note: Due to the fact that collateral is only recognised on accounts of the Unified Pool in the securities market, only securities market accounts can be donor accounts. If no account fulfills the above requirements, the donor account set is considered empty.

- 2) We calculate the amount of assets transferred from each donor account:

$$COL_OUT(\text{Market}, \text{Account}) = \min \left[COL(\text{In}, \text{Account}); - \sum_{\text{Out}} Profile(\text{In}, \text{Out}, \text{Account}) \right]$$

Step 3. We distribute the aggregate amount of transferred assets across markets:

- 1) Accounts where the below condition is fulfilled are designated 'asset recipient accounts':

$$\sum_{\text{Out}} Profile(\text{In}, \text{Out}, \text{Account}) > 0$$

- 2) We calculate the aggregate amount of asset profiles received by recipient accounts of the current Settlement Code in all markets:

$$Total(PK) = \sum_{\text{In}} \sum_{\text{Реципиенты}} \sum_{\text{Out}} Profile(\text{In}, \text{Out}, \text{Account})$$

- 3) We calculate the collateral distributed by transferring profiles:

$$COL_OUT(PK) = \sum_{\text{In}} \sum_{\text{Доноры}} COL_OUT(\text{Market}, \text{Account})$$

Note: the collateral for Unified Pool accounts is recognised only in the securities market, therefore value $COL_OUT(\text{Market}, \text{Account})$ for the FX and derivatives markets is always 0.

- 4) We calculate the received amount of assets for each recipient account:

$$COL_IN(\text{Market}, \text{Account}) = \sum_{\text{Out}} Profile(\text{In}, \text{Out}, \text{Account}) \cdot \frac{COL_OUT(PK)}{Total(PK)}$$

Note: the value of ratio $COL_OUT(PK)/Total(PK)$ cannot exceed 1 as the outflow of donors minimised to the available asset amount cannot exceed the inflow of recipients.

Step 4. Final values are calculated using auxiliary values:

- 1) We calculate final values for donor accounts as follows:

$$COL(\text{Market}, \text{Account}) = COL(\text{In}, \text{Account}) - COL_OUT(\text{Market}, \text{Account})$$

$$POS(\text{Market}, \text{Account}) = \sum_{\text{Out}} Profile(\text{In}, \text{Out}, \text{Account}) + COL_OUT(\text{Market}, \text{Account})$$

- 2) We calculate final values for recipient accounts as follows:

$$COL(\text{Market}, \text{Account}) = \max[0; COL(\text{In}, \text{Account}) + COL_IN(\text{Market}, \text{Account})]$$

$$\begin{aligned}
POS(\text{Market}, \text{Account}) &= \\
&= \sum_{\text{Out}} Pr\ ofile(\text{In}, \text{Out}, \text{Account}) + \\
&+ \min[0; COL(\text{In}, \text{Account}) + COL_IN(\text{Market}, \text{Account})] - COL_IN(\text{Market}, \text{Account})
\end{aligned}$$

3) We calculate final values for other accounts as follows:

$$\begin{aligned}
COL(\text{Market}, \text{Account}) &= \max[0; COL(\text{In}, \text{Account})] \\
POS(\text{Market}, \text{Account}) &= \sum_{\text{Out}} Pr\ ofile(\text{In}, \text{Out}, \text{Account}) + \min[0; COL(\text{In}, \text{Account})]
\end{aligned}$$

Step 4. Final values POS and COL are used in the algorithm as follows:

- POS value is added to the net position under the Settlement Code.
- COL value is used instead of DEPO under the Settlement Code.