APPROVED
Executive Board

CCP NCC
10 September 2020

(Minutes No. 40)

____
Eddie Astanin
CEO
CCP NCC
L.S.

RISK METHODOLOGY

IN STANDARDIZED OTC DERIVATIVES MARKET

CONTENT

1 General provisions

This risk methodology applied on the Standardized OTC Derivatives Market (hereinafter the Methodology) has been designed in accordance with the Clearing Center's Clearing Rules for the market (hereinafter the Clearing Rules) to set out the procedure for evaluation of risk parameters used by the Clearing Center to monitor and manage risks.

The Methodology is published on the Clearing Center's website.

The Methodology uses the following terms and definitions:

Variation margin – the term used herein for variation margin for exchange-traded financial instruments and deposit margin for OTC instruments.

Contract – a standartised OTC derivative contract.

Clearing Center – Central Counterparty National Clearing Centre Closed joint-stock **company (NCC).**

Vanna – Volga (VV) Method – an approach for constructing implied volatility curves (using the Black-Scholes formula) based on quotes of three instruments: ATM Straddle, Risk Reversal and Butterfly, with a fixed time to expiration.

Shift-Twist-Butterfly model – a model for evaluation of the initial margin requirement by using three base scenarios for interest rate curves shifts.

Portfolio – totality of outstanding Contracts concluded by certain Clearing Member.

Pool – the Contract parameter defining the currency of the CSA, i.e. the variation margin currency: RUB, USD, EUR or CHF.

NPV – the value of a Contract or a Portfolio of Contracts as determined in accordance with Section 3 below.

Any terms not specifically defined herein shall have the meanings ascribed to them by the Clearing Rules, Specifications, and regulatory acts of the Bank of Russia.

For the purposes of admission of non-residents to the clearing service, the international credit rating is set at the level of Russia's sovereign rating lowered by two notches.

2 Collateral sufficiency

Collateral is considered to be sufficient if the clearing member's position security level is non-negative:

Position security level=collateral value – IM requirement ≥ 0, where collateral value and IM requirement are values determined in paragraphs in 2.1 and 2.2 below, respectively.

2.1 Collateral evaluation

Collateral is assessed as follows:

$$\text{Collateral assessment} = \sum_{FX_j} \text{Funds}_{FX_j} \times X_{FX_j/RUB} + \text{Risk Netting},$$

where:

Funds_{FX_j} – the clearing member's collateral (collateral assets and asset profiles transferred) in currency FX_j which is recorded on the relevant settlement codes;

RiskNetting – the component related to netting between exchange risk and collateral as determined in paragraph 2.3.1.4 below;

$X_{FX_j/RUB}$ – exchange rates determined in paragraph 3 below.

2.2 Margin requirement calculation

The size of the Initial Margin Requirement is determined as follows:

$$\text{Margin Requirement} = \text{Initial Margin} - \text{Mark-to-Market position},$$

where:

Initial Margin – part of the margin requirements that covers costs which the Clearing Center may incur as a result of the default management process and termination of clearing service for the member;
Mark-to-market position – part of the margin requirements that covers adjusted NPV of the Clearing Member's Portfolio:

$$Mark - to - market\ position = \sum_{FX_j} (NPV_{FX_j} - VM_{FX_j}) \times X_{FX_j/RUB},$$

where

NPV_{FX_j} – the sum of NPVs of Contracts from the relevant FX_j pool, where FX_j is one of the following currencies: RUB, USD, EUR or CHF.
Accumulated VM_{FX_j} – the total Variation Margin paid/received for the Contracts of the relevant FX_j pool.

If an active Order has an active matching order, the Margin Requirement is determined as follows:

$$\text{Margin Requirement} = \text{Margin Requirement}(P + Order),$$

Where
P – the Portfolio of the Clearing Member.

If a matching order is not found, the margin requirement remains unchanged.

2.3 Initial Margin Calculation

Portfolio Initial Margin (IM) is calculated to secure variation margin which may take place in future, as well as to secure potential costs which the Clearing Center may incur carrying out the default management process.

The IM consists of the following components:

1. Market risk (*MarketRisk*)
   a. Interest rate risk

i. Shift-Twist-Butterfly factor model,
ii. Correction for errors in the Shift-Twist-Butterfly model,
iii. Correction for errors in the interest rate model,

b. Currency risk,
c. Volatility risk.

2. Liquidity risk (*LiquidityRisk*),

Thus, Initial Margin can be defined as a sum of components:

$$IM = IM[MarketRisk] + IM[LiquidityRisk]$$

2.3.1 Market risk

2.3.1.1 Risk factors

Risk factors are values that specify the movement of the instrument's NPV in the model described in Section 4.

The following risk factors are included into the model:

1. Exchange rates of foreign currencies to RUB $X_{FXj/RUB}$:
   a. USD/RUB : $X_{USD/RUB}$,
   b. EUR/RUB: $X_{EUR/RUB}$,
   c. CHF/RUB: $X_{CHF/RUB}$

2. Interest rate curves (IR):

   a. OIS RUONIA curve
   b. Mosprime curve
   c. Rusfar 3m curve
   d. XCCY_Adjusted curve
   e. Rusfar curve
   f. KeyRate curve
   g. USD LIBORcurve
   h. EURIBOR curve
   i. CHF LIBOR curve
   j. OIS SOFR curve
   k. OIS ESTR curve
   l. OIS SARON curve

3. Curves of the term structure of volatility:
   a. ATM straddle volatility,
   b. Risk reversal volatility,
   c. Butterfly volatility.

Thus, the risk factor space consists of

- FX rates $X_{\frac{USD}{RUB}}, X_{\frac{EUR}{RUB}}, X_{\frac{CHF}{RUB}}$;
- Interest rate curves: $IR_i = \left(IR_i^j\right),\ i =$ $\mathrm{RUONIA}, Mosprime, Rusfar\ 3m, XCCY_{Adjusted}, Rusfar, KeyRate, USD\ LIBOR, SOFR,$

$EURIBOR,\ ESTR, CHF\ LIBOR, SARON$;

- Volatility curves: $FXVL_i = (FXVL_i^j)$, i= ATM Straddle $USD/\ RUB$, Risk Reversal $USD/\ RUB$, Butterfly $USD/\ RUB$; where index j runs over "liquidity points" of each curve (the array of key maturities: O/N, 1W, 2W, 1M, 2M, 3M, 6M, 9M, 1Y, 2Y, 3Y, 4Y, 5Y, 6Y, 7Y, 8Y, 9Y, 10Y).

2.3.1.2 Delta margining. Market risk components

Any change of the Portfolio NPV may be represented as follows:

$$\Delta NPV \approx \sum_i \langle P.Delta[IR_i], \Delta IR_i \rangle + \sum_i \langle P.Delta[FXVL_i], \Delta FXVL_i \rangle + \sum_i \langle P.Delta[FX_i], \Delta FX_i \rangle$$

Where

$P.Delta[C_i]$ – vectors of sensitivity of the Portfolio to a 1 bp change in the relevant risk factor curve or exchange rate ($C_i = IR_i, FXVL_i, FX_i$),

The j[th] component of $P.Delta[C_i]$ vector is determined as follows:

$$P.Delta[C_i]^j = NPV\left(C_i^j + 1bps\right) - NPV(C_i^j)$$

The $IM[MarketRisk]$ market component of the Initial Margin is represented as follows:

$$IM[MarketRisk] = IM[MarketRisk][IR] + IM[MarketRisk][FXVL] + IM[MarketRisk][FX],$$

where summands in the right represent interest rate risk, volatility risk and currency risk, respectively.

2.3.1.3 Interest rate and volatility risks

The $IM[MarketRisk][IR]$ component of interest risk and $IM[MarketRisk][FXVL]$ component of volatility risk are calculated on the basis of the Shift-Twist-Butterfly model of risk factor curves for interest rates and volatility curves. Every $IM[MarketRisk][\mathrm{C}]$ ($\mathrm{C} = IR, FXVL$) component is represented as follows:

$$IM[MarketRisk][\mathrm{C}] = IM[MarketRisk][\mathrm{C}][Model] + IM[MarketRisk][\mathrm{C}][ModelError],$$

where:

$IM[MarketRisk][\mathrm{C}][Model]$ – the model component,

$IM[MarketRisk][\mathrm{C}][ModelError]$ – correction for errors in the model (this summand is considered if such errors have a significant impact on the Initial Margin).

2.3.1.3.1 Model component

Components $IM[MarketRisk][\mathrm{C}][Model]$ of the Initial Margin are calculated using the VaR methodology for a portfolio of instruments. In this case, the following assumptions are made:

- Risk factor curve evolutions used in the model are mutually independent
- Changes in the risk factor curves are characterized by three major components: $shift$, $twist$, and $butterfly$.

Given the above assumptions:

$$IM[MarketRisk][\mathrm{C}][Model] =$$

$$= \sqrt{\sum_i \langle P.Delta[\mathrm{C}_i], Shift_i\rangle^2 + \langle P.Delta[\mathrm{C}_i], Twist_i\rangle^2 + \langle P.Delta[\mathrm{C}_i], Butterfly_i\rangle^2}$$

where $Shift_i$, $Twist_i$, and $Butterfly_i$ specify scenarios for the curves along the major components with predetermined probability:

$$Shift_i = f_i\, \sigma_{i\, shift}\, shift_i \quad ,$$

$$Twist_i = f_i\, \sigma_{i\, twist}\, twist_i \quad ,$$

$$Butterfly_i = f_i\, \sigma_{i\, butt}\, butterfly_i$$

where $shift_i, twist_i, butterfly_i$ are normalized vectors defining the profiles of major components: $\|shift_i\|_\infty = \|twist_i\|_\infty = \|butterfly_i\|_\infty = 1$, ($\|x\|_\infty = \max x_j$), $\sigma_{i\, shift,twist,butt}$ – volatility of the relevant components of interest rate changes, f_i - volatility multiplier of the i^{th} curve (derived from the confidence probability level IM and the risk assessment horizon). The $Shift_i$, $Twist_i$, and $Butterfly_i$ risk parameters (vector values) are determined in Section 5 below.

To define certain additive components of $IM[MarketRisk][\mathrm{C}]$, the following values are calculated:

$$M[MarketRisk][\mathrm{C}_i][Shift] = \langle P.Delta[\mathrm{C}_i], Shift_i\rangle^2 / \, IM[MarketRisk][Model][\mathrm{C}] \, ,$$

$$IM[MarketRisk][\mathrm{C}_i][Twist] = \langle P.Delta[\mathrm{C}_i], Twist_i\rangle^2 / \, IM[MarketRisk][Model][\mathrm{C}],$$

$$IM[MarketRisk][\mathrm{C}_i][Butterfly] = \langle P.Delta[\mathrm{C}_i], Butterfly_i\rangle^2 / IM[MarketRisk][Model][\mathrm{C}],$$

$$IM[MarketRisk][\mathrm{C}][Model] = \sum_i \sum_{c \in \{Shift, Twist, Butterfly\}} IM[MarketRisk][\mathrm{C}_i][c]$$

The formula given above to evaluate $IM[MarketRisk][\mathrm{C}][Model]$ is modified as follows when it comes to assessment of interest risk by interest risk curves listed in paragraphs 2.3.1.1.

The set of interest curves:

$$\mathcal{A} = \begin{Bmatrix} XCCY_{Adj}, Rusfar, RUONIA, Mosprime, Rusfar\ 3m, KeyRate, \\ USD\ Libor, EURIBOR, CHF\ Libor, SOFR, ESTR, SARON \end{Bmatrix}$$

The model interest risk assessment formula:

$$IM[MarketRisk][IR][Model] = \sqrt{\mathrm{IR}_{RUB}^2 + \mathrm{IR}_{USD}^2 + \mathrm{IR}_{EUR}^2 + \mathrm{IR}_{CHF}^2 + \sum_{\mathrm{C}_j \in \mathcal{A} \setminus \{RUONIA, SOFR, ESTR, SARON\}} \mathrm{IR}_{\mathrm{C}_j}^2}$$

Components of shifts on the OIS RUONIA curve involve sensibility evaluation in total across all RUB curves (i.e. we suppose the concurrent shift of all RUB curves C_j by shift, twist, butterfly (fly) in RUONIA):

$$\mathrm{IR}_{RUB} = \sum_{\mathrm{C}_j \in \beta} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Shift}_{RUONIA} \right\rangle^2 + \sum_{\mathrm{C}_j \in \beta} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Twist}_{RUONIA} \right\rangle^2 + \sum_{\mathrm{C}_j \in \beta} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Fly}_{RUONIA} \right\rangle^2$$

The set of RUB curves:

$$\beta = \{XCCY_{Adj}, Rusfar, RUONIA, KeyRate, Mosprime, Rusfar\ 3m, \}$$

Components of shifts on the OIS SOFR curve involve sensibility evaluation in total across all USD curves (i.e. we suppose the concurrent shift of all USD curves C_j by shift, twist, butterfly (fly) in SOFR):

$$\mathrm{IR}_{USD} = \sum_{\mathrm{C}_j \in \{SOFR, USD\ Libor\}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Shift}_{SOFR} \right\rangle^2 + \sum_{\mathrm{C}_j \in \{SOFR, USD\ Libor\}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Twist}_{SOFR} \right\rangle^2 + \sum_{\mathrm{C}_j \in \{SOFR, USD\ Libor\}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Fly}_{SOFR} \right\rangle^2$$

Components of shifts on the OIS ESTR curve involve sensibility evaluation in total across all EUR curves (i.e. we suppose concurrent shift of all EUR curves C_j by shift, twist, butterfly (fly) in ESTR):

$$\mathrm{IR}_{EUR} = \sum_{\mathrm{C}_j \in \{ESTR, EURIBOR\}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Shift}_{ESTR} \right\rangle^2 + \sum_{\mathrm{C}_j \in \{ESTR, EURIBOR\}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Twist}_{ESTR} \right\rangle^2 + \sum_{\mathrm{C}_j \in \{ESTR, EURIBOR\}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_j}} \middle| \mathrm{Fly}_{ESTR} \right\rangle^2$$

Components of shifts on the OIS SARON curve involve sensibility evaluation in total across all CHF curves (i.e. we suppose concurrent shift of all CHF curves C_j by shift, twist, butterfly (fly) in SARON):

$$\mathrm{IR}_{CHF} = \sum_{\substack{C_j\in\{SARON,\\ CHF\ Libor\}}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_J}} \middle| \mathrm{Shift}_{SARON} \right\rangle^2 + \sum_{\substack{C_j\in\{SARON,\\ CHF\ Libor\}}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_J}} \middle| \mathrm{Twist}_{SARON} \right\rangle^2 + \sum_{\substack{C_j\in\{SARON,\\ CHF\ Libor\}}} \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_J}} \middle| \mathrm{Fly}_{SARON} \right\rangle^2$$

In component $\mathrm{IR}_{\mathrm{C}_j}$ (where $C_j \in \mathcal{A}\backslash\{RUONIA, SOFR, ESTR, SARON\}$), scenarios Shift, Twist and Fly for curves XCCY_Adj, Rusfar, Mosprime, KeyRate, Rusfar 3m, USD Libor, EURIBOR and CHF Libor which are set to be a potential discrepancy between the scenarios and similar scenarios for curves RUONIA, SOFR, ESTR, and SARON in the relevant currency:

$$\mathrm{IR}_{\mathrm{C}_j} = \sqrt{\left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_J}} \middle| \mathrm{Shift}_{\mathrm{C}_j} \right\rangle^2 + \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_J}} \middle| \mathrm{Twist}_{\mathrm{C}_j} \right\rangle^2 + \left\langle \overrightarrow{\frac{\partial \mathrm{NPV}}{\partial \mathrm{C}_J}} \middle| \mathrm{Fly}_{\mathrm{C}_j} \right\rangle^2}$$

2.3.1.3.2 Correction for errors in the Shift-Twist-Butterfly model

In assessing $IM[MarketRisk][C]$, the following assumptions are made: risk factor curves are mutually independent and moves in the curves are explained only by the three components, shift, twist and butterfly. Therefore, e.g., there are nonempty Portfolios, for which

$$IM[MarketRisk][\mathrm{C}_i] = 0,$$

i.e. these are the following Portfolios:

$$P{:}\,\langle P.Delta[\mathrm{C}_i], shift_i\rangle = \langle P.Delta[\mathrm{C}_i], twist_i\rangle = \langle P.Delta[\mathrm{C}_i], butterfly_i\rangle = 0.$$

Correction for errors related to such facts are defined as follows:

$$MinIM[\mathrm{C}_i][ErrorSTB] = f_i\, \sigma_i^{ErrorSTBC} \sum_j |P.Delta[\mathrm{C}_i]^j|$$

Risk parameters $\sigma_i^{ErrorSTBC}$ are determined by the unexplained dispersion portion when principal components $shift_i$, $twist_i$, $butterfly_i$, are defined as well as by possible correlation between the curves.

The component $IM[MarketRisk][IR_i][ErrorSTB]$ of the Initial Margin is determined as follows ($x^+ = x$, if $x \geq 0$, $x^+ = 0$, if $x < 0$):

$$IM[MarketRisk][\mathrm{C}_i][ErrorSTB] =$$

$$= \left(MinIM[\mathrm{C}_i][ErrorSTB] - \sum_{c\in\{shift,twist,butterfly\}} IM[MarketRisk][\mathrm{C}_i][c]\right)^+$$

2.3.1.3.3 Correction for errors in the interest rate model

The risk factor model is based on the market data in liquidity spots $(1W, 2W, 1M, \dots, 10Y)$. The curves' values at interim points are interpolated using such data. Therefore, their estimates and, hence, prices and risks of the relevant instruments may differ from NPV.

In terms of the Portfolios, this implies, for example, the existence of nonempty Portfolios, for which $P.Delta[C_i]^j = 0$, and, therefore, zero components of the market risk described above.

Let us determine values including possible convexity of curves in intervals between liquidity points:

$$MinIM[\mathrm{C}_i][ModelError\mathrm{C}] = f_i \sigma_i^{ErrorModel\mathrm{C}} \sum_t \sum_{Deal(t) \in P} \sum_j \left| Deal(t).Delta[\mathrm{C}_i]^j \right|.$$

where $\sum_{Deal(t)\in P}$ means summation of all trades from the portfolio P with contract expiration date t,

risk parameter $\sigma_i^{ErrorModelC}$ represents volatility assessment, i.e. the curve change component in local intervals between liquidity points.

Components of the Initial Margin $IM[MarketRisk][\mathrm{C}_i][Error\mathrm{C}]$ are determined as follows:

$$IM[MarketRisk][\mathrm{C}_i][Error\mathrm{C}] =$$

$$= \left(MinIM[\mathrm{C}_i][Error\mathrm{C}] - \sum_{c \in \{shift, twist, butterfly, ErrorSTB\}} IM[MarketRisk][\mathrm{C}_i][c]\right)^+$$

2.3.1.3.4 Aggregate components of interest rate and volatility risks

Summarizing all components of the interest rate risk and volatility risk, we finally have:

$$M[MarketRisk][IR] = \sum_i \sum_{c \in \{Shift, Twist, Butterfly, ErrorSTB, ErrorIR\}} IM[MarketRisk][IR_i][c]$$

$$IM[MarketRisk][FXVL] = \sum_i \sum_{c \in \{Shift, Twist, Butterfly, ErrorSTB, ErrorFXVL\}} IM[MarketRisk][FXVL_i][c]$$

2.3.1.4 Currency risk

$IM[MarketRisk][FX]$ is determined as follows:

$$M[MarketRisk][FX] = \sum_{FX_j} IM[MarketRisk][FX_j]$$

$$IM[MarketRisk][FX_j] = -\min_{-FX_j Rate \le \delta \le FX_j Rate} \left(\mathrm{NPV}(X_{FX_j/RUB}(1+\delta)) - \mathrm{NPV}(X_{FX_j/RUB})\right)$$

where $IM[MarketRisk][FX_j]$ is the minimum movement of the Portfolio value on the set of FX_j/RUB exchange rate scenarios with other risk factor remaining unchanged:

$X_{FX_j/RUB} \to X_{FX_j/RUB}(1+\delta)$, where δ parametrises scenarios of the relevant exchange rate and changes from $-FX_jRate$ to $+FX_jRate$, where FX_jRate – the risk rate for FX_j.

$$\text{RiskNetting} = IM[MarketRisk][FX] +$$

$$+\sum_{FX_j} \min_{-FX_jRate\le\delta\le FX_jRate} (\text{NPV}(X_{FX_j/RUB}(1+\delta)) - \text{NPV}(X_{FX_j/RUB}) + \delta \times X_{FX_j/RUB} \times Funds_{FX_j})$$

2.3.2 Liquidity risk

This component of the Initial Margin has been designed to cover possible costs associated with market liquidity risk.

The market component of the Initial Margin is determined on the assumptions about perfect liquidity of financial instruments: the default procedures may be implemented within one trading day after the relevant decision was made.

We introduce the component $IM[Liquidity]$, which takes into account the potential increase in the time period for performance of the default procedure due to limited liquidity of the Contracts ($\mathrm{C} = IR, FXVL$):

$$IM[Liquidity] =$$

$$= \sum_j l_{FX_j}\, IM[MarketRisk]\left[FX_j\right] + \sum_{j,c} l_{j,c}\, IM[MarketRisk]\left[\mathrm{C}_j\right][c]$$

$$l_{FX_j} = (\sqrt{Time_{FX_j} + AddTime_{FX_j}} - \sqrt{Time_{FX_j}})/\sqrt{Time_{FX_j}}$$

$$l_{C,j,c} = (\sqrt{Time_C + AddTime_{C,j,c}} - \sqrt{Time_C})/\sqrt{Time_C}$$

$$AddTime_{FX_j} = \left(\frac{\left|P.Delta\left[FX_j\right]\right|}{L_{FX_j}} - 1\right)^+, c = Shift_j, Twist_j, Fly_j$$

$$AddTime_{C,j,c} = \left(\frac{\left|\langle P.Delta\left[C_j\right], c\rangle\right|}{L_{C,j,c}} - 1\right)^+, c = Shift_j, Twist_j, Fly_j$$

where $Time_{FX_j}$, $Time_{IR}$ and $Time_{FXVL}$ are the risk assessment horizons for the relevant risk factors and risk parameters L_{FX_j}, $L_{IR,j,c}$, $L_{FXVL,j,c}$ determine the maximum absolute values of sensitivity ratios $P.Delta$, which may be hedged with trades within one trading day without influencing materially the Contracts' prices.

As shifts in main components shift, twist, fly for RUONIA, SOFR, ESTR and SARON were considered in the interest risk model along with all interest curves grouped by currency, $AddTime_{IR,OIS,\mathrm{c}}$, $AddTime_{IR,SOFR,\mathrm{c}}$, $AddTime_{IR,ESTR,\mathrm{c}}$ and $AddTime_{IR,SARON,\mathrm{c}}$ also treat sensibility in total across all curves grouped by currency:

$$AddTime_{IR,RUONIA,c} = \left(\frac{\left| \sum_{C_j \in \mathcal{A}} \left\langle \overrightarrow{\frac{\partial NPV}{\partial C_J}} \middle| c \right\rangle \right|}{L_{IR,RUONIA,c}} - 1 \right)^+$$

$$c = Shift_{RUONIA}, Twist_{RUONIA}, Fly_{RUONIA}$$

$$\mathcal{A} = \{XCCY_{Adj}, Rusfar, RUONIA, KeyRate, Mosprime, Rusfar\ 3m, KeyRate\}$$

$$AddTime_{IR,SOFR,c} = \left(\frac{\left| \sum_{C_j \in (SOFR, USD\_Libor)} \left\langle \overrightarrow{\frac{\partial NPV}{\partial C_J}} \middle| c \right\rangle \right|}{L_{IR,SOFR,c}} - 1 \right)^+$$

$$c = Shift_{SOFR}, Twist_{SOFR}, Fly_{SOFR}$$

$$AddTime_{IR,ESTR,c} = \left(\frac{\left| \sum_{C_j \in (ESTR, EURIBOR)} \left\langle \overrightarrow{\frac{\partial NPV}{\partial C_J}} \middle| c \right\rangle \right|}{L_{IR,ESTR,c}} - 1 \right)^+$$

$$c = Shift_{ESTR}, Twist_{ESTR}, Fly_{ESTR}$$

$$AddTime_{IR,SARON,c} = \left(\frac{\left| \sum_{C_j \in (SARON, CHF\_Libor)} \left\langle \overrightarrow{\frac{\partial NPV}{\partial C_J}} \middle| c \right\rangle \right|}{L_{IR,SARON,c}} - 1 \right)^+$$

$$c = Shift_{SARON}, Twist_{SARON}, Fly_{SARON}$$

3 The NPV of a Portfolio. The NPV of instruments

The NPV of a Portfolio is generally determined by calculating the sum of net present values of cash flows discounted by the curve of the relevant FX pool FX_i:

$$NPV_{FX_i}(Portfolio) = \sum_{FX_j} \sum_{FX_j\ cash\ flows} DF_{FX_j}(t) CF_{FX_j}(t) X_{FX_j/FX_i}$$

where:

$DF_{FX_j}(t)$ – the discount factor for payments in the FX_j currency,

$CF_{FX_j}(t)$ – the amount of payments in the FX_j currency; positive $CF_{FX_j}(t)$ shows the amount of the Clearing Center's obligation, negative $CF_{FX_j}(t)$ shows the amount of the Clearing Member's obligation. Floating flows in OIS and XCCY swaps are derived from the relevant forward curves calibrated on market data, while conditional flows in FX options are determined through the Vanna-Volga method.

X_{FX_j/FX_i} – the exchange rate of the currency FX_j against the currency FX_i. Currencies FX_j and FX_i run over the set of USD, EUR and RUB. Exchange rates X_{FX_j/FX_i} are calculated as follows for the purpose of NPV: current relevant fixings (calculated under the Moscow Exchange Fixings Methodology) are set to be $X_{USD/RUB}$ and $X_{EUR/RUB}$; $X_{CHF/RUB}$ is set to be the central rate for CHF/RUB on the FX Market according to the CCP NCC Risk Parameters Methodology for Moscow Exchange FX and Precious Metals Markets.

For the purpose of collateral evaluation, the exchange rates are set to be the central rates: collateral evaluation before mark-to-marking on T0 is carried out at the central rate set on T-1; new central rates are used in collateral marking-to-market on T0.

Exchange rate $X_{FX1/FX2}$ is calculated as the cross rate: $X_{FX1/FX2} = X_{FX1/RUB}/X_{FX2/RUB}$; reverse exchange rates are calculated as per the following formulas: $X_{FX_j/FX_i} = 1/X_{FX_i/FX_j}$, exchange rates X_{FX_j/FX_j} are set to one; unless otherwise stated, these exchange rates are used as currency pairs rates for the purposes set forth in the Clearing Rules.

The formulas given below are for the calculation of NPV in particular cases: OIS, IRS, XCCY and USD/RUB options.

3.1 NPV (OIS): OIS evaluation

The NPV of the Interest Rate Swap Contract with OIS code given in its specification is determined as follows:

$$NNPV_{FX1}(OIS) = Notional\left(\sum_{floating} DF_{FX1}(t_j)\beta_j CompoundedRate(t_j) - \sum_{fixed} DF_{FX1}(t_i)\alpha_i\, c_{fixed}\right) + DF_{FX1}(t_{pr})premium_{FX1}$$

$$NPV_{FX2}(OIS) = Notional\left(\sum_{floating} DF_{FX2}(t_j)Y(t_j)\beta_j CompoundedRate(t_j) - \sum_{fixed} DF_{FX2}(t_i)Y(t_i)\alpha_i\, c_{fixed}\right) + DF_{FX2}(t_{pr})premium_{FX2}$$

where α_i, β_j are relevant Ratios for calculation of days in the Interest rate Period,

$CompoundedRate(t)$ is the expected in the said Interest rate Period accumulated rate, calculated along the forward overnight curve,

c_{fixed} is the Fixed Rate under the Contract.

The calculation of the NPV of the Contract includes outstanding coupon payments and outstanding premium.

$X(t)$ – forward rate FX2/FX1, $Y(t) = 1/X(t)$,

The values $premium_{FX1}$ and $premium_{FX2}$ are connected with an exchange rate $X(t_{pr})$.

3.2 NPV (IRS): IRS evaluation

The NPV of the Interest Rate Swap Contract with its IRS code set out in the specification, is determined as follows:

$$NPV_{FX1}(IRS) = Notional \left(\sum_{floating} DF_{FX1}(t_j)\beta_j FwdCurve(t_j) - \sum_{fixed} DF_{FX1}(t_i)\alpha_i \, c_{fixed} \right) + DF_{FX1}(t_{pr})premium_{FX1}$$

$$NPV_{FX2}(IRS) = Notional \left(\sum_{floating} DF_{FX2}(t_j)Y(t_j)\beta_j FwdCurve(t_j) - \sum_{fixed} DF_{FX2}(t_i)Y(t_i)\alpha_i \, c_{fixed} \right) + DF_{FX2}(t_{pr})premium_{FX2}$$

where α_i, β_j are relevant Ratios for calculation of days in the Interest rate Period,

$FwdCurve(t)$ is the forward curve rate (determined in accordance with clause 5.5 of the Methodology) for the said Interest-Rate Period,

c_{fixed} is the Fixed Rate under the Contract.

The calculation of the Settlement Value of the Contract includes outstanding coupon payments and outstanding premium.

The values $premium_{FX1}$ and $premium_{FX2}$ are connected with an exchange rate $X(t_{pr})$.

3.3 NPV (XCCY) – cross-currency swap evaluation

The NPV of the Cross Currency Swap Contract with IRS code is determined as follows

$$\begin{aligned} NPV_{FX1}(XCCY) &= Notional_{FX2} \sum_{floating/fixed} DF_{FX1}(t_j)X(t_j)\beta_j FwdCurve(t_j) \\ &+ Notional_{FX2}X(T)DF_{FX1}(T) - Notional_{FX1} \sum_{fixed/floating} DF_{FX1}(t_i)\alpha_i \, c_{fixed} \\ &- Notional_{FX1}DF_{FX1}(T) + DF_{FX1}(t_{pr})premium_{FX1} \end{aligned}$$

$$\begin{aligned} NPV_{FX2}(XCCY) &= Notional_{FX2} \sum_{floating/fixed} DF_{FX2}(t_j)\beta_j FwdCurve(t_j) \\ &+ Notional_{FX2}DF_{FX2}(T) - Notional_{FX1} \sum_{fixed/floating} DF_{FX2}(t_i)Y(t_j)\alpha_i \, c_{fixed} \\ &- Notional_{FX1}DF_{FX2}(T)Y(t_j) + DF_{FX2}(t_{pr})premium_{FX2} \end{aligned}$$

If the obligation of one party to the Contract to transfer ownership of currency to the second party in the amount of the Nominal Amount set for the second party, and the obligation of the second party to pay the first party the Nominal Amount set for the first party have not yet been performed, the above formula is supplemented with the following:

$$NPV_{FX1}(FrontNotionalPayment) = -\,Notional_{FX2}X(T_0)DF_{FX1}(T_0) + \,Notional_{FX1}DF_{FX1}(T_0)$$

$$NPV_{FX2}(FrontNotionalPayment) = -\,Notional_{FX2}DF_{FX2}(T_0) + \,Notional_{FX1}DF_{FX2}(T_0)Y(T_0)$$

where α_i, β_j are relevant Factor for calculation of days in the Interest rate Period,

$FwdCurve(t)$ is the forward curve rate for a given Interest Rate Period,

c_{fixed} is the Fixed Rate under the Contract,

$X(t)$ is the forward rate FX2/FX1, $Y(t) = 1/X(t)$, T is the Contract expiration date, T_0 is the effective date of the Contract. The amount includes outstanding coupon payments and outstanding premium. The values $premium_{FX1}$ and $premium_{FX2}$ are connected with an exchange rate $X(t_{pr})$.

3.4 NPV (FX Swaps, FX forwards and FX futures)

The Settlement Value of the FX Swap, FX Forward or FX Futures Contract is determined as follows:

$$NPV_{FX1}(FX\ Swap) = Notional \times \big(SwapForwardRate - X(T)\big) \times DF_{FX1}(T) + DF_{FX1}(t_{pr})premium_{FX1}$$

$$NPV_{FX2}(FX\ Swap) = Notional \times (SwapForwardRate \times Y(T) - 1) \times DF_{FX2}(T) + DF_{FX2}(t_{pr})premium_{FX2}$$

If the obligation of one party to the FX Swap Contract to transfer ownership of currency to the second party in the amount of the Nominal Amount set for the second party, and the obligation of the second party to pay the first party the Nominal Amount set for the first party have not yet been performed, the above formula is supplemented with the following:

$$NPV_{FX1}(FrontPayment) = -Notional \times \big(SwapSpotRate - X(T_0)\big) \times DF_{FX1}(T_0)$$

$$NPV_{FX2}(FrontPayment) = -Notional \times (SwapSpotRate \times Y(T_0) - 1) \times DF_{FX2}(T_0)$$

where $X(t)$ is the forward rate FX2/FX1, $Y(t) = 1/X(t)$,

T is the Contract’s expiration date,

T_0 is the Contract’s effective date,

$SwapForwardRate$ is the forward rate in the swap/forward/futures,

$SwapSpotRate$ is the Contract's underlying rate.

The calculation of the Settlement Value of the Contract includes outstanding coupon payments and outstanding premium. The values $premium_{FX1}$ and $premium_{FX2}$ are connected with an exchange rate $X(t_{pr})$.

3.5 NPV (FX option)

The settlement value of FX options is derived through the Vanna-Volga method. For the option buyer:

$$NPV_{FX_i}(Vanilla) = OptionValue_{FX_i} - NPV_{FX_i}(Premium),$$

where $OptionValue_{FX_i}$ – the option's settlement value of the option, i.e. the value calculated by the Vanna-Volga method, $NPV_{FX_i}(Premium)$ - the net present value in the premium currency. For the option seller, $NPV_{FX_i}(Vanilla)$ has the opposite sign. The settlement value of the option strategy is the amount of settlement values of $Vanilla$ Contracts in the Portfolio.

The Vanna-Volga method is used to infer the Black-Scholes implied volatility from quotes of three available instruments: the ATM Straddle, Risk Reversal and Butterfly with a given maturity (the ATM Straddle strike is determined subject to a 50% forward Delta; instruments Risk Reversal and Butterfly Vanilla with a 25% forward Delta). The method is based on the construction of locally replicating portfolios whose associate hedging costs are added to corresponding Black-Scholes prices (i.e. are used as a Black-Scholes price adjustment) so as to produce values consistent with the options' market prices. In the Black-Scholes model, the payoff of a European call is determined by the function $C^{BS} = C^{BS}(t, K, S_t, DF_{RUB}, DF_{USD}, T, \sigma)$, where t – the moment at which the price is determined, K – the option strike, $S_t = X_{FX_j/RUB}$, the exchange rate at time t, DF_{RUB}– the RUB discount factor (cross currency–adjusted), DF_{USD} – the USD discount factor, T – maturity time, σ – the market volatility. In the model, the option price is determined as follows:

$$C_{VV} = C_{BS} + x_p(K)\big(C_{MKT}(K_p) - C_{BS}(K_p)\big) + x_o(K)(C_{MKT}(K_o) - C_{BS}(K_o)) + x_c(K)\big(C_{MKT}(K_c) - C_{BS}(K_c)\big),$$

where $C_{MKT}(K_i)$ – the market option prices for relevant strikes which can be definitely recovered from the ATM Straddle, Risk Reversal and Butterfly, $C_{BS}(K_i)$ – the options prices for the relevant strikes in the BS model, $x_i(K)$ – the weight, i=p,o,c –the index denoting the strike.

$$x_p(K) = \frac{\nu(K)}{\nu(K_p)} \frac{ln\frac{K_o}{K} ln\frac{K_c}{K}}{ln\frac{K_o}{K_p} ln\frac{K_c}{K_p}}$$

$$x_o(K) = \frac{\nu(K)}{\nu(K_o)} \frac{ln\frac{K}{K_p} ln\frac{K_c}{K}}{ln\frac{K_o}{K_p} ln\frac{K_c}{K_o}}$$

$$x_c(K) = \frac{\nu(K)}{\nu(K_c)} \frac{ln\frac{K}{K_p} ln\frac{K}{K_o}}{ln\frac{K_c}{K_p} ln\frac{K_c}{K_o}}$$

where $\nu(K), \nu(K_i)$ – the options' Vega ($Vega(K) = \nu(K) = \frac{\partial c_{BS}}{\partial \sigma}$).

3.6 Option strategies

3.6.1 Straddle

This strategy consists of buying a call option and buying a put option, both of them have similar direction to the order. The Variation Margin currency is the same for both options and is specified in the order. The notional value of the options is the notional value specified in the order:

$$\text{ATM Straddle} = \text{Call(FX Pair, Expiry, Notional, ATM Call Strike)} +$$

$$+\text{Put(FX Pair, Expiry, Notional, ATM Put Strike)}$$

From this point onward, this denotes that the strategy consists of appropriate options. Sign "+" means that the option has the same direction to the strategy. Buying the Straddle means buying a call option and buying a put option with the parameters specified.

3.6.2 Risk Reversal

$$\text{RR} = \text{Call(FX Pair, Expiry, Notional, RR Call Strike)} - \text{Put(FX Pair, Expiry, Notional, RR Put Strike)}$$

3.6.3 Butterfly

$$\begin{aligned} \text{BF} = \text{Call}\left(\text{FX Pair, Expiry}, \frac{\text{Notional}}{2}, \text{ATM Call Strike}\right) \\ + \text{Put}\left(\text{FX Pair, Expiry}, \frac{\text{Notional}}{2}, \text{ATM Put Strike}\right) - \\ -\text{Call}\left(\text{FX Pair, Expiry}, \frac{\text{Notional}}{2}, \text{BF Call Strike}\right) \\ - \text{Put}\left(\text{FX Pair, Expiry}, \frac{\text{Notional}}{2}, \text{BF Put Strike}\right) \end{aligned}$$

3.7 Distribution of option premiums

The option premiums are generally distributed:

$$\text{Strategy} = \sum_{j=1}^{N} \text{Vanilla}_j \;, \qquad \text{Vanilla}_j = \text{Call/Put}$$

Therefore, the premium on the strategy equals the amount of premiums on options in the strategy. Let $\text{Vanilla}_j.\text{TV}$ be the theoretical premiums on atomic call and put. Then, the theoretical price of the strategy:

$$\text{Stategy. TP} = \sum_{j} \text{Vanilla}_j\text{. TP}$$

The premium on the strategy Strategy. P specified in the order is distributed among atomic options as follows:

$\text{Vanilla}_j\text{. P} = \text{Vanilla}_j\text{. TP} + \frac{\alpha}{N}(\text{Strategy. P} - \text{Stategy. TP})$, where α=1, if the position in the relevant option Vanilla_j is long (expressed as a positive value in the strategy), and α= -1, if the position in the relevant option Vanilla_j is short (expressed as a negative value in the strategy).

3.8 Variation margin

The Variation Margin paid for a Contract is determined in accordance with the Contract Specifications. The NPV for a Contract from the FX_i pool is $NPV_{FX_i}(t)$.

$\text{Variation Margin}_{FX_i}(t) = NPV_{FX_i}(t) - NPV_{FX_i}(t-1)$, where $NPV_{FX_i}(t-1)$ is set to zero if the day t is the Contract execution date.

The NPV is set to zero for Contracts already settled (obligations not performed by the Clearing Member are not included in the trade structure).

4 Risk factor curves model

4.1 Market data

The model's input parameters consist of the following sets of market data:

1. Exchange rates:
    a. USDRUB
    b. EURRUB
    c. CHFRUB
2. Interest rates:
    a. RUONIA:
        i. RUONIA
        ii. RUONIA OIS: 1W, …, 2Y
    b. Mosprime:
        i. Fixing Mosprime1M, Mosprime3M, Mosprime6M,
        ii. FRA Mosprime3M: 3M×6M, 6M×9M
        iii. IRS Mosprime3M: 1Y, 2Y, 3Y, 4Y, 5Y, 6Y, 7Y, 8Y, 9Y, 10Y
    c. FX curve:
        i. FX Swaps: TN, 1W, …, 1Y
        ii. USDRUB XCCY: 1Y, 2Y, 3Y, 4Y, 5Y, 6Y, 7Y, 8Y, 9Y, 10Y
    d. Rusfar:
        i. Rusfar ON, Rusfar 3M, Rusfar1W, …, 1Y
    e. KeyRate:
        i. IRS KeyRate: RUB Swap vs Key Rate 3M, 6M, 9M, 1Y, 2Y, 3Y, 4Y, 5Y, 6Y, 7Y, 8Y, 9Y, 10Y

USD Libor:

ii. Fixing USD Libor1M, USD Libor3M, USD Libor6M
iii. FRA USD Libor3M: 3M×6M, 6M×9M
iv. IRS USD Libor3M: 1Y, 2Y, 3Y, 4Y, 5Y, 6Y, 7Y, 8Y, 9Y, 10Y

f. Euribor:
   i. Fixing Euribor1M, Euribor3M, Euribor6M
   ii. FRA Euribor3M: 3M×6M, 6M×9M
   iii. IRS Euribor3M: 1Y, 2Y, 3Y, 4Y, 5Y, 6Y, 7Y, 8Y, 9Y, 10Y
g. CHF Libor:
   i. Fixing CHF Libor1M, CHF Libor3M, CHF Libor6M
   ii. FRA CHF Libor6M: 1M× 7M, 2M× 8M, 3M× 9M, 4M× 10M, 5M× 11M, 6M× 12M, 9M× 15M
   iii. IRS CHF Libor6M: 1Y, 2Y, 3Y, 4Y, 5Y, 6Y, 7Y, 8Y, 9Y, 10Y
h. SOFR:
   i. SOFR
   ii. SOFR OIS: 1W, …, 10Y
i. ESTR:
   i. ESTR
   ii. ESTR OIS: 1W, …, 10Y
j. SARON:
   i. SARON
   ii. SARON OIS: 1W, …, 10Y

3. Volatility surface:
   a. ATM Straddle: 1W, …, 2Y
   b. Risk Reversal: 1W, …, 2Y
   c. Butterfly: 1W, …, 2Y

The Bloomberg codes used to download quotes for the above-mentioned instruments are given in Appendix 1 hereto.

4.2 Risk factor curve model parameters

The model is a set of parameters and algorithms to assess the settlement value of derivative instruments. The following aggregate of factors is used in this Methodology as the parameter space:

1. FX rates
   a. USDRUB,
   b. EURRUB,
   c. CHFRUB.
2. US dollar curves
   d. Discount curve,
   e. USD Libor spot curve,
   f. Overnight SOFR curve.
3. EUR curves
   g. Discount curve,
   h. Euribor spot curve,
   i. Overnight ESTR curve.
4. CHF curves

j. Discount curve,
k. CHF Libor spot curve,
l. Overnight SARON curve.
5. RUB curves
m. Discount curve,
n. Overnight RUONIA curve,
o. Mosprime curve,
p. Overnight RUSFAR curve,
q. KeyRate curve,
r. Rusfar 3m curve.
s. Volatility term structure curves
t. ATM Straddle curve,
u. Risk Reversal curve,
v. Butterfly curve.

4.3 Model calibration

The general approach to the model calibration is to determine values of risk factors at which settlement values of instruments with respect to which the model is calibrated correspond with market prices.

4.4 FX curves

The foreign currency spot curves (US Dollar - USD LIBOR,Euro – EURIBOR) are curves for which the present value of all instruments FRA3M×6M, FRA6M×9M, IRS1Y, IRS2Y, IRS3Y, IRS4Y, IRS5Y IRS6Y, IRS7Y, IRS8Y, IRS9Y, IRS10Y equals zero. CHF Libor: CHF FRA1X7, CHF FRA2X8, CHF FRA3X9, CHF FRA4X10, CHF FRA5X11, CHF FRA6X12, CHF FRA9X15, CHF IRS1Y, CHF IRS2Y, CHF IRS3Y, CHF IRS4Y, CHF IRS5Y, CHF IRS6Y, CHF IRS7Y, CHF IRS8Y, CHF IRS9Y, CHF IRS10Y. Discount curves for foreign currencies are constructed on the relevant spot curves. Forward curves are constructed as the implied rate curves on the relevant discount curves.

The SOFR, ESTR and SARON OIS curves are set to be curves in which the discounted value of all cash flows for each instrument composed of the OIS index swaps on SOFR, ESTR and SARON, respectively, is evaluated to zero.

4.5 RUB curves

4.5.1 Discount curves

The RUB discount curve is a curve with the zero present value of all cash flows from every instrument in the set comprising FX swaps with maturities up to one year and USDRUB underlying asset and XCCY swaps (Libor3M vs Fix) with maturities ranging from one year to five years, provided that the Libor spot curve constructed according to Section 4.4 hereof is used to discount USD cash flows and calculate relevant forward rates.

4.5.2 RUONIA OIS curve

The RUONIA OIS curve is a curve for which the present value of all cash flows from every instrument in the set comprising overnight index swaps (OIS) on RUONIA, equals zero.

4.5.3 Mospime curve

The Mosprime curve is constructed in a similar way to FX curves on a set with Mosprime3M as the underlying asset.

4.5.4. Rusfar 3M curve

The Rusfar 3M curve is constructed similar to FX curves based on instruments on Mosprime 3M. Quotes of instruments on Mosprime 3M adjusted for the spread between the Mosprime 3M and Rusfar 3M fixings are used as quotes for those instruments.

4.5.5. Rusfar OIS curve

The Rusfar curve is constructed similar to the OIS curve by using data for underlying asset Rusfar, if any, or by using data for underlying asset RUONIA, otherwise.

4.5.6. KeyRate curve

The KeyRate curve is calibrated as a curve for which discounting cash flows makes the Bank of Russia Key Rate swap equal zero, subject to the assumption that floating flows in this curve are calculated as imputed, while fixed flows are calculated based on the market data.

4.6 Volatility curves

The volatility curves are three curves ATM Straddle, Risk Reversal and Butterfly constructed on quotes of the relevant instruments.

5 Calculation of risk parameters

5.1 Statistical risk parameters

In the symbols below, the i index numbers the risk factor curves:

$\mathrm{i} = \mathrm{R}UONIA, \mathrm{Mosprime}, \mathrm{Rusfar\ 3m}, \mathrm{XCCY\_adjusted}, \mathrm{Rusfar}, \mathrm{KeyRate}, \mathrm{USD\ Libor}$, SOFR, EURIBOR, ESTR, CHF Libor, SARON, ATM Straddle , Risk Reversal, Butterfly, and the c index refers to the principal movement components of the relevant curves:

$c = shift, twist, butterfly$.

Risk parameter	Symbol
Volatility multiplier of the ith risk factor curve	f_i
Scenario parameters for $Shift_i$ components	$Shift_i^j$
Scenario parameters for $Twist_i$ omponents	$Twist_i^j$
Scenario parameters for $Butterfly_i$ components	$Butterfly_i^j$
Shift-twist-butterfly error volatility	$\sigma_i^{ErrorSTB}$

Model error volatility	$\sigma_i^{ErrorModel}$
FX_j exchange rate liquidity ratio	L_{FX_j}
Liquidity ratio of the risk factor curve component	$L_{i,c}$
Currency risk assessment horizon for FX_j	$Time_{FX_j}$
Volatility risk assessment horizon	$Time_{FXVL}$
Interest rate risk assessment horizon	$Time_{IR}$
Member's creditworthiness rate	$CreditQuality$
Ratio connecting the currency risk rate and discount rate	$FXRiskToDiscount$
FX position rollover rate	R_{FX_i}
Ratio of the Price Corridor width to the Initial Margin	k
The currency risk rate	FX_jRate

5.2 Currency risk rates

The FX_jRate rates are determined by the relevant collateral rates applicable in the Moscow Exchange FX Market. Such collateral rates are calculated in accordance with the current Moscow Exchange Risk Parameters Methodology of the FX Market and Precious Metals Market which is available on the CCP NCC website.

5.3 Contract price limit

The Contract's price is within the established limit if its absolute settlement value does not exceed the product of certain ratio and the Initial Margin for such Contract:

$$|NPV| \leq k \cdot IM$$

Where the k risk parameter is set by Clearing Center.

5.4 Parameters of Contracts with Defaulting Members

5.4.1 Swap trade parameters

Penalty rates R_{FX_i} are static risk parameters which are set individually for each currency, including RUB. Penalty rate R_{FX_i} is the interest rate used to calculate the FX swap price which is set equal to this rate for every FX swap denominated in currency FX_i (imputed rate for quote currency is set to zero), which swap is executed between a defaulting clearing member and the Clearing Center if there is debt and/or obligations in FX_i under trades not secured by the appropriate assets. The swap base rate (the first part rate) is set to equal the MOEX Fixing for the relevant currency pair as of 12:30 MSK on the current trading day according to the Moscow Exchange Fixing Methodology. If the swap trade date is not a trading day, or, if the fixing is not set, the swap base rate is set to equal the central rate for the relevant currency established by the Clearing Center.

6 Appendix

6.1 The Bloomberg codes for interest rate derivatives, FX options and fixings (subject to revision at the discretion of CCP NCC when the relevant instrument become available)

Term	RUONIA		Mosprime			USDRUB Curve		Libor			Euribor			ATM	RR	BF
	Fixing	OIS	Fixing	FRA	IRS	FX Swaps	XCCY	Fixing	FRA	IRS	Fixing	FRA	IRS	FX Option	FX Option	FX Option
SPT	RUONIA Index	-	-	-	-	RUBTN Curncy	-	-	-	-	-	-	-	USDRUBVON Curncy	USDRUB25RON Curncy	USDRUB25BON Curncy
1w	-	RRSO1Z Curncy	-	-	-	RUB1W Curncy	-	-	-	-	-	-	-	USDRUBV1W Curncy	USDRUB25R1W Curncy	USDRUB25B1W Curncy
2w	-	RRSO2Z Curncy	-	-	-	RUB2W Curncy	-	-	-	-	-	-	-	USDRUBV2W Curncy	USDRUB25R2W Curncy	USDRUB25B2W Curncy
3w	-	-	-	-	-	-	-	-	-	-	-	-	-	USDRUBV3W Curncy	USDRUB25R3W Curncy	USDRUB25B3W Curncy
1m	-	RRSOA Curncy	MOSKP1 Index	-	-	RUB1M Curncy	-	US0001M Index	-	-	EUR001M Index	-	-	USDRUBV1M Curncy	USDRUB25R1M Curncy	USDRUB25B1M Curncy
2m	-	RRSOB Curncy	-	-	-	RUB2M Curncy	-	-	-	-	-	-	-	USDRUBV2M Curncy	USDRUB25R2M Curncy	USDRUB25B2M Curncy
3m	-	RRSOC Curncy	MOSKP3 Index	RRFR0CF Curncy	-	RUB3M Curncy	-	US0003M Index	USFR0CF Comdty	-	EUR003M Index	EUFR0CF Comdty	-	USDRUBV3M Curncy	USDRUB25R3M Curncy	USDRUB25B3M Curncy
6m	-	RRSOF Curncy	MOSKP6 Index	RRFR0FI Curncy	-	RUB6M Curncy	-	US0006M Index	USFR0FI Comdty	-	EUR006M Index	EUFR0FI Comdty	-	USDRUBV6M Curncy	USDRUB25R6M Curncy	USDRUB25B6M Curncy
9m	-	RRSOI Curncy	-	-	-	RUB9M Curncy	-	-	-	-	-	-	-	-	-	-
1y	-	RRSO1 Curncy	-	-	RRSWM1 Curncy	-	RRUSSW1 Curncy	-	-	USSA1 Curncy	-	-	EUSW1V3 Curncy	USDRUBV1Y Curncy	USDRUB25R1Y Curncy	USDRUB25B1Y Curncy
2y	-	-	-	-	RRSWM2 Curncy	-	RRUSSW2 Curncy	-	-	USSA2 Curncy	-	-	EUSW2V3 Curncy	-	-	-
3y	-	-	-	-	RRSWM3 Curncy	-	RRUSSW3 Curncy	-	-	USSA3 Curncy	-	-	EUSW3V3 Curncy	-	-	-
4y	-	-	-	-	RRSWM4 Curncy	-	RRUSSW4 Curncy	-	-	USSA4 Curncy	-	-	EUSW4V3 Curncy	-	-	-
5y	-	-	-	-	RRSWM5 Curncy	-	RRUSSW5 Curncy	-	-	USSA5 Curncy	-	-	EUSW5V3 Curncy	-	-	-
6y	-	-	-	-	RRSWM6 Curncy	-	RRUSSW6 Curncy	-	-	USSA6 Curncy	-	-	EUSW6V3 Curncy	-	-	-
7y	-	-	-	-	RRSWM7 Curncy	-	RRUSSW7 Curncy	-	-	USSA7 Curncy	-	-	EUSW7V3 Curncy	-	-	-
8y	-	-	-	-	RRSWM8 Curncy	-	RRUSSW8 Curncy	-	-	USSA8 Curncy	-	-	EUSW8V3 Curncy	-	-	-

9y	-	-	-	-	**RRSWM9 Curncy**	-	**RRUSSW9 Curncy**	-	-	**USSA9 Curncy**	-	-	**EUSW9V3 Curncy**	-	-	-
10y	-	-	-	-	**RRSWM10 Curncy**	-	**RRUSSW10 Curncy**	-	-	**USSA10 Curncy**	-	-	**EUSW10V3 Curncy**	-	-	-

Term	**KeyRate**	**CHF Libor**			**SOFR**		**ESTR**		**SARON**	
	IRS	**Fixing**	**FRA**	**IRS**	**Fixing**	**OIS**	**Fixing**	**OIS**	**Fixing**	**OIS**
SPT	-	-	-	-	**SOFRRATE INDEX**	-	**ESTRON INDEX**		**SRFXON3 INDEX**	-
1w	-	-	-	-	-	**USOSFR1Z Curncy**	-	**EESWE1Z Curncy**	-	**SFSNT1Z Curncy**
2w	-	-	-	-	-	**USOSFR2Z Curncy**	-	**EESWE2Z Curncy**	-	**SFSNT2Z Curncy**
1m	-	**SF0001M Index**	**SFFR0AG**	-	-	**USOSFRA Curncy**	-	**EESWEA Curncy**	-	**SFSNTA Curncy**
2m	-	-	**SFFR0BH**	-	-	**USOSFRB Curncy**	-	**EESWEB Curncy**	-	**SFSNTB Curncy**
3m	**RUKRSC Curncy**	**SF0003M Index**	**SFFR0CI**	-	-	**USOSFRC Curncy**	-	**EESWEC Curncy**	-	**SFSNTC Curncy**
4m	-	-	**SFFR0DJ**	-	-	-	-	-	-	-
5m	-	-	**SFFR0EK**	-	-	-	-	-	-	-
6m	**RUKRSF Curncy**	**SF0006M Index**	**SFFR0F1**	-	-	**USOSFRF Curncy**	-	**EESWEF Curncy**	-	**SFSNTF Curncy**
9m	**RUKRSI Curncy**	-	**SFFR0BH**	-	-	**USOSFRI Curncy**	-	**EESWEI Curncy**	-	**SFSNTI Curncy**
1y	**RUKRS1 Curncy**	-	-	**SFSW1**	-	**USOSFR1 Curncy**	-	**EESWE1 Curncy**	-	**SFSNT1 Curncy**
2y	**RUKRS2 Curncy**	-	-	**SFSW2**	-	**USOSFR2 Curncy**	-	**EESWE2 Curncy**	-	**SFSNT2 Curncy**
3y	**RUKRS3 Curncy**	-	-	**SFSW3**	-	**USOSFR3 Curncy**	-	**EESWE3 Curncy**	-	**SFSNT3 Curncy**
4y	**RUKRS4 Curncy**	-	-	**SFSW4**	-	**USOSFR4 Curncy**	-	**EESWE4 Curncy**	-	**SFSNT4 Curncy**
5y	**RUKRS5 Curncy**	-	-	**SFSW5**	-	**USOSFR5 Curncy**	-	**EESWE5 Curncy**	-	**SFSNT5 Curncy**
6y	**RUKRS6 Curncy**	-	-	**SFSW6**	-	**USOSFR6 Curncy**	-	**EESWE6 Curncy**	-	**SFSNT6 Curncy**
7y	**RUKRS7 Curncy**	-	-	**SFSW7**	-	**USOSFR7 Curncy**	-	**EESWE7 Curncy**	-	**SFSNT7 Curncy**
8y	**RUKRS8 Curncy**	-	-	**SFSW8**	-	**USOSFR8 Curncy**	-	**EESWE8 Curncy**	-	**SFSNT8 Curncy**
9y	**RUKRS9 Curncy**	-	-	**SFSW9**	-	**USOSFR9 Curncy**	-	**EESWE9 Curncy**	-	**SFSNT9 Curncy**

10y	RUKRS10 Curncy	-	-	SFSW10	-	USOSFR10 Curncy	-	EESWE10 Curncy	-	SFSNT10 Curncy

6.2 Interest rates for accumulated deposit margin

CSA	IRs
RUB	RUONIA
USD	FEDFUND (FEDL01 Index)
EUR	EONIA (EONIA Index)
CHF	SARON (SRFXON3 Index)

6.3 Decomposition of the Initial Margin

Component		Market risk factors														
		IR												USDRUBVol		
		RUONIA	Mosprime	Rusfar 3m	XCCY adjusted	Rusfar	KeyRate	USD Libor	SOFR	CHF Libor	SARON	Euribor	ESTR	ATM	RR	BF
Market risk	Shift															
	Twist															
	Butterfly															
	STB model error															
	Risk factor curve model error															
Liquidity risk																
Total																

Component		FX risk factors			
		USD	EUR	CHF	Total
Market risk	Shift				
	Twist	-	-	-	
	Butterfly	-	-	-	
	STB model error	-	-	-	
	Risk factor model error	-	-	-	
Liquidity risk					
Total					