

APPROVED  
by resolution of the Executive Board  
National Clearing Centre  
25 March 2020

A.Khavin  
Chairman

L.S.

**NCC Risk Methodology for  
Moscow Exchange FX & Precious Metals Market**

**Moscow 2020**

**Contents**

1. Terms and definitions.....	3
2. General provisions .....	8
3. Risk management parameters .....	8
4. Central rate algorithm .....	8
5. The estimate of upper and lower market risk bands .....	10
6. Rollover rate.....	12
7. Algorithm for Central Indicative Swap Rates and Interest Risk Rates.....	13
8. Algorithm for Inter-product Spread Discount .....	17
9. Algorithm for Price Band Limits .....	19
10. Price band shift at market open and during trading hours (widening the Price Band) 22	
11. Shifting Market Risk Assessment Range limits (three levels) for Instruments without full collateral required at market open and during trading hours (widening the Market Risk Assessment Range).....	24
12. IR Risk Bands Shift before opening and during trading .....	25
13. Narrowing Risk Assessment Ranges and Price Bands at market open .....	26
14. Specifics of risk parameters for fix trades .....	26
15. Procedure for determining prices of balancing transactions on the FX and Precious Metals Markets .....	27

## 1. Terms and definitions

1.1. This Risk Methodology uses the following terms and definitions:

<b><i>Underlying Asset</i></b>	Foreign currency and/or precious metals allowed for trading without full prefunding (on margin).
<b><i>Current Financial Statements</i></b>	Clearing Members' financial statements as of the last reporting date submitted to the Clearing Centre to the extent and within timeframes established in the Clearing Rules.
<b><i>Currency Pair</i></b>	A unit of FX and the quote currency or one of precious metal and the quote currency traded on Moscow Exchange's FX and Precious Metals Markets.
<b><i>Upper/Lower Limits of the Market Risk Assessment Range</i></b>	The maximum (minimum) rates for trades in FX/Precious Metals used by the Clearing Centre to assess market risks for trades without full prefunding (on margin). There are three levels in the Risk Assessment Range.
<b><i>Upper/Lower Indicative Swap Rate</i></b>	The minimum (maximum) swap price for the relevant time interval between the first and the second settlement dates used by the Clearing Centre to assess interest risk for trades without full prefunding. There are three levels for the range.
<b><i>Upper/Lower Price Band Limit</i></b>	The maximum/minimum order price levels applicable during trading hours on the FX/Precious Metals Market.
<b><i>OTC FX trade</i></b>	A trade in a foreign currency between the Clearing Center and a clearing member/liquidity provider on the OTC market.
<b><i>Off order book order</i></b>	An order submitted to the off order book trading boards of the FX and Precious Metals Markets.
<b><i>Volatility</i></b>	The degree of price variability. In terms of quantity, it is measured as a standard deviation of changes or relative changes of exchange-quoted rates for FX/Precious Metals during the Risk Assessment Period.
<b><i>Risk Parameters Calculation Time</i></b>	The time at which the risk parameters are calculated. In this Methodology, it is set to 19:00 MSK.
<b><i>Risk Assessment Range</i></b>	The range of exchange-quoted FX/Precious Metals rates that are determined so that, with given probability levels, market-based FX/Precious Metals rates do not exceed their boundaries upon the expiry of the Risk Assessment Period. Intervals between the boundaries (bands) and the Central Rate may be

---

	determined as a fraction (percent) of the Central Rate, and also in the FX/precious metal rate bps. Three Risk Assessment Range levels are determined.
<b><i>Instruments with full collateral required</i></b>	Instruments of the Moscow Exchange's FX and Precious Metals Markets which require 100% prefunding.
<b><i>Instruments without full collateral required (on-margin)</i></b>	Instruments of the Moscow Exchange's FX and Precious Metals Market which do not require 100% prefunding.
<b><i>Clearing Centre</i></b>	The Bank National Clearing Centre (Joint-stock company).
<b><i>Key maturity</i></b>	The due date of the second leg of an order book swap and swap contract, as well as the due date of a Futures Contract.
<b><i>Cross currency pair</i></b>	A currency pair in which both currencies are not RUB.
<b><i>Concentration limit, first and second level</i></b>	Limits determining net obligations (net requirements) for Clearing Members on a given settlement code. The limits are based on Margin rates and Interest Rate Risk rates Level 1, 2 and 3 accordingly.
<b><i>Non-business days</i></b>	Days on which the Moscow Exchange's FX and Precious Metals Markets are closed.
<b><i>Risk Assessment Period</i></b>	The interval which the Clearing Centre finds sufficient to detect and handle a Clearing Member's failure to fulfil its obligations under trade and/or margin requirements.
<b><i>Clearing Rules</i></b>	The National Clearing Centre Clearing Rules for the FX and Precious Metals Markets.
<b><i>Estimated FX Rate</i></b>	The estimate of the FX rate as of the start of trading for USD/RUB and EUR/RUB, which is determined based on the ratio of the EUR/USD on Forex to the value of the bi-currency basket calculated within forty minutes before the start of trading. It is the current OTC quote for other currency pairs (if any; otherwise, Forex cross rates are used).
<b><i>Business day</i></b>	A day which may also be a weekend or a holiday, on which Moscow Exchange FX and Precious Metals Markets are open for at least one of the instruments.
<b><i>Order book order</i></b>	An order intended to execute the trade placed during trading on the FX & Precious Metals Market.

<b>Order book trade</b>	A trade executed based on an order book order.
<b>Inter-product Spread Discount</b>	A reduction (credit) to the combined amount of initial margin requirements for the instruments in a product / assets group eligible for spreading.
<b>Margin Rate</b>	The estimated exchange quoted price variability with the set confidence probability level during the Risk Assessment Period. Margin Rates for three levels are determined.
<b>Interest Risk Rate</b>	Possible change in the Indicative Rate (% per annum) during the Risk Assessment Period. There are three rate levels.
<b>Market Liquidity Risk Rate</b>	The measure used to adjust the Margin Rate/Interest Risk Rate value.
<b>Futures contracts</b>	Deliverable futures with pre-determined delivery dates.
<b>Price Band</b>	Interval of FX rates/Precious Metals prices restricting the order prices in regular trading. For swap orders, Price Bands are set separately.
<b>Central Rate</b>	The rate calculated in accordance with this Methodology and used to determine Price and Risk Bands.
<b>Central Indicative Swap rate</b>	Swap difference determined by the Clearing Center for the relevant swap term in accordance with this Methodology.
<b>Synthetic Swap</b>	The combination of spot orders and opposite Futures Contract orders. The synthetic swap is based on a no-arbitrage principle and used for the purposes of the calculation of the Indicative Swap Rates and interest rate risk monitoring.

- 1.2. Any terms not expressly defined herein have the meanings ascribed to them by the laws and regulations of the Russian Federation, regulations of the Bank of Russia, internal documents of the National Clearing Centre, and the Trading Rules of the Moscow Exchange for the FX and Precious Metals Market.
- 1.3. This Methodology uses the following symbols (sub-indices mean business days; it is assumed that risk parameters are assessed as of the Risk Parameters Calculation Time on the day  $i$ ):

No	Parameter	Symbol
1	Business day on which risk parameters for the next business day are determined (sub-index).	$i$
2	Central Rate calculated on business day $i$ for all currency pairs.	$RC_i$
3	The first, second, and third level of Margin Rate determining the Risk Bands. It is calculated as a fraction of the Central Rate $RC_i$ for Underlying Assets.	$S_{1_i}$ $S_{2_i}$ $S_{3_i}$

4	Interest Risk Rate of the first, second and third level. Determined for Key Dates.	$\Delta_{1_i}$ $\Delta_{2_i}$ $\Delta_{3_i}$
5	Margin Rate Estimate. Based on Underlying Assets as a fraction of the Central Rate $R_{C_i}$ .	$V_i$
6	Interest Risk Rate Estimate. Determined for Key Dates. In percent per annum.	$V(\text{interest\_risk})_i$
7	Tentative Margin Rate. Based on the Underlying Assets and is a fraction of the Central Rate $R_{C_i}$ .	$S_i^p$
8	Tentative Interest Risk Rate. Determined for Key Dates. In percent per annum.	$\Delta_i^p$
9	Relative rate change on day $i$ . Determined for Underlying Assets and is a fraction of the Central Rates.	$r_i$
10	Maximum intraday price deviation from the Central Rate $R_{C_{i-1}}$ during the trading day $i$ . Determined for Underlying Assets and is a fraction of the Central Rate $R_{C_{i-1}}$ .	$r \max_i$
11	Relative interest rate change on day $i$ . Determined as a spread to the Central Rate. In percent per annum.	$r(\text{interest\_risk})_i$
12	Weighing ratio used in calculating Central Rate volatility and interest rate volatility. Determined at the Risk Parameters Calculation Time on day $i$ .	$a_i$
13	Holiday factor. Determined at the Risk Parameters Calculation Time on day $i$ for Underlying Assets.	$G_i$
14	Number of holidays in the Risk Assessment Period. The value depends on the number of non-operational days in the next Risk Assessment Period for a given currency pair. Determined during risk parameters calculation on day $i$ for Underlying Assets.	$m_i$
15	Exchange rate volatility on day $i$ . Determined at the Risk Parameters Calculation Time on day $i$ .	$\sigma_i$
16	Interest rate volatility on day $i$ . Determined during risk parameters calculation on day $i$ for instruments without full prefunding when settlement dates coincide with the swaps maturity, first leg maturity TOM. In percent per annum.	$\sigma(\text{interest\_risk})_i$
17	Minimum Margin Rates of the first (second, third) level. Values are calculated for each Underlying Asset, in %.	$S_{1\_min}$ $S_{2\_min}$ $S_{3\_min}$
18	Minimum Interest Risk Rate of the first level. In percent per annum.	$\Delta_{1\_min}$
19	Maximum Margin Rate.	$S_{max}$
20	Central Indicative Swap Rate calculated during business day $i$ . Determined for Key Dates, in RUB.	$SWAPCRate_i$
21	Interest Rate Risk (upward/downward scenarios) in rubles calculated during business day $i$ . Determined for on-margin instruments, in RUB.	$SWAPHRate_i$ $SWAPLRate_i$
22	RUB rollover rate	$SD_{RUB}$
23	FX rollover rate	$SD_{VAL}$

24	Market liquidity risk rate for spot trades, in %.	$b$
25	Market liquidity risk rate for swap trades, in %.	$b_{IR}$
26	Volatility multiplier, determined for Margin Rate calculation based on exchange rate volatility or for Interest Risk Rate calculation based on interest rate volatility. May vary depending on the volatility estimates.	$t$
27	Time restriction on Margin Rate reduction, in business days.	$n$
28	Time restriction on Interest Risk Rate reduction, in business days.	$n(interest\_risk)$
29	Minimum Margin Rate movement (step) set as a fraction of Central Rates $R_C$ for Underlying Assets.	$h$
30	Minimum Interest Risk Rate movement (step), in percent per annum of the Central Rate $R_C$ for instruments without full prefunding when settlement dates coincide with the swaps maturity, first leg maturity TOM.	$h(interest\_risk)$
31	Ratio of the Risk Assessment Range to the Price Band. Set for Underlying Assets.	$x$
32	Ratio of the swap Indicative Rates to the swap Price Band. Set for instruments without full prefunding when settlement dates coincide with the swap maturity dates, first leg maturity TOM.	$swapx$
33	Maximum best quotes proximity to the Price Band. Set in fractions of the Price Band range.	$w$
34	Upper weighing ratio.	$a_{\text{верхняя}}$
35	Lower weighing ratio.	$a_{\text{нижняя}}$
36	Number of first on-screen trades not included into the calculation of the maximum relative price deviation during a trading day, for Underlying Assets.	$q$
37	The period of time during which the best quotes are closest to the Price Band. Upon this period expiry the Price Band is to be shifted in the course of trades. In seconds.	$u$
38	Band shift ratio.	$Shift$
39	Minimal step for Interest Risk Rate. Set per each Underlying Asset as fraction of Central rate.	$h_{IR}$
40	Underlying Assets combined in a spreading group.	$Group$
41	Inter-product spread discount. Set as a fraction for each spreading group.	$Skidka(Group)$
42	Inter-product spread discount. Set in fractions as a fraction per the spread supergroup.	$Skidka\_SuperGroup$
43	A flag for EWMA model for Margin Rate calculation.	$isEWMA$
44	A flag for EWMA model for Interest Rate Risk calculation.	$isEWMA_{IR}$
45	A flag for risk monitoring. Set for each Underlying Asset.	$isMonitoring$
46	A Futures contract price for FX or precious metal.	$Fut$
47	Upper/Lower Price Band Limits for FX or precious metals Futures contract.	$SCHFFut$ $SCHLFut$
48	Synthetic Swap price.	$SSwap\_Fut$

49	Level 1 Risk Rate for the <i>i</i> th asset in currency pair Vali (up/down)	$S_{\_1Vali} /$ $S_{\_1Valiup} /$ $S_{\_1Validown}$
50	The risk rate for cross currency pair Val1/Val2	$S_{Val1/Val2} /$ $S_{Val1/Val2up} /$ $S_{Val1/Val2 down}$
51	Upper/lower Price Band limits	$RcH / RcL$
52	Upper/lower limits for the Risk Assessment range	$RtH/RtL$
53	The amount of lot currency in the cross currency pair	$N_{\_}(Val1, Val2)$

## 2. General provisions

- 2.1. This Methodology has been developed in accordance with the Clearing Rules to describe the procedure of risk parameters and swap transactions parameters selection and calculation.
- 2.2. This Methodology, amendments and supplements thereto and their effective dates are adopted by the National Clearing Centre.
- 2.3. This Methodology is available on the Clearing Centre website.

## 3. Risk management parameters

- 3.1. This Methodology describes the rules of determining the following risk parameters:
  - Central Rate;
  - Upper and Lower Limits of the Market Risk Assessment Ranges, Levels 1,2 and 3;
  - Upper and Lower Risk Band Limits;
  - Central, Upper and Lower Limits of the Swap Indicative Rates, Levels 1,2 and 3;
  - Concentration Limits, Levels 1 and 2.
- 3.2. Other parameters listed in paragraph 1.3 herein are for technical purposes and are employed in determination of risk parameters listed in paragraph 3.1 herein.
- 3.3. Parameters listed in paragraph 1.3 of this Methodology (items 2-16, 20-21 and 46-51), are calculated at the Risk Parameters Calculation Time every business day.
- 3.4. Parameters listed in paragraph 1.3 of this Methodology (items 17-19 and 24-44), and Concentration Limits of the first and second level are approved by the resolution of the Clearing Centre and subject to revision when necessary.
- 3.5. The list of Underlying Assets is determined in accordance with the Clearing Rules and published on the Clearing Center website.
- 3.6. At admission of an instrument to clearing, the initial values of the risk parameters listed in paragraphs 3.2-3.3 are set by the Clearing Centre.

## 4. Central rate algorithm

- 4.1. Central Rates are determined at the Risk Parameters Calculation Time every business day.



- 
- 4.2. The Central Rate of the Currency Pair available for trading without 100% collateral required is calculated based on order book trades to buy/sell a foreign currency/precious metal which will be settled on the Settlement Day immediately following the trade date.
- 4.3. The Central Rate of the Currency Pair available only for trading with 100% collateral required is calculated based on all order book trades to buy/sell a foreign currency/precious metal which will be settled on the trade date (T), T+1 and T+2.
- 4.4. The Central Rate for Currency Pairs with Russian Rouble as the quote currency is determined as follows:
- 4.4.1. It is set equal to the average weighted rate calculated based on trades executed for 30 (thirty) minutes before the Risk Parameters Calculation Time with respect to currency pairs without full collateral required in which more than 20 (twenty) trades were executed for 30 (thirty) minutes before that Time;
- 4.4.2. It is set equal to the median of the following values with respect to currency pairs without full collateral required in which no more than 20 (twenty) trades were executed within 30 (thirty) minutes before the Risk Parameters Calculation Time:
- The average weighted rate calculated based on all related trades executed during the current business day until the Risk Parameters Calculation Time. If no trades were executed, the median value is calculated regardless of the average weighted rate;
  - The best bid price on the currency pair submitted on the order book, which is going to be settled on the Settlement Day following the trade date. If no orders were submitted within that period, the value is not used to calculate the median;
  - The best bid price for the currency pair appeared on Bloomberg and/or Reuters. This price may be derived by relating the prices of orders in currency pairs in which one of the currencies is not the currency constituting the pair in question. If no orders were submitted within that period, the value is not used to calculate the median;
  - The best offer price for the currency pair submitted on the order book, which is going to be settled on the Settlement Day following the trade date. If no orders were submitted within that period, the value is not used to calculate the median;
  - The best offer price for the currency pair appeared on Bloomberg and/or Reuters. This price may be derived by relating the prices of orders in currency pairs in which one of the currencies is not the currency constituting the pair in question as the third currency. If no orders were submitted within that period, the value is not used to calculate the median.
- 4.4.3. If no relevant trades were executed on the current Business day by the Risk Parameters Calculation Time, and no orders were submitted to sell/buy the currency pair during that period, the Central Rate is set equal to the Bank of Russia FX rate.

- 4.5. The Central FX Rate for cross currency pairs is set equal to the FX rate derived based on Central Rates of currency pairs in which one of the currencies is the currency constituting the cross currency pair and the other is Russian Rouble.

## 5. The estimate of upper and lower market risk bands

- 5.1. The exponentially weighted moving average (EWMA) estimation is used to determine the Market Risk Band if the EWMA attribute is set to true in calculation of the Market Rate (isEWMA).
- 5.2. The Market Risk Assessment Range is calculated every business day  $i$  at the Risk Parameters Calculation Time.

5.2.1. Relative rate variation  $r_i$  is calculated as follows:

$$r_i = \max \left[ \left| \frac{Rc_i - Rc_{i-2}}{Rc_{i-2}} \right|; |r_{\max_i}| \right], \quad (5.1)$$

i.e. the maximum of two values below:

- Relative two-day Central Rate variation;
- Maximum relative intraday deviation of the prices in TOM instrument during business day  $i$  from Central Rate  $Rc_{i-1}$ ; to exclude unrepresentative data on order book trades at the start of trading,  $q$  of first book trades are not included in calculation. If the amount of trades is insufficient,  $r_{\max_i}$  is set equal to 0.

5.2.2. Weighing ratio  $a_i$  is determined.

- If the relative rate change  $r_i$  exceeds  $\sigma_{i-1}$  on the previous business day,  $a_i = a_{upper}$ , otherwise  $a_i = a_{lower}$ :

$$a_i = \begin{cases} a_{upper}, & \text{если } r_i > \sigma_{i-1}; \\ a_{lower}, & \text{если } r_i \leq \sigma_{i-1}. \end{cases} \quad (5.2)$$

- If in the period between two Business Days  $i-2$  and  $i$  there was more than one holiday,  $a_i$  is set equal to 0.

Hereinafter, the 'holiday' means:

- for USD/RUB Currency Pair: a Non-Business day provided that it is a business day in the US;
- for EUR/RUB Currency Pair: a Non-Business day provided that it is a business day in Germany;
- for Precious Metal/RUB Currency Pair: a Non-Business day provided that it is a business day either in the US, the UK, or China;
- for other Currencies Pair with RUB as the quote currency: a non-business day provided that it is a business day in the currency country of origin.

5.2.3. Holiday ratio  $G_i$  is defined for the upcoming Risk Assessment Period<sup>1</sup>:

$$G_i = \sqrt{1 + \frac{m_i}{2}}. \quad (5.3)$$

<sup>1</sup> Divider 2 means that the Risk Assessment Period equals to 2 business days by default.

Parameter  $m_i$  for a particular instrument is determined as the total number of Non-business days for a given currency pair in the upcoming Risk Assessment Period.

5.2.4. Volatility is recalculated according to the formula:

$$\sigma_i = \sqrt{(1 - a_i) \cdot \sigma_{i-1}^2 + a_i \cdot r_i^2}. \quad (5.4)$$

If price change  $r_i$  exceeds Margin rate  $S_{i-1}$  and in the interval between Business Days  $i$  and  $i-2$  there is no more than one holiday, the following value is determined along with the Volatility derived from formula (5.4),:

$$\sigma_i^* = \frac{r_i}{t}. \quad (5.5)$$

In this case, volatility  $\sigma_i$  is calculated using the formula:  $\sigma_i = \max(\sigma_i, \sigma_i^*)$ .

In the above formula (5.5) and hereinafter,  $t$  is the volatility multiplier based on retrospective analysis and back testing.

5.2.5. Tentative Margin Rate  $S_i^p$  is determined by the following algorithm:

if  $\text{ceiling}\left(\frac{t \cdot \sigma_i}{h}\right) \cdot h \geq S_{i-1}^p + h$ , then  $S_i^p = \text{ceiling}\left(\frac{t \cdot \sigma_i}{h}\right) \cdot h$ ; otherwise  
 if  $\text{ceiling}\left(\frac{t \cdot \sigma_i}{h}\right) \cdot h \leq S_{i-1}^p - h$  and the period from the last change of the tentative margin ratio equals at least  $n$  Business Days, then  
 $S_i^p = S_{i-1}^p - h$ ;  
 otherwise  $S_i^p = S_{i-1}^p$ ,

Where *ceiling* is the function of rounding up to integer.

5.2.6. Minimum Margin Rates of the three levels  $S\_1\_min$ ,  $S\_2\_min$ ,  $S\_3\_min$  are determined with the following purposes:

- to restrict model risk in case of too low volatility estimates if market conditions achieve the levels pre-defined in the stress scenarios;
- to prevent suspension of trading in the event of substantial Price Band narrowing.

5.2.7. Margin Rate estimate  $V_i$  is determined with consideration that it may only vary in a discrete way with the minimum step  $h$ :

$$V_i = \min\left(\text{ceiling}\left(\frac{\max(S_i^p * G_i + b; S\_1\_min)}{h}\right) * h; S\_max\right). \quad (5.6)$$

5.3. The final first level Margin Rate  $S\_1_i$  is equal to the Margin Rate estimate  $V_i$

$$S\_1_i = V_i.$$

5.4. The Level 2 and Level 3 Margin Rates,  $S\_2_i$  and  $S\_3_i$ , are determined through the calculation of volatility in the Risk Assessment Periods for the Level 2 and Level

3 risks subject to Minimum and Maximum Margin Rates established for for Underlying Assets:

$$S_{2_i} = \min \left( \text{ceiling} \left( \frac{\max \left( \sqrt{\frac{rh_{-2}}{rh_{-1}}} \cdot (S_i^p * G_i + b); S_{2\_min} \right)}{h} \right) \cdot h; S_{max} \right),$$

$$S_{3_i} = \min \left( \text{ceiling} \left( \frac{\max \left( \sqrt{\frac{rh_{-3}}{rh_{-1}}} \cdot (S_i^p * G_i + b); S_{3\_min} \right)}{h} \right) \cdot h; S_{max} \right).$$

- 5.5. If the EWMA model attribute is set to false in the Margin Rate calculation (isEWMA) then the Margin Rates are set equal to the minimum Margin Rates.
- 5.6. The Upper Limit of the Market Risk Assessment Range for levels 1, 2 and 3 is calculated according to the formulas below:

$$PtH_{1_i} = P_i \cdot (1 + S_{1_i}),$$

$$PtH_{2_i} = P_i \cdot (1 + S_{2_i}),$$

$$PtH_{3_i} = P_i \cdot (1 + S_{3_i}).$$

- 5.7. The Lower Limit of the Market Risk Assessment Range for levels 1, 2 and 3 is calculated according to the formulas below:

$$PtL_{1_i} = P_i \cdot (1 - S_{1_i}),$$

$$PtL_{2_i} = P_i \cdot (1 - S_{2_i}),$$

$$PtL_{3_i} = P_i \cdot (1 - S_{3_i}).$$

- 5.8. The Clearing Centre has the right to adjust the Margin Rates and Market Risk Assessment Ranges at the market open or during the trading hours.
- 5.9. The risk rates of the relevant levels (J= 1,2,3) are determined as follows:

5.9.1. The upside risk rate is determined as  $S_{J_{up}} = \frac{RtH_J}{P_i} - 1$

5.9.2. The downside risk rate is determined as  $S_{J_{down}} = 1 - \frac{RtL_J}{P_i}$

## 6. Rollover rate

- 6.1. Rollover Rate is the interest rate employed in calculating the price of a swap trade executed by a defaulting Clearing Member and the Clearing Centre. Rollover Rate is determined in % per annum.
- 6.2. Rollover Rate may be denominated in RUB or FX depending on the swap trade's direction. In the swap price formula in the Clearing Rules the rate is indicated in % per annum and is the value below depending on the swap trade direction:

- 6.2.1. If a defaulting Clearing Member buys FX/precious metals for RUB in the first leg of the swap trade executed and sells currency/precious metals in the second leg, the swap rate is equal to  $SD_{VAL}$ .
- 6.2.2. If a defaulting Clearing Member sells FX/precious metals for RUB in the first leg of the swap trade and buys currency/precious metals for RUB in the second leg, the swap rate is equal to  $SD_{RUB}$ .
- 6.3. In specific cases, the Clearing Centre is fully entitled to unilaterally change Rollover Rate for all or some of the Clearing Members including setting the Rates equal zero.

## 7. Algorithm for Central Indicative Swap Rates and Interest Risk Rates

- 7.1. Central Indicative Swap Rates are calculated in the course of trading on day  $i$  at the Risk Parameters Calculation Time using the following algorithm:
- 7.2. If swap transactions with TODTOM expiry have been concluded on the current Business Day, the average weighted Swap Rate  $Rate_{(Y0, Y1, \%)}$  is calculated using the average weighted rate based on data for the current business day (WA).
- 7.3. If swap transactions with TODTOM maturity have not been concluded on the current business day, the Swap Rate  $Rate_{(Y0, Y1, \%)}$  calculated for the previous Central Indicative Swap Rate is used, OR the Swap Rate  $Rate_{(Y0, Y1, \%)}$  may be determined based on a quote for the swap transaction with the relevant maturity available via the Bloomberg and/or Reuters terminal which makes the rate higher (for the bid) or less (for the offer).
- 7.4. The swap rates  $Rate_{(Yn, Ym, \%)}$  (in percent per annum) are calculated which correspond to terms  $Yn/Ym$  of swaps and swap contracts with the first leg settled on T+1 which were executed on MOEX FX and Precious Metals Markets on day  $i+1$  (the "Long Term Swaps").
  - 7.4.1. The swap rates  $Rate_{(Y1, Y2, \%)}$  in percent per annum is set equal to  $Rate_{(Y0, Y1, \%)}$  for each instrument with TOMSPT maturity.
  - 7.4.2. If an order book order was available in the MOEX FX/Precious Metals Markets trading system, and/or a quote for the swap transaction with TOMSPT maturity which makes the rate higher (for the bid) or less (for the offer) was available via the Bloomberg and/or Reuters terminal, the swap rate in percent per annum may be determined using that quote.
  - 7.4.3. As for other maturities of Long Term Swaps, the swap rates  $Rate_{(Y1, Ym, \%)}$  are calculated as follows:
    - The swap rate in percent per annum is calculated using the indicative NFEA FX Swap Rate, if any, for the relevant maturity which is published by the National Foreign Exchange Association

(NFEA). If on the current day, the NFEA FX Swap Rate has not been published or has not been available for other reasons, previous Central Indicative Swap Rate is used. If an order book order was available in the MOEX FX/Precious Metals Markets trading system, and/or a quote for the swap transaction with the relevant maturity which makes the rate higher (for the bid) or less (for the offer) was available via the Bloomberg and/or Reuters terminal, the swap rate of the Central Indicative Swap Rate may be determined using that quote.

- If the NFEA does not provide the NFEA FX Swap Rate for an instrument, the swap rate in percent per annum is based on the average value of the best bids and offers placed in the trading system of the MOEX FX and Precious Metals Markets. If the Reuters and/or Bloomberg terminal provides a quote for the swap trade with the relevant maturity which makes the rate higher (for the bid) or less (for the offer), the Central Indicative Swap Rate may be determined using that quote.

7.4.4. The Clearing Centre is entitled to change swap rates, if necessary for the purposes of the calculation of the Central Indicative Rates in a manner different from that set out above.

7.4.5. For each maturity, further denoted as YX, and corresponding to Futures expiry dates, beside dates for the second leg of Long Term Swap, are calculated at the Risk Parameters Calculation Time in the following manner:

$$Bid\_SSwap(Y0, YX, \%) = (Bid\_Fut(YX) - R_c) / R_c * 365 / T(YX),$$

$$Ask\_SSwap(Y0, YX, \%) = (Ask\_Fut(YX) - R_c) / R_c * 365 / T(YX),$$

$$Last\_SSwap(Y0, YX, \%) = (Last\_Fut(YX) - R_c) / R_c * 365 / T(YX),$$

Where  $Last\_Fut(YX)$ ,  $Bid\_Fut(YX)$  and  $Ask\_Fut(YX)$  are the closing price and best bids/offers for the Futures Contract expired on YX.

7.4.6. The Synthetic Swap Rate  $Rate\_ (Y0, YX, \%)$  for Key Maturities YX is calculated as the median among the values described in the previous paragraph.

7.4.7. The Central Indicative Swap Rates in percent per annum are calculated as follows for Key Maturities corresponding to maturities Ym of the second legs of swap trades and Futures Contracts settlement dates YX:

$$SWAPCRate\_ (Y0, Y1, \%) = Rate\_ (Y0, Y1, \%),$$

$$SWAPCRate\_ (Y0, Y1, \%) = Rate\_ (Y0, Y1, \%),$$

$$SWAPCRate\_ (Y0, Ym, \%) =$$

$$[Rate\_ (Y0, Y1, \%) * T(Y1) + Rate\_ (Y1, Ym, \%) * (T(Ym) - T(Y1))] / T(Ym).$$

Where as  $T(Yn)$  is determined as period corresponding to maturity  $Yn$  in days.

7.4.8. The Central Indicative Swap Rates  $SWAPCRate\_ (Y0, Ym, \%)$  for maturities other than Key Maturities are calculated using the linear interpolation method.

7.5. The Central Indicative Swap Rates  $SWAPCRate\_ (Y0, Ym, RUB)$  for all maturities  $Ym$  is calculated as

$$SWAPCRate\_ (Y0, Ym, RUB) = \frac{SWAPCRate\_ (Y0, Ym, \%) * T(Ym)}{365 * 100} * Rc$$

The Interest Risk Rate of 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> levels are calculated every Business day  $i$  at the Risk Parameters Calculation Time.

7.6. If the EWMA model attribute has been set to True for the Interest Risk Rate (isEWMA\_IR), the Interest Risk Rate for every Key Maturity is calculated daily at the Risk Parameters Calculation Time on the day  $i$  using the exponential weighting method:

7.6.1. The percentage change of the interest rate is calculated as follows:

$$r(\text{interest\_risk})_i = \max \left[ \left| \frac{SWAPCRate_i / Sn_i - SWAPCRate_{i-2} / Sn_{i-2}}{Rc_{i-2}} \right|, \left| \frac{SWAPCRate_i / Sn_i - SWAPCRate_{i-1} / Sn_{i-1}}{Rc_{i-1}} \right| \right] * 36500, \quad (7.1)$$

where  $Sn$  is the number of calendar days in the swap trade price.

7.6.2. Weighing coefficient  $a_i$  is determined.

- If the percentage change of rate  $r(\text{interest\_risk})_i$  is greater than the estimated Volatility  $\sigma(\text{interest\_risk})_{i-1}$  on the previous Business Day,  $a_i = a_{upper}$ , otherwise  $a_i = a_{lower}$ :

$$a_i = \begin{cases} a_{upper}, & \text{если } r(\text{interest\_risk})_i > \sigma(\text{interest\_risk})_{i-1}; \\ a_{lower}, & \text{если } r(\text{interest\_risk})_i \leq \sigma(\text{interest\_risk})_{i-1}. \end{cases} \quad (7.2)$$

- If in the period between the two Business Days  $i-2$  and  $i$ , there was more than one holiday, weighing coefficient  $a_i$  is set equal to 0.

7.6.3.  $G_i$  is determined using the procedure set out in paragraph 5.2.3

7.6.4. The interest rate volatility is recalculated using the formula:

$$\sigma(\text{interest\_risk})_i = \sqrt{(1 - a_i) \cdot \sigma(\text{interest\_risk})_{i-1}^2 + a_i \cdot r(\text{interest\_risk})_i^2} \quad (7.4)$$

If the price change  $r(\text{interest\_risk})_i$  is greater than the Interest Risk Rate  $\Delta_{i-1}$  and in the period between Business Days  $i$  and  $i-2$  there was no more than one holiday, the following value is calculated along with Volatility calculated using formula (7.4):

$$\sigma(\text{interest\_risk})_i = \frac{r(\text{interest\_risk})_i}{t} \quad (7.5)$$

In this case, Volatility  $\sigma(\text{interest\_risk})_i$  is set to the maximum of (7.4) and (7.5).

In formula (7.5) and hereinafter, parameter  $t$  is a Volatility Multiplier determined based on retrospective analysis and backtesting.

- 7.6.5. The Tentative Interest Risk Rate  $\Delta_i^p$  is calculated using the following algorithm:

If  $\text{ceiling}\left(\frac{t \cdot \sigma(\text{interest\_risk})_i}{h(\text{interest\_risk})}\right) \cdot h(\text{interest\_risk}) \geq \Delta_{i-1}^p + h(\text{interest\_risk})$   
then  $\Delta_i^p = \text{ceiling}\left(\frac{t \cdot \sigma(\text{interest\_risk})_i}{h(\text{interest\_risk})}\right) \cdot h(\text{interest\_risk})$   
Otherwise, if  $\text{ceiling}\left(\frac{t \cdot \sigma(\text{interest\_risk})_i}{h(\text{interest\_risk})}\right) \cdot h(\text{interest\_risk}) \leq \Delta_{i-1}^p - h(\text{interest\_risk})$   
and the time since the last change of the Tentative Interest Risk Rate is less than  $n(\text{interest\_risk})$  Business Days, then  $\Delta_i^p = \Delta_{i-1}^p + h(\text{interest\_risk})$  ;  
otherwise  $\Delta_i^p = \Delta_{i-1}^p$  ,

where *ceiling* is the function of rounding up to the nearest integer.

- 7.6.6. The Interest Risk Rate Estimate  $V(\text{interest\_risk})_i$  is determined with consideration that this rate may only vary on a discrete way with the minimum step  $h(\text{interest\_risk})$

$$V(\text{interest\_risk})_i = \text{ceiling}\left(\frac{\max(\Delta_i^p * G_i + b\_IR; \Delta\_1\_min)}{h(\text{interest\_risk})}\right) * h(\text{interest\_risk}). \quad (7.6)$$

- 7.6.7. The final value of the Interest Risk Rate of the 1<sup>st</sup> level is equal to the Interest Risk Rate Estimate  $V(\text{interest\_risk})_i$

$$\Delta\_1_i = V(\text{interest\_risk})_i$$

- 7.6.8. Second level Interest Risk Rate ( $\Delta\_2_i$ ) is determined through recalculating the volatility during the Risk Assessment Period (second level) considering the minimum Interest Risk Rate (second level)  $\Delta\_2\_min$  and the minimum step of the Interest Risk Rate  $h\_IR$ :

$$\Delta\_2_i = \text{ceiling}\left(\frac{\Delta\_1_i * \sqrt{\frac{rh\_2}{rh\_1}}}{h(\text{interest\_risk})}\right) \cdot h(\text{interest\_risk}).$$

- 7.6.9. Third level Interest Risk Rate ( $\Delta\_3_i$ ) is determined by recalculating the volatility during the Risk Assessment Period (third level) considering the



minimum Interest Risk Rate of the third level  $\Delta\_3\_min$  and the minimum step of the Interest Risk Rate  $h\_IR$ :

$$\Delta\_3_i = \text{ceiling} \left( \frac{\Delta\_1 * \sqrt{\frac{rh\_3}{rh\_1}}}{h(\text{interest\_risk})} \right) \cdot h(\text{interest\_risk}) .$$

- 7.6.10. If the attribute isEWAMA\_IR in the calculation of Interest rate risk rates is set to false, the Interest Rate Risk levels are set equal to the lower limit of Interest Rate Risk.
- 7.6.11. The Clearing Centre is entitled to set the final Interest Risk Rate that may differ from the Interest Risk Rate Estimate.
- 7.6.12. Interest Rate Risk (upward/downward scenarios) of J-level (J= 1,2,3) for Key Maturities Ym, corresponding to maturities of the second legs of Long-Term Swaps is determined in the following way for every asset:

$$H\Delta\_J(Ym) = L\Delta\_J(Ym) = \Delta\_J(Ym)$$

Where  $H\Delta\_J(Ym), L\Delta\_J(Ym)$  are the Interest Rate Risk upward/downward scenarios.

For Key expiry dates, corresponding to Futures contracts expiries, the Interest Rate Risk (upward/downward scenarios) are set by linear interpolation method.

- 7.7. Interest Rate Risk (upward/downward scenarios) of J-level (J= 1,2,3) for broken dates, are calculated by linear interpolation. Interest Rate Risk with expiry longer than the maximum Key expiry date is set equal to the maximum Key expiry date.
- 7.8. Interest Rate Risk (upward/downward scenarios) of J-level (J= 1,2,3) in rubles for Ym is calculated as

$$SWAPHRate\_J(Y0, Ym, RUB) = \frac{[SWAPCRate\_J(Y0, Ym, \%) + H\Delta\_J(Ym)] * T(Ym)}{365 * 100} * Rc$$

$$SWAPLRate\_J(Y0, Ym, RUB) = \frac{[SWAPCRate\_J(Y0, Ym, \%) - L\Delta\_J(Ym)] * T(Ym)}{365 * 100} * Rc$$

## 8. Algorithm for Inter-product Spread Discount

8.1. The Clearing Center calculates the Inter-product Spread Discount which is applied to all paired combinations of assets in the spreads.

- 8.1.1. The Clearing Center breaks down the assets into groups each of which includes a set of assets used then to create cross currency pairs.

8.2. The Inter-product Spread Discount is applied to assets (currency pairs) within the same group and across the groups if these groups are in the same supergroup.

- 8.2.1. The supergroup is a combination of groups which provides the Discount for spreading any two assets from different groups of the supergroup.
- 8.2.2. A supergroup may also contain other supergroups and provide the Discount for spreading any two assets from different supergroups within that supergroup.
- 8.2.3. The Inter-Product Spread Discount is applied to any pair of assets from the same supergroup.
- 8.2.4. The Inter-Product Spread Discount applied to all paired assets in the same group is determined as the minimum value of all combinations in the group which are calculated as the minimum across the scenarios:

$$Skidka\_Group_k = \min_{Val1, Val2 \in Group_k} Skidka_{Val1/Val2} \left( \min_{up, down} Skidka_{Val1/Val2} \right)$$

- 8.2.5. The amount of the Inter-Product Spread Discount for a supergroup is calculated in a similar way to that given in paragraph 8.3:
- Inter-Product Spread Discount  $Skidka_{Val1/Val2}$  is calculated for every currency pair;
  - The Discount of the supergroup  $Skidka\_SuperGroup_m$  is calculated as the minimum of the minimum for the pair (*up, down*)

$$Skidka\_SuperGroup_m = \min_{Val1 \in Group_{k1}, Val2 \in Group_{k2}} Skidka_{Val1/Val2} \left( \min_{up, down} Skidka \right)$$

8.3. The Inter-Product Spread Discount for assets within the same group is calculated using the upside/downside risk rates for each asset in the currency pair.

- 8.3.1. The Discount is calculated for upside/downside scenarios for the price of the currency pair

$$Skidka_{Val1/Val2_{up}} = \min \left( \max \left( \frac{S_{1Val1_{up}} + S_{1Val2_{down}} - S_{Val1/Val2_{up}} * \left( \frac{1 + S_{1Val1_{up}}}{1 + S_{Val1/Val2_{up}}} \right)}{2 * \min(S_{1Val1_{up}}, S_{1Val2_{down}})}; 0 \right); 1 \right)$$

$$Skidka_{Val1/Val2_{down}} = \min \left( \max \left( \frac{S_{1Val1_{down}} + S_{1Val2_{up}} - S_{Val1/Val2_{down}} * \left( \frac{1 + S_{1Val2_{up}}}{1 + S_{Val1/Val2_{down}}} \right)}{2 * \min(S_{1Val1_{down}}, S_{1Val2_{up}})}; 0 \right); 1 \right)$$

- where  $S_{Val1/Val2_{up}}$  ( $S_{Val1/Val2_{down}}$ ) is determined in accordance with the section 5.

8.3.2. The upper and lower limits for upside/downside risk rates are calculated:

$$S_{Val1/Val2up}^{min} = \begin{cases} \frac{S_{1Val2down} - S_{1Val1down}}{1 - S_{1Val2down}}, \text{ если } S_{1Val1down} \leq S_{1Val2down} \\ \max\left(0; \frac{S_{1Val1up} - S_{1Val2up}}{1 + S_{1Val2up}}\right), \text{ otherwise} \end{cases}$$

$$S_{Val1/Val2up}^{max} = \frac{S_{1Val1up} + S_{1Val2down}}{1 - S_{1Val2down}}$$

$$S_{Val1/Val2down}^{min} = \begin{cases} \max\left(0; \frac{S_{1Val2up} - S_{1Val1up}}{1 + S_{1Val2up}}\right), \text{ если } S_{1Val1down} \leq S_{1Val2down} \\ \frac{S_{1Val1down} - S_{1Val2down}}{1 - S_{1Val2down}}, \text{ otherwise} \end{cases}$$

$$S_{Val1/Val2down}^{max} = \frac{S_{1Val2up} + S_{1Val1down}}{1 + S_{1Val2up}}$$

## 9. Algorithm for Price Band Limits

9.1. To control orders in foreign currencies and precious metals, The Clearing Center sets the following measures:

- Price Bands to control prices of orders to sell/buy foreign currencies and precious metals, exclusive of swaps;
- Price Bands to control prices of swap orders. Each swap instruments h own Price Band which is determined depending on the swap maturity;
- Price bands to control prices of synthetic orders in cross currency pairs to which the Inter-product Spread Discount is applied.

9.2. The Upper/Lower Price Band for spot book and off book orders in Val1/Val2 is defined as follows for every Ym:

$$RcH_{(Ym)} = RcVal_{(Val1, Val2)} * \left(1 + \frac{S_{1Val1/Val2}}{x}\right) * \left(1 + \frac{(SWAPCRate_{Y0, Ym, \%} + \frac{H\Delta_{1(Ym, Val1)}}{swapx}) * [T(Ym) - T(Y0)]}{365 * 100}\right)$$

$$RcL_{(Ym)} = RcVal_{(Val1, Val2)} * (1 - \frac{S_{1Val1/Val2}}{x}) * (1 + \frac{(SWAPCRate_{(Y0, Ym, \%)} - \frac{L\Delta_{1(Ym, Val1)}}{swapx}) * [T(Ym) - T(Y0)]}{365 * 100})$$

where  $RcVal_{Val1/Val2}$  – the settlement price as of the last clearing which is calculated as the ratio of the central rates considering the amount of lot currency.

9.2.1. Formulas given in paragraph 9.2 are applied to cross currency pairs for which a trade instrument is available.

9.3. The Upper/Lower Price Band limits is calculated as follows for book and off book orders in Val/RUB FX futures contracts settled on YX:

$$SCHFUT_{(YX)} = RcH(Y_0) + SWAPHRate_{(Y_0, YX, Rub)},$$

$$SCLFUT_{(YX)} = RcL(Y_0) + SWAPLRate_{(Y_0, YX, Rub)}$$

9.4. The procedure of defining the Price Band to limit order prices for a swap on currency pair Val1/Val2 for each expiry date Yn/Ym is the following:

9.4.1. The Upper/Lower Limits of the Price Band for swap transactions in percent per annum are defined as follows for every Ym:

$$SWAPHRate_{(Y_0, Ym, \%)} = SWAPCRate_{(Y_0, Ym, \%)} + \frac{H\Delta_{1(Ym)}}{swapx}$$

$$SWAPLRate_{(Y_0, Ym, \%)} = SWAPCRate_{(Y_0, Ym, \%)} - \frac{L\Delta_{1(Ym)}}{swapx}.$$

9.4.2. In the order book boards, the Upper/Lower Price Band Limits for Val1/Val2 swap transactions settled in Val2 for Instruments with settlement dates corresponding to swap dates Yn/Ym are calculated as follows:

$$SWAPCHRate(Yn, Ym, Val1, Val2) = \frac{\left( FwdRate_{(Yn, Ym, \%)} + \frac{H\Delta_{1(Ym, Val1)}}{swapx} \right) * [T(Ym) - T(Yn)]}{365 * 100} \times RcVal_{Val1/Val2}$$

$$\begin{aligned}
& \text{SWAPCLRate}(Yn, Ym, Val1, Val2) \\
&= \frac{\left( \text{FwdRate}_{-}(Yn, Ym, \%) - \frac{L\Delta_{-1}(Ym, Val1)}{\text{swapx}} \right) \times [T(Ym) - T(Yn)]}{365 * 100} \\
&\times RcVal\_Val1/Val2
\end{aligned}$$

Where  $\text{FwdRate}_{-}(Yn, Ym, \%)$  is defined as follows if Val2=RUB:

$$\text{FwdRate}_{-}(Yn, Ym, \%) = \frac{\text{SWAPC\_Rate}_{-}(Y0, Ym, \%) * T(Ym) - \text{SWAPC\_Rate}_{-}(Y0, Yn, \%) * T(Yn)}{T(Ym) - T(Yn)}$$

Otherwise:

$$\left[ \frac{100 + \text{FwdRate}_{-}(Yn, Ym, \%, Val1) * (T(Ym) - T(Yn)) / 365}{100 + \text{FwdRate}_{-}(Yn, Ym, \%, Val2) * (T(Ym) - T(Yn)) / 365} - 1 \right] * \frac{36500}{(T(Ym) - T(Yn))} .$$

9.5. The procedure for determining the Price Bands to control prices of spot trades in cross currency pair Val1/Val2 without a trade instrument:

9.5.1. The Upper/Lower Price Band Limit for spot trades in cross currency pair Val1/Val2 is set as follows regardless of interest risk:

$$\begin{aligned}
RcH_{Val1/Val2} &= \min \left( RcVal_{Val1/Val2} * \left( 1 + \frac{S_{-1Val1/Val2up}}{x_{Val1/Val2}} \right); RcVal_{Val1/Val2} * (1 + PcH_{max}) \right) \\
RcL_{Val1/Val2} &= \max \left( RcVal_{Val1/Val2} * \left( 1 - \frac{S_{-1Val1/Val2down}}{x_{Val1/Val2}} \right); RcVal_{Val1/Val2} * (1 - PcL_{max}) \right),
\end{aligned}$$

$x$  – the coefficient measuring the relation between the Market Risk Assessment Range width and the Price Band width;

9.5.2.  $PcH_{max}$  and  $PcL_{max}$  are determined considering that the Margin Rate changes only in a discrete way with minimum step  $h$ :

$$\begin{aligned}
PcH_{max} &= \frac{h * \text{ceiling} \left( \frac{1}{h} * \text{Abs} \left( S_{Val1/Val2up}^{max} \right) \right)}{x_{Val1/Val2}}; \\
PcL_{max} &= \frac{h * \text{ceiling} \left( \frac{1}{h} * \text{Abs} \left( S_{Val1/Val2down}^{max} \right) \right)}{x_{Val1/Val2}}
\end{aligned}$$

9.5.3. The Price Bands used to control prices of OTC FX orders are set equal to the Price Bands applied to the relevant instruments in the order book boards.

## 10. Price band shift at market open and during trading hours (widening the Price Band)

- 10.1. The Price Band may be changed for any instrument before the start of and during trading in case of receiving an automatic alert to move the bands, except cases stated in clause 10.2 hereof.
- 10.2. If information is available which lead the Clearing Center to believe that no meaningful change occurs in the market condition, and if representative order and trade volumes are not available, the Clearing Centre may decide to remain the Price Band Limit unchanged despite the automatic alert to move the limit.
- 10.3. After the Risk Parameters Calculation Time, the Price Band Limits are not shifted except in order to synchronize them with the Derivatives Market risk parameters which were changed at the Risk Parameters Calculation Time.
- 10.4. For the currency pairs with Risk Monitoring attribute set to false the alerts are suppressed and the bands are not moved as the result.
- 10.5. The Price Band Limits set for OTC trades in foreign currencies are not monitored.
- 10.6. One of the following events triggers the shift the Price Band in order to control order prices in Val1/Val2, except swap orders:
  - Best bids on the order book have approached the Upper Price Band Limit by a value less than  $w * (RtH - RtL)$ , and this situation persists for the period determined by risk parameter  $u$ ;
  - Best offers on the order book have approached the Lower Price Band Limit by a value less than  $w * (RtH - RtL)$ , and this situation persists for the period determined by risk parameter  $u$ ;
  - At the market open, the estimated exchange rate differs from the Price Band Limit by less than  $w * (RtH - RtL)$ , or goes beyond the Price Band.

One of the following events triggers the shift of the Price Band to control Val1/Val2 swap order prices or Val1/Val2 synthetic swaps prices:

- The rates of best order book orders seeking to borrow cash have approached the Upper Price Band Limit by a value less than  $cVal\_Val1/Val2 \times \frac{\Delta_1 \times w}{swapx} \times \frac{[T(Ym) - T(Y0)]}{365 \times 100}$  and this persists for a period determined by risk parameter  $u$ ;
- The rates of best order book orders seeking to lend cash have approached the Lower Price Band Limit by a value less than  $RcVal\_Val1/Val2 \times \frac{\Delta_1 \times w}{swapx} \times \frac{[T(Ym) - T(Y0)]}{365 \times 100}$  and this persists for a period determined by risk parameter  $u$ ;
- At the market open, the estimated rate differs from the Price Band Limit by less than  $RcVal\_Val1/Val2 \times \frac{\Delta_1 \times w}{swapx} \times \frac{[T(Ym) - T(Y0)]}{365 \times 100}$ , or goes beyond the Price Band.

Any event stated above triggers the shift of the Price Band to control prices of orders on futures contracts.

Any event stated above triggers the shift of the Price Band to control prices of spot orders on cross currency pair Val1/Val2.

10.7. If the alert message is not sent automatically and the exchange rate is approaching the Price Band by a value less than  $w$  on the OTC market or is outside the price band, then the Clearing Centre may decide to move the Price Band.

10.8. If the decision has been taken to shift the Upper/Lower Price Band Limit used to control prices of orders on Val1/Val2:

10.8.1. This Upper/Lower Price Band Limit is shifted up/down from the Central Rate by  $Shift * (RcH - RcL)$  (the Price Band width applied to TOD trades is used for spot and forward transactions) as of day i-1 determined at the Risk Parameters Calculation Time, in accordance with the algorithm given in section 11 (for swap transactions)<sup>2</sup>.

10.9. If the decision has been taken to shift the Upper/Lower Price Band Limit to control process of orders on cross currency pair Val1/Val2 for which the Inter-product Spread Discount is applicable:

10.9.1. After the shift was made, the risk rate applicable to cross currency pairs is determined based on this relation:

$$S_{Val1/Val2up} := \max \left( \min \left( S_{1Val1/Val2up} + shift_{S_{Val1/Val2}}; S_{Val1/Val2up}^{max} \right); Abs(S_{Val1/Val2up}^{min}) \right)$$

$$S_{Val1/Val2down} := \max \left( \min \left( S_{Val1/Val2down} + shift_{S_{Val1/Val2}}; S_{Val1/Val2down}^{max} \right); Abs(S_{Val1/Val2down}^{min}) \right)$$

10.9.2. If the shift was made through at least one of risk rates  $S_{1Valiup} / S_{1Validown} / S_{Val1/Val2}$ , the following parameters are reviewed:  $Skidka_{Val1/Val2}$ ,  $Skidka_{Group_k}$ ,  $Skidka_{SuperGroup_m}$ .

10.10. After the Price Bands were shifted with respect to spot transactions, the Upper/Lower Price Band Limit for Futures Contracts are calculated as follows

<sup>2</sup> To calculate the shift for spot and forward transactions, a new value of the risk rate is used which is rounded to four decimal places. This new rate is calculated using formulas set out in paragraphs 11, 5.6 and 5.7 of this Methodology

$$\text{SCHFUT}_{\text{_(YX)}} = \text{newRcH}(\text{Y}_0) + \text{SWAPHRate}_{\text{_(Y0, YX, RUB)}},$$

$$\text{SCLFUT}_{\text{_(YX)}} = \text{newRcL}(\text{Y}_0) + \text{SWAPLRate}_{\text{_(Y0, YX, RUB)}}.$$

10.11. In case of Price Band levels adjustment as per paragraph 10.6 above, the Clearing Centre discloses the information with respect to that adjustment in the Clearing System within 15 minutes after the adjustment was made as well as on the Clearing Centre and Moscow Exchange websites within 30 minutes after that.

# **11. Shifting Market Risk Assessment Range limits (three levels) for Instruments without full collateral required at market open and during trading hours (widening the Market Risk Assessment Range)**

When the Price Band is shifted to control orders prices for foreign currencies/precious metals, except trades settled later than SPT, the Market Risk Assessment Range is reviewed as follows:

- If the Upper Price Band Limit is moved, the Level 1 Upper Risk Limit is determined as follows<sup>3</sup>:

$$RtH = RtH_{i-1} + (RcH - RcH_{i-1})$$

where

$RtH$  – new value of the Upper Risk Band;

$RcH$  – new value of the Upper Price Band;

$RtH_{i-1}$  – value of the Upper Risk Band on day  $i-1$ ;

$RcH_{i-1}$  – value of the Upper Price Band on day  $i-1$ .

Risk Bands of the second and third levels are moved by  $RtH_i - RtH_{i-1}$ .

- If the Lower Price Band Limit is moved, the Level 1 Lower Risk Limit is determined as follows:

$$RtL = RtL_{i-1} + (RcL - RcL_{i-1})$$

where

$RtL$  – new value of the Lower Risk Band;

$RcL$  – new value of the Lower Price Band;

$RtL_{i-1}$  – value of the Lower Risk Band on day  $i-1$ ;

$RcL_{i-1}$  – value of the Lower Price Band on day  $i-1$ .

Risk Bands of the second and third levels are moved by  $RtL_i - RtL_{i-1}$ .

The Market Risk Assessment Range limits are not reviewed after the Risk Parameters Calculation Time, except when these limits are shifted to make them synchronised with the Derivatives Market risk parameters which were changed at the Risk Parameters Calculation Time.

<sup>3</sup> Coefficient  $x$  may be set  $>2$  if, for example, the Margin Rate has been increased due to holidays, i.e. it is applied to a non-standard period, while the Price Band must be applied to intraday fluctuations of the FX rate as usual.



## 12. IR Risk Bands Shift before opening and during trading

12.1. In case of shifting the Price Band shifting alert for SWAP trades with Yn/Ym expires or a Price Band shifting alert for Synthetic Swap Y0/Ym, the following values are changed:  $H\Delta\_J(Ym)$  or  $L\Delta\_J(Ym)$ , by the amount of  $\frac{2 * Shift * \Delta\_1(Ym)}{swapx}$  depending on the shift direction.

12.2. The new value for Key date Ym Interest Rate Risk are defined as:

$$shift\_H\Delta\_J(Ym) = H\Delta\_J(Ym) + \frac{2 * Shift * \Delta\_1(Ym)}{swapx} \text{ for the upward scenario:}$$

$$shift\_L\Delta\_J(Ym) = L\Delta\_J(Ym) + \frac{2 * Shift * \Delta\_1(Ym)}{swapx} \text{ for the downward scenario.}$$

Interest Rate Risk (upward/downward scenarios) of J-level (J=1,2,3) for dates Yn that are different to the Key expiry dates are linearly interpolated.

12.3. Interest Rate Risk (upward/downward scenarios) of J-level (J=1,2,3) in rubles for Key dates Ym upon the Band adjustment are recalculated as:

$$shift\_SWAPHRate\_J(Y0, Ym, RUB) = \frac{[SWAPCRate\_ (Y0, Ym, \%) + shift\_H\Delta\_J(Ym)] * T(Ym)}{365 * 100} * Rc$$

$$shift\_SWAPLRate\_J(Y0, Ym, RUB) = \frac{[SWAPCRate\_ (Y0, Ym, \%) - shift\_L\Delta\_J(Ym)] * T(Ym)}{365 * 100} * Rc$$

12.4. The Upper and Lower Price Bands for swap trades denominated in % annual for each Key date Ym are defined as :

$$shift\_SWAPCHRate\_ (Y0, Ym, \%) = SWAPCRate\_ (Y0, Ym, \%) + \frac{shift\_H\Delta\_1(Ym)}{swapx}$$

$$shift\_SWAPCLRate\_ (Y0, Ym, \%) = SWAPCRate\_ (Y0, Ym, \%) - \frac{shift\_L\Delta\_1(Ym)}{swapx}$$

12.5. The Upper and Lower Bands for swap trades in RUB with the expiry dates corresponding to swap settlement dates Yn/Ym upon shift are recalculated as follows:

$$shift\_SWAPCHRate\_ (Yn, Ym, Val1, Val2) = \frac{\left( FwdRate\_ (Yn, Ym, \%) + \frac{shift\_H\Delta\_1(Ym, Val1)}{swapx} \right) * [T(Ym) - T(Yn)]}{365 * 100} * \frac{Rc(Val1)}{Rc(Val2)}$$

$$shift\_SWAPCLRate\_ (Yn, Ym, Val1, Val2) = \frac{\left( FwdRate\_ (Yn, Ym, \%) - \frac{shift\_L\Delta\_1(Ym, Val1)}{swapx} \right) * [T(Ym) - T(Yn)]}{365 * 100} * \frac{Rc(Val1)}{Rc(Val2)}$$

Where as if Val2 = RUB then  $FwdRate\_ (Yn, Ym, \%)$  is defined as

$$FwdRate\_ (Yn, Ym, \%) = \frac{SWAPC\_Rate\_ (Y0, Ym, \%) * T(Ym) - SWAPCRate\_ (Y0, Yn, \%) * T(Yn)}{T(Ym) - T(Yn)}$$

or alternatively as

$$\left[ \frac{100 + FwdRate\_ (Yn, Ym, \% , Val1) * (T(Ym) - T(Yn)) / 365}{100 + FwdRate\_ (Yn, Ym, \% , Val2) * (T(Ym) - T(Yn)) / 365} - 1 \right] * \frac{36500}{(T(Ym) - T(Yn))}.$$

## 12.6. The Upper/Lower Price Band for Futures contracts upon the shift are calculated as

$$SCHFUT\_ (YX) = RcH(Val1, Val2) + shift\_ SWAPCHRate\_ (Y0, YX, Val1, Val2),$$

$$SCLFUT\_ (YX) = RcL(Val1, Val2) + shift\_ SWAPCLRate\_ (Y0, YX, Val1, Val2).$$

## 13. Narrowing Risk Assessment Ranges and Price Bands at market open

- 13.1. At the market open on business day  $i$  following the holiday for which the Holiday Factor  $G_i > 1$  was applied to determine the risk parameters, the Clearing Centre checks whether the Risk Assessment Ranges for Instruments without full collateral required can be narrowed.
- 13.2. The Risk Assessment Range bands are recalculated for the current day in accordance with the algorithm stated in section 5 hereof with  $G_i = 1$ .
- 13.3. The Price Bands are determined in accordance with section 9 above based on values calculated in accordance with clause 13.2 above.
- 13.4. If the estimated exchange rate for relevant instruments is within the half of the Price Band calculated as per clause 13.3 above, the Risk Assessment Range and the Price Band are to be reviewed. Otherwise, they are not set.
- 13.5. Under specific circumstances, the Clearing Centre may decide to narrow the Risk Assessment Range and the Price Band in a way different from the procedure described above.

## 14. Specifics of risk parameters for fix trades

- 14.1. Risk parameters applied to fix trades in a currency pair are calculated based on risk parameters given in paragraph 3.4 above which are set individually (specifically) for the currency pair.
- 14.2. The Central Rate applied to fix trades in a currency pair is set equal to the Central Rate applied to spot trades in this currency pair at the Risk Parameters Calculation Time.
- 14.3. The Central Indicative Rate applied to fix trades in a currency pair is set equal to the Central Indicative Rate applied to spot trades in this currency pair at the Risk Parameters Calculation Time.

- 14.4. The Market Risk Assessment Range and Upper/Lower Indicative Swap Rates applied to fix trades in a currency pair are determined using the algorithms applied to spot and swap transactions in this currency pair (see sections 5 and 7 above).
- 14.5. The Price Bands Limits are not calculated for fix trades in currency pairs.
- 14.6. It is the Clearing Center that decides to change the risk parameters for fix trades in currency pairs at the market open and during the trading hours.

**15. Procedure for determining prices of balancing transactions on the FX and Precious Metals Markets**

- 15.1. The fair market price of a foreign currency and/or precious metal used to execute trades between the Clearing Center and a non-defaulting clearing member in cases set out in the Common Part of the Clearing Rules is set equal to the last available Central Rate determined in accordance with Section 4 above.
- 15.2. Prices set in accordance with paragraph 15.1 above and used by the Clearing Center to execute balancing transactions with a non-defaulting clearing member are published on the Clearing Center website.