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**Resolution No. 54/17**

**of the KDPW_CCP S.A. Management Board**

**dated 20 November 2017**

**amending the Detailed Rules of the OTC Clearing System**

Pursuant to § 3 subpara. 2, 4 and 8 of the Rules of Transaction Clearing (Non-organised Trading) and § 19 subpara. 2 of the Statute of KDPW_CCP S.A., the KDPW_CCP S.A. Management Board resolves as follows:

§ 1

Appendix 6 to the Detailed Rules of the OTC Clearing System attached to Resolution No. 21/16 of the KDPW_CCP S.A. Management Board dated 17 August 2016 shall be replaced by Appendix of this Resolution.

§ 2

This Resolution shall come into force on 2 December 2017.

| | |
|---|---|
| Sławomir Panasiuk | Michał Stępniewski |
| Vice President | Member |
| of the Management Board | of the Management Board |

Appendix 6 to the Detailed Rules of the OTC Clearing System

# Margin Calculation Methodology and Derivatives, Repo and Sell Transactions Valuation Methodology

## 1. Overview

This Appendix presents the valuation formulas for interest rate derivatives and repo transactions implemented in the KDPW_OTC system, as well as the calculation algorithms used to determine the yield curve and to calculate historically simulated value at risk.

## 2. Valuation formulas for different types of financial instruments

### 2.1 Definitions

The valuation of a transaction is performed in the currency of the contract.

The definitions of symbols used in the valuation formulas are presented below.

| | |
|---|---|
| $r_{t,Z}$ | is the rate for curve $Z$ at date t |
| $df_t$ | is the discount factor for a discount curve at date $t$ |
| $df_{Z,t}$ | is the discount factor at date t for curve Z consistent with the instrument tenor |
| $znak$ | is the counterparty sign, possible values: $1$ or -1 |
| $N$ | is the contract nominal amount |
| $r_{FRA}$ | is the FRA rate |
| $t(d_1, d_2)$ | is the year fraction between date $d_1$ and $d_2$, calculated according to the relevant convention |
| $eff$ | is the instrument effective date or coupon start date |
| $mat$ | is the instrument maturity date or coupon end date |

### 2.2 FRA valuation

FRAs are agreements where the counterparties determine the interest rate to be used at a future date for a specific amount in the transaction currency for a determined period. The FRA value is determined differently before and after the reference rate is set.

The value is determined as follows:

- before the reference rate is set:

$$PV_{FRA} = znak\,N\left[df_{eff} - \left(1 + r_{FRA}\,t(eff, mat)\right) df_{eff}\,\frac{df_{Z,mat}}{df_{Z,eff}}\right]$$

- after the reference rate is set:

$$PV_{FRA} = znak\,\frac{(r_{fixing} - r_{FRA})N\,t\,(eff,mat)}{1 + r_{fixing}\,t(eff,mat)}\;df_{eff}$$

**2.3 IRS valuation**

Interest Rate Swaps is an agreement to exchange interest rate periodic and are made up of two interest cash flows. One counterparty pays interest calculated at a fixed interest rate (fixed leg) and receives interest calculated at a floating rate (floating leg); the other counterparty does the opposite. The contract value is the difference between the valuation of the received leg and the valuation of the paid leg. The valuation of each IRS leg is presented below.

- Fixed leg valuation:

$$PV_{fixed}(t) = \sum_{j:mat(j)>t}^{M_{fixed}} r_{IRS,j}\,N_j\,t(eff(j),mat(j))\,df_j$$

where:

$M_{fixed}$ - is the number of interest periods of the fixed leg
$N_j$ - nominal amount of the contract in interest period *j*
$r_{IRS,j}$ - contractual IRS rate in interest period *j*

- Floating leg valuation:

$$PV_{float}(t) = \sum_{j:mat(j)>t}^{M_{float}} N_j\left(r_j + m_j\right)t\left(eff(j),mat(j)\right)\;df_j$$

$$r_j = \begin{cases} r_{t_{refix_j},index} & t_{refix_j} \le t \\ r_{j,\alpha} & t_{refix_j} > t \end{cases}$$

where:

$r_{j,\alpha}$ - is the rate at date *j* for curve *α*, where *j* = 0 (first coupon cash flow) the rate may be set explicitly without an input rate
$r_{t_{refix_j},index}$ - observed index rate on day $t_{refix_j}$
$M_{float}$ - is the number of interest periods of the floating leg
$m_j$ - is the additive margin (spread) in interest period *j*

**2.4 Basis Swap valuation**

Basis Swaps are a type of interest rate swaps for which both parties pay interest at a different floating rate. The contract value is the difference between the valuation of the received leg and the valuation of the paid leg. The valuation of each leg is presented below.

$$PV_A(t) = \sum_{j:mat(j)>t}^{T} N_j(r_{j,A} + m_{A,j})\, t(eff(j), mat(j))\ df_j$$

$$PV_B(t) = \sum_{j:mat(j)>t}^{T} N_j(r_{j,B} + m_{B,j})\, t(eff(j), mat(j))\ df_j$$

where:

$$r_j = \begin{cases} r_{t_{refix_j},index} & t_{refix_j} \leq t \\ r_{j,\propto} & t_{refix_j} > t \end{cases}$$

| | |
|---|---|
| $r_{t_{refix_j},index}$ | - the index rate observed on day $t_{refix_j}$ |
| $index$ | - rate index for a given floating leg |
| $r_{j,\propto}$ | - is the rate at date *j* for curve ∝, where *j* = 0 it is the rate which may be determined for the first cash flow |
| $T$ | - is the number of interest periods |
| $m_{A,j}, m_{B,i}$ | - is the additive margin (spread) in the interest period |

### 2.5 OIS valuation

OIS are fixed to floating interest rate swaps where the floating leg is indexed to the overnight rate (POLONIA rate in Poland, EONIA in EUR currency). OIS swap two cash flows: a fixed leg which is a one-off cash flow of interest set at a fixed rate determined in the contract for a specific nominal amount, and a floating leg which is a one-off cash flow of interest compounded over every day set at an overnight rate for a specific nominal amount. The settlement amount is the absolute value of the difference between the two legs. The valuation of each leg is presented below.

$$PV_{fixed} = \sum_{j:mat(j)>t}^{T} N\ r_{OIS}\, t(eff(j), mat(j))\ df_{OIS,j}$$

where:

$r_{OIS}$ - set fixed rate of the contract

$$PV_{float}(t) = NR'\, t\,(eff, mat) df_{OIS,mat}$$

$$R' = int(R * 10^4 + 0{,}5)/10^4$$

$$R = \left(\prod_{i=1}^{T}(1 + r_i\, t(eff(i), mat(i))) - 1\right) / t\,(eff, mat)$$

where:

| | |
|---|---|
| T | - is the number of interest periods in the term of the contract, |
| $r_i = \begin{cases} r_{i,index} + s & i \le t \\ r_{i,OIS} + s & i > t \end{cases}$ | |
| $r_{i,index}$ | - observed the index rate at day i |
| $r_{i,OIS}$ | - OIS curve rate at the start date of interest period i |
| s | - is the additive margin (spread) |
| $R$ | - is the effective interest rate |
| $R'$ | - is the effective interest rate rounded off to four decimal places |

### 2.6 Valuation of additional cash flows

If there are additional cash flows under the terms of the transaction, their valuation is determined as follows:

$$NPV_{fee} = \sum_{i=1}^{k} znak\, F_i df_i$$

where:

| | | |
|---|---|---|
| $k$ | - | number of additional cash flows |
| $F_i$ | - | amount of *i*-th cash flow |
| $znak$ | - | 1 if the additional cash flow is to be received or -1 if the additional cash flow is to be paid |

### 2.7 Valuation of repo transactions

The contract value before the settlement of the first leg is calculated as follows:

$$PV = znak\,(N_{Bonds}\,MarketPrice(t)df_{spot} - GrossAmount1\,df_{t1}) - znak\,\left(N_{Bonds}\,MarketPrice(t)df_{spot} - GrossAmount2\,df_{t2}\right)$$

where:

| | |
|---|---|
| $N_{Bonds}$ | - is the transaction volume |
| $t1$ | - is the settlement date of the first leg |
| $t2$ | - is the settlement date of the second leg |
| $GrossAmount1$ | - is the settlement amount of the first leg |
| $GrossAmount2$ | - is the settlement amount of the second leg |
| $MarketPrice$ (t) | - is the settlement price of bonds on day t (including interest accrued since the last coupon payment date) |
| $df_{spot}$ | - discount factor from day t+2 to current date |
| $df_{t2}$ | - discount factor from day t2 to current date |

| | |
|---|---|
| $znak$ | - constant equal to -1 for the repo counterparty and 1 for the reverse repo counterparty |

The contract value after the settlement of the first leg is calculated as follows:

$$PV = -znak\left(N_{Bonds}\, MarketPrice(t)df_{spot} - GrossAmount2df_{t2}\right)$$

**2.8 Valuation of sell transactions**

$$PV = znak\left(N_{Bonds}\, MarketPrice(t)df_{spot} - GrossAmountdf_{t}\right)$$

where:

| | |
|---|---|
| $znak$ | - constant equal to -1 for the seller and 1 for the buyer |
| $GrossAmount$ | - sell transaction settlement amount |
| $df_t$ | - discount factor from day t to current date |

**3. Determining the yield curve**

Yield curve generation is an essential step in the valuation of interest rate products. The curve represents the relationship between the interest rate and time for a specific currency.
Yield curves are implied from market observable interest rate instruments (input rates).

The yield curve is made up of a term structure of observable input interest rates of different maturities $r_t$ and the resultant zero coupon discount factors $df_t$ implied by the input rates at time *t*.
Each term structure groups input rates with a common asset, tenor and currency but of different maturities.
Discount factors are derived from the CASH, FRA, IRS and OIS observable input rates using the bootstrapping method. Discount factors between intermediary points are derived using the loglinear interpolation method.

**3.1 Definitions**

| | |
|---|---|
| $df_t$ | - is the discount factor at time $t$ |
| $r_t$ | - is the input rate with maturity at time $t$ |
| $t(d1, d2)$ | - is the year fraction between date $d1$ and $d2$ |

**3.2 Curve bootstrapping**

Discount factors are implied from input rates iteratively in order of maturity. The initial discount factor is derived first for the shortest maturity. Each next discount factor is derived from previously established values.

### 3.3 Curve generation for Cash and FRA inputs

3.3.1 Calculation of initial discount factor

The first step of curve generation is to derive the initial discount factor $df_{on}$. It is derived from the overnight rate $r_{on}$ as follows:

$$df_{on} = \frac{1}{1 + r_{on} t(0, on)}$$

3.3.2 Calculation of remaining discount factors

The remaining discount factors are calculated in order of maturity (from the shortest to the longest) as follows:

$$df_{mat(i)} = \left(\frac{1}{1 + r_i\, t\big(eff(i), mat(i)\big)}\right) df_{eff(i)}$$

where:

$eff(i)$ - is the effective date of instrument $i$

$mat(i)$ - is the maturity date of instrument $i$

If $df_{eff(i)}$ is unknown, it is interpolated from the two nearest discount factors.

### 3.4 Curve generation for IRS inputs

The system supports two methods to derive the discount factor $df_t$, from an input swap rate $r_t$:
**FIXEDLEG** – the final fixed coupon is derived from all known fixed coupons for the swap
**FLOATLEG** – the final floating coupon is derived from all known fixed coupons and floating coupons for the swap.

3.4.1 FIXEDLEG method

The final fixed cash flow is derived from all previous known fixed cash flows as follows:
For each input rate $r_{s\,(N,t)}$ , the zero coupon rate for period t must be derived:

$r_s$ - is the input rate for swap s

$N$ - is the number of coupons paid annually

$t$ - is the tenor in years

In order to derive this rate, the theoretical price of a bond is calculated as the present value of the cash flows to be received in the future. As the par rate is used the present value of the future coupon payments and the nominal amount is equal to 1.

$$1 = \frac{\big(r_{s(N,t)} t\big(eff(1), mat(1)\big) df_1\big) + \big(r_{s(N,t)} t\big(eff(2), mat(2)\big) df_2\big) + \dots + \big(1 + r_{s\,(N,t)} t(eff(n), mat(n)\,)\big) df_n\big)}{df_{eff(s)}}$$

where:

$df_{eff(s)}$ - is the discount factor on the effective date of swap s

$eff(n)$ - is the effective date of coupon $n$

$mat(n)$ - is the maturity date of coupon $n$

This can be rearranged as:

$$df_n = \frac{1 - \frac{r_{s(N,t)}}{df_{eff(s)}} \sum_{i=1}^{n-1} t\big(eff(i), mat(i)\big) df_i}{\big(1 + r_{s(N,t)} t\big(eff(n), mat(n)\big)\big)} df_{eff(s)}$$

This enables us to solve for $df_n$ from the known fixed coupons.

### 3.4.2 FLOATLEG method

The FLOATLEG approach derives the final floating coupon from a combination of all known fixed and floating coupons. The fixed coupons are derived from the discount curve, and the floating coupons are derived from a combination of the discount curve and the forward curve.

The FLOATLEG bootstrap approach uses the following methodology.

For a par swap, the NPV of the fixed leg equals the NPV of the floating leg.

$$\sum_{i=1}^{n_{fixed}} r_s(N,t) df_{i,D} t\big(eff(i), mat(i)\big) = \sum_{i=1}^{n_{float}} r_i df_{i,D} t\big(eff(i), mat(i)\big)$$

where:

$r_i$ is the forward rate for floating coupon $\mathrm{i}$

$df_{i,D}$ is the discount factor from discounting curve $\mathrm{D}$ for end day of coupon $\mathrm{i}$

Rearranging the above enables us to solve for the forward rate of the final floating coupon:

$$r_{n_{float}} df_{n_{float},D}\ t\left(eff\left(n_{float}\right), mat\left(n_{float}\right)\right) = \sum_{i=1}^{n_{fixed}} r_{s(N,t)}\ \mathrm{df_{i,D}}\ t\big(eff(i), mat(i)\big) - \sum_{i=1}^{n_{float-1}} r_i\ \mathrm{df_{i,D}}\ t\big(eff(i), mat(i)\big)$$

The final discount factor can be derived from the implied forward rate as follows:

$$df_{n_{float},F} = \frac{df_{n_{float}-1,F}}{r_{n_{float}}\ t\left(eff\left(n_{float}\right), mat\left(n_{float}\right)\right) + 1}$$

where:

$df_{n_{float},F}$ - is the discount factor from curve $F$ for end date of coupon $n_{float}$

The discount factors $df_{n,D}$ are derived from the discount curve D using the FIXEDLEG method described in section 3.4.1. The discount factors $df_{n,F}$ for curve F are derived iteratively using the above approach.

3.4.3 Swap rate interpolation

When the curve is bootstrapped, discount factors for more than one cash flow may be unknown. Interpolation is required in order to derive the unknown cash flows. KDPW_CCP determines the unknown swap rates through cubic spline interpolation.

**3.5 Interpolation methods**

KDPW_CCP system derives missing discount factors using the loglinear interpolation method.

**3.6 Exceptions**

In certain cases, curve inputs are not available due to lack of liquidity or for other reasons. Bootstrapping issues can also occur during the yield curve calculation process. This section describes common exceptions and how they are handled by the KDPW_CCP system.

3.6.1 First curve input effective date later than business date

If the first curve input effective date is after the business date, then both the effective date discount factor $df_{eff}$ and the maturity date discount factor $df_{mat}$ are unknown.
In that case, KDPW_CCP approximates them as follows:

- First, an approximate discount factor $df_{\sim mat}$ is calculated:

$$df_{\sim mat} = \frac{1}{1 + (r_t\ t(0, mat))}$$

$df_{eff}$ can then be interpolated:

$$df_{eff} = 1 - (1 - df_{\sim mat})\,\frac{t(0, eff)}{t(0\ , mat)}$$

- Finally, $df_{mat}$ can be derived in the same manner as other curve input points:

$$df_{mat} = \left(\frac{1}{\left(1 + \left(r_t\ t(eff, mat)\right)\right)}\right) df_{eff}$$

3.6.2 Second curve input effective date later than business date

If the effective date of the second curve input is later than the business date, both $df_{eff(2)}$ and $df_{mat(2)}$ will be unknown for this curve input (unless the effective date for this curve input is the same as the maturity date of the first curve input).
Approximation is required to derive either $df_{eff(2)}$ or $df_{mat(2)}$. The KDPW_CCP system extrapolates $df_{\sim eff(2)}$ from the first discount factor as follows:

$$df_{\sim eff(2)} = 1 - \left(1 - df_{mat(1)}\right) \frac{t(0, eff(2))}{t(0, mat(1))}$$

$df_{mat(2)}$ can then be derived in the same manner as other curve input points using $df_{\sim eff(2)}$.

3.6.3 Multiple curve inputs mature on the same date

If multiple curve input points have the same maturity date, KDPW_CCP chooses one curve input only. Precedence is given to CASH rates over FRAs, and FRAs over Swaps.

## 4. Calculating the required initial margin

The required initial margin is equal to the value of HVaR (i.e. VaR calculated using historic scenarios) for a given account while applying the following parameters:

- holding period
- confidence level
- decay rate
- number of historical events (time horizon)
- method used to calculate rates for VaR scenarios

### 4.1 Overview

KDPW_CCP performs a Value at Risk (HVaR) calculation. The model calculates a potential Profit / Loss (PL) based on historical market movements within the set time horizon. Statistical analysis of the P&L sample space is then used.

Calculation of margins (and other risk measures, if any) is a three-step process:

- generate scenarios from the market history;
- price the portfolio using each of the generated historical scenarios;
- calculate quantile values.

### 4.2 Scenario generation

The HVaR model generates market scenarios based on historical market movements over a specified date range, from today to a specified date in the past.

Scenarios are generated in the date range:

$(t-N)$ do $(t)$

where:

$t$ - is the current business day

$N$ - is the number of the historical observation period

Each scenario *i* is defined as the vector of *n* market inputs that impact the value of the portfolio.

For interest rates, KDPW_CCP calculates $\delta_i$ using the additive movement which includes scaling of the portfolio holding period:

$$\delta_i = r_t + \sqrt{l}\,(r_{i+1} - r_i)$$

and for fx rates it uses the multiplicative movement:

$$\delta_i = \max(0, r_t(1 + \left(\frac{r_{i+1}}{r_i} - 1\right)\sqrt{l})).$$

#### 4.3 Valuation under scenarios

The portfolio is valued as at today's business date for each scenario using the historical market inputs.

This results in the following vector *V* of potential loss:

$$V = \begin{bmatrix} \sum_{c=1}^{Y}\left(MtM_{1,c} - MtM_{t,c}\right)ExR_{1,c} \\ \sum_{c=1}^{Y}\left(MtM_{2,c} - MtM_{t,c}\right)ExR_{2,c} \\ \cdots \\ \sum_{c=1}^{Y}\left(MtM_{N,c} - MtM_{t,c}\right)ExR_{N,c} \end{bmatrix}$$

where:

$\mathrm{N}$ -is the number of scenarios,

$\mathrm{MtM}_{i,c}$ - is the hypothetical value of the portfolio of transactions in currency *c* in scenario *i* in the range 1 to N,

$\mathrm{MtM}_{t,c}$ - is the mark to market of the portfolio of transactions in currency *c*,

$ExR_{i,c}$ - is the fx rate under scenario *i*, used to convert the value of the portfolio in currency *c* to PLN.

Given a portfolio of *m* trades, the potential $\mathrm{PV}_i$ is calculated in PLN as:

$$MtM_{i,c} = \sum_{j=1}^{m} f(T_{j,c}, s_{i,c})$$

where:

$f$ - is the function which returns the valuation of transaction $T_j$ in currency *c* in scenario $s_i$

$T_{j,c}$ - is the j-th trade in currency *c* in the portfolio

$s_{i,c}$ - is scenario *i* for currency *c*

### 4.4 Calculating the margin

In its statistical analysis of a sample of potential Profit / Loss values, KDPW_CCP assumes that scenarios used in the portfolio valuation are assigned equal weights (each scenario has equal probability).

When calculating percentiles, vector values are ordered from lowest (largest loss) to highest (largest profit). Given *N* ranked valued from the sector *V*, the rank *x* L for target percentile *P* is calculated as:

$$x = \frac{P}{100}(N-1)+1$$

Then splitting *n* into its integer *k* and decimal component *d*, such that $x = k + d$, we calculate the percentile value P ($v_P$) as:

$$v_P = \begin{cases} v_1, & x = 1 \\ v_N, & x = N \\ v_k + d(v_{k+1} - v_k), & 1 < x < N \end{cases}$$

The value $V_p$ is the required level of initial margin.

## 5. Definition of projection curves and discount curves

### 5.1 Projection curves

5.1.1 1M curve

| | PLN | EUR |
|---|---|---|
| 1M | WIBOR | EURIBOR |
| 2M | FRA 1x2 | IRS 2m1s |
| 3M | FRA 2x3 | IRS 3m1s |
| 6M | IRS 6m1s | IRS 6m1s |
| 9M | | IRS 9m1s |
| 1Y | IRS 1y1s | IRS 1y1s |
| 2Y | IRS 2y1s | IRS 2y1s |
| 3Y | IRS 3y1s | IRS 3y1s |
| 4Y | | IRS 4y1s |
| 5Y | | IRS 5y1s |

| | | |
|---|---|---|
| 6Y | | IRS 6y1s |
| 7Y | | IRS 7y1s |
| 8Y | | IRS 8y1s |
| 9Y | | IRS 9y1s |
| 10Y | | IRS 10y1s |
| 12Y | | IRS 12y1s |
| 15Y | | IRS 15y1s |
| 20Y | | IRS 20y1s |
| 30Y | | IRS 30y1s |
| 50Y | | IRS 50y1s |

5.1.2 3M curve

| | **PLN** | **EUR** |
|---|---|---|
| 3M | WIBOR | EURIBOR |
| 4M | FRA 1x4 | FRA 1x4 |
| 5M | FRA 2x5 | FRA 2x5 |
| 6M | FRA 3x6 | FRA 3x6 |
| 7M | FRA 4x7 | FRA 4x7 |
| 8M | FRA 5x8 | FRA 5x8 |
| 9M | FRA 6x9 | FRA 6x9 |
| 10M | FRA 7x10 | FRA 7x10 |
| 11M | FRA 8x11 | FRA 8x11 |
| 1Y | FRA 9x12 | FRA 9x12 |
| 15M | FRA 12x15 | FRA 12x15 |
| 18M | FRA 15x18 | FRA 15x18/IRS 18m3s |
| 21M | FRA 18x21 | FRA 18x21 |
| 2Y | FRA 21x24 | FRA 21x24/IRS 2y3s |
| 3Y | IRS 3y3s | IRS 3y3s |
| 4Y | IRS 4y3s | IRS 4y3s |

| | | |
|---|---|---|
| 5Y | IRS 5y3s | IRS 5y3s |
| 6Y | IRS 6y3s | IRS 6y3s |
| 7Y | IRS 7y3s | IRS 7y3s |
| 8Y | IRS 8y3s | IRS 8y3s |
| 9Y | IRS 9y3s | IRS 9y3s |
| 10Y | IRS 10y3s | IRS 10y3s |
| 12Y | IRS 12y3s | IRS 12y3s |
| 15Y | IRS 15y3s | IRS 15y3s |
| 20Y | IRS 20y3s | IRS 20y3s |
| 30Y | | IRS 30y3s |
| 40Y | | IRS 40y3s |
| 50Y | | IRS 50y3s |

5.1.3. 6M curve

| | **PLN** | **EUR** |
|---|---|---|
| 6M | WIBOR | EURIBOR |
| 7M | FRA 1x7 | FRA 1x7 |
| 8M | FRA 2x8 | FRA 2x8 |
| 9M | FRA 3x9 | FRA 3x9 |
| 10M | FRA 4x10 | FRA 4x10 |
| 11M | FRA 5x11 | FRA 5x11 |
| 1Y | FRA 6x12 | FRA 6x12 |
| 18M | FRA 12x18 | FRA 12x18 |
| 2Y | FRA 18x24 | FRA 18x24 |
| 3Y | IRS 3y6s | IRS 3y6s |
| 4Y | IRS 4y6s | IRS 4y6s |
| 5Y | IRS 5y6s | IRS 5y6s |
| 6Y | IRS 6y6s | IRS 6y6s |
| 7Y | IRS 7y6s | IRS 7y6s |

| | | |
|---|---|---|
| 8Y | IRS 8y6s | IRS 8y6s |
| 9Y | IRS 9y6s | IRS 9y6s |
| 10Y | IRS 10y6s | IRS 10y6s |
| 12Y | IRS 12y6s | IRS 12y6s |
| 15Y | IRS 15y6s | IRS 15y6s |
| 20Y | IRS 20y6s | IRS 20y6s |
| 30Y | | IRS 30y6s |
| 40Y | | IRS 40y6s |
| 50Y | | IRS 50y6s |

5.1.4 OIS curve

| | **PLN** | **EUR** |
|---|---|---|
| O/N | POLONIA (index) | EONIA |
| 1W | OIS 1W | OIS 1W |
| 2W | OIS 2W | OIS 2W |
| 3W | OIS 3W | OIS 3W |
| 1M | OIS 1M | OIS 1M |
| 3M | OIS 3M | OIS 3M |
| 6M | OIS 6M | OIS 6M |
| 9M | OIS 9M | OIS 9M |
| 1Y | OIS 1Y | OIS 1Y |
| 15M | | OIS 15M |
| 18M | | OIS 18M |
| 21M | | OIS 21M |
| 2Y | | OIS 2 Y |
| 3Y | | OIS 3Y |

| | | |
|---|---|---|
| 4Y | | OIS 4Y |
| 5Y | | OIS 5Y |
| 6Y | | OIS 6Y |
| 7Y | | OIS 7Y |
| 8Y | | OIS 8Y |
| 9Y | | OIS 9Y |
| 10Y | | OIS 10Y |
| 15Y | | OIS 15Y |
| 20Y | | OIS 20Y |
| 30Y | | OIS30Y |
| 50Y | | OIS 50Y |

**5.2 Discount rate curves**

5.2.1 PLN curve

| O/N | POLONIA (index) |
|---|---|
| 1W | OIS 1W |
| 2W | OIS 2W |
| 3W | OIS 3W |
| 1M | OIS 1M |
| 3M | OIS 3M |
| 6M | OIS 6M |
| 9M | OIS 9M |
| 1Y | OIS 1Y |
| 2Y | IRS 2y1s |
| 3Y | IRS 3y1s |
| 4Y | IRS 4y3s |

| | |
|---|---|
| 5Y | IRS 5y3s |
| 6Y | IRS 6y3s |
| 7Y | IRS 7y3s |
| 8Y | IRS 8y3s |
| 9Y | IRS 9y3s |
| 10Y | IRS 10y3s |
| 12Y | IRS 12y3s |
| 15Y | IRS 15y3s |
| 20Y | IRS 20y3s |

5.2.2 EUR curve

The EUR discount curve is the OIS EUR curve described in point 5.1.4.

## 6. Sources of market data

Sources of market data for respective types of data include:

1) WIBOR (index) – fixing organised by GPW Benchmark S.A.,
2) POLONIA (index) - fixing organised by Narodowy Bank Polski,
3) FRA, IRS, OIS (PLN) – transaction data and contributor quotes available from the relevant news service,
4) EURIBOR (index) – fixing organised by European Money Market Institute,
5) EONIA (index) - fixing organised by European Money Market Institute,
6) FRA, IRS, OIS (EUR) – transaction data and contributor quotes available from the relevant news service.

Market data will be downloaded from the Thomson Reuters, Bloomberg or SuperDerivatives news service.

On the basis of the data referred to in point 3 above, KDPW_CCP determines the reference rates for cleared PLN interest rate derivatives. In determining market value, KDPW_CCP uses in the first place data available from the Bloomberg service. If on a given day when valuation is performed the quality of the data from the Bloomberg service is low in the opinion of KDPW_CCP or their availability is limited, KDPW_CCP acting to ensure the safety of transaction clearing may:

1) use data provided by Thomson Reuters in whole or in part, or

2) determine relevant rates taking into account market data provided by both services.

For EUR interest rate derivatives, the quotes provided by SuperDerivatives are used in the first place, followed by data available from Bloomberg or Thomson Reuters.