Methodology to calculate PVBP

- Latest available FBIL published benchmark rates shall be used as term curve input, i.e. the rate published at End of the Day by FBIL shall be used to compute PVBP as per methodology described below.

- PVBP computation shall be done daily at End of Day and the PVBP limit utilization shall be published at CCIL website under **"Derivatives-Trade Repository — Non Resident OIS PVBP Limit Utilisation"**

The methodology includes the following steps:

1. Curve Construction
2. Boot-strapping for zero rates
3. MTM Calculation
4. PVBP Computation

Curve Construction for INR OIS:

Currency	Benchmark Used	Details	Tenor of Instrument	Cash flows
INR	FBIL O/N Mibor	A/365, cash rate	<= 1 year	Bullet
INR	FBIL O/N Mibor	A/365, swap rate	> 1 year	Semi Annual

FIMMDA Standardized tenor OIS swap rates starting from O/N FBIL Mibor, 1 month and upto 10 years is used. Latest available FBIL published benchmark rates are used as term curve input.

Bootstrapping

From the above mentioned benchmark points, the swap rates are bootstrapped to arrive at the discount factors as follows

$$1 = C_n \cdot \Delta_1 \cdot df_1 + C_n \cdot \Delta_2 \cdot df_2 + C_n \cdot \Delta_3 \cdot df_3 + \cdots + (1 + C_n \cdot \Delta_n) \cdot df_n$$

therefore

$$df_n = \frac{(1 - \sum_{i=1}^{n-1} C_n \cdot \Delta_i \cdot df_i)}{(1 + C_n \cdot \Delta_n)}$$

(this formula is precisely forward substitution)

where

C_n is the swap rate of the 'n' yr tenor

Δ_i is the length, or day count fraction, of the period [i-1,i] in years

df_i Is the discount factor for that time period

df_n is the discount factor for the entire period, from which we derive the zero-rate

Interpolation method for unknown swap points

Where swap rates are unknown, such as the mid - 1.5 yr , 2.5 yr points …, the respective $\log(df_n)$ are assumed to be linearly interpolated in time between $\log(df_{i-1})$ [i.e. $\log(df_{1y})$] and $\log(df_{i+1})$ [i.e. $\log(df_{2y})$] , { $\log(df_{i-1})$ [i.e. $\log(df_{2y})$] and $\log(df_{i+1})$ [i.e. $\log(df_{3y})$]},…..and so on.

Effectively:

$$df_i = df_{i+1}\wedge[(\Delta_i)/(\Delta_i + \Delta_{i+1})] * (df_{i-1})\wedge[(\Delta_{i+1})/(\Delta_i + \Delta_{i+1})]$$

MTM Calculation

MTM calculations involve the multiplication of Cash-flows with the respective Discount factors at the cash-flows dates to arrive at the PV of the same.

Fixed Leg

- The accumulated interest will be calculated from the last payment date to the next payment date using:
  - Fixed coupon Cash flow = Swap Fixed Rate*Notional*Δ_i

- All the Cash-flows will be calculated on the respective dates by using the same formula
- The sum of the product of the Cash-Flows and the respective DFs shall give the PV of the fixed leg

Floating Leg

- The accumulated interest will be calculated from the last payment date to the next payment date using:

  Floating coupon Cash flow = $[\prod_{i=1}^{i=N}(1+M_i/365)-1]$*Notional   where N = number of days between the previous cash flow date and the next cash flow date.

  Where M_i is the FBIL O/N Mibor, either as realized reset rates or if not realized- in terms of daily forward rates computed from the bootstrapped DFs.

- All the Cash-flows will be calculated on the respective dates by using the same formula

- The sum of the product of the Cash-Flows and the respective DFs shall give the PV of the floating leg

  MTM = PV Fixed coupon cash flow– PV Floating coupon cash flow

PVBP Computation

MTM is computed as above by shifting the swap curve upwards and downwards by 1 BPs. The MTM for the upwards and downwards shifted curve are termed as MTM[+1BP] and MTM[-1BP] respectively.

Rate (%)

Parallel Shift up (+1) BP

Original Curve

Parallel shift down (-1) BP

Maturity in years
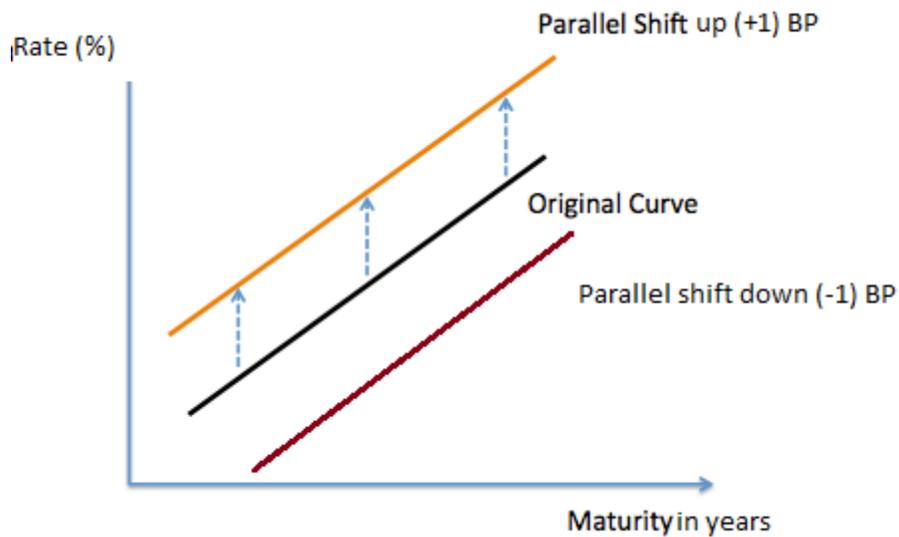
Up-PVBP= MTM[+1BP] – MTM;

Down-PVBP= MTM – MTM[-1BP]

The PVBP of the Swap is defined as

$$\text{PVBP} = [\text{Up-PVBP} + \text{Down-PVBP}]/2 = \{\text{MTM}[+1\text{BP}] - \text{MTM}[-1\text{BP}]\}/2$$