

Calculation Technique

The effective interest rate (EIR) for a deal is calculated using the following formula:

$$CF(t_0) = \sum_{i \geq 1} CF(t_i) * \exp(-EIR * \Delta(t_i, t_0))$$

Here $CF(t_0)$ represents the initial cash flows for the deal (i.e. the outpayment of the nominal amount by the bank plus/minus possibly arising transaction costs, premiums/discounts or upfront payments), $CF(t_i)$ stands for the cash flows for the deal at further payment dates t_i and $\Delta(t_i, t_0)$ is the time gap between payment date t_i and deal origination date t_0 .

Hence, the EIR is calculated by implicitly solving the above non-linear equation. In the solution, this is performed by using a Newton iteration.

The above formula expresses that the EIR exactly discounts the estimated future cash payments or receipts through the expected life of a financial instrument to its net carrying amount.

The following example explains an EIR calculation (regardless of the general [challenges](#) of EIR calculations and possible effects occurring from changes in deal data).

The following deal data are considered:

| Deal Data | |
|----------------------------|-----------------|
| Deal type | Fixed rate loan |
| Deal start Date | 19.12.2013 |
| Maturity | 03.01.2015 |
| Next interest payment Date | 03.01.2014 |
| Principal | 1.000.000 |
| Discount | 3,000 |
| Client rate | 6.00% |
| Margin | 1.00% |
| Day count convention | 30/360 |
| Interest payments | quarterly |

Hence, the following cash flows are relevant:

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| Liquidity Cash Flows | | | | |
|----------------------|---------------|-----------|----------|----------|
| value date | capital | interest | discount | time gap |
| 19/12/2013 | -1,000,000.00 | | 3,000.00 | 0 |
| 03/01/2014 | | 2,333.33 | | 0.03889 |
| 03/04/2014 | | 15,000.00 | | 0.28889 |
| 03/07/2014 | | 15,000.00 | | 0.53889 |
| 03/10/2014 | | 15,000.00 | | 0.78889 |
| 03/01/2015 | 1,000,000.00 | 15,000.00 | | 1.03889 |

Using the EIR formula, the following equation needs to be considered:



$$997.000 = 2333,33 * e^{-EIR*0,03889} + 15.000 * e^{-EIR*0,28889} + 15.000 * e^{-EIR*0,53889} + 15.000 * e^{-EIR*0,78889} + 1.015.000 * e^{-EIR*1,03889}$$

Solving the equation leads to an approximated value for $EIR = 6.45264\%$.