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

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

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 (t_i,t_0) is the time gap between payment date t_i and deal orgination 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:

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%*.