
Bootstrapping Technique

To calculate the zero coupon discount factors using the swap market rates, the following “bootstrapping” technique is employed.

The one year swap rate represents a single fixed payment, with the first discount factor calculated as follows:

$$d_i = \frac{1}{1 + A_i R_i}$$

Where R_i is the one year euro swap rate quoted vs. 3 month Euribor® in nominal terms. As per the example, $R_i = 0.00599$.

The swap rates for two years and beyond cover multiple annual fixed payments. The bootstrapping methodology needs to take into account earlier annual payments to calculate the zero discount factor for each subsequent payment; calculated as follows:

$$d_i = \frac{1 - R_i \sum_{j=1}^{i-1} A_j d_j}{1 + A_i R_i}$$

Euro Swapnote® Market Price

The market price of Swapnote® futures can be calculated using forward par swap rates as of the contract’s effective date. Euro Swapnote® futures effective dates follow the IMM convention, i.e. Swapnote® futures can be calculated using IMM par swap rates.

Euro par swap rates represent the annual fixed rates payable on a fixed-for-floating interest rate swap of different term-to-maturities. Euro par swap rates are established on the basis that the value of a par swap at the start of the swap’s life is zero. To have the starting value equal to zero, the fixed rate on the swap has to be set such that the present value of the swap’s fixed payments equals the present value of the swap’s floating payment.

The IMM par swap rates can be calculated using a forwarding curve with future payments present valued using a discounting curve as follows:

For a par swap: $PV_{\text{fixed}} = PV_{\text{floating}}$

$$PV_{\text{fixed}} = \text{fixedrate} \times \sum \text{daycount}_n \times \text{discount}_n$$

$$PV_{\text{floating}} = \sum \text{floatrate}_m \times \text{daycount}_m \times \text{discount}_m$$

Re-arranging: $\text{fixedrate} = \frac{\sum \text{floatrate}_m \times \text{daycount}_m \times \text{discount}_m}{\sum \text{daycount}_n \times \text{discount}_n}$

10 YEAR € SWAPNOTE®

MATURITY	ANNIVERSARY DATE (IMM)	IMM PAR SWAP RATE	DAYCOUNT	ZERO COUPON DISCOUNT FACTOR	CASHFLOW	DISCOUNTED CASHFLOW
1	20 Jun 13	0.607%	1.00000000	0.99396276	6.00000000	5.96377656
2	20 Jun 14	0.884%	1.00000000	0.98253670	6.00000000	5.89522020
3	22 Jun 15	0.985%	1.00555556	0.97090894	6.03333336	5.85781730
4	20 Jun 16	1.133%	0.99444444	0.95577373	5.96666664	5.70278323
5	20 Jun 17	1.293%	1.00000000	0.93742789	6.00000000	5.62456734
6	20 Jun 18	1.436%	1.00000000	0.91730149	6.00000000	5.50380894
7	20 Jun 19	1.557%	1.00000000	0.89638778	6.00000000	5.37832668
8	22 Jun 20	1.663%	1.00555556	0.87474438	6.03333336	5.27762445
9	21 Jun 21	1.752%	0.99722222	0.85313729	5.98333332	5.10460477
10	20 Jun 22	1.833%	0.99722222	0.83107561	105.98333332	88.08016339
VALUE						122.79

Further Information

Interest Rate Derivatives

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