Treasury Services

IN COMPLIANCE WITH THE ESMA GUIDELINES

Interest Rate Risk Management

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Introduction

Interest risk is the risk that changes in interest rates have a negative impact on the result or on the capital of an organisation. For asset managers, pension funds and other investors, interest rate risk is the risk that the value of their fixed income portfolios decreases as a result of a change in interest rates. For companies, interest rate risk is the risk that the interest costs increase as a result of a change in interest rates. In order to avoid interest rate risk, many companies choose to fix the interest rates for the complete term of every loan that they take up. Some companies, however, do not choose to fix the interest rate at the start of a loan, and instead choose for a floating rate. This means that they are accepting the fact that they are exposed to interest rate risk. If these companies, during the term of the loan, would change their mind and would like to decrease or eliminate the interest risk of their floating rate loan, they can use interest rate derivatives, for instance interest rate swaps and interest rate options.

1 Interest rate swaps

An interest rate swap (IRS) is an over-the-counter interest rate derivative contract in which two parties enter into a reciprocal obligation to exchange interest coupon payments in the same currency during an agreed period of time without exchanging principals. Interest rate swaps are used to change the interest rate conditions of a financial instrument, from fixed to floating or vice versa.

1.1. Product characteristics of interest rate swaps

The following transaction data should be recorded in an interest rate swap contract:

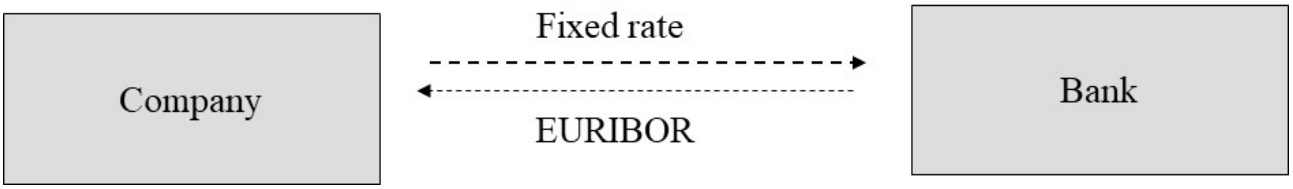
- the notional value or contract amount
- the reference rate for the floating interest rate and the daycount convention (e.g. EURIBOR or LIBOR, actual/360)
- the contractual interest rate; the level of the fixed interest rate and the daycount convention
- the term
- any possible repayment schedule
- who the buyer is and who the seller is; i.e. the fixed rate payer and fixed rate receiver

For the party that pays the fixed rate in an interest rate swap, the swap is referred to as a payer's swap. For the party that receives the fixed rate, the same interest rate swap is called a receiver's swap. Sometimes the terms buying or selling an interest rate swap are used. As usual, the general rule with regard to buying and selling in financial markets applies: a buyer profits from an increase and a seller profits from a decrease in the price determining parameter, in this case the fixed interest rate. The buyer of an interest rate swap is thus the party who pays the fixed rate. He profits from a rise in interest rates.

The term for interest rate swaps can vary from only several days to fifty years. The principal sum can also vary widely. For most transactions, it varies between EUR 1 million and EUR 100 million. The reference for the floating rate for a swap is generally the 1,3 or 6 month EURIBOR rate or LIBOR rate. If these reference rates are used, then the interest rate swaps are referred to as EURIBOR swaps or LIBOR swaps.

Figure 1 shows a diagram of an interest rate swap. The company pays the fixed rate and receives the floating rate.

Figure 1 Interest rate swap



The price or interest rate swap rate for a swap is the fixed rate level. The fixed rate is usually fixed for the entire term of the interest rate swap.

1.2 Hedging the interest rate risk of a loan with a floating rate

Interest rate swaps are often used by organisations which want to convert a floating interest rate of an existing loan into a fixed rate. These swaps are called funding swaps or liability swaps. The combination of the floating rate loan and the interest rate swap gives a synthetic fixed rate loan. It the organisation would unwind the existing floating rate loan and would take up a new loan with a fixed rate, then it would have to re-negotiate loan conditions. The advantage of using an interest rate swap is that the organisation does not have to the need to renew its existing loan or have to make changes to an existing loan agreement. An interest rate swap, in itself, is a standing contract. This means that the interest rate swap does not even need to be conducted with the bank where the loan was taken out as counterparty.

It is important that the conditions of the interest rate swap exactly match the conditions of the loan:

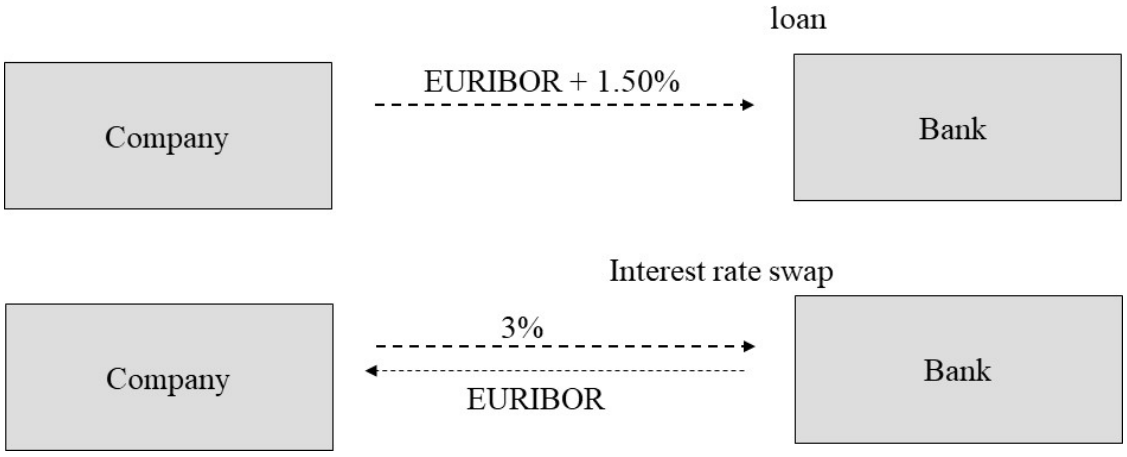
- the contract amount of the interest rate swap should match the loan amount;
- the coupon dates of the interest rate swap should match the coupon dates of the loan;
- the reference rate of the floating leg of the interest rate swap should match the reference rate of the loan;
- if the loan has an amortization scheme, then the interest rate swap should have the same amortizations scheme.

Example

A company has a loan with a floating interest rate. The interest rate is based on the 3-month EURIBOR. For the loan a credit spread of 1.50% has been agreed. The

remaining term for the loan is four years. The company wants to cover the interest rate risk of the loan for the remaining term and concludes an interest rate swap. The four-year interest rate swap rate is 3%. The upper side of figure 2 shows a diagram of the loan whereas the lower side of figure 2 shows a diagram of the interest rate swap.

Figure 2 Combination of a loan with a floating rate and an interest rate swap



The effective interest rate during the remaining term of the loan is 3% + 1.5% = 4.5%.

In the table below the interest costs are calculated which the company incurs with different EURIBOR fixings during the term. The table shows that the interest costs for the company are independent of the level of EURIBOR; the company has fixed its interest costs at a level of 4.5%.

EURIBOR fixing	Interest costs for the loan (-)	Interest income floating coupon interest rate swap (+)	Interest costs fixed coupon interest rate swap (-)	Total Interest Costs
-0.50%	-1.00%	-0.50%	-3.00%	4.50%
0.50%	-2.00%	+0.50%	-3.00%	4.50%
1.50%	-3.00%	+1.50%	-3.00%	4.50%
2.50%	-4.00%	+2.50%	-3.00%	4.50%
3.50%	-5.00%	+3.50%	-3.00%	4.50%

1.3 Pitfalls that account managers and treasury advisors should be aware of

In loan agreements, sometimes a floor is agreed, which means that if the floating reference rate (EURIBOR ore LIBOR) becomes negative, it will be fixed at zero. For instance, if in the above example EURIBOR was fixed at -0.25% then the interest rate for the next coupon of the loan would be set at 0% + 1.50% = 1.50% instead of -2.5% + 1.50% = 1.25%. With interest rate swaps, however, it is not common to agree such a floor. If this is the case, then, in the above example, the floating coupon of the interest rate swap would still be fixed at -0.25% for the next coupon period. This means that the net interest costs for the company with a EURIBOR fixing of -0.25% are not 4.5% but instead the sum of 1.50%, as a result of the loan, and 3% - - 0.25 = 3.25% for the interest rate swap, which adds up to 4.75%. This means that the interest rate costs are not fixed completely. This is shown in the table below.

EURIBOR fixing	Interest costs for the loan (-)	Interest income floating coupon interest rate swap (+) – *no floor*	Interest costs fixed coupon interest rate swap (-)	Total Interest Costs
-0.50%	-1.00%	*0%*	-3.00%	*5.00%*
-0.25%	-1.25%	*0%*	-3.00%	*4.75%*
0%	-1.50%	0%	-3.00%	4.50%
0.25%	-1.75%	+0.25%	-3.00%	4.50%
0.50%	-2.00%	+0.50%	-3.00%	4.50%

Account managers and treasury specialists should explain the consequences of a floor very carefully to their clients and they have to warn them for the fact that their risk is not completely hedged.

Apart from the problem that may arise as a result of a floor, there is another important issue of which account managers and treasury specialists should be aware of. This is the fact that loan with a floating rate can be amortized on any re-fixing moment during the term. The loan agreement itself does not have to contain an amortization scheme, i.e. the loan is a so-called bullet loan. If a company wants to hedge the interest rate risk of a bullet loan by using an interest rate swap, then the contract amount of the interest rate swap is fixed for the whole period that the company wants to hedge.

If the company decides to make use of the right to pay back the loan partially and it would not, at the same time, unwind the interest rate swap for the same amount, then the company would be 'over-hedged'. This means that a part of the interest rate swap will become to have a speculative character. In the derivative agreements that banks reach with their clients, usually it is stated that the company has the obligation to take the initiative to adjust the contract amount of an interest rate swap if it pays back a loan early. However, although this is an obligation for the client, account managers and treasury specialists are well-advised to check periodically whether the contract amount of interest rate swaps still match with the loan amounts of the loan that they are related to.

Following the derivative agreements with their banks, clients, therefore, are not allowed to be over-hedged. However, on the other hand they are allowed to conduct interest rate swaps for smaller amounts or for shorter periods than apply for their loans. This means that clients are allowed to be under-hedged.

Finally account managers and treasury advisors should be aware of the fact that with interest rate swaps only the floating rate is fixed. Banks often have the right, however, during the term of a floating rate loan to change the credit spread. Interest rate swaps do not hedge that risk. This is not only true, however, for interest rate swaps, but for all interest rate derivatives

1.4 Forward start interest rate swaps

With regular interest rate swaps, the coupon period of both the floating coupon and the fixed coupon will start immediately which means that an organisation that uses an interest rate swap in order to hedge its interest risk is immediately protected. Sometimes, however, the protection is not needed immediately, for instance if a company wants to already hedge the interest rate risk of a loan which it is planning to take up after one year.

Let us take as an example a company that has decided to build a new industrial plant after one year and needs to finance this for a term of seven years. If the treasurer would decide to hedge the interest rate risk for this future loan, he can conduct a forward start swap that starts after one year and has an effective term of seven years. The fixed rate of the forward start swap is agreed at the moment that the contract is conducted. If after one year the company still has a need to finance its activities, then it can take up a loan with a floating rate from the bank with a term of seven years. If the fixed interest rate of the forward start interest rate swap would have been agreed at 5%, then figure 3 shows the coupon flows for the company during the term of the loan.

Figure 3 Loan and forward start interest rate swap

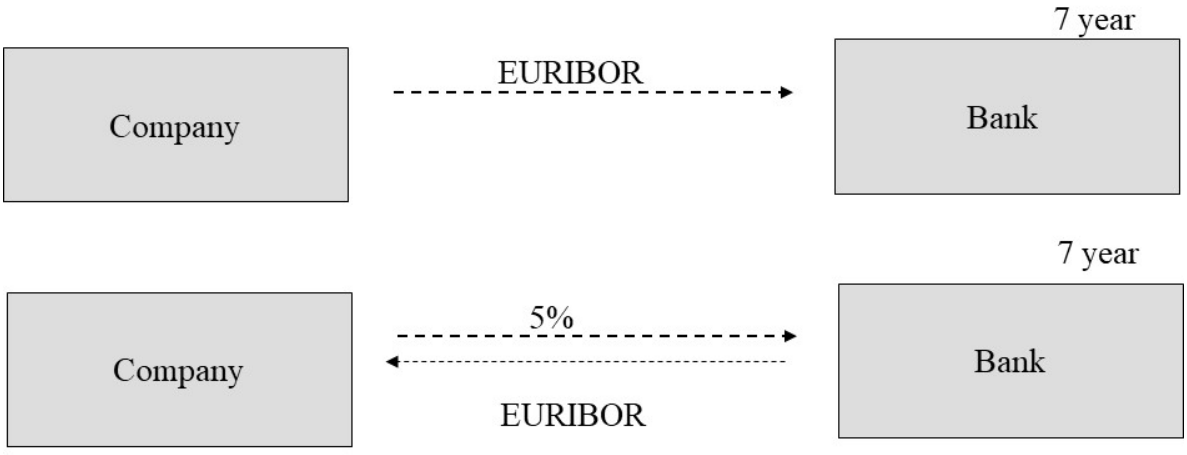


Figure 3 shows that the company is paying 5% during the term of the loan (i.e. EURIBOR minus EURBOR plus 5%). This means that, if after one year the seven years interest rate would be higher than 5%, then, with hindsight, the company is very happy with its decision to conduct the forward start interest rate swap. However, if after one year the seven years interest rate would be lower than 5%, then, again with hindsight, the company is faced with an opportunity loss. It has to pay the agreed rate of 5% as a result of the forward start interest rate swap whereas it could have done better if it would not have hedged the interest rate risk.

Another situation arises if it turns out that the company has no financing need after one year. The company is now over-hedged and the forward start swap contract becomes to have a speculative character.

Following the agreement with its bank, the company has to unwind the forward start swap contract. If the seven year interest rate would be higher than 5%, then the forward interest rate swap contract would have a positive value and, as a result of the unwind, the company would receive the market value of the contract from the bank. However, if the seven year interest rate would be lower than 5%, then the forward interest rate swap contract would have a negative value and, as a result of the unwind, the company would have to pay the market value of the contract to the bank.

2 Interest rate options

Organisations that fix their interest costs by using interest rate swaps know exactly what their interest costs are during the contract term of the interest rate swaps. They are, therefore, protected against increases in interest rates. However, a disadvantage of interest rate swaps is that it makes it impossible to profit from decreases in interest rates. Another disadvantage is that, for instance in case of early redemption of a loan, a company can become in a situation in which it is over-hedged and, as a result, has a speculative position. These disadvantages can be avoided by using interest rate options instead of interest rate swaps. Interest rate options protect against unfavourable changes in interest rates whereas the buyer can still profit from favourable changes in interest rates.

2.1 Cap

A cap is an over-the-counter interest rate instrument whereby one party has the right, at various moments in the future, to settle a coupon amount which is based on the difference between an agreed interest rate (the strike rate) and the reference rate if this reference rate is higher than the exercise price. A cap is actually a series of consecutive options which are referred to as caplets. Caps can be used by parties that hold a floating rate loan and want to cover themselves against rising interest rates but still want to be able to profit from low interest rates.

The characteristics of the caplets which together form a cap are:

- the same contract amount;
- the same exercise price;
- the same reference rate;
- consecutive underlying periods.

The amount paid out on each individual expiry date is calculated by expressing the difference between the level of the reference rate and the strike level as a percentage. This percentage is then applied to the agreed contract amount and settled over the underlying period for the individual option, usually 1 month or 3 months and occasionally 6 months. If the reference rate is lower than the strike rate on an expiry date, the option in question will expire worthless The options with a later expiry date still continue to exist.

Example

A company buys a cap with a strike price of 3.5% and a term of five years. The underlying value of the cap is 6-months EURIBOR. The contract amount is two million euro.

Let us assume that, during the contract term, EURIBOR develops as follows:

1st coupon period	2nd coupon period	3rd coupon period	4th coupon period	5th coupon period	6th coupon period
3.00%	3.40%	3.80%	4.10%	4.30%	4.40%

During the first two coupon periods, the cap is out-of-the-money because the EURIBOR fixing is lower than the strike price of the cap (i.e. 3.5%). The company then has no right to receive a settlement amount as a result of the cap. During coupon period 3 to 6 the cap is in-the-money and this means that the company will receive a settlement amount. The table below shows the pay-out schedule of the cap:

Period	Calculation	Settlement amount
1	n.a.	
2	n.a.	
3	2,00,000 x (3.80% -3.50%) x 1/2	3,000
4	2,00,000 x (4.10% -3.50%) x 1/2	6,000
5	2,00,000 x (4.30% -3.50%) x 1/2	8,000
6	2,00,000 x (4.4% -3.50%) x 1/2	9,000

Just like for any option, for a cap a market party has to pay a premium. This premium can be paid up-front which means that the whole premium is paid at the start date of the contract. Banks, on the other hand, sometimes offer their clients the opportunity to

pay the premium in instalments during the contract term of the cap. This is referred to as amortizing the premium. The amortized premium can be expressed as a annual percentage.

Example

Let us assume that the upfront premium for the cap in the previous example is EUR 30,000. If the company decides to amortize the premium, then the company is paying EUR 10,000 each year (contract term is 3 years). Expressed as an annual interest rate that is charged over the contract amount, this gives EUR 10,000 / EUR 2,000,000 x 100% = 0.5%.

If a company buys a cap and amortizes the cap premium. It can easily calculate its effective interest rates for different EURIBOR fixings. They can use the following equation for this purpose:

Effective (annual) interest rate = EURIBOR fixing + amortized cap premium + credit spread of the loan.

Example

The company in the previous examples has a loan with a remaining term of three years for which it is paying EURIBOR + 1.20%. The effective interest rates for the company under the earlier mentioned interest scenario are shown in the table below:

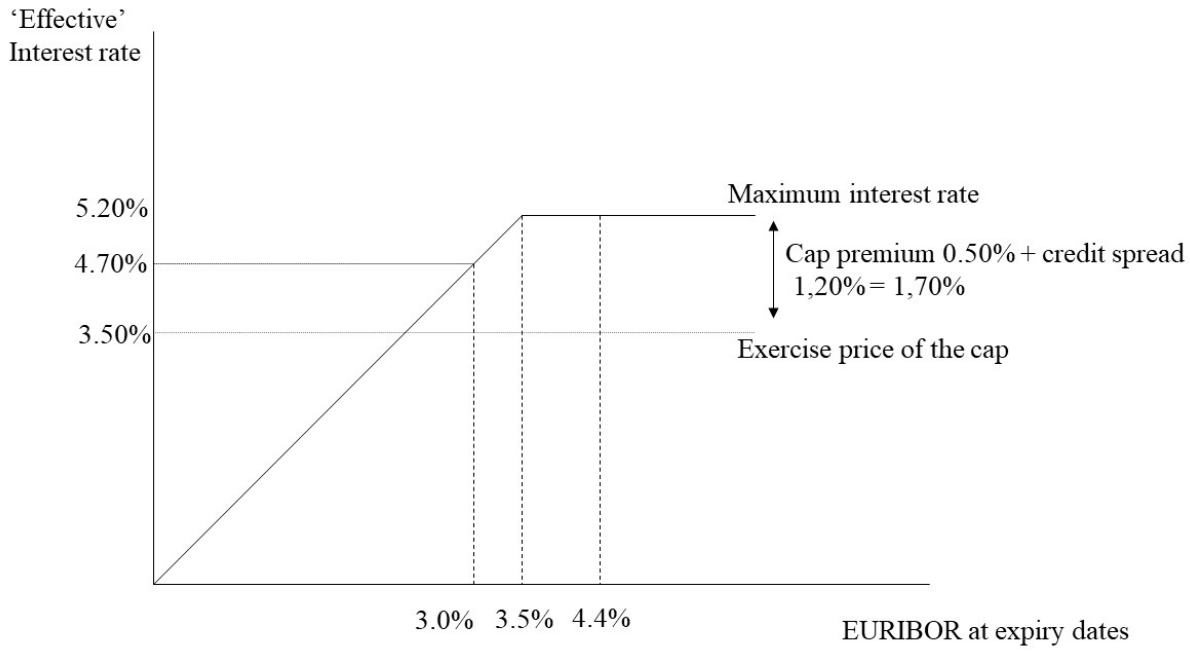
Period	**EURIBOR**	**Interest costs for the loan**	**Cap premium**	**Cap settlement**	**Effective interest rate**
1	3.00%	3.00% + 1.20%	0.50%	0	4.70%
2	3.40%	3.40% + 1.20%	0.50%	0	5.10%
3	3.80%	3.80% + 1.20%	0.50%	- 0.30%	5.20%
4	4.10%	4.10% + 1.20%	0.50%	- 0.60%	5.20%
5	4.30%	4.30% + 1.20%	0.50%	- 0.80%	5.20%
6	4.40%	4.40% + 1.20%	0.50%	- 0.90%	5.20%

The table shows that the maximum effective interest rate for the company is 5.20%. The maximum effective interest rate can be found by using the following equation:

Maximum effective (annual) interest rate = Cap strike + amortized cap premium + credit spread of the loan.

Figure 4 shows a diagram of the effective interest rates for different EURIBOR fixings.

Figure 4 Effective interest costs in case of a hedge with a cap



2.2 Floor

A floor is an over-the-counter interest rate instrument whereby one party has the right, at various moments in the future, to settle the difference between an agreed interest rate (the strike rate) and the reference rate, generally a 3 or 6 month EURIBOR, if this reference rate is lower than the exercise price.

A floor also consists of a number of consecutive interest rate guarantees with the same exercise price: floorlets. Floors can be used by market parties who have long

investments with a floating interest rate and who want to protect themselves against rate falls.

2.3 Collar

An interest rate collar or simply collar is an option strategy whereby a party purchases an out-of-the-money cap and simultaneously sells an out-of-the-money floor with the same maturity period, reference interest rate and exercise dates (or vice versa). The premium for the floor is used to meet the requirement for the premium for a cap. This results in a strategy whereby the interest costs for the buyer of this strategy remain within a certain range.

Example

A company has a medium-term loan with a remaining term of four years and a floating interest rate condition based on three-month EURIBOR. The company believes that the interest rate over the next four years will not go up but also that it will not fall much. The company has a policy to limit interest rate risks and to strive to achieve the lowest possible interest costs. The current three-month EURIBOR rate is 2.55% and the four-year interest rate swap rate is 3.40%.

If the company decides to hedge its interest rate risk by using an interest rate swap, it will fix the interest rate at 3.40% for five years. Compared with the current money market rate, the interest costs will rise immediately by 0.85%.

The company can also opt for a collar: It then buys a 4.50% cap and 'pays' for this by writing a 2.70% floor. The effect of this strategy is that the interest costs for the company will stay in a range between 2.70% and 4.50%.

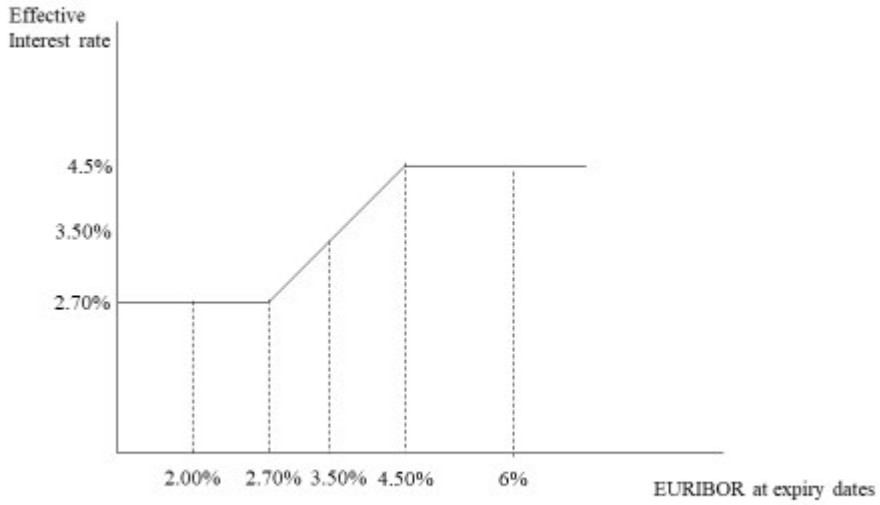
If EURIBOR rises above the strike rate for the cap, for example to 5.1%, then the company pays 5.1% under the loan (excluding credit spread) but receives back 0.60% as a result of the cap. On balance, the company pays 4.50%.

If, on the other hand, a EURIBOR fixing will be lower than 2.70%, for example

2.00%, then the company then pays 2.00% under the loan but is required to pay a settlement amount equivalent to 0.70% to the bank as a result of the sold floor. On balance, the company pays 2.70%.

For all EURIBOR rates between 2.70% and 4.50%, neither the cap nor the floor is in-the-money so that neither option needs to pay out. The total interest costs to the company are then equal to the interest costs under the loan. Figure 5 shows a diagram of the effective interest costs for the company.

Figure 5 Collar



In the above example we assumed that the credit spread was zero. If, for instance, the credit spread in the loan would have been 0.80%, then the maximum interest costs for the company would be 4.50 + 0.80% = 5.30% whereas the minimum costs would be

2.70% + 0.80% = 3.50%. The effective interest rates for the company for various EURIBOR fixings are then as follows:

Period	EURIBOR	Interest costs for the loan	Cap settlement	Floor settlement	Effective interest rate
1	2.00%	2.00% + 0.80%	-	0.70	3.50%
2	2.50%	2.50% + 0.80%	-	0.20	3.50%
3	3.00%	3.00% + 0.80%	-	-	3.80%
4	3.50%	3.50% + 0.80%	-	-	4.30%
5	4.00%	4.00% + 0.80%	-	-	4.80%
6	4.50%	4.50% + 0.80%	-	-	5.30%
7	5.00%	5.00% + 0.80%	- 0.50%	-	5.30%
8	5.50%	5.50% + 0.80%	- 1.00%	-	5.30%

2.4 Swaption

A swaption is an over-the-counter interest rate instrument whereby, on the expiry date, one party has the right to conduct an interest rate swap against a predetermined interest rate. A payer's swaption gives the buyer of the option the right to pay the fixed interest rate in the underlying interest rate swap. If, on the expiry date, the swap rate in the market is higher than the exercise price, the buyer will exercise the option and thus concludes the swap. He then pays a fixed interest rate that is lower than the current market rate. A receiver's swaption gives the buyer of the option the right to receive the fixed interest rate in the underlying interest rate swap.

On the exercise date of an in-the-money swaption, the holder can also choose for a cash settlement. He will then receive the market value of the underlying swap.

Example

A company expects that it needs to take up a loan with a term of 10 years after a period of one year. The company wants to cover itself against rising interest rates, but at the same time wants to be able to profit from low interest rates. The company therefore chooses to buy a payer's swaption with a contract period of one year and a strike level of 5.5%.

If, after one year, the company really needs to take up a loan, there are several possible scenarios:

The first scenario is that the interest rate swap rate is higher than the strike rate, e.g. 6%. The company will now exercise the swaption and, as a result, concludes a payer's interest rate swap in which it pays a fixed rate of 6.0%. To cover its liquidity position, it takes up a floating rate loan with a term of 10 years.

The second scenario is that the interest rate swap rate is lower than the strike rate, e.g. 4%. In this case, the company will not exercise the swaption and lets the swaption expire worthless. To cover its liquidity position, it takes up a fixed rate loan with a term of 10 years and a fixed rate of 4%.

If, after one year, the company would not need to take up a loan, with the first scenario the company has to cash settle the swaption. With the second scenario, nothing will happen. The company will let the swaption expire worthless.
