5. interest rate options: cap and floor

product description

An interest rate option, similarly to a foreign exchange option used for the purpose of managing foreign exchange risk, is like an insurance contract that provides complete protection against adverse changes in the market, but does not exclude the possibility for you to derive maximum benefit from favourable changes in interest rates.

Cap and floor options are built up of series of options. Cap options are built up of caplets and floor options are built up of floorlets. Caplets and floorlets are tied to an interest period. Cap and floor options are built up of as many caplets or floorlets as the number of remaining interest periods from the given deal.

By buying an interest rate option, your company will have a right, in the case of an adverse change in the market, to pay or receive interest rate during the interest payment period at the option strike rate. The interest rate option is separate from the underlying transaction, and only the difference between the strike and the floating interest rate applied on the notional amount and for the time period settled between the parties.

There are two types of the interest rate option:

● **buying of cap option:** protection for borrowers against rising interest rates. If at the outset of the interest payment period, the market rate is above the cap interest rate, the bank will pay the client the difference at the end of the interest period. If the market rate is below the cap interest rate, there will be no payment between the parties. At different cap interest rate levels, you can achieve various levels of protection: if the cap interest rate is lower, your protection will be at a more favourable level, but the option will also be more expensive, and vice versa.

● **buying of floor option:** protection for depositors against decreasing interest rates. If at the outset of the interest period, the market rate is below the floor interest rate, the bank will pay the client the difference at the end of the interest period. If the market rate is above the floor interest rate, there will be no payment between the parties. At different floor interest rate levels, you can achieve various levels of protection: if the floor interest rate is higher, your protection will be at a more favourable level, but the option will also be more expensive, and vice versa.

In most cases settlement is based on the reference interest rate fixing 2 days before the end of the interest period, however it is possible to agree otherwise.

A) cap option: protection against rising interest rates

A company has a EUR 300 000 floating rate loan with a remaining tenor of 3 years. The 3-month EURIBOR is 0.50%. The current 3-year fixed interest rate is 0.85%. In the middle term, this company expects interest rates to decrease by more than what is expected by the market, but it would also like to exclude any scenario in which its financing expenses would suddenly exceed 1.00% annually. Therefore, it buys a forward starting 3-year cap option with a cap strike at 1.00%, for which it pays a premium at 0.40% of the notional (equivalent with paying approx. 0.1357% p. a. payable every 3 months). By buying the cap option, this company can make sure that its interest expenditure in relation to the loan in question will not exceed 1.00% p.a. (plus the annualized premium charged for the cap option).

Cap option can be bought without treasury limit, if the option premium is paid up front. However a treasury master agreement and a completed MiFID questionnaire is always required.

EUR yield curve at end of 2012
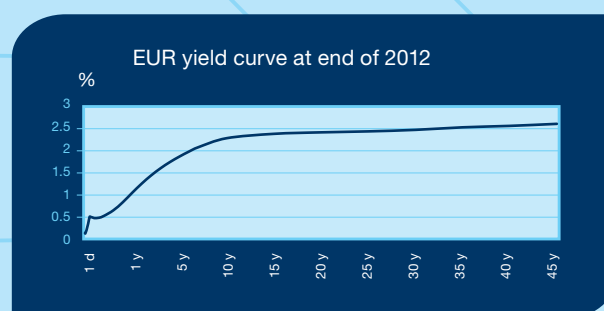
EUR yield curve: increasing. If you expect that interest rates in the future will increase a larger extent than expected by the market, the cap option may provide favourable protection against sudden interest rate increases.

parameters of the cap option	
notional	EUR 300 000
tenor	3 years
variable notional	no
cap (maximum) strike	1.00%
frequency of interest payment	quarterly
Interest rate fixing date	2 working days before onset of the interest period
interest rate calculation convention	actual number of days/360
settlement of interest payments	net settlement at the end of each interest period
precondition for settlement of cap interest payment	3-month EURIBOR above 1,00% at the start of the interest payment period
current 3-month EURIBOR	0.50%
current 3-year ICAPEURO offer rate against 6-month EURIBOR (Day count: ANN 30/360 vs 6M EURIBOR)	0.85%
option premium (paid by the client on the trade date)	0.40% * notional, that is EUR 1 200 upfront (approx. 0.1357% p.a. payable every 3 months, EUR 101.78 per quarter)
possible scenarios at the end of each interest period assuming that on the fixing dates the 3-month EURIBOR is	
above 1.00%	your company pays 1% interest on the loan in every interest period
below 1.00%	your company pays 3 month EURIBOR on the loan in every interest period
best-case scenario (treasury transaction on a standalone basis)	On the fixing days 3 month EURIBOR above 1.00%. Your company receives the time proportional difference between 1.00% and 3 month EURIBOR for the actual notional amount in each interest rate period.
worst-case scenario (treasury transaction on a standalone basis)	On the fixing days 3 month EURIBOR below 1.00%. No net settlement between the parties. The loss of your company is equal to the option premium.

the market value of the position one year after the contract conclusion from the customer's point of view

market value: the cost of liquidating the position calculated at a given point of time and under the prevailing market terms and conditions (in the event of positive sign the company can close the transaction at a profit) (assumption: there is parallel shift in the entire yield curve in the extent of the change of the 3-month EURIBOR, and the shape of the yield curve remains unchanged)
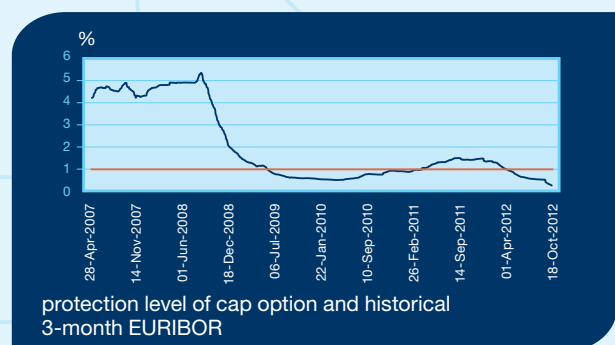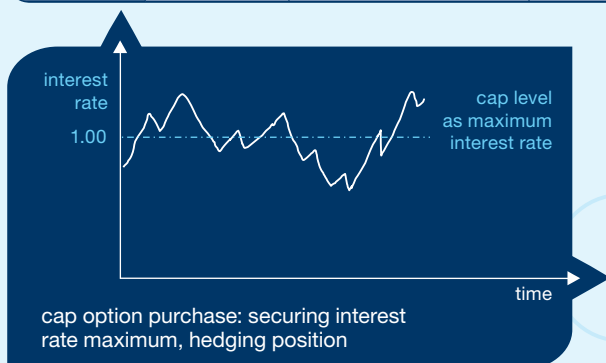
The number of possible outcomes is unlimited, and there may be even more extreme values than the ones presented below.

3-month EURIBOR in one year (%)	market value of the position (EUR)
-1.00	0
0.50	330
2.00	2 820

financial outcome of some possible scenarios 1 year after the trade date, supposing that the 3-month EURIBOR evolves as below in the last quarter of the given year

The number of possible financial outcomes is unlimited, and there may be even more extreme values than the ones presented below.

end of period (outstanding principal EUR 300 000)	3-month EURIBOR at the start of the interest period (%)	underlying exposure's financial outcome with no treasury transaction (3 months' interest expense without cap, EUR)	profit/loss of the product on a standalone basis (net settlement at the end period, client pays if value is "+", EUR)	underlying exposure's financial outcome with the treasury transaction, hedged position (3 months' interest expense with cap and premium, EUR)	underlying exposure's financial outcome with the treasury transaction, hedged position (3 months' interest expense with 0,60% IRS, EUR)
1 year	-1.00	-750	0	-(750 + 101.78) = -648.22	450
1 year	0.00	0	0	101.78	450
1 year	0.50	375	0	375 + 101.78 = 476.78	450
1 year	1.50	1 125	-375	750 + 101.78 = 851.78	450
1 year	2.50	1 875	-1 125	750 + 101.78= 851.78	450

cap option purchase: securing interest rate maximum, hedging position

protection level of cap option and historical 3-month EURIBOR

The chart shows the interest level(s) of the treasury deal and the historical evolution of 3 month EURIBOR. The historical data is intended merely to compare the interest level(s) of the deal to the historical rates. Future evolution of interest rates and interest changes for the remaining tenor are unforeseeable in advance, actual profit and loss depends on the interest rate prevailing on the fixing days. The chart is not suitable to forecast interest rates and market value of the position.

B) floor option: protection against decreasing interest rates

A company has a floating rate deposit and it would like to hedge the interest rate for a tenor of 3 years. The 3-month EURIBOR is 0.50%. The current 3-year fixed interest rate is 0.85%. In the middle term, this company expects interest rates to decrease by more than what is expected by the market, but it would also like to exclude any scenario in which interest rates would drop significantly. Therefore, it buys a 3-year floor option with a floor strike at 1.00%, for which it pays a premium at 1.56% of the notional (equivalent with paying approx. 0.1555% p. a. payable every 3 months). By buying the floor option, this company can make sure that its interest income in relation to the deposit in question will not be below 1.00% p.a. (minus the annualized premium charged for the floor option).

Floor option can be bought without treasury limit, if the option premium is paid up front. However a treasury master agreement and a completed MiFID questionnaire is always required.

parameters of the floor option	
notional	EUR 300 000
tenor	3 years
variable notional	no
floor (minimum) strike	1.00%
frequency of interest payment	quarterly
Interest rate fixing date	2 working days before onset of the interest period
interest rate calculation convention	actual number of days/360
settlement of interest payments	net settlement at the end of each interest period
precondition for settlement of floor interest payment	3-month EURIBOR below 1,00% at the start of the interest payment period
current 3-month EURIBOR	0.50%
current 3-year ICAPEURO offer rate against 6-month EURIBOR (market reference rate)	0.85%
option premium (paid by the client on the trade date)	1.56% * notional, that is EUR 4 680 up front (approx. 0.1555% p.a., EUR 116.63 payable every 3 months)
possible scenarios at the end of each interest period assuming that on the fixing dates the 3-month EURIBOR is	
above 1.00%	your company receives 1% interest on the deposit in every interest period
below 1.00%	your company receives 3 month EURIBOR on the deposit in every interest period
best-case scenario (treasury transaction on a standalone basis)	On every fixing day 3 month EURIBOR below 1.00%. Your company receives the time proportional difference between 1.00% and 3 month EURIBOR for the actual notional amount in each interest rate period.
worst-case scenario (treasury transaction on a standalone basis)	On every fixing day 3 month EURIBOR above 1.00%. No net settlement between the parties. The loss of your company is equal to the option premium.

the market value of the position one year after the contract conclusion from the customer's point of view

market value: the cost of liquidating the position calculated at a given point of time and under the prevailing market terms and conditions (in case of a positive value the company can close the transaction with profit) (assumption: there is parallel shift in the entire yield curve in the extent of the change of the 3-month EURIBOR, and the shape of the yield curve remains unchanged)
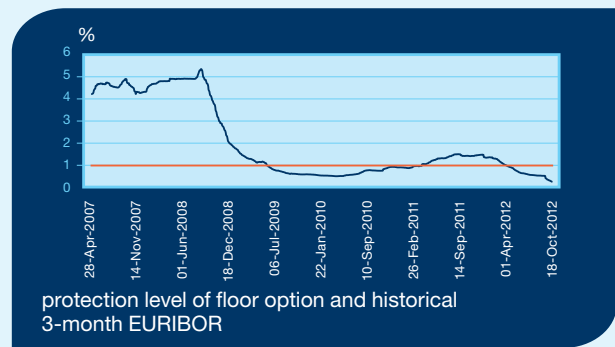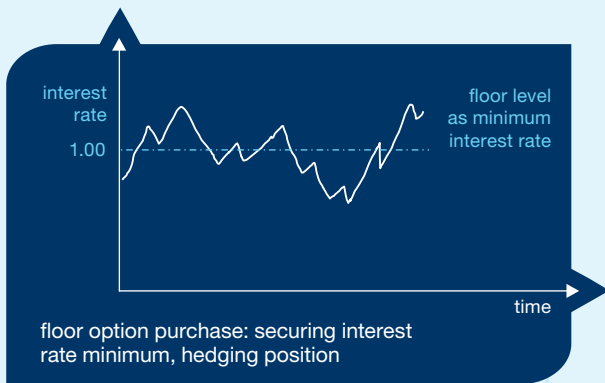
The number of possible outcomes is unlimited, and there may be even more extreme values than the ones presented below.

3-month EURIBOR in one year (%)	market value of the position (EUR)
-1.00	13 095
0.50	4 680
2.00	0

financial outcome of some possible scenarios 1 year after the trade date, at the end of the interest rate period, supposing that the 3-month EURIBOR evolves as below in the last two days at the beginning of the given period

The number of possible financial outcomes is unlimited, and there may be even more extreme values than the ones presented below.

end of period (outstanding principal EUR 300 000)	3-month EURIBOR at the start of the interest period (%)	underlying exposure's financial outcome with no treasury transaction (3 months' interest expense without floor, EUR)	profit / loss of the product on a standalone basis (net settlement at the end period, client receives payment if value is "+", EUR)	underlying exposure's financial outcome with the treasury transaction, hedged position (3 months' interest expense with floor and premium, EUR)	underlying exposure's financial outcome with the treasury transaction, hedged position (3 months' interest expense with 0,60% IRS, EUR)
1 year	-1.00	-750	1 500	750.00 – 116.63 = 633.37	450
1 year	0.00	0	750	750.00 – 116.63 = 633.37	450
1 year	0.50	375	375	750.00 – 116.63 = 633.37	450
1 year	1.50	1 125	0	1 125 – 116.63 = 1 008.37	450
1 year	2.50	1 875	0	1 875 – 116.63 = 1 758.37	450

floor option purchase: securing interest rate minimum, hedging position

protection level of floor option and historical 3-month EURIBOR

The chart shows the interest level(s) of the treasury deal and the historical evolution of 3 month EURIBOR. The historical data is intended merely to compare the interest level(s) of the deal to the historical rates. Future evolution of interest rates and interest changes for the remaining tenor are unforeseeable in advance, actual profit and loss depends on the interest rate prevailing on the fixing days. The chart is not suitable to forecast interest rates and market value of the position.

advantages of transaction

- complete protection against adverse changes in interest rates, the worst-case scenario is known
- you can fully benefit from advantageous changes in interest rates
- available for both loans and deposits
- an option can be attached to a loan taken out from, or deposit placed with, another financial institution, because the interest rate option is (in legal terms) separate from the underlying loan or deposit transaction
- the maximum / minimum of the future interest payment / income can be fixed in advance
- available in most liquid currencies
- the expiry date, the cap / floor strike, and the frequency of interest payments can be set at your will, in accordance with your expectations, plans and budget; the change of one parameter will cause the rest of the parameters to change, too
- available with any kind of repayment schedule
- your position can be closed at any time by means of a counter-deal (selling of the option) in the market

risks of transaction

- similarly to an insurance premium, the option premium is paid either up-front, or at the end of each interest period, evenly spread over the tenor of the contract
- similarly to foreign exchange options, interest rate options also involve the paradox that the holder of the option is in a better situation if at expiry there is no need to exercise the option
- when the underlying loan is prepaid, or the underlying deposit is broken, it is advisable to close the interest rate option, as well, because the risk arising from the underlying business activity is no longer there. When closing the deal, that is, on selling the option, you may incur a loss; although an option never has a negative value, you may receive less on selling your option than what you

paid as a premium when the contract was made. The value of a cap option increases as interest rates rise, and can even come to zero if interest rates are cut sharply. The value of a floor option increases as interest rates decline, and can even come to zero if interest rates hike sharply.

- the market value of interest rate derivatives is determined by the evolution of market interest rates, the length of interest rate periods, the number of days remaining until the expiry of the transaction, the daycount method and the evolution of the notional until expiry. In the case of an interest rate option the evolution of market volatility also influences the market value. The drop in market liquidity could lead to a bid-offer spread widening, which could also affect the market value of the position negatively.
- if the company sells a cap or a floor option, the change in market value could lead to an obligation of temporary or permanent increase of collateral which may affect the company's liquidity and solvency negatively. In case of exceptional market circumstances (eg, money market and other crisis) the negative market value of the position from the Client's viewpoint could reach so extreme levels that providing the adequate collateral may lead to the company's insolvency. Moreover, failure to provide additional collateral in time might lead to the closure of open positions thus prompt realization of losses, which may affect the company's liquidity and solvency negatively.
- chapter I/b. entitled "Risk Factors" of "K&H Treasury Handbook of Market Risk Management" lists those risks that do not originate exclusively from the nature of the product described here, but rather, from other factors.

product structure

The product is built up of a forward rate agreement. The sections on forward rate agreements of Chapter I/c. entitled "5 Basic Products" of "K&H Treasury Handbook of Market Risk Management", also applies to this product.

If you expect interest rates to decrease by a greater degree than what is foreseen by the market (e.g. in the yield curve), the premium paid for the cap option can be off-set by a subsequent interest rate decrease that is greater than the market expectations.

If, however, you expect that interest rates will not change significantly over the tenor of the contract, and you want to avoid paying for protection, and in return you are prepared to accept that an interest payment obligation is created at a lower interest rate, then you can choose a zero cost interest rate collar (see paragraph **7 of this chapter – interest rate collar).**

In specific cases, a swaption (see in a different document) will give you more effective and less expensive protection against an unfavourable turn in interest rates, but this is a hedging product that is less flexible than an interest rate option (see paragraph **6 of this chapter – swaption).**