

# OUTRIGHTS / FX SWAPS

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# 1. FX Forward Outrights

An outright is an agreement between two counterparts to exchange currencies on a future date at a fixed rate.

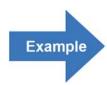
# 1.1 Conventions and Terminology

#### Value date

The regular terms for outrights are the straight months (resp. weeks) up to 1 year e.g.: 1w, 2w, 3w, 1m, 2m, 3m, 4m...12m. For the major currencies terms of up to 5 years are possible. The term of an outright deal is measured starting with the spot value date.



If the theoretical value date of an outright is a Saturday, Sunday or a bank holiday, the value date is deferred to the next working day.



The value date of a 1-month outright, traded on Wednesday, the 22<sup>nd</sup> of October, would be the 24<sup>th</sup> of November. If the 24<sup>th</sup> of November is a Sunday, the value date will be the 25<sup>th</sup> of November.

For the so-called **end / end deals** (outrights with spot value dates on the last working day of a month), the value date of the outright is the **last working day**.

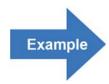


The trading day of a one-month outright deal is Wednesday, the 29<sup>th</sup> of October. Value date of the spot deal would be Friday, the 31<sup>st</sup> of October. The value date of the outright deal is in this case Friday the 28<sup>th</sup> of November (last bank day in November).



# 1.2 Computing Outright Rates

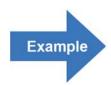
The table shows some examples of spot 12-month outright rates:



	EUR/USD	USD/CHF	EUR/GBP
Spot	1.0980	1.5000	0.6975
12 mth	1.0870	1.4720	0.7033

These examples demonstrate that the outright rates usually differ from the spot rate, but they are not a forecast for the spot rate at the end of the term. If, for example, the rate for a 12-month outright USD/CHF is 1.4720, this does not mean that the market expects a rate of 1.4720 in 12 month time.

The difference between the outright rate and the spot rate only reflects the interest differential between the two currencies involved. Would the outright rates not conform to the interest differential, arbitrage between the foreign exchange market and the euro deposit market would be possible.



USD/CHF spot: 1.5000

USD 6-mth deposit rate: 6 %

CHF 6-mth deposit rate: 2 % (184 days).

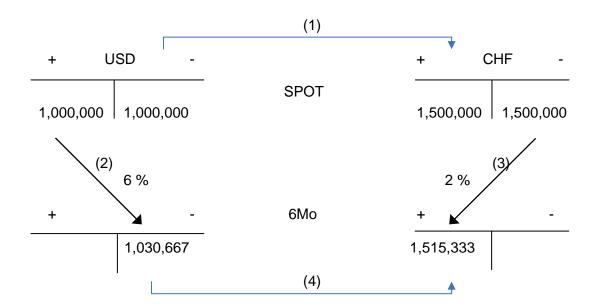
A company is long USD/CHF value date 6 months and wants to hedge the FX-risk. There are two alternatives:

- Sell USD outright against CHF or
- Sell USD spot against CHF and refinance USD for 6 months by means of an interbank deposit and invest CHF for 6 months by means of an interbank deposit

The results of both alternatives must be the same. Otherwise the market participants would do arbitrage that means they would buy the cheaper alternative and close the position by selling the other one. Hence the difference would disappear very quickly.

If both alternatives produce the same result, the 6 months outright rate can be computed as shown below:





- Sell spot USD 1,000,000 against CHF at a rate of 1.5000 (1)
- Take 184 days USD deposit 1,000,000 at 6 % (2)
- Give 184 days CHF deposit 1,500,000 at 2 % (3)
- Computing the outright rate: 1,515,333/1,030,667 = 1.4702 (4)

The outright rate can be computed by using the stated formula, too.

$$O = SPOT \times \frac{1 + \left(i_{V} \times \frac{D}{B_{V}}\right)}{1 + \left(i_{B} \times \frac{D}{B_{B}}\right)}$$

D = number of days

O = outright rate

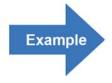
SPOT = spot rate

i<sub>B</sub> = interest rate p.a. in decimals, base currency

i<sub>V</sub> = interest rate p.a. in decimals, quote/variable currency

B<sub>B</sub> = basis of term calculation for the base currency (360 or 365)

 $B_V$  = basis of term calculation for the quote/variable currency (360 or 365)



What is the 6-month outright rate of USD/CHF (184 days)?

USD/CHF spot: 1.5000

interest rates: USD (base currency) 6 %

CHF (quote currency) 2 %



In order to compute the outright rate, you need

- the spot rate
- the number of days
- the interest rates for both currencies.

$$O=1.50 \times \frac{1 + \left(0.02 \times \frac{184}{360}\right)}{1 + \left(0.06 \times \frac{184}{360}\right)} = 1.4702$$

Compare the result with the rate, which was derived from the cash flows on the previous page. Both rates are **1.4702**.

#### Premium/Discount

If the outright rate is lower than the spot rate, the base currency is at a discount. If the outright rate is higher than the spot rate, the base currency is at a premium.

### Rules for premium/discount

If a currency is at a premium or discount depends on the interest rates

interest rate base currency < interest rate quote currency → premium interest rate base currency > interest rate quote currency → discount



### Computing outright rate in consideration of bid/offer rates

Since deposit rates are usually quoted with a spread the bid and the offer rate has to be taken into account when computing the bid resp. the offer rate of an outright

$$O_{Bid} = SPOT_{Bid} \times \frac{1 + \left(i_{BidV} \times \frac{D}{B_{V}}\right)}{1 + \left(i_{OfferB} \times \frac{D}{B_{B}}\right)}$$

$$O_{Offer} = SPOT_{Offer} \times \frac{1 + \left(i_{OfferV} \times \frac{D}{Bv}\right)}{1 + \left(i_{BidB} \times \frac{D}{B_B}\right)}$$

D = number of days

O = outright rate

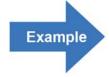
SPOT = spot rate

i<sub>B</sub> = interest rate p.a. in decimals, base currency

i<sub>V</sub> = interest rate p.a. in decimals, quote/variable currency

 $B_B$  = day basis of the base currency (360 or 365)

 $B_V$  = day basis of the quote/variable currency (360 or 365)



You receive the following quotes:

USD/CHF 1.5000-10 interest rate USD, 184 days  $5^{7}/_{8}$  - 6 %

interest rate CHF, 184 days 2 - 2<sup>1</sup>/<sub>8</sub> %

What is the quotation of a 6-months (184 days) outright USD/CHF?



Using these prices the quotation for a 6-months outright rate (USD/CHF) can be computed as follows:

Outright rate Bid

$$=1.5000 \cdot \frac{1 + \left(0.02 \cdot \frac{184}{360}\right)}{1 + \left(0.06 \cdot \frac{184}{360}\right)} = 1.4703$$

Outright rate Offer

$$=1.5010 \cdot \frac{1 + \left(0.02125 \cdot \frac{184}{360}\right)}{1 + \left(0.05875 \cdot \frac{184}{360}\right)} = 1.4731$$

The 6-months USD/CHF outright rate is 1.4703 –31.

# 1.3 Quotation of Outright Rates

In day-to-day business, outright rates are quoted in swap points. By adding (premium) or subtracting (discount) these swap points from the spot rate, you get the full outright rate. The swap points are also called forward points.

Two examples of Reuters pages are shown below:

# EUR/USD swaps:

RIC	Bid	Ask
EURON= EURTN= EURSN= EURSW= EUR1M= EUR1M= EUR2M= EUR3M= EUR4M= EUR5M= EUR6M= EUR7M= EUR7M= EUR11M= EUR11M= EUR1Y= EUR1Y= EUR3Y= EUR3Y= EUR3Y= EUR4Y= EUR5Y= FIIR10V=	-0.385 -1.25 -0.41 -3.29 -5.8 -12.67 -23.66 -33.05 -33.01 -53.04 -62.05 -71.2 -80.6 -89.20 -97.62 -105.63 -112.60 -177.5 -215 -219 -214 -191	-0.335 -1.21 -0.38 -3.24 -5.7 -12.42 -22.66 -32.55 -42.61 -52.54 -61.65 -70.2 -79.6 -88.00 -96.37 -104.38 -111.40 -172.5 -195 -189 -174

### USD/CAD swap

RIC	Bid	Ask
CADON= CADON= CADON= CADSW= CADSW= CAD2M= CAD2M= CAD3M= CAD9M= CAD1Y= CAD2Y= CAD3Y= CAD3Y= CAD3Y= CAD3Y= CAD3Y= CAD5Y=	2.96 2.70 0.73 5.25 23.30 48.70 74.00 154.50 239.00 317.00 580 790 900 1056	3.01 2.80 0.78 5.55 23.70 49.50 75.00 157.00 243.00 322.00 605 830 950 1093

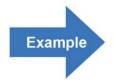


#### **Premium / Discount**

Usually, traders do not state the algebraic sign when quoting swap points. There are two ways to find out whether the swap points are at a premium or at a discount.

Analysis of the interest rates

interest rate base currency < interest rate quote currency → premium interest rate base currency > interest rate quote currency → discount



interest rates:

USD: 1.50% EUR: 2.50% CAD: 3,50%

Are the swap points of EUR/USD and USD/CAD at a premium or

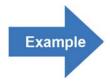
discount?

EUR/USD: EUR rate > USD rate → discount USD/CAD: USD rate < CAD rate → premium

Analysis of the quotation

Forward points are quoted with bid and offer rates, just like spot rates. The market user sells at the bid rate and buys at the offer rate.

Note: Quotes near parity (+/-0) are usually quoted with plus and minus.



The table shows the spot rates and swap points for several terms

	GBP/USD	EUR/USD
Spot	1.5930 - 1.5935	1.1805 - 1.1810
1 month	40 - 39	20 - 21
3 months	120 - 118	35 - 37
12 months	280 - 275	65 - 70

What are the outright rates of GBP/USD and EUR/USD?



GBP/USD: the bid rate is higher than the offer (e.g. 40 - 39 for 1 month).

#### This means:

- GBP/USD is at a discount
- The forward points have to be subtracted.

GBP/USD rate	1-month	3-months	12-months
Spot rate	1.5930 - 1.5935	1.5930 - 1.5935	1.5930 - 1.5935
Forward points (discount)	40 - 39	120 - 118	280 - 275
Outright rate	1.5890 - 1.5896	1.5810 - 1.5817	1.5650 - 1.5660

EUR/USD: the bid rate is lower than the offer rate (e.g. 20 – 21 for the 1-month term).

#### This means:

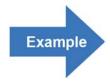
- EUR/USD is at a premium
- the forward points have to be added to the spot rate.

EUR/USD rate	1-month	3-month	12-month
Spot rate	1.1005 - 1.1010	1.1005 - 1.1010	1.1005 - 1.1010
Forward points (premium)	20 - 21	35 - 37	65 - 70
Outright forward rate	1.1025 - 1.1031	1.1040 - 1.1047	1.1070 - 1.1080

# Which factors do influence the outright rate?

Since the outright rate consists of the spot rate plus or minus the swap points it changes if:

- the spot rate changes or
- the interest rate differential changes (i.e. the swap points change).



The quotation for 3-month outright EUR/USD is 35/37 and changes to 50/52.

Knowing this we can conclude that:

The interest rates in USD are higher than the interest rates in EUR. (bid < offer → EUR is at a premium).</p>



The forward points increased as the interest differential increased. This could mean that either the interest rates for USD rose or that the EUR interest rates fell. Just by knowing the change in forward points we cannot conclude which of the two things actually happened.

# Computing discount / premium

The swap points can be computed by means of the swap formula, which is derived from the outright formula.

$$Premium/discount = SPOT \times \left(\frac{1 + \left(i_{V} \times \frac{D}{B_{V}}\right)}{1 + \left(i_{B} \times \frac{D}{B_{B}}\right)} - 1\right)$$

D = number of days

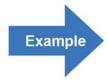
SPOT = spot rate

i<sub>B</sub> = interest rate p.a. in decimals, base currency

i<sub>V</sub> = interest rate p.a. in decimals, quote/variable currency

B<sub>B</sub> = basis of the base currency (360 or 365)

 $B_V$  = basis of the quote/variable currency (360 or 365)



#### Premium/discount

interest rates: USD (base currency) 6 %

CHF (quote currency) 2 %

Spot rate: USD/CHF 1.5000

What are the 6-month swap points?

Discount=1.50 × 
$$\frac{1 + \left(0.02 \times \frac{184}{360}\right)}{1 + \left(0.06 \times \frac{184}{360}\right)} - 1 = -298$$

6-months USD/CHF swap points are - 298.



# Taking bid / offer rates into account when computing swap points

#### Bid

$$\begin{aligned} & \text{Premium/discount}_{\text{Bid}} = \text{SPOT}_{\text{Mean}} \times \left( \frac{1 + \left( i_{\text{BidQ}} \times \frac{D}{B_{\text{Q}}} \right)}{1 + \left( i_{\text{OfferB}} \times \frac{D}{B_{\text{B}}} \right)} - 1 \right) \end{aligned}$$

#### Offer

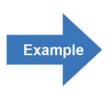
$$Premium/discount_{Offer} = SPOT_{Mean} \times \left(\frac{1 + \left(i_{OfferQ} \times \frac{D}{B_{Q}}\right)}{1 + \left(i_{BidB} \times \frac{D}{B_{B}}\right)} - 1\right)$$

D = number of days

B = basis of the term calculation (360 or 365)

i = interest rate p.a. in decimals

Note: As only the premium/discount has to be computed, the calculation may be done with the mean quotation of the spot rate. Bid and offer for spot has almost no impact on the fair price.



USD/CHF 1.5000-10

USD interest rate, 184 days 5<sup>7/8</sup> - 6 %

CHF interest rate, 184 days 2 - 2<sup>1/8</sup> %

What are the 6-month swap points and outright rates?

$$BID = 1.5005 \times \left(\frac{1 + \left(0.02 \times \frac{184}{360}\right)}{1 + \left(0.06 \times \frac{184}{360}\right)} - 1\right) = -298 \qquad Offer = 1.5005 \times \left(\frac{1 + \left(0.02125 \times \frac{184}{360}\right)}{1 + \left(0.05875 \times \frac{184}{360}\right)} - 1\right) = -279$$

 Spot
 1.5000
 - 1.5010

 swap (discount)
 298
 - 279

 = outright rate
 1.4702
 - 1.4731



### Why premium / discount is quoted?

There are a lot of reasons why outrights are quoted in terms of forward points:

- Forward points are mainly influenced by interest rates. Interest rates are not that volatile than spot rates. If outright rates would be quoted, they would have to be updated for every move in the spot rate.
- Customers, or market users, compare the quotes of different market makers and look at the spot rate only when they are ready to deal.
- In practical dealing the FX-forward trading book is separated from the FX-spot trading book. Thus forward points (FX swaps) are not quoted at the spot desk. Usually the FX-forward desk belongs to the money market department.
- Forward deals are most frequently used as a part of FX-swap transactions in the interbank market. FX-swaps are dominated by the interest rate differential rather than the spot rate.

### Calculation of forward rates for broken dates – linear interpolation

If you have to compute a forward rate for a certain period, you can also calculate this rate by linear interpolation of the two nearest forward rates.



Market data:

Spot EUR/USD: 1.1500 – 10

6 months swap: 1.1438 – 40 180 days 9 months swap: 1.1380 – 82 270 days

You have to sell EUR 8 months forward (240 days).

What is the forward rate?





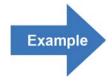
You know that the 8 months swap is between the 6 months and 9 months swaps. As you want to sell EUR, you have concentrate on the bid rates.

The difference between the 6 months and 9 months swaps is 58 pips (1.1438 - 1.1380). If the EUR/USD forward curve runs linear you can assume that between the 6 and 9 months the discount per month has to be 19.3 pips (one third of 58). So you would have an estimated 8 months forward rate of 1.1399 (1.1380 - (-) 0.00193).

$$O = 1.1438 + \left[\frac{1.1380 - 1.1438}{270 - 180}\right] (240 - 180) = 1.1399$$

You can sell EUR at 1.1399 8 months forward.

Of course you can use the linear interpolation also for swap points.



Market data:

Spot EUR/USD: 1.1500 – 10

6 months swap: 62 - 60 180 days 9 months swap: 120 - 118 270 days

You have to sell EUR 8 months forward (240 days).

What are the swap points?

You are looking for the bid rate of the 8 months swap.

swappo int s = 
$$-62 + \left[ \frac{-120 - (-)62}{270 - 180} \right] \times (240 - 180) = -100.67$$

The discount for 8 months is – 100,67 pips.

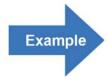


# 1.4 Cross Rates of Outrights

Forward cross rates are outright rates of two currencies, where none of these two is USD. Like spot transactions most of the outright deals are done against the USD. This means that liquidity in crosses is lower and the spreads are usually higher. Thus cross rates are frequently derived from quotes against the USD. If for example a bank likes to sell outright CHF against GBP, it would usually do the following transactions

- sell CHF outright against USD
- sell USD outright against GBP

The result of these transactions represents the GBP/CHF outright cross rate.



	USD/CHF	USD/AUD
Spot rate	1.3757/62	1.5930/35
3-month	125/120	115/110

What are the forward cross rates for CHF/AUD?

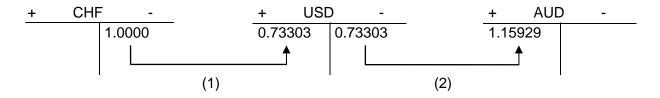
Step 1: determine the USD outright rates

	USD/CHF	USD/AUD
Spot	1.3757/62	1.5930/35
Swap points	-125/-120	-115/-110
Outright rate	1.3632/42	1.5815/25

Knowing the outright rates, the same rules as used for spot crosses can be used.



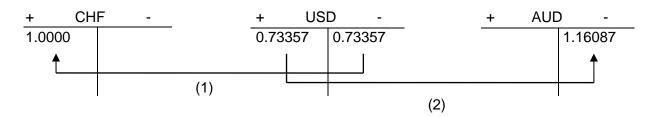
#### Bid



- (1) Sell CHF 1 against USD 0.73303 (1.3642)
- (2) Sell USD 0.73303 against AUD 1.15929 (1.5815)

By selling 1 CHF you receive AUD 1.15929. Thus the CHF/AUD bid rate is 1.1593.

#### Offer



- (1) Buy CHF 1 against USD 0.73357 (1.3632)
- (2) Buy USD 0.73357 against AUD 1.16087 (1.5825)

By buying 1 CHF you receive AUD 1.16087. Thus the CHF/AUD offer rate is 1.1609.

# 1.5 Time Options

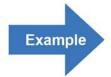
Contrary to traditional FX forward contracts the settlement of a time option is not on a specified day but – depending on the customer's choice – within a specified period of time. The term "option" therefore only relates to the **date of settlement**, not meaning that the customer has a choice to fulfill the contract or not (like with FX options).

Time options are only traded by customers, not in the interbank market. Customers use time options for hedging when the exact date of payment is not known. For this flexibility they have to accept an unfavourable rate compared to the rate of a traditional forward contract. (Professional market participants prefer traditional forward deals and compensate any differences in the date of settlement with FX swaps.)



# 1.5.1 Pricing of Time Options

Note: you always quote the rate for the worst case scenario (for the bank) which is the most unfavourable settlement date.



Time option when having discounts:

EUR/USD spot: 1.2050 - 55

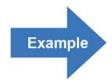
3 mo swap: 45 - 434 mo swap: 62 - 60

What are the rates for a time option from 3 to 4 months?

	Bid	Offer
3 mo	1.2005	1.2012
4 mo	1.1988	1.1995

You are quoting the two worst rates, i.e. 1.1988 – 1.2012.

When having discounts: for the bid rate you take the discounts for the latest possible settlement, for the offer rate you calculate the discounts for the earliest possible settlement date.



Time option when having premiums:

EUR/USD spot: 1.2050 - 55

3 mo swap: 43 - 454 mo swap: 60 - 62

What are the rates for a time option from 3 to 4 months?

	Bid	Offer
3 mo	1.2093	1.2100
4 mo	1.2110	1.2117

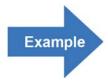
You are quoting the two worst rates, i.e. **1.2093 – 1.2117**.

When having premiums: for the bid rate you take the premiums for the earliest possible settlement, for the offer rate you calculate the premiums for the latest possible settlement.



# 1.5.2 Remaining Risk for Time Options

The time options pricing is based on the most unfavourable settlement date. Also the hedging of this position is done for this date. The bank assumes that at any other settlement date the result will be better. This assumption however is only correct when discounts do not turn into premiums and vice versa.



Your customer sells a time option from 11 to 12 months.

EUR/USD spot: 1.2050 - 1.2055

11 mo swap
 220 - 222
 12 mo swap
 235 - 237

Due to the premiums you are quoting the bid price for the shortest period, i.e. 1.2270. Also the hedge is done for 11 months.

You assume that your result will improve when your customer settles on a later date as then you could roll-over the hedging position with premiums.

After 11 months the EUR rates have risen and EUR/USD is quoted with discounts.

If the customer settles the deal on a later date, you have to roll-over your position with discounts which impairs your result.

The risk is a change from discount to premium (and vice versa). This risk cannot be hedged completely. It can only be reduced by limiting the period of the time option (e.g. max. one month).



# 1.6 Non-deliverable Forwards (NDF)

A Non-deliverable Forward (NDF) is a contract between two parties that fixes the rate of exchange that will apply on a notional FX forward transaction.

The NDF is to the FX forward market what the FRA is to the money markets: both are agreements between parties to compensate each other for movements in a market rate.

As with the FRA, the counterparties to an NDF do not exchange the notional amount, they simply pay each other a cash sum based on the difference between the NDF rate and a reference FX spot rate at the contract's maturity.

The NDF was developed in the 1990s to help investors into emerging markets manage their exposures to non-convertible currencies, or to currencies whose forward markets are restricted.

# 1.6.1 Terminology

#### **NDF** rate

The forward rate which is agreed on in the NDF (Outright rate).

#### Reference rate

Is fixed on the fixing date. For most currencies there is an official fixing which is published on Telerate and Reuters. Usually this is a spot rate which is determined by a certain bank panel at a certain time.

### **Compensation payment/ Cash Settlement**

The compensation payment is based on the difference between NDF rate and reference rate referring to the nominal amount and is usually settled cash in USD.

#### Fixing date

The day where the reference rate which is needed for the compensation payment is fixed.



#### Settlement date

The day where the cash settlement is conducted (= value date of the fixing date)

### **Buyer of an NDF**

The buyer of an NDF is – like in a conventional FX forward transaction – the buyer of the base currency (only notional amount). For e.g. USD/BRL he would be USD buyer, i.e. he has got a long USD position and wants a rising USD/BRL rate (= weakening of BRL). Should the BRL fall until maturity and the USD/BRL rate rises above the NDF rate, the buyer receives a compensation payment from the seller.

Foreign companies with asset exposures in the non-convertible currency (or investors speculating on a depreciation of that currency) are natural buyers of NDFs on the hard currency.

#### Seller of an NDF

Along the lines of the buyer the seller of an NDF is the (fictitious) seller of the base currency, e.g. USD seller for USD/BRL, i.e. he participates in a falling USD/BRL rate (= rising BRL). Should the BRL rise until maturity and the USD/BRL fall below the NDF rate, the seller receives a compensation payment from the buyer.

Foreign companies with requirements for the non-convertible currency (or investors speculating on a rise in the value of that currency) are natural sellers of NDFs on the hard currency.



The Taiwan subsidiary of a multinational company plans to repatriate TWD 350 mio. at the year-end but expects the TWD to weaken substantially against the USD, so they would like to hedge the position. The central bank operates severe restrictions on the local FX forward market, so the parent company enters into a 12-months USD/TWD NDF.

Spot USD/TWD: 33.75

12-months forward USD/TWD: 33.20 – 33.27

The company has to hedge against a falling TWD (rising USD/TWD), i.e. it buys the 12-months NDF at 33.27.

The NDF is settled after 12 months.



USD/TWD on fixing date: 33.43

(published on Reuters page TFEMA at 11.00 a.m. Taipeh time)

As the fixing is above the NDF rate the company receives the compensation payment.

Calculation:

350,000,000/33.27 - 350,000,000/33.43

= 10,519,987.98 USD - 10,469,638.05 USD

= 50,349.93 USD

The company receives 50,349.93 on the settlement date.

In this scenario the payment of USD 50,349.93 in favour of the company would have compensated the company for an equivalent loss on the underlying TWD 350 m repatriation.

If the USD/TWD had fallen, the company would have been required to pay a compensation sum to the seller.

#### 1.6.2 Risks for NDF

### **Market Risk**

The market risk is the risk of a loss due to market price changes, here the currency rate. The market risk of a NDF is the same as with a traditional forward contract.

#### **Credit Risk (Counterparty Risk)**

The credit risk is the risk of a loss due to a default of the counterparty. With NDFs there is the risk that the counterpart does not pay the compensation payment. This kind of credit risk is called **replacement risk**. It is the same for NDFs as for traditional forward contracts.

Another kind of credit risk is the settlement risk which only occurs with exchange transactions. If one party has already fulfilled its part of the contract, the other party fails to fulfill the remaining part. As there is only a cash settlement for NDFs and no exchange of principal there is no **settlement risk** for NDFs.



### **Conversion Risk**

Either way, the NDF effectively neutralises the underlying FX exposure. Although it does not cover the risk that the company may be physically unable, in the event, to convert the underlying TWD into hard currency.

Even when a conversion is possible it is not sure if it can be conducted at the fixing rate. Especially in times of crisis the fixing rate can differ from the market rate considerably.



# 2. FX Swaps

An FX swap is a contract to buy an amount of the base currency at an agreed rate, and simultaneously resell the same amount of the base currency for a later value date to the same counterpart, also at an agreed rate (or vice versa).

Technically an FX swap is a combination of a spot deal and a reverse outright deal.



EUR/USD Spot 1.1548 – 52

12-mth swap: 112 – 110

A dealer wants to sell an FX swap for EUR 10 m.

# 2.1 Terminology

In FX swaps the term sell or buy refers to the **forward leg**. Since the dealer acts here as a market user he sells at the bid rate i.e. 112 (bid > ask  $\rightarrow$  discount!).

In order to avoid misunderstandings it is advisable to say "buy-and-sell" instead of sell (and sell-and-buy instead of buy).

Buy-and-sell here refers both to the EUR, which are bought spot and sold forward (it does not mean you buy EUR and sell USD!)

#### Spot basis

Both spot and forward transaction are agreed on the same spot basis, usually the current **mid rate** i.e. 1.1550.

If the mid rate is an uneven figure it is usually rounded to the nearest round lot, which lies within the current quote. E.g.: spot  $1.1547 - 52 \Rightarrow$  spot basis: 1.1550

#### Volume

In a regular FX swap the base currency's volume both for the spot and the forward transaction is the same, in the example EUR 10 m.

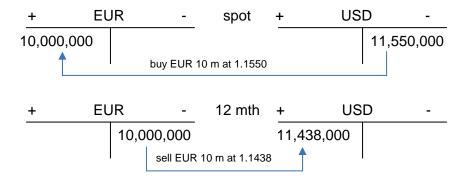
(However in the last years it became common to do FX swaps with uneven volumes as well. The reason is to avoid the residual FX risk)



#### Cash flows

The dealer buys-and-sells EUR 10 m spot against 12 month at – 112, thus he

- buys spot EUR 10 m at 1.1550 and
- sells forward 12 month EUR 10 m at 1.1438



This figure can be interpreted in two ways:

- A pair of offsetting FX transactions for different value dates, concluded at the same time and on the same deal ticket with the same counterpart.
- Looked at vertically over time you are actually borrowing EUR for 12-month time and lending USD over the same period.

The FX swap is a pair of money market deals effected by means of FX transactions!

#### Distinction between FX outrights and FX swaps

An FX outright contract is exposed to an FX risk for the full nominal amount.

In an FX swap contract the FX risk of the spot transaction is offset by the forward transaction (except a small residual risk). Thus FX swaps are exposed to an interest rate risk rather to an FX-risk.

The difference between an outright and a FX swap is shown in the table below:

Outright	FX swap
buy outright	sell-and-buy (S/B)
	(= sell spot and buy forward)
or	or
sell outright	Buy-and-sell (B/S)
	(= buy spot and sell forward)



# 2.2 Quotation of FX swaps

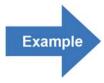
FX swaps are quoted in swap points (or forward points).

An example of a Reuters page is shown below:

# EUR/USD swaps:

RIC	Bid	Ask
EURON=	-0.385	-0.335
EURTN=	-1.25	-1.21
EURSN=	-0.41	-0.38
EURSW=	-3.29	-3.24
EUR2W=	-5.8	-5.7
EUR1M=	-12.67	-12.42
EUR2M=	-23.66	-22.66
EUR3M=	-33.05	-32.55
EUR4M=	-43.01	-42.61
EUR5M=	-53.04	-52.54
EUR6M=	-62.05	-61.65
EUR7M=	-71.2	-70.2
EUR8M=	-80.6	-79.6
EUR9M=	-89.20	-88.00
EUR10M=	-97.62	-96.37
EUR11M=	-105.63	-104.38
EUR1Y=	-112.60	-111.40
EUR2Y=	-177.5	-172.5
EUR3Y=	-215	-195
EUR4Y=	-219	-189
EUR5Y=	-214	-174
EUR10Y=	-191	-91

At the **bid rate** the **market user sells** the swap i.e. he buys spot and sells forward. At the **ask rate** the **market user buys** the swap i.e. he sells spot and buys forward.



EUR/USD spot: 1.1548 - 52

You ask a bank for the 6-mth EUR/USD swap and get the following quote:

6 month swap: 62.05 - 61.65

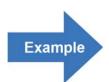
You buy and sell EUR 10 m. What are the transactions?

- you buy spot EUR 10 m against USD at 1.1550 (mid rate) and
- you sell 6 month forward EUR 10 m at 1.148795 against USD
   (= 1.1550 0.006205)



# 2.3 Mark to Market of FX swaps

The mark to market value of an FX swap is the sum of the present values of all cash flows which would occur if the swap were closed at the current market rate.



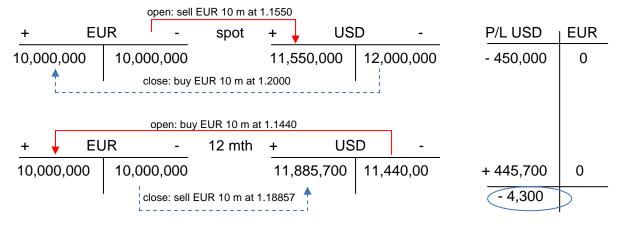
EUR/USD spot: 1.1550

1 year swap: 112 – 110 (365 days)

1 year USD: 6.00 % 1 year EUR: 7.00 %

You speculate that EUR rates will fall today. Since this would lead to a fall in the swap points you sell/buy EUR 10 m spot against 1 year at – 110 points. Some hours later interest rates are still unchanged but EUR/USD surged to 1.2000 from 1.1550. This leads to an increase in the swap rate to – 114.30. Since you bought at –110 you expect a loss of 4.3 pips i.e. USD 4,300 (10,000,000 x 0.00043).

The example illustrates the mark to market at the current swap of -114.30:



"pretended loss"

When closing the swap at the current rates you lose USD 450,000 spot and gain USD 445,700 forward. If the position is marked to market we are interested in the present value. Thus we have to discount the profit in 1 years time by the current USD rate of 6%.

present value = 
$$\frac{\text{future value}}{1 + \text{rate} \times \frac{\text{days}}{\text{basis}}}$$
 present value = 
$$\frac{445,700}{1 + 0.06 \times \frac{365}{360}} = 420,141.40$$

The profits present value is just USD 420,141.40. Thus the total loss amounts to **USD 29,858.60** (420,141.40 – 450,000) instead of the expected loss of USD 4,300.



# 2.4 Residual FX Risk of FX Swaps (FX Tail)

The example above illustrates that the mark to market of FX swaps may change solely due to a change in the spot rate even if interest rates remain unchanged. This may be surprising as we figured out earlier that FX swaps are actually comparable to two money market operations and that the FX risk of the spot leg is offset by the reverse forward leg. Strictly speaking this is not quite true.

Changes in the spot rate have two effects on an FX swap position:

- A change in the spot rate leads to profits and reverse losses at different points in time. Since future cash flows have to be funded this may lead to additional profits or losses which is demonstrated in the example above.
- Since the spot rate is a part of the swap formula a change in the spot rate will also cause a change in the forward points, even if interest rates do not change. You can check this by applying the same interest rates to different spot rates in the swap formula.

#### General Rule for the residual FX risk

The FX position is the sum of the present value of all future cash flows in the foreign currency

The following example illustrates how the residual FX risk of FX swap can be identified.



Follow-on of the mark-to-market example:

EUR/USD spot: 1.1550

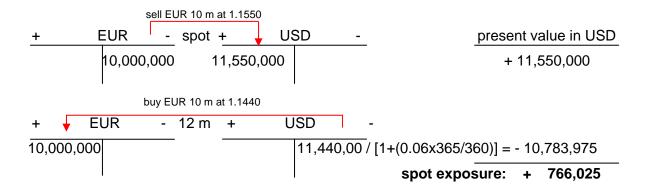
1 year swap: 112 – 110 (365 days)

1 year USD: 6.00 % 1 year EUR: 7.00 %

You sold and bought EUR 10 m at – 110. What is the residual FX risk (FX tail)?



In order to identify the spot risk we have to discount all cash flows of the foreign currency (USD). Afterwards we sum up the present values.



The given FX swap leads to an FX risk of USD + 766,025 i.e. EUR – 663,225. In order to hedge against to risk you should buy EUR 663,225 spot. The profit / loss on this hedge position offsets the profit / loss on the FX swap due to a spot change.

#### Check:

You bought EUR/USD 663,225 at 1.1550 (hedge of the residual spot risk) EUR/USD goes up to 1.2000.

Profit on the hedge:  $663,225 \times (1.2000 - 1.1550) =$ **USD 29,845** 

This profit offsets the loss suffered on the FX swap (see example above)

#### Calculation of the FX tail:

The FX tail can be calculated with the following formula:

FX tail = volume spot + 
$$\frac{\text{volume forward}}{1 + r \times \frac{D}{B}}$$

For the above example the open USD FX position is calculated as follows:

FX tail = (+)11,550,000 + 
$$\frac{(-)11,440,000}{1+0.06 \times \frac{365}{360}}$$
 = (+)766,025

The FX position for this swap is + USD 766,025 and can be hedged by selling spot USD 766,025.



# 2.5 Effects of the Spot Basis on FX Swaps

FX swaps with the same principal amounts for the spot and forward transactions are also called Matched principal swaps and always have a FX Risk which can be hedged with a spot transaction. If the rate of the spot hedge equals the agreed spot rate the hedge will produce neither a profit nor a loss. Does it differ from the agreed rate, there will be either a profit or loss. Thus the choice of the spot basis of Matched principal swaps does have a direct effect on the P/L of the position.



EUR/USD spot: 1.1545 - 55

1 year swap: 112 – 110 (365 days)

1 year USD rate: 6.00%1 year EUR rate: 7.00%

You sell and buy 100 m EUR/USD (matched principal) at –110. Hoes does your P/L change, if as spot basis you fix the a) bid, b) mid or c) offer rate?

In the first step we calculate the FX tail.

(Note: for the exact calculation one should rather calculate with the foreign currency volumes. For simplification reasons here we are calculating with EUR volumes.)

FX tail = 
$$(-)100,000,000 + \frac{(+)100,000,000}{1+0.07 \times \frac{365}{360}} = (-)6,626,897$$

For hedging purposes you should buy spot EUR 6,626,897 against USD at the actual offer rate 1.1555.

#### Result:

Spot basis:	hedge rate:	P/L in pips	P/L in USE	)
Bid 1.1545	1.1555	-10	USD 6,627	7
Mid 1.1550	1.1555	- 5	USD 3,313	3
Offer 1.1555	1.1555	0	USD (	)



# 2.6 Matched and Mismatched Principal FX Swaps

Matched principal swaps are FX swaps where the base currency is traded for the same volumes in the spot and in the forward transaction. With FX swaps you trade interest rate risks. With matched principal swaps the FX risk occurs as an unwanted side effect which is usually hedged by a FX spot trade.

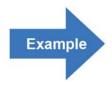
The effect of the spot basis on the P/L can be summarized as follows:

	Buy & Sell	Sell & Buy	
High spot basis:	loss	profit	
Low spot basis:	profit	loss	

Reason: the present value of the forward transaction is always lower than the one of the spot transaction. Therefore with an e.g. buy-and sell swap you have to sell additionally in the spot market. Is the rate of the spot basis higher than the actual FX rate, there will be a loss.

The FX risk for both parties are exactly contrary. As both want to hedge their FX risk, one has to buy spot and the other has to sell spot. Thus both have the problem of potential risks if the hedge transaction can only be conducted with an unfavourable rate compared to the spot basis.

Therefore it became common practice to trade FX swaps with different principal amounts in the spot and forward transaction (so-called **mismatched principal FX swaps**). Here the forward volume equals the compounded spot volume. Thus the present value of the forward transaction equals the volume of the spot transaction, the FX risk is zero.



EUR/USD spot: 1.1545 - 55

1 year swap: 112 – 110 (365 days)

1 year USD rate: 6.00%1 year EUR rate: 7.00%

You are trading a mismatched principal swap for EUR 10 m. Which amount is traded in the forward transaction?

The volume of the forward transaction equals the volume of the spot transaction:

volume forward = 
$$100,000,000 \times \left(1 + 0.07 \times \frac{365}{360}\right) = 107,097,222.22$$



# 2.7 Forward / Forward Swap

A forward/forward swap is an FX swap that starts in the future.

Contrary to a plain FX–swap where a spot and reverse forward transaction are combined, both FX–transactions in the forward/forward swap are forward transactions.

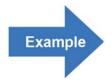
You can also describe a forward/forward swap as two different FX swaps.

A 3/6 forward/forward swap means

- buy 3 months swap (= sell spot, buy forward) and
- sell 6 months swap (= buy spot, sell forward)

As both spot-transactions offset each other (if done at same spot rate and same volumes), the result of both transactions will be as follows:

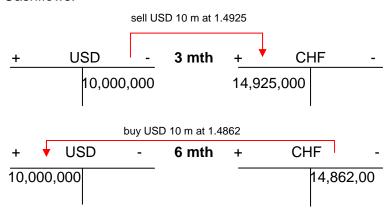
- buy base currency 3 months forward and
- > sell base currency 6 months forward



USD/CHF spot: 1.5000 3 month forward: 1.4925 6 month forward: 1.4862

You sell and buy USD 10 m 3 month against 6 month.

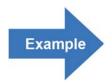
#### Cashflows:





### Construction of forward/forward swaps

Like spot start swaps fwd/fwd swaps are quoted in forward points rather than in FX forward rates. The fwd/fwd swap points are the margin between the near forward transaction and the far forward transaction. The price can be derived by combining two reverse spot start swaps.



USD/CHF spot: 1.5000

3 month swap: 75 - 73

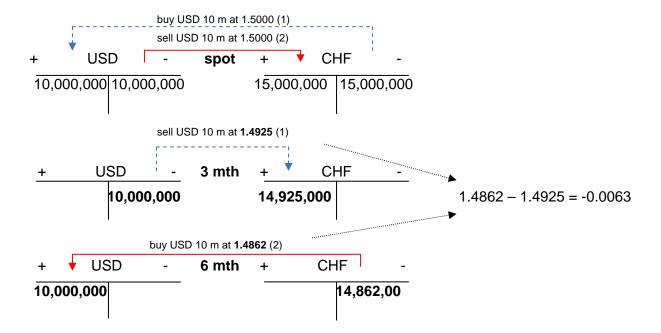
6 month swap: 140 -138

Construct the following fwd/fwd swap:

sell and buy (S/B) USD 10 m 3 against 6 month

The fwd/fwd can be produced by effecting two reverse spot start FX swaps.

- ▶ (1) buy-and-sell (B/S) 3 month at 75
- (2) sell-and-buy (S/B) 6 month at −138



The spot transaction of the 3 month swap is offset by the spot transaction of the 6 month swap. The remaining forward transactions represent the 3/6 fwd/fwd swap:

You sold 3 month at 1.4925 and bought 6 month at 1.4862.

The forward points are the margin between these two rates:

3/6 fwd/fwd points = -63 (=1.4862 - 1.4925)



### Calculation rule for forward / forward swaps

Since you can construct fwd/fwd swaps from spot start swaps the price of fwd/fwd swaps can be derived from the spot start swaps as well.

The stated rules can be applied in order to compute fwd/fwd prices:

bid rate: bid long term - ask short term

ask rate: ask long term - bid short term



USD/CHF spot: 1.5000 3 month swap: 75 - 73

6 month swap: 140 -138

What is the price of the 3/6 fwd/fwd swap?

bid rate: bid long term: -140 ask rate: ask long term: -138

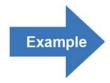
- ask short term: - -73 - bid short term: - -75

3/6 fwd/fwd bid: - **67** 3/6 fwd/fwd ask: - **63** 

### The 3/6 fwd/fwd swap points are 67 - 63.

### "Spot Basis" of forward/forward swaps

In a forward / forward swap, the agreed rate for the short leg is not the current spot rate but the appropriate forward mid rate for the start date of the fwd/fwd swap.



USD/CHF spot: 1.5000

3 month swap: -75

3/6 fwd/fwd: 67 - 63

You sell and buy USD/CHF 3 against 6 month fwd/fwd.

Which rates do you agree?

As a market user you S/B on the ask rate (- 63)

▶ You sell 3 month at 1.4925 (1.5000 – 0.0075) and

You buy 6 month at 1.4862 (1.4925 – 0.0063)



# 2.8 Short dated FX Swaps – FX Deals for Value prior to Spot

Usually FX swaps start value date spot (e.g. spot against 1 week, 1 month etc.). However, there are also swaps which start prior to value spot. There are two regular terms:

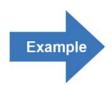
- O/N: starts today and ends tomorrow
- Tom/Next: starts tomorrow and ends the day after tomorrow (i.e. spot)

The figure below shows an example of a Reuters page for EUR/USD swaps:

RIC	Bid	Ask	Srce	Time
EURON= EURTN= EURSN= EURSW= EUR2W= EUR1M= EUR2M= EUR2M= EUR3M=	-0.385 -1.25 -0.41 -3.29 -5.8 -12.67 -23.66 -33.05	-0.335 -1.21 -0.38 -3.24 -5.7 -12.42 -22.66 -32.55	RBSL BOAF RBSL DRE4 INGX PBGR INGX	12:46 13:03 12:46 13:03 12:59 13:03 13:03
FIIRAM=	-43 N1	-42 61	HOHM	13.02

Using this short-dated swaps you can produce "forward" FX deals for value date prior to spot e.g. value tomorrow or even value today.

#### Producing an FX transaction value tomorrow



Market data:

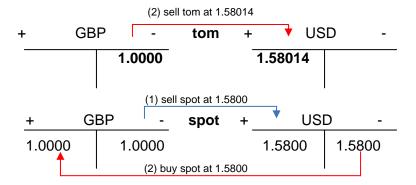
GBP/USD 1.5800 - 1.5805

Tom/Next 1.5 - 1.4

You want to sell GBP/USD value tomorrow. Which rate can you produce?

In order to produce an FX deal value tomorrow you do the following deals:

- Sell GBP/USD spot at 1.5800 and (1)
- Sell-and-buy GBP/USD tom/next at −1.4 (2)



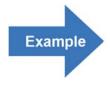


The long leg of the tom/next swap offsets the spot transaction. The rate of the resulting sale of GBP/USD value tomorrow is 1.58014 (=1.5800 – (-)0.00014).

### Rule for computing FX rates for value tomorrow

In order to compute the price of FX-deals for value tomorrow apply the following rule:

- reverse side and sign of tom/next swap points and
- add them to the spot rate (value spot)



Follow-on:

Market data

GBP/USD 1.5800 - 1.5805

Tom/Next 1.5 - 1.4 (discount)

What is the rate of GBP/USD value tomorrow?

Spot: 1.5800 - 1.5805

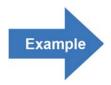
Reversed swap: +1.4 +1.5

GBP/USD value tom 1.58014 - 1.58065

Note: As we are calculating the result for value tom on the basis of the rate for value spot, for an exact calculation, you would have to discount the difference for value spot for one day with the T/N interest rate of the foreign currency. However, in practice this is disregarded.



### Producing an FX transaction value today



Market data:

GBP/USD 1.5800 - 1.5805

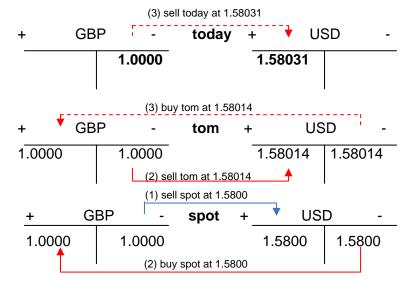
O/N 1.8 – 1.7

Tom/Next 1.5 - 1.4

You want to sell GBP/USD value today. Which rate can you produce?

In order to produce an FX deal value today you do the following deals:

- sell GBP/USD spot at 1.5800 and (1)
- sell-and-buy GBP/USD tom/next at -1.4 (2)
- sell-and-buy GBP/USD O/N at -1.7 (3)



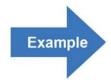
The long leg of the tom/next swap offsets the spot transaction. The long leg of the O/N swap offsets the short leg of the tom/next swap. The rate of the resulting sale of GBP/USD value today is 1.58031 (=1.5800 - (-)0.00014 - (-)0.00017).

Rule for computing FX rates for value today

In order to compute the price of FX-deals for value today apply the following rule:

- reverse side and sign of tom/next and O/N swap points and
- add them to the spot rate (value spot)





Follow-on:

Market data

GBP/USD 1.5800 - 1.5805

O/N 1.8 – 1.7

Tom/Next 1.5 - 1.4

What is the rate of GBP/USD value today?

Spot: 1.5800 - 1.5805

Reversed swap O/N: +1.7 +1.8

Reversed swap T/N: +1.4 +1.5

GBP/USD value today 1.58031 - 1.58083

Note: As we are calculating the result for value today on the basis of the rate for value spot and value tom, for an exact calculation, you would first have to discount the difference for value spot for one day with the T/N interest rate of the foreign currency and then you would have discount this T/N rate with the O/N interest rate of the foreign currency. However, in practice this is disregarded.

# 2.9 SAFE, FXA and ERA

A SAFE (Synthetic Agreement for Forward Exchange), since 1987 governed by the BBA (British Bankers' Association) is a synthetic agreement for an FX swap. The purpose of SAFEs is the fixing of future swap rates resp. outright prices, without settlement risk (as with all traditional FX swap).

#### There are two kinds of SAFEs:

- ERA (Exchange Rate Agreement): Launched by Barclays Bank in 1987, agreement between two parties to level off the difference between an agreed, future swap rate and the actual swap rate prevailing two days before the start of the swap term (cash settlement as for FRAs)
- FXA (Forward Exchange Agreement): Launched by Midland Bank some weeks later in1987. In FXAs, the difference between an agreed outright price and the spot price at the beginning of the swap period are leveled off additionally.

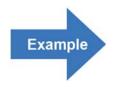


# 3. Applications of FX Outrights and FX Swaps

# 3.1 Using FX Swaps for Hedging an Outright deal

FX swaps can be used to transfer the value date of FX transaction to a later or an earlier date. By that means a spot deal's value date may be postponed to a future date or an outright trades value date may be brought forward towards the spot date.

FX outrights concluded with customers are usually hedged by a combination of a spot deal and an FX swap rather than by means of a single interbank FX outright. The advantage of this practice (compared to a single outright deal) is the higher liquidity in the markets for FX swaps and spot compared to the outright markets.

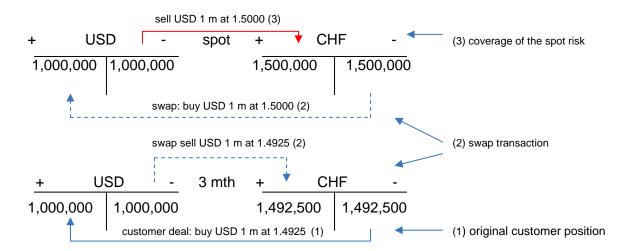


USD/CHF spot: 1.5000

3 month swap: - 75

You bought from a customer USD/CHF 1 m outright 3 month at 1.4925.

How can you cover the risk?

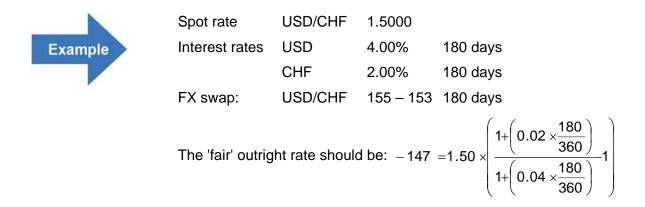


- 1) original position: you bought USD 1 m from the customer
- 2) transfer the value date to the spot date by means of an FX swap you buy-and-sell USD/CHF spot against 3 month
- 3) cover the FX risk by selling USD 1 m spot

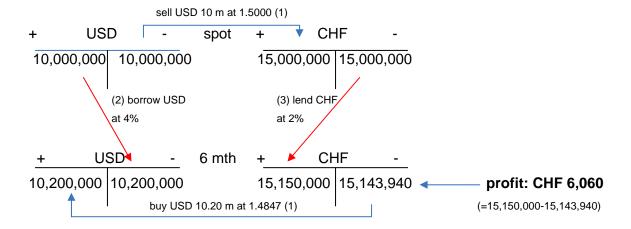


# 3.2 Arbitrage between Deposits and FX Swaps

The FX swap rate of two currencies has to correspond to the actual spot rate and the interest differential of the two currencies. If this is not the case, arbitrage between spot, outright and deposit markets is possible.



As the quoted discount is higher than the theoretical value we decide to buy the swap (i.e. sell-and-buy) at -153 and to close the position with deposit transactions (i.e. at -147).



Result: The FX swap (1) is hedged by means of interbank deposits (2) + (3). The **remaining profit is CHF 6,060**.

Note: In practice, bid / offer spreads, equity costs and limits have to be taken into account.



# 3.3 Computing the Interest Rate from Spot and Forward Rate

FX swaps are often employed if an existing asset (liability) in one currency shall be transformed into an asset (liability) in another currency for a specified period. As FX swaps are off balance products a bank's cash liquidity position can be managed very efficiently.



A customer placed CHF 15,000,000 at the given terms with you.

Interest rate CHF 1.75%

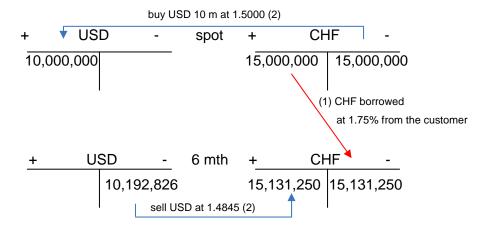
Term: 180 days

Spot rate USD/CHF 1.5000

FX swap: USD/CHF 155 – 153 (180 days)

You do need USD liquidity rather than CHF.

How can you transform CHF into USD?



### Transactions:

- (1) customer placement CHF 15 m at 1.75%
- (2) FX swap: buy-and-sell at -155 (1.5000 and 1.4845)

### Result:

You produced a synthetic USD borrowing operation by using the FX swap. The CHF liquidity is transformed into USD liquidity, i.e. you receive USD 10,000,000 value spot and have to pay back 10,192,826 in 180 days time.

A trader might be interested in, which effective rate arises for the synthetic USD borrowing from these transactions. You can use the following formulas to compute the rate.



### Interest rate calculation out of FX swaps

### rate of the base currency

### rate of the quote currency

$$i_{B} = \left\{ \frac{\left(1 + \left(i_{_{Q}} \times \frac{D}{B_{_{Q}}}\right)\right) \times S}{O} - 1 \right\} \times \frac{B_{B}}{D}$$

$$i_{Q} = \left\{ \frac{\left(1 + \left(i_{_{B}} \times \frac{D}{B_{_{B}}}\right)\right) \times O}{S} - 1 \right\} \times \frac{B_{Q}}{D}$$

i<sub>B</sub> interest rate of base currency

i<sub>Q</sub> interest rate of quote currency

O outright

S spot rate

D days

B<sub>B</sub> day basis of base currency for calculation

B<sub>Q</sub> day basis of quote/variable currency for calculation



Follow-on:

A customer placed CHF 15,000,000 at the given terms with you.

Interest rate CHF 1.75%

Term: 180 days

Spot rate USD/CHF 1.5000

FX swap: USD/CHF 155 – 153 (180 days)

You do need USD liquidity rather than CHF.

Which synthetic USD rate can you produce?

In order to swap the CHF deposit into a synthetic USD deposit you have to buy-and-sell USD/CHF at –155. Thus you buy USD/CHF spot at 1.50 and sell forward at 1.4845. Computing the rate of the base currency (USD):

$$i_Q = \left\{ \frac{\left(1 + \left(0.0175 \times \frac{180}{360}\right)\right) \times 1.5000}{1.4845} - 1 \right\} \times \frac{360}{180} = 3.8565\%$$

By swapping CHF into USD you get a synthetic USD deposit at 3.8565%.



# 3.4 Prolongation of FX Forward Deals

The economical background for the prolongation of FX forward deals is based on the use of forward deals as hedging instruments. If the settlement of the underlying contract (e.g. delivery problems, delayed finalisation), the forward deal has to be prolonged in order to fix the hedge rate until the final settlement of the underlying contract.

Forward deals can be rolled-over by FX swaps at maturity. Due to the difference between the original forward rate and the actual spot rate of the FX swap cash-flows are created on the date of the original maturity. To avoid these cash-flows customers often ask for a prolongation at a historic rate instead of trading an FX swap at actual rates.

### Prolongation at Actual Rates ("Best practice")

Therefore it is recommended to settle the original deal and then trade an FX swap for the remaining period which is only possible at actual rates. The difference between actual spot rate and original forward rate leads to financing costs resp. investment revenues.

Should the forward deal have a negative market value (from the customer's point of view), the bank has a credit risk for this amount. This risk has to be taken into account for the credit line.

#### **Prolongation at Historic Rates**

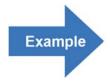
The prolongation of forward deals at historic rates has got some additional risks and is therefore regarded critically by several associations (e.g. ACI).

Following items have to be considered:

- There can be a concealment of profits and losses.
- There can be additional credit risks.

Prolongations at historic rates should therefore only be conducted in exceptional cases; the bank has to ensure that a complete documentation (reason for the prolongation, approval of management, etc.) is made.





6 months ago your customer has sold EUR 5 m against USD at 1.1440 as 6-months forward to hedge his USD outgoing payments. The deal is due today. Because of a delay of delivery he wants to prolong the deal at historic rates for another 6 months (180 days).

Actual spot EUR/USD: 1.2000 6-mo EUR/USD swap: 80 / 78

6-mo EUR rate: 2.50% (180 days) 6-mo USD rate: 1.20% (180 days)

What will be the rate for a prolongation at historic rates?

As the customer does not fulfill the contract at maturity you have to roll-over your original hedge transaction with an FX swap:

### Spot transaction swap: buy EUR at 1.2000 (2) Spot 5,000,000 5.000.000 5,720,000 6.000.000 280,000 Original hedge: sold EUR at 1.1440 (1) refinancing EUR 280,000 (3) 1.20% USD **EUR** 6 mo 5,000,000 5,960,000 281,680

Forward transaction swap: sell EUR at 1.1920 (2)

- (1) Original hedge: sold EUR/USD 5 m at 1.1440
- (2) FX swap: B/S EUR 5 m at 1.2000 und 1.1920
- (3) refinancing of the difference: 280,000 USD at 1.20%

For the new maturity you have the following effective rate:  $5,678,320 \ (=5,960,000-281,680) / 5,000,000=$ **1.135664** The discount for the new period will be 83.36 points.



#### **Credit Risk**

Compared to the original maturity the forward deal had a negative market value for the customer in the amount of USD 280,000 [ $5,000,000 \times (1.1440 - 1.2000)$ ].

The bank has to take this amount into account additionally to the credit line for the traditional forward deal. As the bank has to finance this amount, the customer's particular credit margin has to be added to the interbank rate for the calculation of the new forward rate.

### **Calculation for the Prolongation at Historic Rates**

Bid side forward deal (customer has sold)

$$O_{\text{new}} = O_{\text{old}} + swap_{\text{bid}} + \left[ \left( O_{\text{old}} - spot \right) \! \times r_{\text{Q}} \! \times \! \frac{D}{B_{\text{Q}}} \right]$$

offer side forward deal (customer has bought)

$$\boxed{O_{\text{new}} = O_{\text{old}} + swap_{\text{offer}} + \left[ \left( O_{\text{old}} - spot \right) \times r_{\text{Q}} \times \frac{D}{B_{\text{Q}}} \right]}$$

D = number of days

O = outright

Spot = actual spot rate

 $r_Q$  = interest rate p.a. in decimals, quote currency  $B_Q$  = calculation basis, quote currency (360 or 365)



Matured forward deal: customer sells EUR/USD at 1.1440

Actual EUR/USD spot: 1.2000 6-mo EUR/USD swap: 80 / 78

6-mo USD rate: 1.20% (180 days)

What is the calculational rate for a prolongation of 180 days at historic rates?

$$O_{\text{new}} = 1.1440 + (-)0.0080 + \left[ \left( 1.1440 - 1.2000 \right) \times 0.012 \times \frac{180}{360} \right] = 1.135664$$

Due to the refinancing costs of the difference in rates the discount increases from -80 to -83.36 points.