Foreign Exchange and Money Market Transactions
Currency markets are a source of fascination to market players and observers alike. The momentum and the volatility of the markets, the wide range of factors affecting exchange rates and their impact on the economy as a whole make this a particularly varied and interesting topic. There is good reason why currency market analysis is regarded as one of the key economic disciplines.

After all, the currency markets influence many areas of our daily life. Their impact extends beyond imports and exports to factors that have an indirect effect on us, e.g. the relationship between interest rates and exchange rates. These in turn influence economic decisions that apparently have nothing to do with foreign trade.

Changes in exchange rates are one of the major risks to which companies and investors are exposed. It is thus impossible to imagine company managers or asset managers ignoring the risks inherent in a shift in exchange rates.

This publication looks at various aspects of the foreign currency markets. It starts with an overview of the main factors determining exchange rates and a brief history of the currency markets. However, the main focus is on how the currency markets work, with particular reference to new financial instruments. The aim is to provide a balanced insight into the theory and workings of the currency markets.
What do exchange rate and volatility mean?
Anyone who has travelled abroad is aware that there is a certain element of risk involved in changing money. The price paid for a foreign currency – known as the exchange rate – can fluctuate. The following sections provide some basic definitions and outline the factors affecting long-term exchange rates. Terms such as exchange rates, volatility, balance of payments and gross domestic product are introduced to illustrate the concept of purchasing power parity and the importance of capital flows in determining exchange rates. Currencies are referred to using the official ISO codes. For example, CHF stands for the Swiss franc and USD for the US dollar.

Exchange rates show the purchasing power of a currency in a different currency. They make the monetary value of goods, services, capital spending and investments comparable the world over. An exchange rate of e.g. USD/CHF 1.39 expresses the price of the US dollar in Swiss francs. The notation USD/CHF is the system used by traders, although mathematically it would be more correct to express the exchange rate the other way round, as it shows how many CHF have to be paid to obtain USD 1. At this exchange rate, CHF 1,000,000 would buy goods, services or securities worth USD 719,424. If the exchange rate were to drop from USD/CHF 1.39 to USD/CHF 1.37, the Swiss franc would appreciate. At the new exchange rate, we obtain more USD for the same amount of CHF, i.e. 1,000,000 would now buy USD 729,927. If one currency appreciates, the other automatically depreciates.

Depending on agreements between different countries, exchange rates may be fixed or floating, i.e. determined solely by free market forces. If exchange rates are fixed, the countries involved guarantee that their central banks will exchange one currency for the other at a fixed rate. In the case of floating rates, the exchange rate is determined by supply and demand in the currency market. As a result, floating rates can
fluctuate enormously. In a system based on a mixture of fixed and floating rates, such as the European Monetary System, parities are set and exchange rates are allowed to deviate from these by a set percentage. The central banks are only obliged to intervene in the market when the currencies reach the upper and lower limits of the bands set.

One yardstick of the risk that exchange rates will alter is volatility. Volatility is an indicator of the extent to which exchange rates fluctuate. It is extremely important in assessing the risk inherent in foreign currency positions and forms the basis for valuing options. Volatility is measured as the standard deviation of the percentage change in exchange rates projected over a year. Volatility of 12% indicates that there is a 66% probability that exchange rates will fluctuate within a band of ±12% over the coming year. Calculating volatility on the basis of historical data shows that, contrary to prevailing opinion, fluctuations in exchange rates have declined in recent years.
USD/CHF exchange rates and volatility since 1974

The cyclical volatility of the USD/CHF exchange rate has been around 10% in the past few years. Exchange rate fluctuation has actually declined since the start of the 1990s.
What does purchasing power parity mean?
2. Factors determining long-term currency market trends

Overview
In the long run, we would expect that equivalent goods in different countries should cost the same in a free market after conversion into a particular currency. The profit opportunities from cross-border trade should only be temporary. If prices and exchange rates are flexible, they should change in such a way that these opportunities for arbitrage gradually disappear. The price alignment process starts when goods which are cheaper abroad are imported. This will cause demand for foreign currencies. The increase in demand for a foreign currency will result in its costing more. This in turn will cause a gradual increase in the price of the foreign goods, and this process will continue until the goods cost the same in both countries and the exchange rate evens out the purchasing power of both currencies. Different prices for market goods are thus a driving force behind exchange rate movements. In a world where goods and capital move freely, it would therefore be natural to expect the prices of similar products to be in proportion to the exchange rate. This equilibrium will emerge across a long period, during which all prices have been aligned. In this trading environment with prices that are balanced out, absolute purchasing power parity applies. The “law of one price” applies, i.e. all goods and services cost the same after conversion.

Example:
Absolute purchasing power parity and the Big Mac
The British magazine “The Economist” uses a special international product to measure purchasing power parity: the Big Mac. It is prepared using the same recipe and ingredients by McDonald’s in more than 80 countries. Global Big Mac purchasing power parity would be reached if Big Macs were to cost the same in all countries after conversion using actual exchange rates. Comparing the purchasing power of
the USD with other currencies gives the following picture:

**Big Mac purchasing power parity (PPP)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Price in local currency</th>
<th>Price in USD in April 1996</th>
<th>Actual exchange rate on 25 April 2000</th>
<th>Implied PPP of the dollar</th>
<th>Local currency under (–) or over (+) valuation versus the dollar</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>USD 2.51</td>
<td>USD 2.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>CLP 1260</td>
<td>USD 2.45</td>
<td>514</td>
<td>502</td>
<td>–2%</td>
</tr>
<tr>
<td>China</td>
<td>CNY 9.90</td>
<td>USD 1.20</td>
<td>8.28</td>
<td>3.94</td>
<td>–52%</td>
</tr>
<tr>
<td>Germany</td>
<td>DEM 4.99</td>
<td>USD 2.37</td>
<td>2.11</td>
<td>1.99</td>
<td>–6%</td>
</tr>
<tr>
<td>France</td>
<td>FRF 18.50</td>
<td>USD 2.62</td>
<td>7.07</td>
<td>7.37</td>
<td>+4%</td>
</tr>
<tr>
<td>Russia</td>
<td>RUR 39.50</td>
<td>USD 1.39</td>
<td>28.50</td>
<td>15.7</td>
<td>–45%</td>
</tr>
<tr>
<td>Sweden</td>
<td>SEK 24.00</td>
<td>USD 2.71</td>
<td>8.84</td>
<td>9.56</td>
<td>+8%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>CHF 5.90</td>
<td>USD 3.48</td>
<td>1.70</td>
<td>2.35</td>
<td>+39%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>TWD 70.0</td>
<td>USD 2.29</td>
<td>30.6</td>
<td>27.9</td>
<td>–9%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>CZK 54.37</td>
<td>USD 1.39</td>
<td>39.1</td>
<td>21.7</td>
<td>–45%</td>
</tr>
<tr>
<td>Hungary</td>
<td>HUF 339</td>
<td>USD 1.21</td>
<td>279</td>
<td>135</td>
<td>–52%</td>
</tr>
</tbody>
</table>

The price of a Big Mac in local currency in April 2000 is divided by its price in the USA (= USD 2.51). This figure shows the purchasing power of the local currency against the dollar. For example, on 25 April 2000 a Big Mac cost SEK 24.00 in Sweden. If the exchange rate had been USD/SEK 9.56, the Big Mac would have cost the same in both countries. However, the actual exchange rate on the day in question was USD/SEK 8.84. In other words, the Swedish Big Mac cost USD 2.71, USD 0.20 more than if it had been bought in the USA, implying that the SEK was 8% overvalued against the dollar.

A comparison of prices shows clearly that exchange rates and purchasing power parity can differ widely. There are a number of reasons for this “infringe-
ment” of purchasing power parity. Transport costs can affect the price of the final products. This means that the same products should be priced differently in different places: they should be cheapest close to where they are produced. But trade barriers too—such as customs duties or import restrictions—can lead to a gap between domestic and foreign prices. In addition, the cross-border mobility of the working population is low. This can result in permanent wage differentials. Finally, a variety of goods and services which help make up the final price are not marketable. For example, you can buy real estate abroad, but you cannot use it as a retail site in your own country.

However, this “interference” with marketability does not necessarily prevent the establishing of a long-term parity benchmark for currencies. Instead of individual prices, comparisons can be made between price levels calculated from baskets of goods. Changes in price levels can express shifts in the purchasing power of one currency relative to another. The most common benchmark for price levels in a country is the retail price index. This measures the price of a basket of goods typically consumed by private households.

The growth of the prices combined in the basket can be used to identify the rate of price increases, in other words inflation. The key factors determining exchange rate movements according to purchasing power parity are the prices of the marketable goods measured in the producer price index. In the case of relative purchasing power parity, movements in the exchange rate should reflect changes in the price level of the marketable goods in the countries concerned. This does not affect actual purchasing power itself. The important factor is therefore the development of the relative price level in the relevant countries. Any change in the relative price level is simply the difference between the inflation rates in the two
countries. The principle of relative purchasing power parity should therefore mean that a change in exchange rates corresponds to the difference in manufacturing price inflation between the countries being analyzed. In other words, the real exchange rate should be constant.

**Example:**

**Producer prices in France and Germany**

Comparing producer price inflation in Germany and France with changes in the DEM/FRF exchange rate shows that long-term exchange rate trends can be determined by differences in the inflation rate for traded goods. Between 1979 and 1987 producer price inflation was far higher in France than in Germany. As a result, the FRF depreciated against the DEM. The exchange rate has only been relatively stable since 1988, i.e. since the time both countries have had similar inflation rates.

**Producer prices in France and Germany and DEM/FRF**
The purchasing power parity alignment processes have a direct impact on the creation of income in an economy. Exchange rates are the major factor affecting the prices of imports and exports.

Exports are the sale of domestic goods and services abroad. Imports are purchases of foreign goods and services for domestic consumption. “Net exports” refer to the aggregate international trade in a country’s goods and services. They are calculated as total exports less imports over a specific period. Positive net exports mean that more has been exported than imported.

Flows of goods and services reflect the creation and utilization of income. Exports result in the creation of domestic income. Imports represent spending by residents and thus reflect the utilization of income. If more is exported than imported in terms of value, domestic net assets increase during the accounting period due to the net inflow of income. If net exports are negative, domestic net assets drop because there has been an outflow of net income.
The creation and utilization of all income generated in a country is recorded in the national accounting system. This also includes all foreign transactions. The gross domestic product (GDP) is the total income generated within the country. It corresponds to aggregate consumer spending by private households, public-sector spending on goods and services, capital expenditure and net exports.

The commercial transactions of a domestic economy with the rest of the world are recorded in the balance of payments. This contains not only all imports and exports of goods, but also all capital movements relating to investments, capital spending and public-sector capital transactions. In reality, the term “balance of payments” is doubly misleading. On the one hand, it is not only international payments which are recorded in the balance of payments, but also the underlying flows of goods and services. On the other,

### Balance of payments diagram

- **Balance of payments**: total movements of goods and capital
  - **Current account** (current transactions)
  - **Capital account**: change in SNB’s net status
    - **Net exports**
    - **Balance of unilateral transfers**
      - **Trade balance**
      - **Invisible account**: (including wages and salaries and return on capital)
the term “balance” is inaccurate from the accounting perspective, as the balance of payments records flows over a period, rather than holdings and inventories at one particular time. At the most, the sub-accounts of the balance of payments are balanced purely fortuitously. In aggregate terms, however, their balances must always bring the overall balance of payments to equilibrium. Strictly speaking, there can be neither a balance of payments surplus nor a deficit. When people talk of balance of payments surpluses or deficits, they have misunderstood the concept of the balance of payments.

What they actually mean are imbalances in sub-accounts or balances, such as the trade balance, current account, or capital account.

If a country records a current account deficit, for example because it has imported more than it has exported, it has to assign a receivable for the surplus of goods imported from abroad. The current account deficit is therefore offset by a surplus in the capital account. More sustained balance of payments deficits can only exist as long as residents want to borrow abroad or foreigners are willing to invest in the domestic economy. These capital transactions represent changes in net assets. The result of a current account deficit is thus to reduce domestic net assets.

Example:
US net foreign assets
The USA has run a current account deficit every year since President Reagan’s first term of office. This situation was triggered by a sharp reduction in US tax rates. Since this was initially only accompanied by a slight reduction in State spending, the result was a budget deficit that could not be financed solely out of domestic savings. The USA were thus forced to import foreign capital to finance government spending by running up a deficit on its balance of payments on current account. While the US have built net foreign assets...
assets up to over USD 400 bn in the period up to 1980, they have subsequently declined from this time on. Today, the USA are the world’s biggest debtor.

Portfolio considerations play an increasing role in setting exchange rates. An investment portfolio consists of a mix of domestic and foreign investments. These investments in a number of countries are not completely interchangeable because diversification and risk spreading considerations mean that investors will only ever invest part of their assets in a particular country. If a current account surplus is maintained with a trading partner over several years, the number of foreign investments in the domestic portfolio will increase. The moment the specified portion of investments in the country with the current account deficit is exceeded in the domestic portfolio, surpluses of these investments flow onto the international capital market. Investors seek to replace these investments with domestic or other foreign investments. The result is a surplus supply of the currency of the surplus investment. The exchange rate reacts to this change in the investment portfolio: the capital mar-
Kets can only be balanced by devaluing the foreign currency. After devaluation, the value of the foreign currencies, expressed in the domestic currency, again equals the specified portion of the investment portfolio.

Over the long term, therefore, a situation can be reached where the current account is in equilibrium. Net creditor countries must accept that their currency is stronger than would be necessary for a balanced trade account. Inflows of investment income must be compensated by a trade deficit for the current account to be balanced. In turn, substantial longer-term current account deficits result in the long-term devaluation of the currency of the country concerned. This is why even over a very long period, the currency may not reflect the purchasing power parity on the markets for goods.

According to purchasing power parity theory, real exchange rates (i.e. purchasing power parity adjusted to take account of producer price inflation) should remain constant, at least in the long run. In fact, the impact of a reduction in net foreign assets stretches beyond an inflation-related change in the exchange.

**Change in real exchange rates and cumulative current account surplus/deficit (1995)**
rate to depreciation of the currency. Approximate net foreign assets can be calculated from past cumulative current account deficits/surpluses because the current account reflects changes in net foreign assets. The best example of this is Japan. The yen has appreciated in real terms as a result of the sustained surplus on its balance of payments on current account.

Nowadays, transactions directly related to trade in goods account for less than 5% of trading volumes on the international foreign exchange markets. Most transactions are based either on transactions indirectly triggered by the commercial sector or on business or financial market investment. The reason behind this is that in recent years capital has become extremely mobile, firstly because of the leap in technology, and secondly because barriers to capital movements are increasingly being eliminated.

The devaluation of the USD as a result of rising producer price inflation is shown by purchasing power parity (PPP). Clearly the relative rise in Switzerland’s net asset position means that in the medium term the USD/CHF exchange rate should be below the level implied by purchasing power parity. Accordingly, in the long run Switzerland should have a trade deficit, at least with the USA.
The description of the long-term factors affecting exchange rates shows clearly that it is quite possible to identify exchange rate trends based on macroeconomic arguments. In fact, PPP is relatively well suited to forecasting exchange rate movements over several months. For daily operations and currency risk management, however, they are not sufficiently powerful. The following chapter will therefore look at the factors which have an immediate impact on exchange rates.
What do interest rate parity and real interest rate parity mean?
3. Factors with an immediate impact on exchange rates

Overview
The foreign exchange market is a “fast-moving” market. It can react immediately to any news which could potentially impact exchange rates. Changes in expectations are almost immediately noticeable on the foreign exchange market in the form of rate realignments. This chapter describes the factors that have an immediate impact on foreign exchange market movements. It starts by explaining the concept of interest rate parity. This is followed by an analysis of how exchange rates can overshoot their new long-term values in the short term although purchasing power parity still obtains in the long run. Finally, the effects of monetary and fiscal policy on exchange rates under fixed and flexible exchange rate regimes will be discussed.

In the short run, the primary factor affecting the value of exchange rates is demand for currencies from investment decisions. These capital flows are oriented to expected returns. The returns on investments abroad depend on the relevant foreign interest rate and the expected movement in the value of the currency. These expected exchange rate movements can be derived from the difference between the relevant interest rates of the two currencies. For example, if the foreign interest rate is higher than the domestic rate, and no exchange rate movement is anticipated, capital will flow abroad because interest rates are higher there. When capital starts to flow out, a shortage would occur in the domestic capital markets and interest rates would start to rise. On the foreign exchange markets, the demand for foreign currency and the supply of domestic currency would rise, which is why any expectation that there will be no change cannot be correct. The concept of interest rate parity gives us one answer to this apparent contradiction. This says that the domestic interest rate equals the foreign interest rate, plus the expected movement in the exchange rate. The interest differential reflects the anticipated future development of the exchange rate.
Example:

Interest rate parity
On 26 May 2000, the EUR/CHF exchange rate was 1.5660. On the same date, the yield on a 1-year money market investment was 3.69% in CHF and 4.81% in EUR. The anticipated exchange rate in one year’s time \(X\) can be derived from these figures.

\[
3.69\% = 4.81\% + \frac{(X - 1.5660)}{1.5660}
\]

\(X\) can be calculated as follows:

\[
X = 1.5660(3.69\% - 4.81\%) + 1.5660 = 1.5485
\]

In other words, the market expects the exchange rate to be 1.5485 for 26 May 2001.

The expected future interest rate level thus plays a key role in determining interest rate developments. In the long term, purchasing power parity means that the exchange rate reflects the relative development of prices for goods and services. Because the prices of goods and services even out only gradually, purchasing power parity cannot apply in the short term. In the long term, however, the interest differential should be the same as the difference in inflation between the two currencies. In other words, the exchange rate movement ensures that real interest rates are in line with each other internationally.

As long as the price adjustment process for goods and services is a drawn-out one, exchange rates must ensure that expected returns are evened out. For example, if the domestic central bank suddenly increases money supply growth, the market will expect the rate of inflation to rise once prices have adjusted. In the long term, this will result in the devaluation of the domestic currency, in other words the exchange rate will have to rise. However, the greater money supply growth also means that there...
is a surplus of money. The initial effect of this is to cut interest rates. The principle of interest rate parity, however, states that the greater interest differential should mean that the exchange rate will be expected to fall, i.e. appreciation will set in.

The more expansionary policy of the central bank causes an apparent dilemma for expectations: a higher exchange rate – a devaluation – is expected in the long term, but in the short term, expectations of an appreciation are needed to fulfil interest rate parity. On the basis of its predictive nature, the foreign exchange market is able to reconcile these expectations immediately, although they appear to be incompatible in both the short and the long term. If the announcement of an expansionary monetary policy results in the exchange rate rising beyond its new level expected in the long term, together with falling interest rates, the medium-range development towards the long-term level will correspond to the expected appreciation resulting from the interest differential. The reaction of the exchange rate is to overshoot its new long-term level (exchange rate overshooting).

**Overshooting**

Abbreviations:  
E = Exchange rate, I = Interest rate,  
P = Price level, M = Money supply
In the medium term, higher inflation will push interest rates up again and cause the exchange rate to fall. The narrowing interest differential also cuts expectations of exchange rate changes. Once all prices have been adjusted, the exchange rate again reflects purchasing power parity and the interest differential merely reflects the different inflation rates in the two countries.

The phenomenon of overshooting explains at least part of the prolonged deviation of exchange rates and purchasing power parity. The more inflexible the price adjustment process, the greater these deviations will necessarily be. If you remember that interest rate parity means that all factors which can trigger a change in future exchange and interest rates result in a change in today’s exchange rates, then it also becomes apparent why exchange rates are so volatile. This is why it is so important to take account of a variety of factors, their interactions and their impact on market expectations when analyzing the foreign exchange market.

A booming foreign economy may have two consequences. Firstly, strong demand for labour and heavy production capacity utilization are likely to cause inflation rates to rise. Secondly, a central bank driven by price stability considerations will try to restrain the economy at an early stage before any sharp increase in inflation by tightening the money supply, and thus pushing up interest rates.

If the foreign central bank does not react, the foreign interest rates will remain slightly higher than domestic rates due to the cyclically induced greater demand for money. The exchange rate initially over-shoots its purchasing power parity, followed by a continuous devaluation of the foreign currency. According to the theory of overshooting, a preventive interest rate hike by the central bank should cause the exchange rate
to climb further, followed by a gradual depreciation of the foreign currency. The key question affecting the actual movement of the exchange rate over time is the extent to which any change in monetary policy is expected by the market. If the market has anticipated that interest rates will rise, the exchange rate may fall immediately even if the expectation is met. In such cases, the market has already anticipated the rise in interest rates and the exchange rate has risen even before the change in monetary policy. The primary factor affecting exchange rate developments is therefore the expectations of the market players.

Example:

**Publication of US labour market statistics**

On 7 March 1997, as on the first Friday of every month, the currency market was waiting for the release of the latest US labour market statistics.

**Publication of US labour market statistics**
Prior to publication of the data, the market assumed that 225,000 new jobs had been created in February. The exchange rate rose slightly before the data were published. When the figures were published at 1.30 p.m., they showed that, at 339,000, the number of new jobs created was again well above expectations. The market therefore decided that the Fed would adopt a tighter monetary stance in the future. As a result, the USD rose more than DEM 0.0050 in the following 15 minutes.

Changes in a country’s fiscal policy can also impact exchange rates. If government spending rises, growing public-sector demand is likely to have a direct effect on economic growth in the first instance, as it flows directly into the national accounting system when gross domestic product is calculated. Indirect effects can be derived from the secondary orders in the economy resulting from government contracts. The contribution of fiscal expansion to economic growth thus exceeds the amount originally spent, and this is termed the “multiplier effect” of fiscal policy.

A rising gross domestic product also means that there will be a lag in the rise of inflation. In any case, demand for money rises, so interest rates will rise as well. If government spending has been financed by borrowing, interest rates will climb again substantially. However, this rise in interest rates will normally restrain private demand, a phenomenon which economists term “crowding out.” If this occurs, the public-sector demand for capital to finance its deficit will displace the private demand for capital to finance investments. In other words, the additional public-sector demand is offset by reduced private demand and there would no longer be any impact on growth. In reality, however, complete displacement never happens. The expansion in public-sector debt generally results in borrowing abroad. Together with a rise in inflation, the deterioration in the net domestic
asset position results in devaluation of the currency over the long term. In the short term, the theory of overshooting would initially see devaluation, followed by gradual appreciation.

Example:
**Expansionary fiscal policy in the USA**
When the USA started to cut taxes in 1981, the budget deficit rose sharply, from 2.2% in 1980 to 4–5% between 1982 and 1986. At the same time, real interest rates rose to over 8% and the USD appreciated 25% by 1985. Sustained depreciation in the dollar did not set in until foreign debt increased dramatically.

**Fiscal expansion in the USA**

The illustration of the various factors affecting exchange rates shows clearly that, with flexible exchange rates, economic stimuli can be transferred across borders. The rise in the exchange rate means that positive economic developments abroad have a

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**Flexible exchange rates stabilize the global economy**
dual impact on the domestic economy. On the one hand, other countries will increase their demand for domestically produced goods and services. On the other, exports become cheaper. This shows that exchange rates promote the cross-border transfer of growth stimuli. At the same time, they restrain excessive fluctuations in the national economy and it is true to say that exchange rates have a stabilizing effect on the global economy. As explained in the previous chapter, however, the past and present are full of examples of countries which jointly anchor their currencies in a fixed exchange rate mechanism.

It is worth examining the effects of economic policy stimuli in a system of fixed exchange rates. If incomes rise abroad in such an exchange rate system, demand for export industry goods will rise in exactly the same way as with flexible exchange rates. On the foreign exchange markets, the rising demand for goods means increased demand for the domestic currency. However, because the exchange rate is fixed, the domestic central bank is immediately forced to absorb the upward pressure by buying foreign currencies. In other words, the central bank sells its national currency against foreign currency. The issue of national currency by the central bank causes a rise in money supply. As exports increase, the gross domestic product grows, domestic demand for imports rises, and the initial current account surplus is reduced.

In a system of fixed exchange rates, fiscal policy measures can also result in increased growth. Higher government spending boosts domestic incomes. On the domestic money market, there is excess demand for liquid funds and interest rates have to rise. In such a case, the domestic economy will attract foreign capital and the result will be currency firming. To prevent this, the central bank will provide the money market with the amount of liquid funds it

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**Fixed exchange rates:**

foreign economic stimulus from export growth

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An expansionary fiscal policy makes an expansionary monetary policy necessary
wants. The rise in public-sector spending thus raises incomes and forces the central bank to support the economy through monetary expansion. This combination of an expansionary fiscal and monetary policy increases incomes still further.

Thus, the need to assure the fixed exchange rate means that monetary policy has totally lost any form of independence. Monetary expansion would merely lead to a surplus on the domestic monetary market, with a fall in interest rates. The domestic currency would then come under pressure to devalue. However, in a fixed exchange rate system, the exchange rate cannot depreciate because the central bank is obliged to guarantee it. If there is pressure to devalue, the central bank is forced to make direct sales of its currency reserves to remove domestic currency from the market. In doing so, it immediately reduces the money supply again. The original monetary expansion needs to be reversed at once. In short: with fixed exchange rates, active monetary policy is a non-starter.

In both fixed and flexible exchange rate systems, any excessively expansionary monetary policy will result in a long-term rise in prices. Whereas exchange rate movements in systems with flexible exchange rates can still absorb this, differing rates of inflation in a system of fixed exchange rates present a number of problems. Exchange rates must be realigned regularly, and in practice, fixed exchange rates are nothing but an illusion.

Example:
India 1995
Between the start of 1993 and autumn 1995, the Indian government tried to peg the rupee to the USD. This was doomed to failure because the Indian central bank could not cut inflation to the US level. With an inflation differential of up to 12%, the result was serious overvaluation of the Indian currency. In

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An active monetary policy
is no longer possible
In the long term, the USD/INR exchange rate had to be adjusted to a level that reflected purchasing power parity.

**India 1995**

Following the explanations of the underlying factors affecting exchange rates, the next chapter gives a brief outline of the history of the foreign exchange market.
What do gold parities and arbitrage mean?
4. History of the foreign exchange market

Overview
This chapter describes the history of exchange rate regimes over the past century and the experience gained from them. There have been a number of exchange rate regimes over the past one hundred years or so. Exchange rate regimes are agreements, institutions, treaties or practices which govern the setting of exchange rates between countries. This means that an exchange rate regime regulates more than merely the question of whether exchange rates are set flexibly on the market, or are fixed by the intervention of central banks. The first regime to be presented is the gold standard established by the industrialized nations towards the end of the 19th century. It was the gold standard which first produced the notion of foreign exchange dealing as we know it today. During and between the two world wars, political events overshadowed the foreign exchange markets. To restore a stable economic environment, the industrialized nations established a system of fixed exchange rates which set the framework for foreign exchange dealing. The collapse of this system of fixed interest rates in the early 1970s laid the foundations for the subsequent exchange rate regime. The market prices for USD, JPY, CHF and EUR are flexible. In contrast, the currencies of the European Union stuck largely to fixed parities in the days before monetary union.

The gold standard was established in the 1870s as an instrument of confidence. At that time, the global economy was dominated by Britain, and administered by London, the global financial centre. The degree of political stability guaranteed by British dominance was the condition for the emergence and continuation of this gold-based, multilateral exchange rate regime. For the first time, widespread international trade based on the clearing balances of commercial banks was possible. The gold standard implied a system of fixed exchange rates. All participating currencies were pegged to gold at a fixed parity, and
central banks had to maintain gold reserves to cover their currencies.

International payments were based on gold. At the same time, there was also a free market for gold. Gold could be imported and exported everywhere without restriction, and could be turned into coin against payment of a mintage fee. Because gold supported all the participating currencies, and because gold coin was legal tender, the gold standard currencies enjoyed widespread acceptance. The fixed exchange rates between the currencies were derived from the parities of the individual currencies to gold. Gold coverage and the free movement of gold guaranteed the stability of these parities, although minor fluctuations in exchange rate parities could occur because of the transport and costs of gold-based transactions.

Originally, membership of the gold standard required the central banks of the member countries to redeem the banknotes they issued against gold at any time on demand, and to cover a certain percentage of the money stock in circulation by gold reserves. This was the “Gold Specie Standard.” The exchange and reserve requirement meant that liquidity in the economy depended directly on gold production and industrial demand for gold, and this represented a substantial monetary restriction. The world supply of gold is, after all, not linked to the liquidity requirements of the individual economies, and is determined by gold mining and the discovery of new gold deposits.

Through the gold coverage, the gold supply in a country determined the volume of money in circulation. Trade deficits or surpluses were neutralized by flows of gold. A trade deficit automatically represented an outflow of gold. At the same time, this meant a drop in domestic money supply. The reduction in the money supply led to higher interest rates, and
thus to potential capital – and gold – inflows. The lower money supply automatically meant lower prices, and thus greater international competitive strength. Rising exports then returned the trade balance to equilibrium and the money supply started expanding again. This “automatic function” of gold automatically imposed trade balance equilibrium on countries. The domestic economy was therefore directly exposed to developments abroad. Britain’s leading role as a trading power and global creditor meant that the Bank of England was able to exercise considerable influence on the development of the global economy.

This system collapsed with the outbreak of the First World War. Financing the wartime economies demanded the immediate and massive creation of money. This saw prices climb rapidly in some countries, a situation which was incompatible with rigid gold coverage. During the war, many countries decoupled themselves completely from the foreign exchange market through foreign exchange rationing, i.e. government control of the import and export of foreign currencies.

At the end of the war, there was an attempt to restore the stability of the gold standard. Britain, which had only been able to finance the war by tapping the financial strength of the New World, now had to share leadership of the global economy with the USA. The shift in the flows of goods and capital was immense. Agreement was reached on the introduction of the Gold Bullion Standard. The traditional Gold Specie Standard, in which gold could be used directly as a means of payment, was abolished. For the first time, government currency reserves were allocated a central bank guarantee function in addition to gold, and the system of fixed coverage was dropped. This meant that the countries were now free to set the amount of money in circulation. The only obligation imposed on the central banks was

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A new start with the Gold Bullion Standard after the First World War
to ensure that exchange rates remained fixed at the gold-based parities by intervening directly in the foreign exchange market.

This was not a particularly good time for proving that such a system would work, however. Money was created at an ever increasing rate by resorting to the printing press, above all in an attempt to reduce the debt or reparation payments resulting from the war. This saw an increasing gulf between the inflation rates in the individual countries, and the attempt to restore the agreed original parities was unsuccessful. Monetary expansion increased the downward pressure on a range of currencies, even resulting in competitive devaluation. Devaluation was achieved by expansion of the money stock.

The new attempt to create a stable monetary system ultimately collapsed due to the lack of any coordinated monetary policy by the countries involved. The political and institutional stability needed to curb the devaluation pressure, and inflation simply did not exist. The stock market crash of 1929 triggered the Great Depression. The worldwide economic crisis at the beginning of the 1930s was inevitable and resulted in most countries abandoning the gold standard. Again, they instituted exchange controls in an attempt to maintain an artificial exchange rate for their currency, or went a step further and prohibited foreign exchange dealing outright. The restrictions this imposed, including on global trade, merely accelerated the pace of economic decline. The downward spiral towards instability could not be halted.

Even before World War II had drawn to a close, the USA and Britain started work on creating a new world economic order. This multilateral trading and monetary system was designed to be anchored in the organizations of the United Nations. However, as the world congealed into “Eastern” and “Western”

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The gold exchange standard (1944–1971): the Bretton Woods system – goals and functions
blocs, it was no longer possible to embed this system in functions of the UN. Instead, the Bretton Woods conference in July 1944 created the Bretton Woods institutions as a separate international treaty regime. The goal of this new trading, monetary and financial system was to reconstruct Europe and restore the system of international trade and links between currencies. The International Monetary Fund (IMF) was established to monitor the new global monetary system. Membership in the IMF obliged a country to respect particular monetary policy rules, and guaranteed help in times of financial crisis. Each member currency agreed a parity with the IMF, expressed either in gold or in US dollars.

Under the IMF Treaty, the countries were required to guarantee the fixed USD parity in foreign exchange trading. The spot rate had to remain within a ±1% margin of the agreed USD parity. The parity could be supported on the foreign exchange market by central bank intervention. The margin was twice as large (±2%) for the bilateral rates of the non-USD currencies, derived from the two dollar parities. In practice, central bank intervention to stabilize exchange rates tended to start at the margin limits of ±0.75% and 1.5%.

Example:

**Gold parities and arbitrage**

The USA fix the dollar price of gold at USD 35 per ounce. France fixes the franc price at FRF 210 per ounce. This gives a franc/dollar exchange rate of 6 USD/FRF. If the currencies were to be traded at USD/FRF 6.20, there would be scope for a triangular arbitrage operation: in France, it would be possible to purchase gold for FRF 210 per ounce. The gold could be converted into dollars in the USA for USD 35 per ounce. The dollars could be reconverted into FRF at a rate of USD/FRF 6.2 (USD 35 x USD/FRF 6.2 = FRF 217). This would mean a gain of FRF 7 per ounce of gold. Of course, immediate capital movements would not
have produced such a fluctuation in the exchange rate in the first place.

Currency parity realignments could be decided unilaterally, but had to be confirmed and announced by the IMF. A condition for realigning a currency was an evident, fundamental payments imbalance. This conditional flexibility was the result of the common desire to secure the system against competitive devaluation. Again, to avoid devaluations as much as possible, members were allowed to apply for credit from the IMF in the event of balance of payments problems. The credits were designed to prevent liquidity shortages suffocating the economy in the case of high balance of payments deficits where the central bank had to balance out goods and capital transactions.

Despite periodic crises, the international monetary system created at Bretton Woods proved to be stable for around a quarter of a century. The system revolved around the role of the dollar as the key or anchor currency. It was marked by the dominance of the USA and underpinned by the massive gold reserves which had flowed into the USA since the country’s rise as the leading industrial nation. In the early stages, stability was transmitted to the system by the strength of the dollar.

Cracks in the Bretton Woods system started becoming apparent in the 1960s. From 1958 to 1960, the USA recorded balance of payments deficits again for the first time. To maintain dollar parity, the European central banks had to introduce their domestic currencies onto the market, which drove up inflationary expectations. The fear of inflation caused a run on gold, the exchange of which was still guaranteed, and the market price exceeded the fixed rate of USD 35 per troy ounce. To head off this crisis on the gold market, the central banks decided to cooperate in a gold pool. The objective of the pool was to guarantee...
the gold price at the official level of USD 35 per troy ounce by means of intervention.

High growth rates and rising balance of payments surpluses in the Netherlands and Germany resulted in pressure to revalue the NLG and DEM in early 1961. Between 1963 and 1967, sterling was maintained artificially at the pegged level by support buying, primarily by the Fed, but ultimately had to be devalued in 1967. In the long run, the gold losses of the central banks exceeded the gold pool, and it was killed off in 1968. The gold market then split into a cordoned-off central bank market with a fixed gold price and a “public” gold market with flexible prices. The system now started to fall apart at the seams.

The social unrest in France in May 1968 resulted in an exodus of capital which saw the Banque de France losing the bulk of its currency reserves. The FRF had to be devalued by 11.1%. Ever increasing capital inflows into Germany ended in a further revaluation of the DEM by 9.3% in 1969. US short-term foreign liabilities outstripped falling US gold reserves. Confidence in the dollar disappeared. The enormous level of defence expenditure as a result of the Cold War and the escalating Vietnam War resulted in high budget deficits in the USA at the end of the 1960s. To cut the cost of public-sector borrowing, interest rates were kept artificially low with the aid of monetary policy. Money supply growth started to push up price levels, and a realignment in the dollar parity was overdue. For the first time ever, the USA recorded a trade deficit in 1970: the era of huge balance of payment surpluses had passed. Capital flowed increasingly out of the dollar, to the higher interest rates and potentially stronger currencies in Europe.

Without any prior public debate, President Nixon announced the unilateral suspension of the dollar’s convertibility into gold in August 1971. This allowed gold to be finally withdrawn from the exchange rate system before any devaluation of the dollar, which would have had to be implemented in the IMF and
thus in full sight of the market. In the same year, many countries started loosening the ties between their exchange rates and the parities. The aim was to allow the market to set exchange rates by “floating” their currencies. The European countries agreed on an attempt to maintain the parities between their currencies in the European currency snake. When the dollar was finally devalued in December 1971, a last-ditch attempt was made to save the Bretton Woods system. The Smithsonian Agreement defined new parities. The fluctuation margins of the currencies to the dollar were expanded to 2.25%. The official price of gold was increased to USD 38. Gold convertibility was not reintroduced. Capital still flowed into Switzerland, Japan, the Netherlands and Germany. Sterling and the lira were unable to maintain their parities. Despite further revaluations, the stronger economies were unable to meet their intervention obligations. They could only buy dollars by printing more money, forcing them towards an inflationary monetary policy. In the spring of 1973, they finally severed their currencies from dollar parity. The IMF’s role was transformed into that of monitoring a global system of flexible exchange rates, approving regional exchange rate regimes with fixed parities.

The European Economic Community (EEC) was established in 1958. The members of the EEC achieved closer economic integration during the 1960s. As the markets for goods began to converge, the capital markets moved with them. The economic partners understood the need for a synchronized monetary policy. Unilateral economic policies at the cost of the trading partners should be prevented at all costs. For this reason, the EEC member States tried to maintain a system of narrow-band parities before the collapse of the Bretton Woods system. As far as possible, the currencies fluctuated together, with additional external margins – especially against the dollar. If one currency changed against the USD, all other exchange rates were realigned against the USD accordingly.
giving rise to the term “currency snake.” The system was the forerunner of the European Monetary System (EMS), established in 1979.

The establishment of the EMS anchored the currency snake in a settlement currency, the ECU – European Currency Unit. The EMS replaced the fixing of all currencies to a single benchmark, for example gold, by a basket of currencies consisting of the member currencies. The relationship between the currencies contained in the basket was defined. Adding up the member currencies results by definition in exactly 1 ECU. The composition of the currency shares in the ECU at that time had been in existence since 1989 until the end of 1998. As a unit of account, the ECU was used to set the central rates of the EMS member currencies. The weighting of the currencies originally reflected the relative size of the country, based mainly on gross domestic product and the volume of trade. They then reflected realignments to the central rates. Currencies which joined the EMS after 1989 were no longer weighted in the ECU basket. Instead, a

**Calculation of the ECU and parities in the EMS**

<table>
<thead>
<tr>
<th>Currency</th>
<th>Share of the currency in 1 ECU</th>
<th>Weighting (12/97)</th>
<th>Central rate 1 ECU = (12/97)</th>
<th>DEM rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEM</td>
<td>0.6242</td>
<td>32.08%</td>
<td>1.94583</td>
<td>–</td>
</tr>
<tr>
<td>FRF</td>
<td>1.332</td>
<td>20.14%</td>
<td>6.614</td>
<td>3.35</td>
</tr>
<tr>
<td>NLG</td>
<td>0.2198</td>
<td>9.87%</td>
<td>2.22661</td>
<td>1.13</td>
</tr>
<tr>
<td>BEF</td>
<td>3.301</td>
<td>8.10%</td>
<td>40.7642</td>
<td>20.63</td>
</tr>
<tr>
<td>LFR</td>
<td>0.130</td>
<td>0.32%</td>
<td>40.7642</td>
<td>20.63</td>
</tr>
<tr>
<td>ITL</td>
<td>151.8</td>
<td>7.84%</td>
<td>1937.16</td>
<td>–</td>
</tr>
<tr>
<td>DKK</td>
<td>0.1976</td>
<td>2.63%</td>
<td>7.52606</td>
<td>3.81</td>
</tr>
<tr>
<td>IEP</td>
<td>0.008552</td>
<td>1.12%</td>
<td>0.763225</td>
<td>0.41</td>
</tr>
<tr>
<td>GBP</td>
<td>0.08784</td>
<td>13.12%</td>
<td>0.669259</td>
<td>–</td>
</tr>
<tr>
<td>GRD</td>
<td>1.440</td>
<td>0.46%</td>
<td>310.863</td>
<td>–</td>
</tr>
<tr>
<td>ESP</td>
<td>6.885</td>
<td>4.12%</td>
<td>167.119</td>
<td>85.07</td>
</tr>
<tr>
<td>PTE</td>
<td>1.393</td>
<td>0.69%</td>
<td>201.994</td>
<td>102.51</td>
</tr>
</tbody>
</table>
direct parity was set corresponding to the exchange rate to the ECU or the euro. As in all fixed rate systems, bilateral parities could be derived from the central rates.

In the EMS, the exchange rate could only fluctuate around the bilateral central rates within a set margin. The goals of the EMS were to ensure exchange rate stability and the economic convergence of the member countries, while at the same time keeping inflation rates low. To achieve this goal, the EMS margins were defined with a spread of ±2.25% around the central rate, which was later expanded to ±15%. As in the Bretton Woods system, the upper and lower bands denoted the central bank intervention points. In the EMS, the central banks were obliged to underpin the value of the currency against all other member currencies. Normally, a currency fluctuated within the band around the central rate, unless “disruptions” systematically pushed it towards the edge of its band. The central bank of the weaker currency had to intervene at the latest when the edge of the band was reached by selling currency reserves against its own currency. If the currency reserves were insufficient, the central banks of the weaker currencies could borrow funds from the central banks of the stronger currencies. This asymmetrical intervention mechanism was a major factor contributing to the need to orient the monetary policy of the member countries to the strongest currency. Intervention normally only occurred in an invisible interim band. Such interventions meant that fewer reserves had to be used in support of buying operations, and the foreign exchange market was deterred from speculating. If any disruption caused a permanent shift in purchasing power, the parity could be realigned. This was done by changing the central rate of a currency to the ECU. If one parity was changed, then obviously all other parities in the parity grid of the currency concerned had to be changed as well.

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Margins and intervention obligations
This chart of the DEM/FRF exchange rate and its fluctuation bands (see below) illustrates clearly that even after the introduction of the EMS, there is no evidence at all of any long-term fixed exchange rate. The frequency of parity realignments did not decline until the mid-80s.

**DEM/FRF and the development of the EMS**

In the early phase, the EMS was accompanied by frequent parity realignments. Due to its strength and the reputation of the Bundesbank, at that time one of the most independent central banks in the world, the DEM emerged as the anchor currency. In addition, the Bundesbank held the largest currency reserves and was thus in a position to be able to support potentially any exchange rate. This gave the other currencies an opportunity to latch onto the DEM, with its stable inflation, and thus import monetary stability. In France, for example, the rate of inflation dropped...
from over 14% to around 3% during this period. The transition to lower inflation rates was also accompanied by greater fiscal discipline. The abrupt halt to the extremely rapid rise in the dollar and the subsequent strengthening of the DEM in 1985 resulted in further parity shifts.

From 1987 to the beginning of the 1990s, there was a period of true stability, marked by the convergence of the economies and harmonization of monetary policy. However, the sudden end of the Cold War with German unification in 1990 was bound to have an effect on exchange rates. German unification brought with it a fundamental change in the economic and monetary policy of the anchor country. As a result of the decision on transfers to eastern Germany, German fiscal policy was forced to steer a distinctly more expansionary course, while monetary policy tried to combat the consequences of the overinflated money supply following monetary union in Germany. The exceptionally high level of capital spending needed in eastern Germany also played its part in pushing up interest rates in Germany. It was inevitable that the DEM had to become more appealing, to be able to attract capital. The result was a crisis in the EMS in September 1992. The GBP and the ITL left the exchange rate mechanism and floated freely on the market. Other currencies could only be supported by massive shifts in reserves. When another crisis loomed in 1993, the EMS countries decided to allow a new convergence phase, and the bands were widened to ±15%.

At the latest when the two Germanys came together, it had become clear to even the most ill-informed observer that European monetary policy was dominated by the central bank of the anchor currency, the DEM. This realization was a driving force behind the decision by the other members to move to a monetary union with a new European Central Bank (ECB). The Maastricht Treaty came into force in November
1993. It governed the transition to European Economic and Monetary Union (EMU): the harmonization of monetary policy in the European System of Central Banks (ESCB) and the introduction of the euro as a pan-European currency. Criteria governing the economic situation of the member states were formulated in the Maastricht Treaty as guidelines for the transition to EMU. These convergence criteria aim to ensure that the transition to a common monetary policy runs as smoothly as possible. The following years were marked by attempts by all member States of the European Union to meet these convergence criteria.

Within a monetary area, a common currency eliminates the uncertainties which cause exchange rate fluctuations in international trade transactions. Externally, trade is still exposed to the fluctuations of flexible exchange rates. Whereas in the European Union, it was and is evident that efforts were being made to avoid these fluctuations, at least for most of the volume of trade, Swiss monetary policy was still driven by the wish to remain independent. In fact, the role of the CHF far exceeds the importance of Switzerland in the global economy. Although Swiss gross domestic product only accounts for around 1% of global income, the CHF is still the sixth most important trading currency in the world.

Example:

**Bank for International Settlements (BIS)**

**currency turnover statistics**

Switzerland has also been able to retain its status as a currency dealing centre. Despite the growing concentration of European foreign exchange dealing in London, Switzerland is still in third place, and a clear concentration on Zurich is evident within the country itself. The following chapter describes how foreign exchange dealing is handled in practice.
What do long and short positions mean?
5. Principles of foreign exchange dealing

Overview
To be able to explain how foreign exchange dealing actually happens in practice using a number of examples, it is important to understand some of the principles underlying the money market transactions involved. In addition to exchange rate quotation, this chapter also explains how dealers manage positions, and describes the most fundamental operation of all, the spot transaction.

In the introduction to this booklet, the exchange rate was defined as the price of a foreign currency in domestic currency units. This definition of an exchange rate is also termed a “direct quotation,” and is used by most countries. The price of (as a rule) one hundred units of foreign currency, but only the price of one unit in the case of the dollar and sterling, is quoted in the domestic currency. In Switzerland, therefore, foreign currencies are quoted in CHF, but there are exceptions to this rule. Since the decimal system was not used in Britain in the early years, the equivalent of sterling was quoted in the foreign currency. This method is known as “indirect quotation.” Even today, sterling is still quoted indirectly.

To ensure that the market functions smoothly, it needs other conventions. In professional foreign exchange dealing between banks, dealers normally quote dollar rates. This means that the values of the various local currencies are expressed by indicating the price of one USD in the local currency. For instance, in response to an inquiry from Zurich at a Norwegian bank about its NOK rates, the Norwegian dealer will not quote the rate for the CHF against the NOK, but of the USD against the NOK.

This method of quoting currencies in dollar rates, standard practice since the 1950s, has had a serious impact on the meaning of arbitrage in foreign currency operations.
Between the two world wars, foreign currencies were still quoted against the country's own currency. For example, a Swiss dealer enquiring about the DEM rate at a bank in Stockholm would have received a reply in SEK. If this resulted in a deal, the Swiss dealer would then have tried to sell the DEM in another country, covered by a purchase of SEK somewhere else. This resulted in a whole range of true arbitrage operations. Originally, “arbitrage” meant taking quick advantage of price differences prevailing in different markets, a process which eventually tended to make these differences disappear quickly. Arbitrage in the earlier sense of the term is more or less impossible. Nowadays, arbitrage means exchange gains from professional interbank business, as against customer-related business.

In foreign exchange operations, customers are offered two rates for each currency pair. For example if the USD is quoted against the EUR at EUR/USD 1.1521/1.1536, the first of these rates is the buying rate offered by the bank for the EUR, while the second rate is the selling rate for the EUR. Professionals refer to this first rate as the bid rate. The second rate is the selling rate for the EUR, or the buying rate of the USD. It is also known as the ask rate. The middle rate is the mid-point between the buying and selling rates.

### USD closing rates on 27 January 1999

<table>
<thead>
<tr>
<th>Currency Pair</th>
<th>Buying rate (bid) for USD</th>
<th>Selling rate (ask) for USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD/CHF</td>
<td>1.3932</td>
<td>1.3942</td>
</tr>
<tr>
<td>EUR/USD</td>
<td>1.1521</td>
<td>1.1536</td>
</tr>
<tr>
<td>USD/JPY</td>
<td>113.75</td>
<td>113.85</td>
</tr>
<tr>
<td>GBP/USD</td>
<td>1.6554</td>
<td>1.6564</td>
</tr>
<tr>
<td>USD/DKK</td>
<td>6.4513</td>
<td>6.4553</td>
</tr>
<tr>
<td>USD/SEK</td>
<td>7.7199</td>
<td>7.7249</td>
</tr>
<tr>
<td>USD/NOK</td>
<td>7.4565</td>
<td>7.4665</td>
</tr>
<tr>
<td>USD/CAD</td>
<td>1.5200</td>
<td>1.5210</td>
</tr>
</tbody>
</table>
The table shows the buying and selling rates for interbank foreign exchange operations. In the case of transactions involving smaller amounts, the margins between the bid and ask rates are rather larger.

In recent years, trading in “cross currencies” has increased considerably. Customers and smaller banks want to do business against currencies other than the dollar, for instance EUR against CHF or GBP against CHF. In such cases, “cross rates” have to be calculated.

Example 1:
**EUR/GBP cross rates**
What is the middle rate for EUR against GBP, based on the middle rates for EUR against USD and GBP against USD? The result is obtained by establishing a chain equation:

\[
\text{GBP} \ = \ \text{EUR} 1, \text{ if } \text{EUR} 1 = \text{USD} 1.1530 \\
\text{and, } \text{USD} 1.6560 = \text{GBP} 1
\]

Answer:
\[
\text{EUR} 1 = \frac{1.1530}{1.6560} = \text{GBP} 0.69630
\]

Example 2:
**EUR/CHF cross rates**
What is the middle rate for EUR against CHF, based on the middle rates for EUR against USD and USD against CHF?

\[
\text{CHF} \ = \ \text{EUR} 1, \text{ where } \text{EUR} 1 = \text{USD} 1.1530 \\
\text{and } \text{USD} 1 = \text{CHF} 1.3940
\]

Answer:
\[
\text{EUR} 1 = 1.1530 \times 1.3940 = \text{CHF} 1.6073
\]

What is interesting in the latter case is how the formula is influenced by the indirect quotation for EUR.
An international bank must always maintain sufficient foreign exchange holdings in all major currencies to be able to execute international payment orders. As a rule, current or checking accounts maintained with foreign correspondent banks cannot be overdrawn. The balances in these accounts are known as “working balances.” However, a credit balance also means that if the exchange rate climbs, the bank’s assets – expressed in the domestic currency – also rise. This is referred to as a “long position.” Holdings of foreign currencies have been bought against holdings of other currencies or against the bank’s own currency. This automatically results in a “short position” in the bank’s own currency.

For a number of reasons, the bank’s foreign exchange position is only rarely identical to its “working balances.” Firstly, Swiss banks are not interested in having to maintain large working balances in all major trading currencies, due to the inherent exchange risk. They try to eliminate this risk, and swap transactions offer an opportunity to do this (this process will be described at a later stage).

Money market operations can also result in long and short positions which differ from the working balances. Let’s assume that a bank maintains an EUR account with a Paris bank with a balance of EUR 1 million. A customer now deposits EUR 10 million for three months. For a number of reasons, the bank decides to convert this amount into USD and deposit these dollars for three months. The EUR exchange position will therefore be “short” to the tune of EUR 9 million. In addition to the original balance of EUR 1 million, a liability of EUR 10 million has arisen, although the working balance is still EUR 1 million.

Of course, the bank’s foreign exchange operations constantly change its foreign exchange position. If it starts the day with a long position of USD 10 million, later sells USD 2 million to a client and then USD 3 million to a bank, the long position is reduced to
USD 5 million. The bank’s foreign exchange department has to keep constant track of the positions in various currencies. IT programs support and simplify these monitoring activities.

The foreign exchange position reflects the bank’s total exposure in various currencies, regardless of maturities. It records not only direct foreign exchange transactions, but also the currency exposures resulting from money market operations.

However, a bank may have certain foreign currency assets which it does not want to be included in daily dealing operations. Whenever currency risks are left unhedged, such items are excluded from the dealer position, which may therefore differ from the bank’s total position.

A long position in a particular foreign currency always implies a corresponding short position in another currency. If there are long and short positions in several foreign currencies, we need a common denominator to measure the total exposure.

The domestic currency is actually this common denominator. Since all currencies in foreign exchange operations are quoted in USD, it is convenient to keep the dealer position on a dollar basis, even if the bank’s domestic currency is not the dollar.

Example:
**Dealer position in USD**

If the dollar is the common denominator for measuring the total currency exposure, the dealer position will look as follows:

<table>
<thead>
<tr>
<th>Currency</th>
<th>Long position</th>
<th>Short position</th>
<th>In USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBP</td>
<td>2 000 000</td>
<td></td>
<td>-3 312 800</td>
</tr>
<tr>
<td>CHF</td>
<td>4 000 000</td>
<td>2 871 088</td>
<td></td>
</tr>
<tr>
<td>EUR</td>
<td>500 000</td>
<td></td>
<td>-581 800</td>
</tr>
<tr>
<td>JPY</td>
<td>300 000 000</td>
<td>2 637 363</td>
<td></td>
</tr>
<tr>
<td>USD total</td>
<td></td>
<td></td>
<td>+1 613 851</td>
</tr>
</tbody>
</table>
A bank which plays a major role on the foreign exchange markets will not normally be content merely to carry out orders from its customers, but will also wish to trade for its own account. It will constantly try to buy currency at the lowest possible rates and sell it on at a profit. A conservative bank will place more emphasis on arbitrage transactions than on the hope of making money with its own foreign exchange position. The bank’s dealing operations bring more depth to the market.

If it only conducted customer business, trading patterns would tend to be patchy and exchange rate fluctuations more erratic, which in the long run, would be to the detriment of its commercial customers. In an actively traded market, rates adjust much more quickly on an international scale. The market is therefore sufficiently liquid to handle large customer transactions without any major distortions in exchange rates.

How do foreign exchange dealers prepare for their working day? Foreign exchange dealing in Europe is officially opened at 8 a.m., but the dealer’s work starts at least one hour earlier. Every morning, the chief dealers give their staff guidelines for their dealing activities. They will reassess their strategy on the basis of their estimation of the market over the next few months. They will also decide their tactics for the day, based on the following factors:

- Trading activities in the past few hours in New York and the Far East. Because of the time difference, banks in New York will have continued trading for several hours longer than the banks in Europe, while in the Far East the working day is already closing when the European day begins.
- New economic and political developments. As was demonstrated in the theoretical discussion of how exchange rates are set, changes in interest rates, economic indicators and monetary aggregates are the fundamental factors influencing exchange
rates. Political events such as military conflicts, social unrest, the fall of a government, etc., can also influence, and sometimes even dominate, the market scene.

– The bank’s own foreign exchange position.

Early in the morning, market makers use electronic information systems to catch up on any events of the past night which might impact exchange rates. Charts (graphic presentations of rate movements) and screen-based rate boards allow dealers to study the latest developments in foreign exchange rates in New York and the Far East. As soon as this preparatory work is completed, the dealers will be ready for international trades (between 8 am and 5 pm).

The day starts with a series of telephone calls between the key market players, the aim being to sound out what intentions are. Until recently, brokers also acted as intermediaries in foreign exchange and money market operations. Nowadays, however, the Electronic Broking System (EBS) has largely replaced the activities of the brokers themselves. The original brokers used to work with minimum amounts of e.g. USD 5 million, whereas the EBS allows flexible trading from e.g. USD 1 to 999 million. EBS does not only deal in USD, however. Currencies such as EUR/CHF, EUR/JPY and EUR/GBP are also traded. This means that the continuity of rate determination is substantially higher, as a larger number of smaller amounts, previously negotiated privately between banks, now play a role in setting rates. Another advantage of this cost-effective system is that the rates are always available on-screen.
What do spot and forward transactions mean?
6. Types of foreign exchange trading

**Foreign exchange operations**

Foreign exchange trading operations will be explained with the aid of the next diagram. The type of operation selected depends on the date set for delivery of the currency. As a general rule, four types of operations are used: spot transactions, forward transactions, swaps and futures.

Spot transactions are the basic type of foreign exchange operation. Under spot agreements, both parties fulfil their obligations two working days after conclusion of the trade. In the old days, the two-day period between conclusion and execution of the agreement was required for completion of the accompanying paperwork. Although this no longer applies in the same way, the traditional system has been retained. In principle, spot transactions can also be concluded for execution on the next working day or even for the same day. However, in such cases, slightly modified prices are used instead of the normal spot prices. The premium/discount to the spot price depends on the interest rate for the currencies concerned. Before we turn to transactions covering more than two working days, let us take a closer look at how spot transactions work. The various stages to the settlement of a spot transaction will be illustrated by means of an example. Let’s assume that a further decline in US inflation has been announced on the previous day. A low inflation effects generally a higher valuation of the underlying currency. Let us assume that yesterday’s closing rate for the USD/CHF was 1.3810/1.3820, while New York closed at 1.3855/1.3865 and the exchange rate in the Far East is currently 1.3860/1.3870. If a bank in, for example, Frankfurt asks for a quote, the trader will quote a slightly higher price, for example 1.3865/1.3875. If no transaction is concluded, it may be assumed that the bank considered the exchange rate quoted to be correct. Accordingly the trader will not modify it. This is what traders call “par” or “parity.”
Instead of quoting the full exchange rate, professional traders merely give the last two decimal places, e.g. 65/75, because they know what the other figures are. By quoting a bid/ask spread, the bank undertakes to buy or sell a certain amount of the currency concerned at the prices quoted. It is not normally evident from the enquiry whether the counterparty wishes to buy or sell. There are no fixed rules on the sums for
which quotes are given, but it is standard practice for major banks to quote each other bid/ask spreads for at least USD 10 million or the equivalent. The Frankfurt bank in our example does not take any action on a spread of 1.3865/75.

A contract for delivery of currencies more than two working days later is known as a forward transaction. Such transactions are concluded at forward rates, not at spot rates. Forward rates reflect the time for which the agreement runs. Theoretically, the forward rate for a currency can be identical to the spot rate, but in practice it is almost always higher (premium) or lower (discount). Forward transactions are used for a variety of purposes. They are most commonly used to hedge trading risks and the risks arising from financial transactions.

Forward operations cannot be set apart from currency swaps, which are a mixture of spot and forward transactions. To prevent confusion between these two types of forward transaction, traders use the term “outright” transactions for simple forward rate transactions that are not part of a swap operation.

Forward rates are not quoted directly. Professional traders work with the difference between spot and forward prices expressed in decimals. In other words, they work on the basis of premiums and discounts. Another term for this difference is the “swap rate,” although as the term suggests, it strictly applies to swap operations.

The term “outright” is used to show that the quote refers to the forward rate rather than the swap rate, i.e. the corresponding premium or discount. The table below shows how spot rates and swap rates are shown on the screens. Swap rates are always expressed as decimal places in the currency concerned in relation to the USD. On 5 August 1996, the rates were as follows:
The forward rate is obtained by adding the premium to the spot rate or deducting the discount. Even when swap rates are quoted without a plus or minus sign, traders would see immediately that the GBP is trading at a discount to the USD. How?

The answer is easy. Regardless of whether they are looking at spot or forward operations, the bid price (purchase price) is always lower than the asked price (selling price). Moreover, the spread has to be wider for forward rates than for spot rates.

Where the currency is trading at a discount, the figures on the bid side are higher than those on the ask side, and vice versa when the currency is trading at a premium.

**Example:**

GBP/USD spot rate 1.6604 1.6614
– discount (3 months) –33 –30
= FORWARD RATE 1.6571 1.6584

The spread is 10 pips between the spot rates but 13 pips between the forward rates.

Similarly, a 3-month forward rate of 52.9/53.2 for the EUR against the USD indicates a premium.

EUR/USD spot rate 1.1575 1.1590
+ premium (3 months) 50 53
= FORWARD RATE 1.1625 1.1643
The spread is 15 pips between the spot rates but 18 pips between the forward rates.

Interest rates for the currencies concerned determine whether currency forwards are traded at a premium or a discount. At the same time, interest rates determine the extent of the difference between spot and forward rates. However, it is the interest spread between the two currencies on the international money markets that is important, not the interest rate in each currency. This is due to the fact that when a bank enters into a forward transaction, it has open positions.

International trade creates an ongoing demand for currency forwards, which are used to hedge currency risks. For example, a Swiss importer may purchase goods from Germany that are invoiced in EUR, payable within 90 days. To eliminate exposure to the risk of a rise in the EUR in the meantime and provide a sound basis on which to set his prices, the importer buys the EUR required to pay the invoice in an “outright” transaction for delivery in three months. Conversely, if a Swiss exporter knows that he will receive a payment in EUR in three months’ time, he can eliminate the exchange risk by entering a 3-month outright deal to sell EUR. Failure to undertake these forward operations would be tantamount to speculating on a fall in the EUR in the first example and a rise in the EUR in the second example. Foreign currency holdings that have to be hedged can also be generated by a wide range of non-commercial transactions:

- investment in securities, money market investments, loans to foreign subsidiaries, direct investment, etc. undertaken in foreign currencies represent foreign currency assets. The exchange risk can be eliminated by selling the currencies concerned forward.
- raising loans on foreign capital markets in foreign currencies generates foreign currency liabilities.
The associated exchange risk can be hedged by forward purchase transactions for the currency in question.

Forward transactions can also be used to hedge risks when the underlying business is medium- or long-term. For many currencies, it is difficult to conclude forward transactions for more than twelve months. However, by renewing 12-month contracts regularly when they expire, long-term transactions can be hedged. Naturally, hedging costs are only known for the first period. However, the fact that the hedging costs for the ensuing period are uncertain is not necessarily a reason to refrain from hedging. In many instances, the customer is interested in relative hedging costs (i.e. the costs in per cent p.a.) rather than in absolute costs. Let’s take the example of a Swiss exporter who will receive payment for his goods in USD in six months’ time. When he asks his bank for the spot and six-month forward rates for USD/CHF, he is given the following information:

<table>
<thead>
<tr>
<th>Rate Type</th>
<th>CHF 1.3820</th>
<th>CHF 1.3830</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot USD/CHF</td>
<td>1.3820</td>
<td>1.3830</td>
</tr>
<tr>
<td>Discount 6 months</td>
<td>249</td>
<td>246</td>
</tr>
<tr>
<td>Discount 12 months</td>
<td>481</td>
<td>476</td>
</tr>
</tbody>
</table>

The customer will not tell the bank whether he is interested in buying or selling so the bank quotes both bid and asked prices.

The exporter then knows that he can sell USD in return for CHF for delivery in six months’ time at a discount of 249 points. Deducting the discount from the spot price of 1.3820 gives a forward rate of 1.3571. However, for the purpose of his calculations, the exporter wants to know the discount (i.e. the hedging costs) in percent p.a. He thus converts the discount for the period concerned into a discount for the full year and looks at it in relation to the spot price.

\[
\frac{(0.0249 \times 2 \times 100)}{1.3820} = 3.60\%
\]
If the customer had sold USD for CHF for delivery in twelve months time, the forward rate would have been 1.3339 (1.3820 minus 481 points) and thus lower than the forward rate for three months. Accordingly, the hedging costs would have been lower i.e.:

\[
\frac{(0.0481 \times 1 \times 100)}{1.3820} = 3.48\%
\]

In the same way as a premium or discount expressed in absolute terms can be expressed in per cent p.a., the same calculation can be performed in the opposite direction. If the hedging costs are 3.60% p.a., the absolute discount can be calculated using the following formula:

\[
\frac{[(\text{spot rate}) \times (\text{hedging costs in } \% \text{ p.a.}) \times (\text{term of the transaction in months})]}{[100 \times \text{no. of months in year}]} = \text{CHF 0.0249}
\]

(Discount – 6-months)

Most “outright” transactions between banks and their customers are for broken periods (odd dates). These are non-standard periods falling between the standard periods for forward contracts (1, 2, 3, 6 and 12 months). Banks normally endeavour to close out forward positions entered into through customer business by entering into counter-transactions for the same period. However, counter-transactions cannot always be entered into even though the bank may feel that it has an obligation to enter into the contract with its customer. For both long maturities and for currencies outside the standard range, it is comparatively difficult to find a counterparty for counter-transactions.

The method used to calculate the pips (swap rate) for broken periods is illustrated in the example given below. For the purposes of the calculation, the difference between the two closest trading dates for for-
ward contracts is divided by the number of days between the two dates. The result is then multiplied by the number of days between the broken date and the later forward date. The result of this is subtracted from the swap rate for the later date.

The swap rate on Monday 25 April is to be calculated on 3 March.

1-month swap rate 101 pips
2-month swap rate 203 pips
Value date for spot transactions on 3 March = 7 March
1-month value date = 7 April
2-month value date = 9 May
25 April – 9 May = 14 days

\[
\begin{array}{c}
203 \\
-101 \\
102
\end{array}
\]
2-month swap rate
1-month swap rate
= 3.4 pips per day
(approximation)

\[
14 \times 3.4 = 48 \text{ pips for 14 days (approximation)}
\]

\[
\begin{array}{c}
203 \\
-48 \\
155
\end{array}
\]
= arithmetic swap rate
on 3 March for delivery on 25 April

Money market transactions, specifically those geared to short-term capital exports, are often coupled with swap transactions. If the outflow of capital involves investment in another currency and this investment has to be hedged, a swap transaction is required. As we have seen, a swap is a combination of a spot purchase and a simultaneous forward sale (or vice versa) in a given currency.

It should be noted that the method used to calculate the costs of swap transactions is not the same as the method used for “outright” transactions. This is
because the amount invested in the spot price is hedged and the sum involved in the forward transaction is paid back (capital plus interest). If the forward rate is below the spot rate (i.e. if it is trading at a discount), the swap costs are slightly higher in percentage terms. In the past this was taken into account by using the forward rate instead of the spot rate.

However, the sharp increase in interest spreads in the 1980s meant that the rates calculated were increasingly unsatisfactory. Deviations of up to 0.5% were observed. Consequently, a somewhat more complicated formula is now used to calculate the exact costs, although approximations are often sufficient in individual cases. The two methods give the following results:

**Old method:**

\[
\text{Swap costs} = \frac{\text{swap} \times 100 \times 360}{\text{spot} \times \text{maturity}} = \frac{0.0034 \times 100 \times 360}{0.6740 \times 90} = 2.02\%
\]

**New calculation:**

\[
\text{Swap costs} = \frac{(\text{swap} \times \text{deposit rate} \times \text{maturity}) + (\text{swap} \times 100 \times 360)}{\text{spot} \times \text{maturity}}
\]

\[
\frac{(0.0034 \times 5.42 \times 90) + (0.0034 \times 100 \times 360)}{0.6740 \times 90} = 2.03\%
\]

The difference between the two methods lies in the fact that in the second method in addition to the capital interest rates are hedged.

Another detail relating to the calculation of swap costs should be noted. Since it makes little difference to the calculation whether the bid or offer price is used, a rate between the two is generally used, giving a relatively “round” end-result. Long-term funds are generally invested abroad for two reasons:

- either because the domestic money market does not offer suitable investment opportunities
- or because investment in other countries and currencies generates a higher return, even after hedging.
This is an appropriate place to point out that—contrary to popular opinion—exchange rate hedging does not necessarily involve costs. “Weak” currencies are normally hedged against “stronger” currencies by entering into forward rate agreements for the “weak” currency. Many people believe that “weak” currencies are currencies trading at a “discount.” In such cases, hedging does entail costs. However, it has often been the case that the apparently “weak” currency has strengthened while the currency that was assumed to be “stronger” (trading at a premium) has weakened. Here are two examples to illustrate this: between February and October 1982 the GBP dropped from USD 1.82 to USD 1.61 although it traded at a premium throughout this period. Between February and September 1984 the dollar rose from DEM 2.70 to DEM 3.10, regardless of the fact that it consistently traded at a discount. In these specific cases, it would have been advisable to hedge sterling and the DEM against the dollar (in other words to buy dollars at a forward rate). This would have avoided exchange losses and even generated a “hedging gain.” Recent years have shown that exchange rates often move contrary to expectations. Outright transactions can just as easily generate high losses as high gains. Not only does this affect investors—be they private persons, companies or banks—it also affects banks in their function as counterparties.

Now let us return to the question of how forward rates are determined. It is hardly surprising to find that the forward rate for a currency alters in parallel with changes in the spot rate. However, it is interesting to establish why the difference between spot and forward rates varies, and when and why discounts and premiums expand and contract. Let us start by looking at the swap rate as this expresses an important relationship: In a free market such as the Euromarket, the swap rate tends to correspond to the interest spread between two currencies. For example, if a 3-month Eurodollar investment yields
6% p.a. and a 3-month Eurofranc investment yields 2.5% p.a., the swap rate will be around 3.5% p.a. In other words the dollar will trade at a discount of 3.5% p.a. to the franc or, putting it the other way round, the franc will trade at a premium of 3.5% p.a. against the dollar.

The constant interrelationship between swap rates and interest rates is evident. Assuming that dollar investments yield 6% p.a. and that the dollar’s discount against the franc is just 1% p.a., the net yield would be 5% p.a. Under these conditions, hardly anyone would remain in francs at 3.5%. Large sums would be shifted into dollars – bought at the spot rate and sold at the forward rate, thus increasing the discount. Moreover, the interest rate on dollars would decline and the interest on francs would rise. This process of adjustment would thus quickly even out the difference between the interest spread and the swap rate. As we have seen, the swap rate tends to be in line with the interest spread on the Euromarket, but which rate determines the other? So what determines the demand and supply of currencies at forward rates?

In normal times, in other words, when the markets are not overshadowed by currency turmoil or political upheaval, most forward transactions are generated by the money market and, to a lesser extent, commercial transactions. The level of interest payable on the various currencies in the Euromarket determines the swap rates. In turn, interest rates on the Euromarket reflect the corresponding domestic interest rates, provided these are not artificially depressed or inflated. Domestic interest rates are often influenced by official institutions and can thus differ from the rates on the Euromarket. In such cases, monetary and economic conditions in the country are reflected accurately in the Euromarket rates but not in domestic interest rates.
For example, if Euroland cuts its discount rate to stimulate the economy while US monetary policy remains unchanged, money market rates will decline in Euroland and – unless it significantly restricts the flow of capital - the short-term EUR rates on the Euromarket will also decline. Accordingly, the dollar’s discount against the EUR will rise to adjust to the wider interest spread between the Eurodollar and the EUR. Under normal circumstances, the swap rates depend on the level of interest rates but the situation is different when a currency suddenly comes under pressure for economic or political reasons. In such cases, outright sales of these currencies will surge suddenly, thus increasing their discount substantially. The interest rates for these currencies on the Euromarket and thus to some extent on their domestic markets will rise to take account of the higher discount.
What do forwards, futures and options mean?
7. Forwards, futures and options

**Futures**
Futures are very similar to forward transactions in many respects. There are a number of differences between the two, however: first, futures positions require a margin deposit to be posted and maintained daily. If a loss is taken on the contract, the amount is debited from the margin account after the close of trading. In other words, these futures are cash settled and no underlying instruments or principals are exchanged. Secondly, all contract specifications such as expiration time, face amount, and margins are determined by the exchange instead of by the individual trading parties. Finally, the standard expiration dates are each third Wednesday of March, June, September, and December. The face amount, and so the value per basis point for the different currencies does vary.

The most liquid futures contracts are those involving USD, EUR, and JPY as the quoted currency. There are, however, other cross rate contracts that trade very liquidly as well.

**Currency options**
Like futures and forwards, options are a way of buying or selling a currency at a certain point in the future. An option is a contract which specifies the price at which an amount of currency can be bought at a date in the future called the expiration date. Unlike forwards and futures, the owner of an option does not have to go through with the transaction if he or she does not wish to do so. As its name suggests, an option is a right but not obligation to buy or sell. Also, unlike forwards or futures, the price at which the currency is to be bought or sold can be different from the current forward price. The price at which the transaction is to be carried out is called the strike price.

There are three main styles of options: European-style options can only be exercised on their expiration date; American-style options can be exercised any
time until the expiration date; exotic options are options that may involve different payoff structures and/or exercise features. Exotic FX options are discussed briefly at the end of this section. The discussion until that point will concern mainly European options.

There are two main types of options: calls and puts. The buyer of a call has the right but not the obligation to buy the underlying asset at the strike price on or before a specified date in the future. However, the seller has a potential obligation to sell the underlying asset at the strike price on or before a specified date in the future if the holder of the option exercises his or her right. The buyer of a put has the right but not the obligation to sell the underlying asset at the strike price on or before a specified date in the future. On the other hand, the seller of a put has a potential obligation to buy the underlying asset at the strike price on or before a specified date in the future if the holder of the option exercises his/her right.

In the case of foreign exchange, every currency option is both a call and a put. For example the buyer of a EUR call / USD put has the right to buy a face amount of EUR in exchange for USD, the quantity of USD being determined by the strike price of the option. Conversely, this option can be considered as the right to sell (put) USD for EUR at an exchange rate defined by the strike price of the option.

### Call and put

<table>
<thead>
<tr>
<th>Long call</th>
<th>Buyer profit/loss</th>
<th>Seller profit/loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium</td>
<td>pays</td>
<td>receives</td>
</tr>
<tr>
<td>Maximum loss</td>
<td>premium paid</td>
<td>unlimited</td>
</tr>
<tr>
<td>Maximum profit</td>
<td>unlimited</td>
<td>premium received</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Long put</th>
<th>Buyer profit/loss</th>
<th>Seller profit/loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium</td>
<td>pays</td>
<td>receives</td>
</tr>
<tr>
<td>Maximum loss</td>
<td>premium paid</td>
<td>strike minus premium received</td>
</tr>
<tr>
<td>Maximum profit</td>
<td>strike minus premium received</td>
<td>premium received</td>
</tr>
</tbody>
</table>
An option is called “at-the-money” if its strike price is exactly the same as the forward price at which the underlying is currently trading. A call with a strike price which is favourable relative to the market price of the underlying, i.e., less than the market price, is called “in-the-money.” A call with a strike price that is greater than the price of the underlying is called an “out-of-the-money” option.

Value of a EUR call option

The following should be noted: if a call with a given strike price is in-the-money, then a put with the same strike price and maturity is out-of-the-money. The same is true in reverse for an out-of-the-money call.

Value of a USD put option
The buyer of an option pays a premium which depends primarily on two factors: its value as a forward contract and its volatility value. For example, an option that is in-the-money has value as a forward contract, since if the underlying exchange rate did not change until after the option’s expiration, then the option would be worth exercising. However, it is unlikely that exchange rates will ever stand still for very long, so that there is the possibility of the option ending up worth more or less in the future. In particular, the underlying price might end up below the strike, so that it is then not worth exercising the call option. Having the right but not the obligation to exercise the option protects one from incurring losses. In fact, the more volatile the exchange rate is, the more valuable the option is. This is referred to as volatility value.

While an in-the-money option has both an intrinsic value and volatility value, at-the-money and out-of-the-money options only have volatility value. The volatility value of an in-the-money call option represents protection from downward movements of the underlying price. In the case of out-of-the-money options the volatility value represents opportunity to profit from a beneficial movement of the underlying price. In general, the longer the time until expiration, the greater is the volatility value of an option.

Currency options are normally settled in the underlying instrument. For example if the buyer of a EUR call / USD put struck at 1.1600 exercises the option, he/she buys the face amount of EUR at the strike price and gives the predetermined USD amount to the seller of the option. Let us assume that the EUR call/USD put struck at 1.1600 has a face value of EUR 1 million and the EUR/USD rate is at 1.1900 at maturity. With the physical settlement, the buyer of the call will have got a bargain on his or her EUR. If he or she had to buy the EUR at market price,
he/she would have to pay USD 1.19 million instead of the USD 1.16 million paid upon the exercising of the option.

It is useful now to consider how to value an option. The value of an option is based on the following six variables: 1. spot price of the underlying; 2. strike price; 3. interest rate of the underlying currency; 4. interest rate of the countercurrency; 5. exchange rate volatility; and 6. time to expiration. By determining the values of the inputs, the price of an option can be determined, but it is outside the scope of this publication to enter here into the details.

**Physical settlement**

**Interest rate derivatives**

There is a myriad of interest rate derivatives. However, it is outside the scope of this booklet to present a comprehensive list or go into much detail on most of these. Consequently, some of the main types of interest rate derivatives will be discussed with a minimum of detail in this section.

For most major currencies there exist exchange-traded futures and OTC forwards on various types of interest rate instruments. For domestic markets this is true primarily for Treasury securities, such as government bonds and bills. In the Eurocurrency markets there are OTC forwards such as Forward Rate Agreements and swaps, and exchange-traded Eurocurrency futures. The latter will be described first, but it may
be useful to previously define what the term “Euro” means: if a product in a certain currency is traded outside its home country, it will be called a Euro product, such as a Euro future or a Euro option for example.

A Eurocurrency future is technically a future on a three-month deposit of an amount that varies by currency. These futures are traded on the International Monetary Market (IMM), LIFFE and SIMEX. For most currencies there are four quarterly expirations: each 3rd Wednesday in March, June, September and December. The exception is the USD, which has monthly expirations.

A Eurocurrency futures strip is a sequence of future contracts with non-overlapping expirations. Strips are usually bought in order to hedge when using Eurocurrency futures. Eurocurrency futures are cash settled daily, which makes them a better instrument to hedge an interest rate exposure than a future on treasury notes or bonds, where the underlying contract has to be delivered at expiration. However, the expiration dates and face amounts are fixed by the exchanges. This makes the futures a less than perfect instrument for hedging a specific interest rate exposure.

For this reason a Forward Rate Agreement (FRA) may be concluded with a bank in the OTC market. The terms of a FRA, such as face amount and expiration, can be fixed by the two parties involved in the agreement. This advantage, however, is offset by the fact that FRAs have credit risk, i.e., reliability of the counterparty and no margin paid upfront.

An OTC alternative to a futures strip, or a strip of FRAs, is a swap. An interest rate swap is an agreement between two counterparties to exchange interest rate payments. A typical swap involves one party paying a fixed rate (the swap rate) and the other
party making payments based on an interest rate that is reset at the beginning of each period. When entering into a swap, the net value is usually zero since the fixed and the floating side are considered to have the same value. No other payments, such as upfront fees or premiums, are to be made. For example, one party might pay in Swiss francs a fixed rate of 3.07% annually and receive the six month LIBOR rate every six months for the next five years.

**Interest rate swap**

In a swap the payments can be netted, and the face amount, referred to as the notional principal, is not exchanged either at the beginning of the swap or at its maturity. When entering into a swap the following parameters need to be specified. 1. Start date: the first day of the period that is covered by the swap, i.e., spot or some day in the future; 2. end date: last day covered by swap; 3. notional principal: basis for calculating the interest rate payments; 4. fixed rate: swap rate, depending on maturity and market conditions when entering into swap; 5. floating rate: rate that is reset for every period, usually 3-month or 6-month LIBOR; 6. date of setting for floating rate: usually two working days prior to each period; 7. reference rate: how floating rate is set, i.e. a Reuters page where LIBOR fixings are published.
The main application for a swap is that the payout of an asset or a liability can be structured in a way preferred by the holder. For instance, floating rate debt can be converted into fixed rate debt. The payer of floating rate debt enters into a swap where he will receive floating payments, which are passed on to the holders of the liability, and makes fixed payments to the counterparty of the swap.

Or, alternatively, a fixed rate debt can be turned into a floating rate debt when entering into a swap by receiving fixed and paying floating. There is no point in describing in detail all the different possibilities of how a swap can be structured since the permutations are endless. Here are simply a few more examples:

- a forward swap: starts at some point in the future
- an amortizing swap: notional principal decreases over time
- quanto swaps: payout of floating rate in another currency than the floating rate index
- an off-market swap: one counterparty receives a premium upfront and pays a higher rate over time
- swap with a fixed final maturity: two floating rates, i.e. a 2-year rate against a 5-year rate, both rates reset every year.

In a cross-currency swap both counterparties exchange at start date the face amounts in two different currencies, at spot exchange rate. During the life of the swap each counterparty makes interest payments in the currency received. At the end date, both counterparties make their last interest payment and exchange the face amounts again at the same condi-

**Cross-currency swap**

<table>
<thead>
<tr>
<th>Currency</th>
<th>Amount</th>
<th>Counterparty</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD</td>
<td>100</td>
<td>Client</td>
</tr>
<tr>
<td>CHF</td>
<td>140</td>
<td>CHF-Bond</td>
</tr>
<tr>
<td>USD</td>
<td>100</td>
<td>UBS</td>
</tr>
<tr>
<td>CHF</td>
<td>140</td>
<td>UBS</td>
</tr>
</tbody>
</table>
tions as at the start date. To illustrate this, consider the following example: a US-based company issues a bond in CHF but needs the money in USD. So it enters into a cross-currency swap where it initially exchanges the CHF for the preferred USD. During the life of the bond the company pays interest in USD to the bank, which in turn pays the CHF interest due on the bond. At redemption, the bank pays the CHF interest and the CHF face amount to pay back the loan, and receives USD from the company.

For the major currencies there are options on literally all types of interest rates and interest rate products such as government bonds and swap rates. Interest rate options can be classified into three groups: floating rate options, fixed rate options and spread options.

A cap is a strip of call options on an interest rate: if at expiration the particular interest rate is greater than the strike rate of the option, then the owner of the option receives payment. This payment is received each time the underlying interest rate is greater than the strike rate of the option at the set time intervals. When buying a cap, the following parameters need to be specified: 1. start date; 2. end date; 3. notional amount; 4. strike rate; 5. life of the underlying instrument; 6. reference rate. A cap for an interim period in a multiperiod agreement is also called a caplet. So, for instance, a cap with an immediate start date, a maturity of 4 years and a reset interval of 6 months is composed of 7 caplets – only 7 since the caplet for the initial period is not calculated. If this first caplet were out-of-the-money, it would be worthless. Were it in-the-money, it would be the same as a deposit since the exact payout would be known.

Let us assume that a firm has to make semi-annual interest payments, the size of which is determined by the six-month interest rate prevailing six months before the payment is due. This borrower is exposed
to the risk of rising interest rates. Consequently, the firm buys an interest rate cap. Often borrowers with floating rate debt are not willing to enter into a swap and pay a fixed rate when the interest rate curve is normally shaped, meaning the short end is lower than the long end. They are reluctant to pay the higher long-term interest rate and therefore prefer to stay floating. But they will buy a cap for protection against higher rates. Some will then buy a cap with a low strike, which is more expensive; others will buy a cap with a high strike (out-of-the-money) as a sort of fire insurance policy.

Lenders are usually concerned about interest rates falling, thus diminishing their investment return. To protect against falling interest rates, a “floor” can be purchased. The floor is a portfolio of puts on the interest rate, with terms similar to those for a cap.

In order to reduce the premium paid for protection, a buyer of a cap might sell a floor. Such a strategy is called a collar. The collar part of the name derives from the fact that the owner of this position will never pay an interest rate higher than the cap strike, but also never pays an interest rate below the floor strike. Hence, the interest rate payment is “collared” between the floor and cap strikes. The strategy is called a zero premium collar when the floor has the same value as the cap. The zero premium part stems from the fact that the floor paid for the cap.

A collar strategy sets a range for the floating rate interest payments to be made or received, while entering into a swap converts floating interest rate payments to a fixed rate. Another possibility is to purchase an option to enter into a swap, called a swaption. Bond options and swaptions are known as fixed rate options. The first step in defining a swaption is to specify into what kind of swap it can be exercised. This could be either of the swaps described above. There are two types of swaptions:

---

A floor protects against falling interest rates

A collar involves a buyer of a cap selling a floor

Fixed rate options

A swaption is the option to enter into a swap
Floating rate options (1)

Cap buyer receives the difference between the market rate and the cap strike from the cap seller

Floating rate options (2)

Floor buyer receives the difference between the market rate and the floor strike from the floor seller
payer’s swaptions and receiver’s swaptions. If the buyer of the swaption has to pay a fixed interest rate when the option is exercised, then it is known as a payer’s swaption. If he/she can receive the fixed rate, however, then it will be called a receiver’s swaption. In addition the expiry date, i.e. when the swaption is exercised (usually two business days before start date of the swap) and the settlement type must be defined. There are two types of settlement: cash or physical. With physical settlement the buyer of a swaption exercises into a real swap position. With cash settlement, the buyer and the seller have to agree on how the value of the swaption is determined when it expires in-the-money. The trader then usually has to contact several banks and ask for the swap rate relating to the underlying swap. The net present value is then calculated from the average of these quotes.

To see why a swaption is equivalent to a bond option, suppose that a company has floating rate liabilities worth CHF 200,000,000. Although the company is satisfied with the current level of interest rates, it is concerned that they could suddenly rise. To reduce its exposure, the firm buys a payer’s swaption on CHF 500 million. This swaption gives the firm the right to pay a predetermined fixed rate on 25% of its debt. The firm could just as easily have bought a put on a bond. The put could be made out to a face value of CHF 500 million at a price determined by the swap rate.

Spread options are options whose returns vary according to the difference between two interest rates, either in the same currency or in different currencies. For example, an option can be bought to receive the difference between the one-year USD interest rate and the five-year USD interest rate in six months time. An example for the latter would be an option on the difference between the EUR and CHF five-year...
interest rates. The former are more often used by bond fund managers, while the latter are used by both bond fund managers and managers of debt portfolios in different currencies.

As with currency options, exotic options also exist on interest rates.

Below are a few examples:
– chooser cap: instead of buying a normal cap with for example 10 caplets the buyer only has the right to the payout of 5 caplets, which can be freely chosen.
– knock-out cap: if the interest rate at fixing date of a caplet is above the outstrike, there is no payout for this caplet.
– digital option (bet option): the owner receives at expiry either nothing or a certain fixed amount.
– contingent swaption: the swaption buyer only has to pay the premium when the swaption expires in-the-money.

**Exotic options**
The term exotic options is normally used for types of options which are not standard in the same way as European or American calls and puts. For a European-style option all that matters is whether or not an option has a favourable strike price compared to the underlying market price at expiration. Unlike “plain vanilla” options (i.e. standard options), exotic options have additional features.

These additional features of exotic options almost always originated from a specific requirement on the part of an end user. Option providers combine a customer’s interests with their own to create what is usually a cheaper option than the standard option due to the different, or adjusted, risk profile. The market for exotic options is growing rapidly and is extremely innovative, as the already broad range of products shows (see chart on next page).
Exotics

Barrier options
- Out options: Knock out, kick out, Double knock out
- In options: Knock in, kick in, Double kick in

Payout options
- European triggers
  - Directional
  - Digital call & put
  - Range
  - Range digital

  - American triggers
    - Directional
    - Lock in, lock out, one touch
    - Range
    - Double lock out, Double lock in

Basket options

Additional options
- Average Rate Options (ARO)
- Compounds
Knock out option

- Automatically terminates if the spot reaches the outstrike before maturity.
- Spot travels in the out-of-the-money direction in order to reach strike.
- Knock out costs less than the standard option with the same strike.

Double lock out option

- Automatic payout of a fixed amount at maturity if the spot trades at or between the predefined outstrikes before maturity.
- Simple way of selling volatility.
- Also used as part of structured products.
The following examples involving barrier options should help illustrate how exotic options work. Barrier options are similar to standard options except that they have an additional feature. This feature is the barrier which either cancels or activates the option. Due to this barrier the option premium is lower than that of a comparable plain vanilla option. The following are examples of barrier options:

In addition to the strike level, the out option has a predetermined barrier level (the “outstrike”). If the underlying breaches the barrier level the option is automatically terminated. If the outstrike is never touched the payoff of the out option will be the same as that of the equivalent standard option. As an example, a knock out option is explained above.

In addition to the strike level, the in option has a predetermined barrier level (the “instrike”). The option is only valid if the instrike is reached during the life of the option. Once the instrike is hit the in option becomes a standard option.

Payout options pay a fixed amount if a certain level is reached (lock in option) or, alternatively, if a certain level is not reached (lock out option). Above is an example of a double lock out option. As long as EUR/USD stays between 1.06-1.26 during the life of the option (i.e., neither barrier is reached) the buyer of the option will receive the prespecified payout amount. If either level is reached, the option is worthless and expires.

**Structured products**
Structured products give investors the opportunity to enhance the performance of their portfolios by harnessing fluctuations in the currency markets. Unlike other types of investment, they also constitute good diversification vehicles. Structured products can be broken down into:
• Capital-protected products (GROIs)
• Non-capital-protected products (DOCUs, BLOCs)

A GROI is an exchange-rate-related investment instrument that secures the buyer a higher return than on money market investments. The capital invested and, depending on the product selected, a minimum rate of interest are repaid in their entirety. Furthermore, the investor participates in a rising, falling or even stagnating market for a currency pair. In order to do this, he or she has to renounce part or all of the short-term interest. If the investor has guessed the direction of the market correctly, he or she will enjoy a maximum return. The individual risk/return profile determines the level of participation in exchange rate fluctuation as well as the level of capital protection.

Types of GROIs:
A GROI can contain all different types of options and, as a result, can be geared to specific client requirements or the market consensus. We break GROIs down into:
**Example of a range GROI:**

**Initial situation:** An investor has USD and wants to enhance his return versus the 3-month USD rate of interest, which stands at 4.8% p.a. He expects the USD/CHF exchange rate to hold steady over the next three months (spot: CHF 1.5000 per USD 1).

**Strategy:** invest in a range GROI; 100% capital protection; minimum interest of 1% p.a.; maximum interest of 8% p.a.; range of CHF 1.4400–1.5600 per USD 1.

**Analysis at maturity:** If the USD/CHF exchange rate remains within the range of 1.4400–1.5600 during the term of the GROI, the investor will receive his capital plus interest of 8% p.a. If, however, the USD/CHF exchange rate moves outside or touches this range, the investor will receive the capital he has invested plus the minimum interest rate of 1% p.a.
DOCUs are structured forex-linked products that have some of the features of fixed-income investment instruments and whose return depends on how a certain exchange rate develops. DOCUs guarantee a rate of interest that is always well above that offered by an ordinary money market investment in the respective base currency. The currency of the repayment is determined by an exchange rate at maturity. The capital invested is either paid out together with interest in the base currency or converted into the second currency at a pre-arranged rate and then paid out to the investor.

DOCUs are available in almost all currency pairs, with a wide range of strike prices, levels of returns, maturity structures and terms. This flexibility allows DOCUs to be tailored to specific client requirements.

Example of a DOCU:

Initial situation: An investor has USD and wants to enhance the yield he will enjoy versus the 3-month CHF rate of interest, which stands at 1% p.a. He expects the USD/CHF exchange rate to hold steady or rise slightly over the next three months (spot: CHF 1.5000 per USD 1).

Strategy: invest in a DOCU with a guaranteed rate of interest of 5% p.a. and a strike price of CHF 1.4600 per USD 1.

Analysis at maturity:
• If the USD/CHF exchange rate is above the strike price on the day the DOCU expires, the investor will receive a payout in CHF comprising the capital he invested plus 5% interest p.a.
• If the USD/CHF exchange rate is below the strike price on the day the DOCU expires, the investor will receive a payout comprising the capital he invested plus 5% interest p.a., converted into USD at a pre-arranged strike price.
BLOCs are a good alternative to direct currency investments if the investor is expecting exchange rates to move sideways or rise slightly. Unlike direct investments, BLOCs allow investors to harness a rise in the spot rate, with leverage, up to the cap level. The amount paid back to the investor depends on the exchange rate at maturity. If, at maturity, the exchange rate is above the cap level, the investor will receive an amount for each BLOC security that is in line with the cap level. If, at maturity, the exchange rate is below the cap level, the investor will receive a unit of the underlying currency for each BLOC security.

The FX-BLOC certificates offered by UBS Investment Bank can be bought and sold freely in the secondary market up until the maturity date. BLOCs can be issued in almost all currency pairs and for almost all maturity periods.

**Example of a BLOC:**

**Initial situation:** An investor has USD and wants to enhance his return versus the 6-month USD rate of interest, which stands at 5% p.a. He expects the
EUR/USD exchange rate to rise slightly over the next six months (spot: USD 1.0650 per EUR 1).

**Strategy:** buy a BLOC with USD 1.1050 cap per EUR 1; price: USD 1.0350, maximum yield 13.5% p.a.

**Analysis at maturity:**
- If the EUR/USD exchange rate is above or at cap level at maturity, a cash payment of USD 1.1050 will be made per certificate (corresponds to a maximum yield of 13.5% p.a.).
- If the EUR/USD exchange rate is below cap level at maturity, the investor will receive one euro per BLOC certificate. In the worst case scenario, the investor has acquired one euro at a better price (USD 1.0350) than would have been available with a forward rate at maturity date.
Chart of an issue
How are cross rates calculated?
A client wishes to buy CHF for EUR 15 million. What is the rate?

Since all currencies are quoted against USD, the relevant rate must be calculated on the basis of the corresponding USD rates, which for the purposes of our example stand at the following:

<table>
<thead>
<tr>
<th>Currency Pair</th>
<th>Bid</th>
<th>Ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUR/USD</td>
<td>1.1383</td>
<td>1.1388</td>
</tr>
<tr>
<td>USD/CHF</td>
<td>1.4150</td>
<td>1.4160</td>
</tr>
</tbody>
</table>

The procedure is as follows:
- A client wishes to buy EUR. If this currency is not in stock, it must be bought against USD (preferably in a Euroland country, for reasons of reciprocity), at the EUR selling rate of the bank in Germany, i.e. for USD 1.1388.
- To purchase the USD, the CHF received by the bank from the client are sold to a bank in Zurich in return for USD at this bank’s USD selling rate, which stands at CHF 1.4160.

The selling rate for EUR against CHF is calculated using the following chain equation:

\[
\text{CHF} \times 1 = \text{EUR 1} = \text{USD 1.1388} = \text{CHF 1.4160} \\
\text{X (EUR 1)} = 1.4160 \times 1.1388 = \text{CHF 1.6125 (selling rate)}
\]

If the EUR are sold at CHF 1.6125, however, the bank does not earn anything because if EUR are bought and CHF are sold on the market, CHF 1.6125 is exactly equal to the cost price. For this reason, a small profit margin is normally added. It is clear that a bank would be more competitive if it already had its own foreign exchange positions.

However, if the customer wants to sell, rather than buy, EUR against CHF, the calculation is as follows:
CHF X = EUR 1
EUR 1 = USD 1.1383
USD 1 = CHF 1.4150
X (EUR 1) = 1.4150 x 1.1383 = CHF 1.6107
(buying rate)

However, there is not very much that a German customer can do with the rates calculated above. He or she would not be buying EUR against CHF, but rather selling CHF against EUR.
In other words, it is not the rate for EUR against CHF which is interesting, but the rate for CHF against EUR. Based on the same market rates
EUR/USD 1.1383 1.1388
USD/CHF 1.4150 1.4160
the calculation is as follows:
EUR X = CHF 1
CHF 1.4160 = USD 1
USD 1.1388 = EUR 1
X (CHF 1) = 1
1.4160 x 1.1388 = EUR 0.6201
(buying rate)

Another example: a customer in Zurich wants to buy GBP against CHF. What is the selling rate?
The current market rates are:
GBP/USD 1.6444 1.6454
USD/CHF 1.4115 1.4125
– GBP are bought against USD from a bank in London at its GBP selling rate of 1.6454.
– CHF are sold against USD to a bank in Zurich at its USD selling rate of 1.4125.
The result is as follows:
X (GBP 1) = 1.6454 x 1.4125 = CHF 2.3241

After the market closed yesterday evening, a bank in Brazil placed the following limit order: CHF 10 million are to be sold in exchange for EUR at a maximum rate of EUR/CHF 1.6000.

Example: limit order
The following opening rates applied this morning:
EUR/USD 1.1383 1.1388
USD/CHF 1.4150 1.4160

Question one:
Was it possible to execute this order when the market opened?

Question two:
Down to what rate would the EUR/USD rate have to fall, assuming that the USD/CHF rate remains unchanged, so that the order can be executed?

Question three:
Down to what point would the USD/CHF rate have to fall, assuming that the EUR against USD rate remains unchanged, to allow the order to be executed?

Question four:
What rate is CHF 1.6000 equal to in EUR?

Solution question one:
No, because the selling price would have been as follows:

\[ X \text{ (EUR 1)} = 1.1388 \times 1.4160 = \text{CHF 1.6125} \]

Solution question two:

\[
\begin{align*}
\text{USD X} & = \text{EUR 1} \\
\text{EUR 1} & = \text{CHF 1.6000} \\
\text{CHF 1.4160} & = \text{USD 1} \\
X \text{ (EUR 1)} & = \frac{1.6000}{1.4160} = \text{USD 1.1299}
\end{align*}
\]

Solution question three:

\[
\begin{align*}
\text{CHF X} & = \text{USD 1} \\
\text{USD 1.1388} & = \text{EUR 1} \\
\text{EUR 1} & = \text{CHF 1.6000} \\
X \text{ (USD 1)} & = \frac{1.6000}{1.1388} = \text{CHF 1.4050}
\end{align*}
\]
Solution question four:

\[
\begin{align*}
\text{EUR} & \quad \times \quad \text{CHF} \quad 1 \\
\text{CHF} \quad 1.6000 & \quad = \quad \text{EUR} \quad 1
\end{align*}
\]

\[
X \quad (\text{CHF} \quad 1) \quad = \quad \frac{1}{1.6000} \quad = \quad \text{EUR} \quad 0.6250
\]

An exporter wants to sell USD 1 million, 3 months forward, for CHF.

**USD/CHF** 1.5000 1.5010

From the reciprocal value it follows:

**USD/CHF** 1.5000 1.5010

**EUR-CHF rates, 3 months** 1.50%–1.70%

**EUR-USD rates, 3 months** 6.00%–6.20%

The technical sequence is as follows (see entries in account form):

1. The bank buys USD 1 million from the customer value-dated November 9, 1998, for CHF at a price still to be determined (1).
2. To eliminate the exchange risk immediately, USD is sold without delay for CHF spot at a market rate of USD/CHF 1.5000 (2).
3. The remaining liquidity risk (matching maturities) is eliminated by (3)
   – borrowing USD 1 million 3 months forward at 6.20%.
   – investing the equivalent in CHF 3 months forward at 1.50%.
4. This transaction costs the bank 4.70% (CHF 1.5000 = 0.0705)
   On a 3-month basis this amounts to
   \[
   \frac{0.0705 \times 90}{360} = 0.017625 = 176 \text{ pips}
   \]
   (without the cost of hedging interest in dollars).
5. The USD loan is repaid with value November 9, 1998 using the USD bought from the customer, while the CHF delivery is made with the maturing CHF deposit. (5)
6. For hedging purposes, the interest costs for the USD loan are bought forward at the approximate
forward rate (spot – interest differential of 1.5010–0.0176 (Pips) = 1.4834). The interest accrued on the CHF investment and the interest costs of the USD loan, expressed in terms of the countercurrency, are credited to and debited from the CHF account respectively. (6)

7. The client can be credited with the capital plus the interest earnings of the CHF investment and minus the interest costs of the USD credit.

Account entries

7 August, 1998

<table>
<thead>
<tr>
<th>USD</th>
<th>CHF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 000 000 (2)</td>
<td>1 500 000 (2)</td>
</tr>
<tr>
<td>1 000 000 (3)</td>
<td>1 500 000 (3)</td>
</tr>
<tr>
<td>1 000 000</td>
<td>1 500 000</td>
</tr>
</tbody>
</table>

9 November, 1998

<table>
<thead>
<tr>
<th>USD</th>
<th>CHF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 000 000 (1)</td>
<td>1 500 000 (5)</td>
</tr>
<tr>
<td>1 000 000 (5)</td>
<td>5 625 (6)</td>
</tr>
<tr>
<td>15 500 (6)</td>
<td>22 993 (6) interest costs</td>
</tr>
<tr>
<td>1 006 200</td>
<td>1 482 632</td>
</tr>
</tbody>
</table>

As the account diagram shows, the bank gets CHF 1,482,632 rather than CHF 1,500,000 after hedging for the USD 1 million received (at the spot rate of USD/CHF 1.500). This represents a USD/CHF forward rate of 1.4826. The difference between the spot and the forward rate is 174 pips. It is quite clear that this is a discount (borrowing in the high-interest currency, investing in the low-interest currency). The rule derived from this is:

- Foreign currencies earning the higher interest rate are traded at a forward rate below the spot rate = discount.
The forward rate of the lower-interest currency is always higher than the spot rate = premium. (Example: the bank borrows at a lower rate and invests in the higher rate counter-currency, resulting in a net profit that is passed on through the higher exchange rate.)

Mathematically, the premiums and discounts can be calculated using the following formula:

\[
\text{Swap} = \frac{\text{spot} \times (\text{deposit rate currency B} - \text{deposit rate currency A}) \times \text{maturity}}{36000 + (\text{deposit rate currency A} \times \text{maturity})}
\]

If the counter-currency interest rate is lower than that of the quoted currency, the result of the swap is negative and the forward rate is less than the spot rate. A discount then results. If the currency B rate is higher than the currency A rate, then there is a premium. The solution of the account example is as follows:

\[
\text{Swap} = \frac{0.7080 \times (4.36 - 1.27) \times 90}{36000 + (1.27 \times 90)} = 0.0054 = 54 \text{ pips}
\]

In principle, forward cross rates are calculated in the same way as spot cross rates. For example, a customer wants to sell GBP one-month forward against CHF one-month forward. What is the buying price?

The market rates are:

<table>
<thead>
<tr>
<th></th>
<th>GBP/USD</th>
<th>USD/CHF</th>
</tr>
</thead>
<tbody>
<tr>
<td>spot</td>
<td>1.6376</td>
<td>1.4070</td>
</tr>
<tr>
<td>- 1 month discount</td>
<td>12</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>1.6364</td>
<td>1.4029</td>
</tr>
<tr>
<td></td>
<td>1.6386</td>
<td>1.4080</td>
</tr>
<tr>
<td></td>
<td>1.6375</td>
<td>1.4040</td>
</tr>
</tbody>
</table>

The forward GBP are sold to a bank in the UK for dollars, i.e. dollars are bought at the forward selling rate of 1.6364 and
– CHF are bought forward, for example from a Zurich bank, and dollars are sold at the forward selling rate of 1.4029.

The calculation is:

CHF X = GBP 1  
GBP 1 = USD 1.6364  
USD 1 = CHF 1.4029  
X (GBP 1) = 1.6364 x 1.4029 = CHF 2.2957

The one-month forward buying price for GBP against CHF is thus CHF 2.2957.

By way of comparison: if the spot rate was

1.6376 X 1.4070 = CHF 2.3041

the discount (CHF 0.0084) would be 4.32% p.a.

Interest costs for a 3-month CHF deposit 1.10% p.a.
– interest earnings on a 90-day USD deposit 4.90%
– on the basis of USD/CHF 1.4070 1.4080
– 3-month discount (90 days) 41 40

The 3-month swap costs can be calculated as follows:
The counterparty buys the dollars forward at a discount of 41 pips, i.e.

\[
\frac{[(0.0041 \times 4.90 \times 90) + (0.0041 \times 100 \times 360)]}{(1.4070 \times 90)} = 1.18\%
\]

Total costs (1.10+1.18) 2.28%  
Interest received 4.90%  
Net interest differential in favour of the bank 2.62%

If there had been no hedge, which cost 1.18% p.a., the interest differential in favour of the bank would be 3.80% p.a. However, if on the maturity of the dollar deposit, the buying rate for dollars had dropped against CHF, the bank would have suffered an exchange loss which may not only have eliminated its anticipated profit, but even caused a book loss.
Here is another example illustrating the second case. The question to be answered is whether investments in other currencies and countries can produce a higher yield, even on a hedged basis. An interest rate advantage would be conceivable in such cases if it was accompanied by a higher-risk investment (e.g. credit or transfer risk).

The assumption is that:

a) the exchange rates are:
   \[
   \begin{align*}
   \text{USD/CHF spot} & : 1.4070 – 1.4080 \\
   \text{3-month premium} & : 41.5 – 40.5
   \end{align*}
   \]

b) the yield for 90-day demand deposits in Switzerland is 1.13% p.a.
   while the yield for US Treasury bills with identical maturities is 4.52% p.a.

A bank now wants to know if it is worthwhile investing in hedged US Treasury bills instead of demand deposits. The calculation it has to make is as follows:

- It will have to buy USD spot and simultaneously sell them 3 months forward, which is possible with a discount of 40.5 pips. (The counterparty dictates the terms!)
- This swap transaction costs
  \[
  \frac{[(0.00405 \times 1.13 \times 90) + (0.00405 \times 100 \times 360)]}{(1.4080 \times 90)} = 1.15\% \text{ p.a.}
  \]
- The hedged arbitrage operation thus yields
  \[
  \begin{align*}
  \text{4.52\% p.a. interest} \\
  - 1.15\% \text{ p.a. swap costs} \\
  \end{align*}
  \]
  \[
  \text{3.37\% p.a. total return}
  \]

The total return is thus higher than that on Swiss demand deposits, which means that the bank could invest in US Treasury bills.
The following is a description of various terms.
<table>
<thead>
<tr>
<th><strong>Glossary</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>American-style option</strong></td>
</tr>
<tr>
<td><strong>Anchor currency</strong></td>
</tr>
<tr>
<td><strong>Appreciation/upvaluation</strong></td>
</tr>
<tr>
<td><strong>Arbitrage</strong></td>
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<tr>
<td><strong>Asked price</strong></td>
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<tr>
<td><strong>At-the-money</strong></td>
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<tr>
<td><strong>Balance of payments</strong></td>
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<tr>
<td><strong>Band</strong></td>
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<tr>
<td><strong>Banknote rate</strong></td>
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<tr>
<td><strong>Banknotes</strong></td>
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<tr>
<td><strong>Bear</strong></td>
</tr>
<tr>
<td><strong>Bid/ask spread</strong></td>
</tr>
<tr>
<td><strong>Bid price (buying rate)</strong></td>
</tr>
<tr>
<td><strong>Bonds</strong></td>
</tr>
<tr>
<td><strong>Break-even point</strong></td>
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more an option is → in-the-money, the closer the
delta is to 1 and the more it is → out-of-the-money
the closer the delta is to 0.

**Delta hedging**  Method of hedging risk entered into by writing an
option by buying or selling a proportion of the under-
lying instrument in line with the delta of the option.
Example: The writer of a call option with a delta
of 0.5 would have to buy half of the amount of the
underlying instrument (e.g. USD) that he could
be forced to deliver upon expiration of the option.

**Deposit money**  Deposits held in current accounts and postal cheque
accounts from which cash can be withdrawn but
which are normally used for non-cash payments.

**Deposit transactions**  → money market operation.

**Devaluation/depreciation**  Rise in the exchange rate of a → currency; in the case
of → floating exchange rates, the currency depre-
ciates in the → currency markets, altering the price
paid in domestic currency for one unit of a foreign
currency. In the case of → fixed exchange rates, the
parity of the domestic currency is officially raised
against the foreign currency (price of one unit of the
foreign currency expressed in domestic currency).

**Digital option**  At expiry, the owner receives either nothing or a
certain fixed amount.

**Digital option**  (bet option)

**Discount**  Amount by which a forward price falls below a spot price.

**ECU**  European Currency Unit. Unit of account and
→ currency basket in the European Monetary
System; replaced by the → euro on 1 January 1999.

**Electronic Broking System**  Electronic trading system which makes flexible trading
possible from a figure of just USD 1 million. USD, CHF,
EUR, GBP and JPY can all be traded on EBS, which
increases the level of rate continuity.
**End-of-month reporting date**  
Last business/trading day in a month.

**Euro**  
Single currency of the → EMU countries, → ECU.

**Eurocapital market**  
Euromarket for long-term international bonds (Eurobonds).

**Eurocredit market**  
Euromarket for medium-term loans.

**Eurodollar**  
All assets and liabilities in the → Euromarket denominated in USD.

**Euromarket**  
International market where assets and liabilities are traded outside the state in which the currency in which they are denominated is legal tender.

**Euromoney market**  
International money markets in the major western European financial centres, especially London, Luxembourg and Zurich. Operates in parallel to national money markets.

**European Economic and Monetary Union (EMU)**  
Grouping of EU states with the objective of creating a common economic area with a single currency → euro.

**European Monetary System (EMS)**  
Exchange rate system set up by the EU member states on the basis of the → Bretton Woods system to create currency stability in a defined area. Preliminary stage in the introduction of the → euro.

**European-style option**  
Unlike → American-style options can only be exercised on → expiration date.

**European Union (EU)**  
15 European States (Austria, Belgium, Germany, Denmark, Finland, France, Greece, UK, Ireland, Italy, Luxembourg, Netherlands, Portugal, Sweden and Spain) which have joined forces to create an economic and political union.

**Exchange rate**  
Price of a foreign → currency expressed by traders as e.g. USD/CHF 1.20, i.e. USD 1 costs CHF 1.20, in other words USD 1 will be exchanged for CHF 1.20.
Harmonization of long-term purchasing power parity expectations and short-term interest parity expectations after a period of disruption. Immediate over-/undershooting of rigid price components offsets the slow alignment phase.

Exchange rate quotations may be either direct or indirect. A direct quotation expresses the value of a foreign currency (usually in units of 1 or 100) in terms of the local currency. Indirect quotations are less common. They express the value of the domestic currency in a foreign currency.

Comprises the exchange rates of a number of currencies that are set using the same principles. All currencies whose exchange rates are set by supply and demand on the currency market form a system of floating exchange rates. A system of fixed exchange rates pegs units of the currency to a reference standard (e.g. gold, USD, ECU, DEM etc.)

Exotic options are standard options with additional features aimed at meeting a client’s specific requirements.

The last day on which an option can be exercised.

Fiscal policy is concerned with public finances, i.e. all state activities giving rise to income and expenditure.

Officially set exchange rate.

Setting of official exchange rates for domestic currencies versus other tradable currencies.

1. Free determination of exchange rates without intervention on the part of the central bank. Prices are set on the currency market by supply and demand.
2. Dirty float: exchange rate policy based on the principle of floating exchange rates but where
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<td>Floating exchange rates are actually influenced by more or less regular intervention in the market.</td>
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<tr>
<td>Floating exchange rate</td>
<td>Exchange rate determined by market forces, i.e. the free interaction of supply and demand.</td>
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<td>Floor</td>
<td>Offers protection against falling interest rates.</td>
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<td>Foreign exchange</td>
<td>Monetary claims (bank balances, cheques, bills) denominated in a foreign currency and payable abroad; does not include foreign coins and banknotes.</td>
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<td>Foreign exchange controls</td>
<td>State controls on payments and capital transactions with foreign countries.</td>
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<td>Foreign exchange position</td>
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<td>Buying and selling of foreign currency, maintaining currency holdings, currency hedging, speculation on the forex market.</td>
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| Forward | 1. Unlike a futures contract, a non-standardized forward transaction that can cater to specific client requirements. Forwards are not traded on official exchanges.  
2. Exchange trades where settlement is more than two working days after conclusion of the contract. |
| Forward discount | → discount |
| Forward Rate Agreements | Two parties can use a forward rate agreement (also known as a future rate agreement) to hedge future changes in interest rates. They agree on the interest rate for a future period in a given currency and a price is assigned to this in advance. The risk element and the final settlement amount to the transfer of the difference between the agreed interest rates and the actual interest rates on the settlement date. Unlike futures, FRAs are not standardized contracts and are |
not traded on the stock market. Instead they are offered through → the interbank market.

**Forex/currency market**  Global system of permanent telephone, telegraph and computer links between buyers and sellers of foreign currency at non-banks and foreign exchange traders at banks and between foreign exchange traders themselves. Place where exchange rates are set.

**Fundamentals analysis**  Analysis of basic economic data (supply and demand) for a given market in order to predict future prices of traded goods. In the currency markets, fundamental analysis focuses on economic data for the relevant country. This forms the basis for forecasting long-term exchange rates.

**Futures contract**  Standardized futures contract traded on an official market (CBOT, IMM, LIFFE, COMEX, NYMEX). Contracts cover set amounts of a given commodity of a defined quality or set a price for a specific financial instrument.

**G-7**  (= Group of 7) Group of major industrialized countries. In view of their global economic power, the G7 countries have decided to coordinate their economic policies. Economic, currency and monetary policy targets are coordinated through contacts between their governments, central banks and other institutions. Member States: USA, France, UK, Germany, Japan, Canada, Italy (and Russia as the 8th member).

**Gamma**  Change in delta in response to a marginal change in the price of the instrument underlying an option.

**GDP**  Total income produced domestically. It corresponds to aggregate consumer spending by private households, public-sector spending on goods and services, capital expenditure and net exports.

**Gold standard**  System of fixed exchange rates in the late 19th /early 20th centuries in which all currencies were convertible into a fixed amount of gold.
Group of Ten  Group of originally 10, now 11 countries (Belgium, Germany, France, UK, Italy, Japan, Canada, Netherlands, Sweden, the USA and Switzerland) that have made the equivalent of 17 bn → SDRs in their currency available to the → IMF for loans under the General Agreement to Borrow. The Group of Ten plays an important role in negotiations on currency issues.

Hedge ratio  Proportion of the underlying instrument or options required to hedge the writing of an option. The hedge ratio is determined by → delta.

Hedging  Covering an open position against possible losses as a result of price movements by entering into a counter-transaction (e.g. → futures of forwards).

IMF  International Monetary Fund. Set up by the Allies in 1944 under the → Bretton Woods Agreement. Came into operation in 1946 in Washington. Its objective is to maintain currency stability. The IMF provides loans to help countries with balance of payments difficulties. Switzerland joined the IMF in the 1990s.

IMM  International Monetary Market.

Implicit volatility  Measure of the expected change in underlying value, calculated using an option valuation model and – inter alia – historical volatility.

Inflation  Reduction in purchasing power as a result of persistent price rises.

Inflation differential  Difference in the inflation rates of two countries. In terms of → purchasing power parity, a positive inflation differential implies a rise in the exchange rate, i.e. → depreciation.

Initial margin  Margin that both parties to a futures contract have to place with the clearing authorities through a bank or broker when the contract is concluded.
**In-the-money**  An option is “in-the-money” when:
- Call: forward rate > strike price
- Put: forward rate < strike price
In the case of → European-style options, the market price should be replaced by the strike price on the expiration date.

**Interbank trading**  Dealing between banks in the wholesale market.

**Interest arbitrage**  An attempt to profit from different interest rates for different maturities and/or different instruments.

**Interest rate parity**  Investments in the domestic and foreign market are equal in value when the interest rate on the domestic investment equals the interest rate on the foreign investment plus the anticipated change in the exchange rate.

**Intervention**  Purchase/sale of the domestic currency by the central bank in return for a foreign currency (usually USD), aimed at underpinning or weakening the exchange rate in line with official policy.

**Intrinsic value**  Difference between the strike price of an option and the future / forward rate for the underlying instrument up to expiration if the option is → in-the-money. The option → premium is composed of the time value and the intrinsic value of the option.

**Invisible account**  Part of the balance of goods and services within the → balance of payments. Comprises transport payments, income and expenditure for travel, insurance, licenses, income and interest from international capital flows as well as factor income.

**Knock out cap**  If the interest rate at fixing date of a caplet is above the outstrike, there is no payout for this caplet.

**Leverage**  Expresses the disproportionate shift in an option premium relative to a change in the price of the underlying instrument.
LIBID  London Interbank Bid Rate. Interest rate at which London banks are prepared to accept short-term funds.

LIBOR  London Interbank Offered Rate. Interest rate which banks in London charge one another for short-term investments.


Limit option  An extra feature of limit options is that they contain a limit at which the → option becomes valid or invalid.

Liquidity  1. Ability of a company to meet its payment commitments at any time.
2. Availability of liquid assets in an economy.
3. Ability of a market to absorb sudden shifts in supply and demand without excessive price fluctuations.

Lombard rate  Interest rate applied to loans secured by assets (commodities or securities) that are readily realizable.

Long and short positions  A bank’s foreign exchange holdings which when the exchange rate climbs cause the bank’s assets – expressed in the domestic currency – to rise. This is referred to as a “long position.” In the case of “short position,” the exchange rate falls causing the assets to decline.

Market maker  Forex trader who quotes buying/selling rates for foreign exchange on the basis of supply and demand in the market and carries out orders from clients.

Margin  1. Spread between → bid and → asked prices.
2. Security that the writer of an option and the purchaser of a forward or futures contract have to place with an approved authority to cover the risk of adverse price movements. → initial margin.
3. → valuation margin.

Mean rate  Margin between the bid and asked prices.
Monetary system
Authority of the State in matters of monetary policy. Determines the unit of currency, monetary policy and the manner in which money shall be issued and the money supply controlled.

Money market
Supply and demand of short-term debt instruments.

Money market operations
Acceptance and re-lending of funds (time deposits) on the money market.

Money supply
Stock of domestic money in the economy, comprising cash and deposits in savings and current accounts.

National accounts
Records of the source and application of funds in a country.

Net exports
Total exports minus total imports over a given period.

Non-transferable goods
Goods and especially services that cannot be traded because of their intrinsic properties or physical characteristics or as a result of legal provisions.

Nostro account
Accounts held (by banks) with other banks.

Option
Contractual right to buy (call option) or sell (put option) a specific amount of a given instrument at a predetermined price on (European-style option) or up to (American-style option) a future date.

Option writer
The party that writes (sells) an option. The writer enters into an obligation to guarantee the terms of the option contract throughout its lifetime. In return, he receives an option premium from the purchaser of the option.

OTC
Market in which securities are traded outside an organized stock market. Unlike stock market trading, transactions do not take place at a specific time or place.

OTC trading
OTC trading is separate from the trading that takes place on an exchange. This type of trading tends to
OTC trading (continued)  be conducted by dealers, brokers and customers by phone and telex.

Out-of-the-money  An option is “out-of-the-money” when:
Call: forward rate < strike price
Put: forward rate > strike price
For European-style options, market price should be replaced by the future price of the underlying instrument on the expiry date.

Outright  Sale/purchase of foreign currency forwards without entering into a corresponding spot transaction, i.e. the transaction is not covered by a swap.

Overnight  → Swap from one trading day to the next, i.e. one day or three days over a weekend.

Parity  Rate at which a unit of currency can be exchanged for a statutorily agreed reference item, e.g. a fixed amount of gold, SDRs or other currencies (official parity).

Pips  The last decimal places in an exchange rate quote. For the sake of simplicity, market makers use the last two decimal places only, as the other places generally do not change unless there are substantial movements in the market. In futures trading, the smallest price increase/reduction possible (one decimal place) is called a “tick.”

Plain vanilla  A standard exchange-traded option that is not tailored to a client’s requirements.

Premium  1. → Amount by which a forward price is above the spot price.
2. The price of the option which the purchaser of the option pays the option writer.

Price level  Price of a standardized basket of goods used to monitor price trends.
| **Purchasing power parity (PPP)** | Exchange rate at which, calculated in domestic currency, goods would be the same price abroad as they are domestically. |
| **Put option** | Opposite of a call option. |
| **Rate of growth in the money supply, Money creation** | Increase in the money supply by the central bank or commercial banks. |
| **Realignment** | Simultaneous, agreed revaluation and devaluation of a number of currencies. The term was first used in December 1971 for the realignment of the currencies of a number of countries under the Smithsonian Agreement. Since then it has been used for all adjustments to exchange rates in the European Monetary System. |
| **Reference/key currency** | Small countries that are heavily dependent on exports base their exchange rates on the major currencies that are important for world trade. anchor currency. |
| **Rigid prices** | Prices that are only adjusted from time to time, e.g. for negotiated wage rates, catalogue prices, etc. |
| **Risk position** | An asset or liability that is exposed to a risk of a change in exchange rates or interest rates. |
| **Rollover** | 1. Extension of the maturity of a foreign exchange transaction through conclusion of a swap (e.g. tom/next swap).<br>2. Variable interest rate for a medium-term loan based on the the current Euromarket rate (gen. LIBOR). |
| **Rollover credit** | Medium-term loan with variable interest rate based on the current Euromarket rate (generally LIBOR). |
| **SIMEX** | Singapore International Monetary Exchange. |
| **Snake** | System of currency cooperation between the EC countries created in 1972. Replaced by the EMS in 1979. |
Special Drawing Right (SDR) Reserve assets held by members of the → International Monetary Fund (→ Bretton Woods system). Members are allocated an amount of SDRs in proportion to their quota in the IMF. Their value is determined via a basket of currencies. Some countries define the → parity of their currency in SDRs.

SDR → Special drawing right.

Spot/next Swap transaction where the spot transaction is due for settlement on the normal delivery date while the forward contract matures one trading day later.

Spot transaction Currency transactions where settlement for both parties is at the latest two working days (generally on the second working day) after conclusion of the contract.

Spread option Spread options are options whose returns vary according to the difference between two interest rates, either in the same currency or in different currencies.

State spending Spending by the state to fulfil its public-sector obligations. Financed by taxation or debt. → fiscal policy.

Stop-loss order Order to buy (short position) or sell (long position) currency if the exchange rate rises above or falls below a given limit. The order is executed at the nearest price as soon as the exchange rate reaches a certain limit. Depending on the market situation, there can be a major discrepancy between the limit and the price at which the transaction is actually executed.

Strike price Price at which the purchaser of an option has the right to buy (call option) or sell (put option) the underlying currency.

Strip Series of financial contracts with non-overlapping maturities. Strips are usually bought for hedging purposes when using Eurocurrency futures.
Swap  Purchase of a currency in return for another currency on a given future date and simultaneous repurchase of the currency from the same counter-party at a different maturity. The delivery date is normally the same as for spot transactions.

Swaption  With a swaption, the purchaser acquires the right but not the obligation to enter into a swap at a predetermined price on a specified future date.

Tau  Expresses the change in the price of an option if the implicit volatility changes by 1%.

Technical analysis  Analysis of historical price and volume data for a market – often with the aid of charts – as a basis for forecasting future price trends for the relevant asset or commodity. Foreign exchange traders often use technical analyses of exchange rates to forecast short-term exchange rate movements.

Theta  Shows the change in the price of an option (change in the premium price) over time (per time unit). Mathematically, this corresponds to the first derivative of the option premium based on time factor.

Tick  → Pips.

Time deposit  Funds placed with a bank for a predefined period at a set interest rate. In Switzerland, time deposits may have maturities of 3–12 months. For larger sums, terms (maturity, interest rate) can be negotiated individually.

Tom/next  → Swap, involving a spot transaction for delivery on the next trading day and a forward contract for delivery on the following trading day, i.e. the normal delivery day for spot transactions.

Trade balance  → Balance of payments, → current account, → net exports, record of the flow of goods.
**Trade-weighted exchange rate** The change in the value of a currency relative to a basket of currencies (index). The composition of the currencies included in the basket and their weighting are determined on the basis of how much the country of the currency to be valued exports to its trading partners.

**Twin deficits** Simultaneous budget deficit and current account deficit. This means that foreign capital flows into the country and domestic capital is therefore reduced.

**Valuation margin** Security to be deposited by the buyer of a forward/futures contract if the initial margin is eroded as a result of price losses during the term of the contract.

**Value date** The date on which an amount is booked by a bank, i.e. the date when the booking of interest starts or finishes.

**Vega** Expresses the change in the price of an option if the implicit volatility changes by 1%.

**Volatility** Measure of the relative deviation of an exchange rate from the mean.

**Volatility value** This is the value of an option when the intrinsic value is zero. It merely reflects potential changes in the price of the underlying instrument that ensure that the option could have an intrinsic value at a later date.
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