
UNIT 5 FOREIGN EXCHANGE MARKET

Objectives

After going through this unit you should be able to:

- Understand spot exchange market and exchange rate;
- Know the meaning of reciprocal and cross rate;
- Understand forward exchange market and forward rate; and
- Calculate arbitrage in spot as well as forward market.

Structure

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5.1 INTRODUCTION

A market is the place where assets are sold and bought. Assets may be in form of a product, a commodity or even a currency. Thus, we may come across a grain market, a cloth market, a furniture market and so on. A foreign exchange market is the one where one currency (foreign currency) is bought and sold against another currency (domestic or home currency). The genesis of foreign currency market is traced to the need for foreign currencies to facilitate international trade, foreign investment and borrowing from or/lending to foreigners. We all know that most of the sovereign nations have their own currency. For example, India's currency is called rupee while that of USA is called dollar and that of Japan is yen and so on. So, for India, all currencies are foreign currencies, except rupee.

Every country needs to deal with several foreign countries for trading, investment and other business activities. In fact, this trend is becoming more and more visible with the globalisation gaining momentum. Now, in order to be able to pay for imports or receive payments for exports, companies/individuals residing in one country have to acquire or dispose off the currency of another country.



Foreign exchange markets provide the facility of exchanging different currencies. The price of one currency in terms of another is known as exchange rate. Exchange dealers do the job of the exchange of currencies. The demand and supply in the foreign exchange markets permits the establishment of the rate of one currency in terms of another. The transaction in the foreign exchange market can be either to exchange cash or to buy/sell some other instruments. The major instruments are currency forward, currency futures, currency options and currency swaps.

The market for foreign exchange is the largest financial market in the world. It is open somewhere or the other in the world all the time such that it is said to be a 24 hours-a-day and 365 days-a-year market. The worldwide trading is more than a colossal amount of US \$1.5 trillion per day. While London is the world's largest foreign exchange trading centre, New York is the largest trading centre in the USA. Other trading centres in the world where trading volumes are significant are Tokyo, Singapore, Frankfurt, Paris, Hongkong and Zurich etc.

In broad sense, foreign exchange market enables the conversion of purchasing power from one currency into another, bank deposits of foreign currency, the extension of credit denominated in a foreign currency, foreign trade financing, and trading in foreign currency options, futures and swaps.

Spot transactions refer to the transactions involving sale and purchase of currencies for immediate delivery.

Currency forward contracts are settled on a future date even though the forward rates are quoted at present moment (or today). They are quoted just like spot rate but actual delivery of currencies takes place much later.

Currency futures are conceptually similar to currency forward. Yet, they are distinctly different from the latter in terms of their quotations and dealing.

Currency options are the instruments that give choice to their holder to buy or sell a foreign currency on or up to a date (also called maturity date) at a specified exchange rate (also called strike rate).

Swaps are the instruments that enable two parties to exchange the stream of cashflows in two different currencies,

5.2 SPOT EXCHANGE MARKET

Spot market is the market where transactions of buying and selling are done for immediate delivery. In real practice, cash settlement is made after two working (business) days, excluding holidays. In some cases, it takes less than two days also. For example, the trades between US dollar and Canadian dollar or Mexican peso are settled in one day.

Spot transactions are increasing in volume. London market is the first market not only in terms of volume but also in terms of the number of currencies traded there. The most significant currencies in terms of volume of their trade are dollar, yen, euro, UK pound and Swiss franc.

The spot exchange market is an over-the-counter (OTC) market. This means that trading does not take place in a central market place at any identified geographical location where buyers and sellers gather to transact. Instead, this market is a worldwide linkage of currency traders, non-bank dealers, foreign exchange brokers who are connected to one another via a network of telephones, computer terminals and automated dealing systems. The largest vendors of quote screen monitors used in the currency trading are Reuters, Telerate and Bloomberg. The communication system of exchange market is rather sophisticated and functions well twenty-four-



hours-a day. The market can be divided into three major market segments: Australasia, Europe and North America. Australasia includes Sydney, Tokyo, Hongkong, Singapore and Bahrain. Europe includes Zurich, Frankfurt, Paris, Brussels, Amsterdam and London. North America includes New York, Montreal, Toronto, Chicago, San Francisco and Los Angeles.

Though some trading rooms may be functioning over three eight-hour shifts in order to trade around the clock, jet most operate over a 9 - to 12 - hour working day. Maximum trading takes place when trading hours of the Australasia centres overlap with that of European centres and when the trading hours of European centres overlap with the American centres. More than half of trading in US centres occurs between 1300 hours and 1700 hours GMT when the European markets are still open.

5.3 PARTICIPANTS IN THE EXCHANGE MARKET

The major participants in the exchange market are Central Banks, commercial banks, brokers, arbitrators, and speculators.

Central Banks participate in foreign exchange markets, essentially to contain the volatility of exchange rate. If the domestic currency fluctuates too violently, it causes uncertainty, in the business transactions. Therefore, central banks buy (or sell) foreign currency from the exchange market in order to avoid sudden and large appreciation (or depreciation) of domestic currency. The objective of Central Bank intervention is not to make profit out of these transactions but to maintain a smooth change in exchange rate in keeping with requirements of national economy. For example, if rupee is witnessing a continuous decline vis-a-vis US dollar, the Central bank (Reserve Bank of India) may release (or sell) dollars to increase their supply in the exchange market. This operation will have effect of halting the slide in the value of rupee vis-a-vis dollar. Or, it can intervene by buying dollars from the market in case it wants to prevent the domestic currency from hardening against dollar.

Commercial banks participate in the foreign exchange market either for their own account or for their clients. When they are dealing for their clients, they act as intermediary between seekers and suppliers of foreign currency. For their own account, banks may operate either as speculators or arbitraguer/or both. Big commercial banks act as market makers, by quoting two-way prices, one for buying and the other for selling a foreign currency. A bank may buy more foreign currency than it sells. For example, a bank has bought euro 1 million and sold euro 0.8 million. So it is holding a net amount of euro 0.2 million. Thus, it is said to have taken a risk by holding a net position. In case, the rate of euro goes down after the bank has taken a net position, it will incur a loss. On the other hand, it will make a gain in case euro goes up while the bank is holding a net position in euro. Thus banks take positions which expose them to exchange risk. When they take risks deliberately, they are said to be acting as speculators.

In a way, foreign exchange market is an extension of one of the primary functions of a commercial bank, that is, to assist the clients who are doing international transactions. For example, a corporate client importing material from abroad would need a source of foreign exchange if the import price is invoiced in the exporter's home currency. On the other hand, an exporter might have to dispose off foreign exchange if the payment for the export was received in the importer's home currency. Commercial banks assist clients in foreign exchange transactions of this type.

Inter-bank foreign exchange market is network of correspondent banking relationship. In this network, large commercial banks maintain demand deposit accounts with one another, called correspondent banking accounts. An example



would clarify how the system operates. Consider a US importer purchasing goods from an European exporter invoiced in euros, at a cost of •800000. The US importer will contact his US Bank and ask it to transfer this euro amount to the European exporter. Say, US Bank offers a price of •0.80/\$ which the US importer accepts. Then US Bank will debit the Importer's account by \$1000000 (or \$1 million) for the purchase of euros. US Bank will instruct its correspondent bank in Europe to debit its correspondent bank account by •800000 and to credit the amount to the European exporter's bank account. Thus there will be a reduction of •800000 in the US Bank's correspondent account held with the European Bank. Of course, there will be reduction of \$1 million in the US importer's account held with the US Bank.

Foreign exchange brokers participate in the market as intermediaries between different dealers or banks. They do not take a position on their own. Their role is simply to find a buyer and a seller for the same amount for given currencies. For their services, they charge a brokerage fee. Certain brokers may specialize in specific currencies. Their fee is small when dealing in highly liquid currencies whereas they are likely to charge higher amounts for relatively illiquid currencies.

Arbitraguers profit by discovering price differences between pairs of currencies at different dealers or banks. Their operations are risk free as they buy cheap and sell dear. For example, a market operator found out that there is a difference between the rates of two dealers. While the dealer A is quoting a rate of Rs 45 per dollar, the dealer B is quoting Rs 45.10 per dollar. The market operator will, without loosing time, buy dollar cheap from the dealer A and sell the same to the dealer B. In the process, he will make a gain of Re 0.10 per dollar. Arbitrage opportunity basically arises from imperfections in the market, giving rise to price differentials. As the markets get more and more integrated, the scope for arbitrage becomes less.

Speculators are deliberate risk-takers. They participate in the market to make a gain which results from an unanticipated change in exchange rate. An open position in a foreign currency is speculation. Speculators can be either bulls or bears, Bulls expect that a currency is going to appreciate in near future. So they buy now or, in other words, they take a long position. They sell it when its value rises, thus making a gain. On the other hand, bears expect that a particular currency is going to become cheaper in future. So they sell it now, or in other words, they take a short position. They buy it back when it depreciates, thus making a gain.

It should be noted that unlike arbitrageur, speculators may suffer loss if the currency of their choice moves in the direction opposite to their expectation. Often, questions are raised as to whether speculation is desirable or whether it should be discouraged. Of course, when some market participants do it to destabilize a market, it becomes an evil. Otherwise, a certain amount of speculation is considered desirable so as to increase the liquidity in the market.

Other participants in the exchange market are individuals who need to buy small quantities for travelling abroad or sell when returning from foreign trips. But their role in terms of volume of transactions is insignificant.

5.4 EXCHANGE RATE QUOTATIONS

Exchange rate means the price of one unit of a currency in terms of some units of another currency. For example, Rs 45/US\$ means that an amount of Rs 45 is needed to buy one US dollar or Rs 45 will be received for selling one US dollar. When there is no difference between buying and selling rate, the rate is unique or unified. But, in practice, it is rarely so. A dealer, who is willing to buy and sell the same currency against another, does not quote an identical price for buying as well as selling. Buying rate is also called bid rate while selling rate is also known as offer rate or ask rate.



The dealer keeps a difference between buying and selling price. This difference is x 100 per cent known as spread and constitutes his profit. Look at the examples given in the Table 5.1.

Table 5.1: Quotations of Exchange Rates

Currency pair	Buying (Bid) rate	Selling (Ask) rate
Rupee/US \$	44.5000	44.6500
Rupee/•	56.0000	56.1250
Rupee/UK £	79.1000	79.3000
Rupee/SFr	31.0000	31.1500

Now consider the rupee/dollar rate. From the figures, it is clear that the bank (dealer) will buy a dollar for Rs 44.5000 and sell a dollar for Rs 44.6500. The difference between the buying and selling rate (or the spread) is Re 0.1500. This is the profit of the dealer. The quotations are always with respect to the dealer. So, if an individual or an enterprise wants to sell a dollar, the dealer will apply his buying rate and give the seller Rs 44.5000 for one dollar. Similarly, the dealer will charge Rs 44.6500 when an individual or an enterprise wants to buy a dollar. The prices are normally quoted upto four decimal points when large transactions are involved. They can be quoted upto two decimal points for small transactions. Likewise, the spreads vary depending on the volume of transactions. For small value., spreads tend to be larger and vice-versa.

Spread can be expressed either as an absolute figure or in terms of percentage.

Thus

$$\text{Spread (in absolute figures)} = \text{Selling rate} - \text{Buying rate}$$

Spread in percentage can be expressed either with reference to buying rate or with reference to selling rate. When buying rate is taken as reference, the denominator is buying rate. Thus,

$$\text{Spread (in percentage)} = \frac{\text{Selling rate} - \text{Buying rate}}{\text{Buying rate}} \times 100 \text{ percent}$$

In case, selling rate is taken as reference, then the denominator is going to be selling rate. That is,

$$\text{Spread (in percentage)} = \frac{\text{Selling rate} - \text{Buying rate}}{\text{Selling rate}} \times 100 \text{ percent}$$

Now, we can calculate spreads for different currency pairs given in Table 1.1.

Example 5.1:

Let us calculate the spread for rupee/euro pair.

$$\begin{aligned} \text{Absolute spread} &= \text{Rs } 56.1250/\bullet - \text{Rs } 56.0000/\bullet \\ &= \text{Rs } 0.1250/\bullet \end{aligned}$$

$$\begin{aligned} \text{Spread (in percentage), based on buying rate} &= \frac{\text{Rs } 56.1250 - \text{Rs } 56.0000}{\text{Rs } 56.0000} \times 100 \\ &= 0.2232\% \end{aligned}$$



$$\begin{aligned}\text{Spread (in percentage) based on selling rate} &= \frac{\text{Rs } 56.1250 - \text{Rs } 56.0000}{\text{Rs } 56.1250} \times 100 \\ &= 0.2227\%\end{aligned}$$

Similarly, spread on rupee/pound currency pair can be worked out as follows:

$$\begin{aligned}\text{Spread (based on buying rate)} &= \frac{\text{Rs } 79.3000 - \text{Rs } 79.1000}{\text{Rs } 79.1000} \times 100 \\ &= 0.2528\% \\ \text{Spread (based on selling rate)} &= \frac{\text{Rs } 79.3000 - \text{Rs } 79.1000}{\text{Rs } 79.3000} \times 100 \\ &= 0.2522\%\end{aligned}$$

For the remaining two pairs of currencies, you work out spreads on your own.

Sometimes buying and selling rates may be written in condensed form rather than full out-right figures. For example, rupee-dollar rate in the Table 5.1 may be shown as 44.5000/6500. This simply means that last four digits of buying rate are to be replaced by 6500 to find outright selling rate. Likewise, rupee-euro rate written as 56.0000/1250 would mean that buying rate is Rs 56.0000/• and selling rate is Rs 56.1250/•. This is found by replacing the last four digits of buying rate by the four digits shown after the slash (/) sign.

It should be noted that the retail bid-ask spread is wider than the inter-bank spread. This means that lower bid and higher ask prices apply to the smaller sums traded at the retail level. The spread is likely to be bigger when the volatility is higher in the exchange market since the trader would like to charge for the increased uncertainty (risk) that comes with higher volatility. On the other hand, the spread decreases with the increase in dealer competition. Empirical studies have revealed that bid-ask spread decreases when the percentage of large dealers in the market place increases. Dealer competition is a fundamental determinant of the bid-ask spread.

5.4.1 Direct and Indirect Quotation

We all know that prices of commodities or products are quoted as Rupees *n* per kg or Rupees *n* per meter or Rupees *n* per piece. They are rarely, if ever, quoted as *m* kg per rupee or *m* meter per rupee or *m* pieces per rupee. But in case of exchange rate, it is quite possible to quote one way or the other. For example, the quotation can be either Rs 45 per dollar or \$0.0222 per rupee. Both quotations have the same meaning and are perfectly all right.

But these two quotations have been given a name. If the quotation in India is Rs 45/\$, then it is called direct form of quotations. The meaning is that one unit of a foreign currency (i.e. dollar) is quoted in terms of some number of rupees. But if the same quotation in India is presented as \$0.0222 per rupee, then it is termed as indirect form. The meaning is that one unit of domestic (local) currency is quoted in terms of some units of foreign currency. The direct form of quotation is also called European whereas indirect form is known as American.

Having understood the above illustration, we can easily identify which of the following is direct or indirect quotation:

- (a) Rs 56/• (in India)
- (b) •0.82/\$ (in USA)



(c) \$1.80/£ (in UK)

(d) •1.44/£ (in eurozone)

We see that quotation (a) and (d) are direct (European), whereas quotations (b) and (c) are indirect (American).

Most countries have adopted one form or the other as a convention for quoting exchange rates for foreign currencies. India and a very large number of other countries follow direct form. Very few countries such as UK and Ireland use indirect form of quotation:

5.4.2 Reciprocal Rates

A quotation in direct form can easily be converted into a quotation in indirect form and vice-versa. This is done by making the reciprocal of the given rate. For example a unique rate of Rs 56/• is in direct form if quoted in India. Its reciprocal •(1/56)/Re (or •0.01786/Re) is the indirect quote in India. In general, the reciprocal rate between two currencies A and B is found as follows:

$$(A/B)_{\text{bid}} = (B/A)_{\text{ask}} \quad (1)$$

and

$$(A/B)_{\text{ask}} = (B/A)_{\text{bid}} \quad (2)$$

Example 5.2:

•/\$ rate in direct form in Europe is given as follows:

$$\bullet 0.80/\$ - \bullet 0.81 /\$$$

To find reciprocal of these, we apply the equations (1) and (2). Thus,

$$\begin{aligned} (\$/\bullet)_{\text{bid}} &= (\bullet/\$)_{\text{ask}} \\ &= (1/0.81) = 1.2345 \end{aligned}$$

Likewise,

$$\begin{aligned} (\$/\bullet)_{\text{ask}} &= (\bullet/\$)_{\text{bid}} \\ &= 1.2500 \end{aligned}$$

So the reciprocal or indirect form of quotation in Europe becomes

$$\$1.2345/\bullet - \$1.2500/\bullet$$

Note that selling (or ask) rate is greater than buying (or bid) rate, as is expected.

5.4.3 Cross Rates

There may be two pairs of currencies with one currency being common between the two pairs. For instance, exchange rates may be given between a pair, A and B and another pair, A and C. Then the rate between B and C derived from the given rates of the two pairs (A and B, and, A and C) is called cross rate. This can be easily done by using the equations (3) and (4).

$$(B/C)_{\text{bid}} = (B/A)_{\text{bid}} \times (A/C)_{\text{bid}} \quad (3)$$

$$(B/C)_{\text{ask}} = (B/A)_{\text{ask}} \times (A/C)_{\text{ask}} \quad (4)$$

It should be kept in mind that these equations make use of the reciprocal equations, such as given below:

$$(B/A)_{\text{bid}} = (A/B)_{\text{ask}} \text{ and } (B/A)_{\text{ask}} = (A/B)_{\text{bid}}$$

Now, we take a simple example to illustrate cross rate.



Example 5.3

The following rates are known:

$$\text{Re/UK£: } 79.00 - 79.70$$

$$\text{Re/US\$: } 44.25 - 44.85$$

Here, between the two pairs, rupee is the common currency. We are required to find the cross rate between US\$ and UK£. So

$$(\text{US\$}/\text{UK£})_{\text{bid}} = (\text{US\$}/\text{Re})_{\text{bid}} \times (\text{Re}/\text{UK£})_{\text{bid}}$$

and

$$(\text{US\$}/\text{UK£})_{\text{ask}} = (\text{US\$}/\text{Re})_{\text{ask}} \times (\text{Re}/\text{UK£})_{\text{ask}}$$

Therefore,

$$(\text{US\$}/\text{UK£})_{\text{bid}} = (1/44.85) \times 79.00 = 1.7614$$

$$(\text{US\$}/\text{UK£})_{\text{ask}} = (1/44.25) \times 79.70 = 1.8011$$

That is, US\$/UK£ rate is 1.7614 - 1.8011. Again, we notice that the selling rate is greater than the buying rate, as expected.

You may be wondering what is the meaning of the cross rate in practice. It is simple to understand. The above rate tells us that by selling one unit of UK£, I will get \$1.7614. In other words, the dealer will buy from me one unit of UK£ by giving me \$1.7614 units of US dollar. But since this rate is not given right away, I have to pass through the common currency i.e. rupee. So, first, I sell one unit of UK£ to get 79.00 units of rupees and then sell this sum of Rs 79.00 to get 79.00/44.85 (or 1.7614) units of US\$. So we say, the dealer's buying rate is US\$1.7614/UK£.

The same logic will explain the selling rate US\$1.8011/UK£. That is, for selling one unit of UK£, the dealer will charge from me US\$1.8011, Since this rate is not given directly, I have to pass through the common currency, i.e. rupee. Therefore, first, I buy rupees with dollars. The dealer will give me Rs 44.25 per dollar. With these rupees, I buy UK£. The dealer will charge Rs 79.70 for each unit of UK£. Thus for the dealer, selling rate works out to be US\$ 1/44.25 x 79.70 per UK£ or US\$1.8011 / UK£.

Please bear in mind that cross rates are not limited to only two pairs of currencies. They can be used to derive a rate from three or more pairs as well. For instance, rates are known in three pairs A and B, A and C, and, B and D. But rate between the pair C and D is not known. This can be found by using equations (5) and (6). That is,

$$(\text{C}/\text{D})_{\text{bid}} = (\text{C}/\text{A})_{\text{bid}} \times (\text{A}/\text{B})_{\text{bid}} \times (\text{B}/\text{D})_{\text{bid}} \quad (5)$$

$$(\text{C}/\text{D})_{\text{ask}} = (\text{C}/\text{A})_{\text{ask}} \times (\text{A}/\text{B})_{\text{ask}} \times (\text{B}/\text{D})_{\text{ask}} \quad (6)$$

Use of these equations is illustrated by example 5.4.

Example 5.4

Three pairs are given below:

$$\text{Re}/\text{\$}: \quad 44.00 - 44.50$$

$$\text{Re}/\text{\bullet}: \quad 56.00 - 56.60$$

$$\text{\$/£} : \quad 1.79 - 1.80$$

From these three pairs, we can find $\bullet/\text{£}$ rate.

$$\begin{aligned} \text{So} \quad \text{So} \quad (\bullet/\text{£})_{\text{bid}} &= (\bullet/\text{Re})_{\text{bid}} \times (\text{Re}/\text{\$})_{\text{bid}} \times (\text{\$/£})_{\text{bid}} \\ &= (1/56.60) \times 44.00 \times 1.79 = 1.3915 \end{aligned}$$



$$\begin{aligned}
 (\bullet/\text{£})_{\text{ask}} &= (\bullet/\text{Re})_{\text{ask}} \times (\text{Re}/\$)_{\text{ask}} \times (\$/\text{£})_{\text{ask}} \\
 &= (1/56.00) \times 44.50 \times 1.80 = 1.4303
 \end{aligned}$$

Hence $\bullet/\text{£}$ exchange rate is 1.3915 - 1.4303.

5.5 ARBITRAGE

As pointed out earlier, arbitrageurs are those operators on the foreign exchange market who search for price discrepancies and make profit by buying cheap from one dealer and selling dear to another. We can define arbitrage as the process of making risk-less profits by intelligently exploiting price differences of an asset at different dealing places. This can be understood with a simple example.

Suppose dealer A and B have unified rates of $\bullet 0.7915/\text{\$}$ and $\bullet 0.7935/\text{\$}$ respectively. Now a vigilant arbitrageur will buy US dollars from dealer A and sell them to the dealer B. He will make a gain of $\bullet 0.002$ per dollar. Though this gain seems to be a very small in percentage, yet, in absolute terms, the gains are substantial if the operator is dealing in hundreds of millions or billions of dollars. Normally arbitrage operations are carried out by institutions or individuals who possess large amounts.

The above example used unified rate between euro and dollar. But, in real life, the rates are rarely unified; they are quoted with a buy-sell spread. So let us take another example with the currency pair of euro and Swiss franc (SFr).

Example 5.5

The rates at dealers, A and B, are given below:

<i>Dealer A</i>	<i>Dealer B</i>
SFr/ \bullet : 1.7550 - 1.7600	1.7620 - 1.7665

By observing these figures, it is quite clear that an arbitrageur stands to gain if he buys euros from Dealer A by paying a sum of SFr1.7600 and sells euros to the Dealer B to receive SFr1.7620. Thus he makes a gain of SFr0.0020 per euro.

Just to appreciate the magnitude of gain, let us suppose that this arbitrageur starts with 100 million Swiss francs. He can buy 56.8182 (100/1.7600) million euros. Then he sells these euros to get 100.1136 (56.8182 x 1.7620) million Swiss francs. In the process his gain is 0.1136 million or 113600 Swiss francs which is a substantial amount in absolute terms.

5.6 FORWARD RATE AND FORWARD MARKET

If the exchange of currencies takes place after some period from the date of the deal, it is a deal in forward market. In other words, forward rate is the price of one currency against another to be settled on a future date. Though the rate is contracted today, settlement would take place on a future date. The forward rate, once contracted, will be valid for settlement irrespective of the actual spot rate on the maturity date of the forward: For example, on 30 June, the three-month forward rate is Rs. 44.50 per US dollar. Two parties A and B enter into a 3 month forward contract to exchange rupees and dollars. Now after 3 months, on 30 September, actual spot rate is Rs. 45 per dollar. Irrespective of this difference in the forward rate maturing on 30 September and spot rate of 30 September, the contracting parties A and B are bound to exchange currencies at a rate of Rs. 44.50 per dollar.

The currencies of only the major developed countries are normally traded in the forward market. Examples of these are US dollar, euro, Japanese yen, UK pound, Canadian dollar, Australian dollar, Swiss franc etc. The currencies of developing



countries are yet to gain importance on forward market. Major participants in the forward market are commercial banks, brokers, arbitrageurs, speculators and hedgers.

Commercial banks operate in this market either to carry out the orders of their clients or place their own cash in different currencies. Brokers do match making between seekers and suppliers of currencies just as they do on spot market.

Arbitrageurs on the forward market look for the mismatch between forward premia or discount and interest rate differentials between different currency pairs. They make risk-less profit from these mismatches. Speculators take risk to make profit. If they anticipate that a currency would depreciate, they sell it forward. If their anticipation turns out to be right, they make a gain on the maturity date by buying on the spot the currency that they had sold forward.

Unlike arbitrageurs and speculators, hedgers participate in the forward market to cover their exposures in foreign currencies that result from their trade or financial transactions such as exports, imports, borrowing and lending etc.

Forward market is also an OTC (over-the-counter) market like spot market and therefore trading mechanics (market microstructure) is much like the spot market as described earlier.

5.6.1 Features of Forward Contract

Significant features of a currency forward contract are listed in Table 5.2.

Table 5.2: Features of Forward Contract

S. No.	Feature	Description
1.	Kind of contract	A contract between two parties, a customer and a dealer
2.	Currencies in the deal	Forward contracts are made in all major currencies of the world. To some extent, they are made in the currencies of developing world as well.
3.	Cashflows	Cashflows between contracting parties take place at the time of maturity.
4.	Quotations	Rates are quoted by dealers with bid-ask spread. The rates are locked in for the entire period of contract.
5.	Risk	There is a risk of default on either side
6.	Dealers' commission	It is inbuilt in the bid-ask spread.
7.	Regulation	Forward market is self-regulated

5.6.2 Quotation in Forward Market

Like spot market quotations, the rates can be either unified or with bid-ask spreads. Usually, they are quoted for maturity of one month, two months, three months, six months, nine months and twelve months. Conceptually, it is possible to have forward rates for any number of months or fraction of months. Yet, normally, they are not quoted for periods such as 4 months, 5 months, 7 months or 1 month 10 days etc. The periods other than normally quoted ones are referred to as odd periods.

The rates may be shown in full outright form or in swap form. Table 5.3 contains examples of outright forward rates, along with bid-ask spreads.

**Table 5.3: \$/• Forward Quotations**

	Buying rate	Selling rate	Spread
Spot	1.2000	1.2050	50 points
One-month forward	1.2030	1.2090	60 points
Two-month forward	1.2060	1.2135	75 points
Three-month forward	1.2100	1.2190	90 points

The same rates can be written with swap points as given below:

	Spot	1-month forward	2-month forward	3-month forward
\$/•	1.2000/50	30/40	60/85	100/140

It may be noted that spreads increase as the maturity period of forward rates increases. This is expected since with longer maturity, uncertainty/risk increases and hence the dealer would like to keep a bigger difference between the buying and selling rates.

The interpretation of swap points is as follows. Here the spot rate is 1,2000/50 which means spot buying rate is \$1.2000 per euro and spot selling rate is \$1.2050 per euro since the last two digits of buying rate are replaced by 50. For the forward rates, if the first figure (before the slash) is smaller than the second figure (after the slash), then these points are to be added to the respective figures of spot buying and selling rates. So one-month forward buying rate becomes 1.2030 ($1.2000 + 0.0030$) and one-month selling rate becomes 1.2090 ($= 1.2050 + 0.0040$). Likewise, two-month forward rates become 1.2060 ($= 1.2000 + 0.0060$) and 1.2135 ($= 1.2050 + 0.0085$) while three-month forward rates turn out to be 1.2100 ($= 1.2000 + 0.0100$) and 1.2190 ($= 1.2050 + 0.0140$). It should be noted that one point is equal to 0.0001 in case the rates are written upto 4 decimal points.

Here the forward rate figures are greater than the spot rate figures since the forward swap points have been added to spot rate figures, It is clear that forward rate is at premium vis-a-vis spot rate.

The other possibility is that forward rate may be at discount vis-a-vis spot rate. In that case, normally, the swap points would be such that first figure (before the slash) is greater than the second figure (after the slash). In such a situation, swap points are subtracted from the respective spot rate figures. Let us take an example to illustrate this point.

Example 5.6

Find the outright rates from the following:

	Spot	one-month forward	two-month forward	three-month forward
Can\$/•	1.710/250		50/40	100/85 155/125

Using the method described above, we find the outright rate to be as given in Table 5.4.

Table 5.4: Can\$/• Rates Quotations

	Buying rate	Selling rate	Spread
Spot	1.7100	1.7250	150
One-month forward	1.7050	1.7210	160
Two-month forward	1.7000	1.7165	165
Three-month forward	1.6945	1.7125	180



From the Tables 5.3 and 5.4, it may be noted that spread of forward rate is equal to the spread of spot rate plus spread of forward swap.

From the above discussion, we have understood that forward rate is at premium when first figure (before slash) of swap points is smaller than the second figure and the forward rate is at discount when first figure of swap points (before slash) is greater than the second figure. But what about the two figures being equal? This has to be inferred from the context. For instance, the swap points of one-month and three-months forward show a premium (first figure being smaller than the second) while those of two-month forward are equal. Since the trend shows forward premia, we will take it that two-month forward is also at premium and therefore add the swap points to the respective spot rate figures. The same logic applies in case of forward discount. That is, if the swap points for a particular forward period are given as equal in the context of forward discount, they will be subtracted from the corresponding figures of spot rates.

Cross rates of forward rates are worked out exactly in the same way as is done for spot rates. For example, two pairs •/US\$ and Re/US\$ are known. We can easily calculate Re/• rate as shown in example 5.7 that follows.

Example 5.7

Calculate Re/• rates from the following data:

	Spot	one-month forward	Three-month forward
US\$/•	1.2000/25	30/25	80/70
Re/US\$	44.5000/550	100/125	320/500

First we write all the rates in outright form. From the swap point trends, we discover that US\$/• rates show forward discount while Re/US\$ rates show forward premium.

Outright rates are:

	Spot	one-month forward	Three-month forward
US \$/•	1.2000/1.2025	1.1970/1.2000	1.1920/1.1955
Re/US\$:	44.5000/44.5550	44.5100/44.5675	44.5320/44.6050

Now, cross rates are to be found as follows:

$$(Re/•)_{bid} = (Re/US\$)_{bid} \times (US\$/•)_{bid}$$

$$(Re/•)_{ask} = (Re/US\$)_{ask} \times (US\$/•)_{ask}$$

For **Spot rate**:

$$(Re/•)_{bid} = 44.5000 \times 1.2000 = 53.4000$$

$$(Re/•)_{ask} = 44.5550 \times 1.2025 = 53.5774$$

For **One-month forward** rate:

$$(Re/•)_{bid} = 44.5100 \times 1.1970 = 53.2785$$

$$(Re/•)_{ask} = 44.5675 \times 1.2000 = 53.4810$$

For **Three-month forward** rate

$$(Re/•)_{bid} = 44.5320 \times 1.1920 = 53.0821$$

$$(Re/•)_{ask} = 44.6050 \times 1.1955 = 53.3253$$



Thus, Re/euro rates can be summarized as follows:

	Spot	one-month forward	Three-month forward
Re/•:	53.4000/53.5774	53.2785/53.4810	53.0821/53.3253

5.6.3 Forward Premium or Discount

If forward rate of a currency is greater than its spot rate, it is said to be at a forward premium. On the other hand, if its forward rate is smaller than spot rate, it is at forward discount. For example Re/• spot rate is Rs 55.50/• and three-month forward rate is Rs. 56/•. This shows that euro is at a forward premium. When one currency of the pair is at forward premium, the other is automatically at discount. But normally, premium or discount is calculated in respect of the currency whose price is quoted. Here, in our example, the price of euro is quoted in terms of rupees. So we talk of premium of euro rather than discount of rupee. The premium or discount is calculated with equation (7) and (8). That is,

$$\text{Premium or Discount} = \frac{\text{Forward rate} - \text{Spot rate}}{\text{Spot rate}} \times \frac{12}{N} \times 100 \text{ per cent} \quad (7)$$

$$\text{Premium or Discount} = \frac{\text{Forward rate} - \text{Spot rate}}{\text{Spot rate}} \times \frac{360}{D} \times 100 \text{ per cent} \quad (8)$$

Where N is the number of months forward and D is the number of days forward. This formula gives premium or discount in terms of annualized percentage. Calculations can be illustrated with an example:

Example 5.8

From the data given below calculate forward premium or discount as the case may be.

	Spot	3-month forward
Re/US\$	44.5000/7050	44.7000/9990

From the rates, it is clear that US dollar is at forward premium vis-a-vis rupee.

$$\begin{aligned} (\text{Forward Premium})_{\text{bid}} &= \frac{44.7000 - 44.5000}{44.5000} \times \frac{12}{3} \times 100 \\ &= 1.80 \text{ per cent pr annum} \end{aligned}$$

$$\begin{aligned} (\text{Forward Premium})_{\text{ask}} &= \frac{44.9990 - 44.7050}{44.7050} \times \frac{12}{3} \times 100 \\ &= 2.63 \text{ per cent pr annum} \end{aligned}$$

5.6.4 Arbitrage in Forward Market

Interest rates of different currencies affect exchange rates and vice-versa. Theoretically, both interest and exchange rates should move in tandem such that interest rate differential of two currencies approximately equals forward premium or discount on their exchange rates. But in practice, this rarely happens. Arbitrageurs make use of this market discrepancy and make profits. This kind of arbitrage process is also known as covered interest arbitrage. The example that follows illustrates covered interest arbitrage.



Example 5.9

Calculate arbitrage gain using the data given below:

Spot exchange rate : Rs 55.00/•

3-month forward rate : Rs 54.85/•

3-month **interest rates**:

Re: 6% p.a.

Euro: 8% p.a.

As is evident from the above data, euro is at forward discount.

$$\text{Discount rate} = \frac{39.85 - 40.00}{40.00} \times \frac{12}{3} \times 100 = 1.09 \text{ per cent per annum}$$

$$\text{Interest rate differential} = 8.0 - 6.0 = 2.0 \text{ per cent per annum}$$

Since interest differential and exchange discount do not match exactly, there is a scope for covered interest arbitrage. An arbitrageur can take the following steps:

- (i) Borrow Rs 1,000 at 6% p.a., for 3 months and sell this amount in spot market to get euros. The amount would be • 18.1818 (= 1000/55.00)
- (ii) Place •18.1818 in the money market at a rate of 8.0% p.a. for 3 months. This would result in •18.1818 [1 + 0.08 x 3/12] = •18.5454
- (iii) Sell • 18.5454 forward. At the end of three months, the amount in rupees would be Rs 18.5454 x 54.85 (= Rs 1017.22)
- (iv) Refund loan of Rs 1,000 with interest on it. Refunded amount would be Rs 1,000 [1 + 0.06 x 3/12] or Rs 1,015
Net gain = Rs 1017.22 - Rs 1,015 = Rs 2.22

This is very small on an initial sum of Rs 1,000. But if the initial sum be in large amounts such as Rs 100 million etc., the absolute gain is substantial. For a sum of Rs 100 million, the gain is going to be (Rs 100 million x 2.22) / 1000 or Rs 222000.

Now, you may wonder why we started with an initial borrowing in rupees. Had we started with an euro borrowing, would we still make a gain? No, there would not be a gain in that case. So how does an arbitrageur decide as to which currency to start with. The simple rule to be followed in this respect is: **In case interest rate differential is higher than premium or discount, then borrow that currency which has lower interest rate and place that currency in money market which has higher interest rate. Conversely, in case, interest rate differential is smaller than premium or discount, then borrow that currency which has higher interest rate and place that currency in money market which has lower interest rate.** In the example above, interest rate differential (=2% p.a.) is higher than the discount (= 1.09% p.a.). So, the arbitrageur borrowed rupees on which the interest rate is lower and placed euro in money market.

5.6.5 Use of Forward Rates in deciding Prices of Exports

One of the important uses of forward rates can be in deciding what prices to quote for exports. The exporting party can get a risk-free definite sum for its product by carefully negotiating its price, taking into account the prevalent forward rates between its operational (domestic) currency and the currency of receivables (foreign currency). Let us look at an example. An American wishes to receive risk-free price of \$100000 from a European buyer who will pay in euros after 3 months. Three-month forward rate is \$1.22/•. So, what the American exporter will do is that he



would negotiate a euro price of •81967 (= 100000/1.22). Immediately after the sales contract, he will sell his receivables of 81967 in a three-month forward market and, as a result, he will receive \$100000 risk-free after three months.

Example 5.10 is a more elaborate illustration of the use of forward rates.

Example 5.10

A company operating in Euro zone is negotiating to sell its product to an American buyer. The American buyer will pay in three equal dollar installments, first being immediately while second and third will come at the end of three and six months respectively. The European company wants to receive a risk-free sum of • 1 million for this export. What dollar price should it negotiate for? The exchange rates are given as follows:

	Spot	3-month forward	6-month forward
•/US\$	0.810/0.812	0.805/0.808	0.802/0.806

The European company is to receive the three installment in equal dollar amounts. Let us say the total price be D dollars. Then each instalment would be $D/3$ dollars. The exporter should sell these $D/3$ dollars in exchange markets right away - first installments in spot and the remaining two in forward market.

Thus, total amount in euros will be

$$D/3 [0.810 + 0.805 + 0.802] = 1 \text{ million}$$

$$\text{or } D = \$3/2.417 \text{ million} = \$1.241208 \text{ million or } \$ 1241208$$

So if the exporter quotes a price of \$1241208, he will receive a desired risk-free sum of •1 million.

Note: You may notice that here the exchange rate that has been used to calculate the receipt in euros is the bid rate and not ask rate. Why? It is so because the European exporter will sell US\$ and hence the relevant rate will be buying rate on the part of the bank.

5.7 SUMMARY

Foreign exchange market is a market where different currencies are bought and sold. The price of one currency in terms of another is known as exchange rate. Currency may be bought and sold either in spot or in forward market. Spot market is the one where exchange of currencies takes place within one or two days whereas in forward market exchange of currencies occurs on a future date, though the rate is fixed today. Major participants in exchange market are central banks, commercial banks, business enterprises and individuals. Foreign exchange market operators may act as brokers, speculators, hedgers or arbitrageurs. Brokers do not buy or sell themselves but enable buyers and sellers to come in contact with each other. For their services, brokers charge commission. Speculators are risk-takers who take positions in the market, expecting that rates would move in their favour. Hedgers are generally business enterprises that like to cover their exposures. Arbitrageurs make risk less profits by exploiting price differences in the market. Normally rates are quoted with a buy-sell spread. The spread is defined as given below:

$$\text{Spread (in absolute terms)} = \text{Selling rate} - \text{Buying rate}$$

$$\text{Spread (in percentage)} = \frac{(\text{Selling rate} - \text{Buying rate})}{\text{Buying rate or Selling rate}} \times 100\%$$



When the price of one unit of foreign currency is quoted in terms of home currency units, the quote is called direct quote. Likewise, when price of one unit of home currency is quoted in terms of foreign currency units, the quote is called indirect quote. Reciprocal of direct quote gives indirect quote. Cross rate refers to the rate between two currencies whose rate is known in terms of a third common currency. Reciprocal and cross rates in relation to forward market are calculated in the same manner as in spot rate. Forward rate is normally either at premium or at discount with respect to spot rate. Premium/discount can be calculated with the formula given below:

$$\text{Premium or Discount} = \frac{\text{Forward rate} - \text{Spot rate}}{\text{Spot rate}} \times \frac{12}{N} \times 100\%$$

or

$$\frac{\text{Forward rate} - \text{Spot rate}}{\text{Spot rate}} \times \frac{360}{D} \times 100\%$$

Where 'N' is the number of months forward and 'D' is the number of days forward.

If the forward rate is not in equilibrium with interest rates of the two underlying currencies, then there is a possibility of covered interest arbitrage. Forward rates can be used in quoting prices of exports and in hedging receivables/payables.

5.8 KEY WORDS

Exchange Rate: It is a price of one unit of a currency in terms of some units of another currency.

Direct Quotation: It refers to the price of one unit of foreign currency in terms of some units of home currency.

Indirect Quotation: It refers to the price of one unit of home currency in terms of some units of foreign currency.

Reciprocal Rate: If a currency A is quoted in terms of the units of another currency B, then the reciprocal rate is the price of currency B in terms of some units of A.

Cross Rate: If two currencies A and B are quoted in terms of currency C, then the rate between A and B, derived by eliminating the currency C is referred to as cross rate.

Arbitrage: It is the process of making risk less profits by exploiting price differences of assets in different markets.

Sport Market: It is the market where transactions are done for immediate settlement.

Forward Market: It is the market where transactions are entered into for settlement on a future date.

5.9 SELF-ASSESSMENT QUESTIONS

- 1) Describe in brief who the major participants in a foreign exchange market are.
- 2) List important features of forward market.
- 3) What purpose do foreign exchange markets serve?
- 4) From the following rates, calculate US\$/• rate:



Rs 56.50 = •1

Rs 44.60 = US\$1

- 5) Calculate the arbitrage gain possible from the following £/US\$ quotations:

0.5625 - 0.5630 (Dealer A)

0.5632 - 0.5635 (Dealer B)

- 6) Writing all the steps involved, work out the arbitrage from the following data:

Exchange rate:

\$1.79 If (spot)

\$1.81 If (6-m forward)

6-m Interest rate:

US\$: 5% p.a.

£ : 4% p.a.

5.10 FURTHER READINGS

Apte, P. G. (1995), "*International Financial Management*", Tata McGraw-Hill Publishing Company Ltd, New Delhi.

Bhalla, V. K., "*International Financial Management*", Sultan Chand & Co. New Delhi.

Jain, P. K., Josette Peyrard and Surendra S. Yadav (1998), "*International Financial Management*", Macmillan India Ltd., New Delhi.

Maurice D. Levi (1996), "*International Finance*", McGraw-Hill Inc.

Shapiro, Alan C. (1999), "*Multinational Financial Management*", John Wiley & Sons, Inc, New York.

Yadav, Surendra S., P. K. Jain and Max Peyrard (2001), "*Foreign Exchange Markets: Understanding Derivatives and Other Instruments*", Macmillan India Ltd., New Delhi.