

CHAPTER

2

The foreign exchange market

Introduction

The foreign exchange market is larger, in terms of trading volume, than any other market, financial or otherwise. In fact, it dwarfs all other markets. It is also the most liquid of all markets. Every transaction arising from international trade or investment must pass through the foreign exchange market, since these transactions involve the exchange of currencies. Furthermore, developments in the foreign exchange market determine the levels of and changes in exchange rates, which have significant implications for businesses and economies. This chapter provides a general overview of the institutional aspects of the foreign exchange market and exchange rate concepts.

Objectives

The objectives of this chapter are:

- To describe the basic features of the foreign exchange market.
- To identify market participants and traded currencies.
- To describe the mechanics and technology of foreign exchange trading.
- To introduce some exchange rate concepts.
- To illustrate foreign exchange position keeping.
- To describe the Australian foreign exchange market.
- To introduce some foreign exchange jargon.

2.1

Definition and characteristics of the foreign exchange market

The **foreign exchange market** is the market in which national currencies are bought and sold against one another. This market is called the ‘foreign exchange’ market and not the ‘foreign currency’ market because the ‘commodity’ that is traded on the market is more appropriately called ‘foreign exchange’ than ‘foreign currency’: the latter is only a small part of what is traded. Foreign exchange consists mainly of bank deposits denominated in various currencies. Still, the term ‘foreign currency’ will be used interchangeably with the term ‘foreign exchange’.

The foreign exchange market is the largest and most perfect of all markets. It is the largest in terms of trading volume (turnover), which currently stands at over one trillion US dollars per day. It is the most perfect market because it possesses the requirements for market perfection: a large number of buyers and sellers; homogenous products; free flow of information; and the absence of barriers to entry. The foreign exchange market is made up of a vast number of participants (buyers and sellers). The products traded on the foreign exchange market are currencies: no matter where you buy your yens, euros, dollars or pounds they are always the same. There is no restriction on access to information, and insider trading is much less important than, for example, in the stock market. Finally, anyone can participate in the market to trade currencies.

The importance of the foreign exchange market stems from its function of determining a crucial macroeconomic variable, the exchange rate, which affects to a considerable extent the performance of economies and businesses. This market is needed because every international economic transaction requires a foreign exchange transaction. Unfortunately, however, its function of exchange rate determination is not very well understood in the sense that economists are yet to come up with a theory of exchange rate determination that appears empirically valid.

Unlike the stock market and the futures market, which are **organised exchanges**, the foreign exchange market is an **over-the-counter (OTC) market**, as participants rarely meet and actual currencies are rarely seen. There is no building called the 'Sydney Foreign Exchange Market', but there are buildings called the 'Sydney Stock Exchange' and the 'Sydney Futures Exchange'. It is an OTC market in the sense that it is not limited to a particular locality or a physical location where buyers and sellers meet. Rather, it is an international market that is open around the clock, where buyers and sellers contact each other via means of telecommunication. The buyers and sellers of currencies operate from approximately 12 major centres (the most important being London, New York and Tokyo) and many minor ones. Because major foreign exchange centres fall in different time zones, any point in time around the clock must fall within the business hours of at least one centre. The 24 hours of a day are almost covered by these centres, starting with the Far Eastern centres (Sydney, Tokyo and Hong Kong), passing through the Middle East (Bahrain), across Europe (Frankfurt and London), and then passing through the US centres, ending up with San Francisco. This is why the first task of a foreign exchange dealer on arrival at work in the morning is to find out what happened while he or she was asleep overnight. Some banks and financial institutions may for this reason operate a 24-hour dealing room or install the necessary hardware (Reuters' screen, etc.) in their dealers' homes. Others may delegate the task to foreign affiliates or subsidiaries in active time zones.

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Market participants

Market participants are foreign exchange traders who, directly or indirectly, buy and sell currencies. These classes of participants enter the market as **arbitragers**, **hedgers** and **speculators**. Arbitragers seek to make profit by exploiting exchange rate anomalies (for example, when an exchange rate assumes two different values in two financial centres at the same time). Hedgers enter the market to cover **open positions** in an attempt to reduce or eliminate foreign exchange risk (an open position arises, for example, when an importer has to meet a foreign currency payment, which is due some time in the future). This position can be covered, for example, by buying the foreign currency forward. Speculators, on the other hand, bear risk deliberately by taking decisions involving open positions to make profit if their expectations turn out to be correct. A speculator would buy a currency if it were expected to appreciate, realising profit if the currency appreciates subsequently (and realising loss otherwise). We will come across and elaborate on these concepts throughout this book, but for the time being we concentrate on the institutional classification of market participants.

There are five broad categories of participants in the foreign exchange market: customers, commercial banks, other financial institutions, brokers and central banks. Customers include individuals and companies utilising the services of commercial banks to buy and sell foreign

exchange in order to finance international trade and investment operations. Thus, customers include, *inter alia*, exporters, importers, tourists, immigrants and investors. Exporters sell the foreign currencies they obtain from foreigners buying their products. Importers buy the foreign currencies they need to pay for the foreign goods they buy from foreign suppliers. Tourists going abroad buy foreign currencies, whereas those coming from abroad (foreign tourists) buy the domestic currency to pay for their living expenses while they are on holiday. Immigrants buy foreign currencies when they transfer funds to relatives in their home countries. Finally, investors buy and sell currencies as part of their acquisition and disposal of assets (bonds, shares, real estate, etc.). Customers are **price takers** in the foreign exchange market, which means that they buy currencies at the exchange rates quoted by **market makers**.

Large commercial banks are market makers in the sense that they stand ready to buy and sell currencies at the exchange rates they declare, acting via their foreign exchange **dealers**. On the retail side commercial banks deal with customers, but on the wholesale side they deal in the **interbank market** or the **wholesale market** (that is, with other banks). Commercial banks participate in the foreign exchange market mainly as speculators, trying to make short-term profit by getting exposed to foreign exchange risk. They also make profit on their dealings with customers from the differences between the buying and selling rates. They execute this function via the **dealing desk** or **dealing room**, which houses a group of dealers. These dealers may specialise in the trading of a particular currency, a group of currencies or a particular type of transaction (for example, **spot transactions** as opposed to **forward transactions**).

Other financial institutions (such as investment banks and mutual funds) and large companies may deal directly by conducting foreign exchange operations themselves and not through banks. Dealers representing commercial banks, other financial institutions and large companies do business with each other in two ways. The direct way is to telephone other dealers directly, or to contact them via an electronic dealing system. Otherwise, dealing can be carried out indirectly via a **broker**, thus preserving anonymity. With the introduction of **online trading systems**, a new (direct) mode of trading has emerged.

The function of a broker is to spread market information and to bring together buyers and sellers with matching needs. Brokers differ from dealers in that they do not take positions themselves, but obtain their 'living' by charging **commission fees**. Major brokerage houses are global in nature, servicing the interbank market around the clock.

Finally, central banks participate in the foreign exchange market because they act as bankers for their governments and also because they run the exchange rate and monetary policies. All of these functions require market participation. For example, under a system of managed floating, central banks often intervene in the foreign exchange market by buying and selling currencies, with the objective of 'smoothing out' exchange rate movements or to prevent the domestic currency from appreciating or depreciating excessively.

The foreign exchange market is dominated by interbank operations, the buying and selling of currencies among banks. The liquidity of the interbank market is due to large-volume transactions, as well as the fact that banks accept an obligation of **reciprocity** in quoting to other interbank dealers. However, it is by no means true that the interbank market is completely homogenous. Furthermore, not all banks are equally active in the interbank market. Thus, participants in the interbank market are classified into: (i) market makers, normally the largest banks; (ii) other major interbank dealers, who are willing to reciprocate quotes in a number of currencies; and (iii) second-tier banks, including banks that are active primarily in their domestic currencies and those unwilling to reciprocate quotes and often dealing in small amounts.

Who are the big players in the foreign exchange market?

In its May 2002 issue, *Euromoney* reported the results of its annual foreign exchange survey. The top 10 institutions in terms of market share were:

Citigroup	11.17
UBS Warburg	10.96
Deutsche Bank	9.79
Goldman Sachs	6.60
JP Morgan Chase	5.86
Chase Manhattan Bank	4.69
Credit Suisse First Boston	4.62
Morgan Stanley	3.70
ABN Amro	3.40
SEB	2.76

In terms of 'who's best where', the Sydney results showed the following (the numbers are votes):

Citigroup	164
ANZ Banking Group	116
Deutsche Bank	114
Westpac Banking Corporation	78
National Australia Bank	62
ABN Amro	60
Commonwealth Bank of Australia	56
HSBC	49
UBS Warburg	49
State Street Bank & Trust	41



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2.3

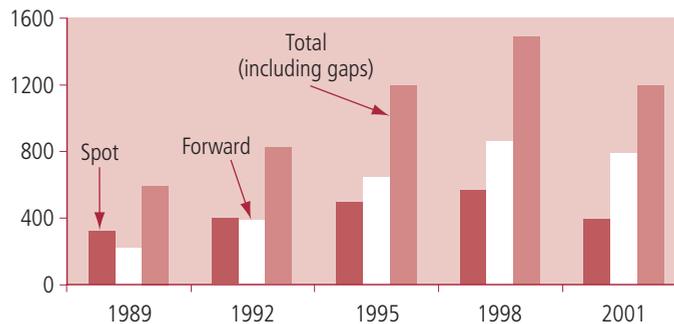
The size and composition of the foreign exchange market

The size of the (global) foreign exchange market is measured by the sum of daily turnover in foreign exchange centres around the world. This is normally done through a survey that is coordinated by the Bank for International Settlements (BIS) and conducted in each financial centre by the domestic central bank (for example, the Sydney survey is conducted by the Reserve Bank of Australia). In this survey, which is conducted every three years in April, banks and financial institutions are asked about their foreign exchange activity, including spot and forward transactions. Since 1995, the survey has been re-designed to cover OTC derivatives activity, including currency and interest rate derivatives (such as currency options). The exposition here is restricted to the so-called 'traditional foreign exchange market', which includes spot and forward transactions only.

Figure 2.1 shows the volume of daily turnover in the global foreign exchange market as measured through the BIS surveys since 1989. The global total is measured by adding up turnover in individual financial markets. In 2001 daily turnover declined, as compared with the previous survey, for the first time. The 19.5 per cent decline to USD1200 is attributed to at

lease two factors. The first is the introduction of the euro and the abolition of the national currencies in 12 European countries. Although the trading of the euro has been more than that of the former German mark, it has also been less than the combined trading of the national currencies. The second reason is consolidation in the banking industry via mergers and acquisitions. As we can see from Figure 2.1, forward transactions (consisting of **outright operations** and **swap operations**) comprise the bulk of transactions in the foreign exchange market.

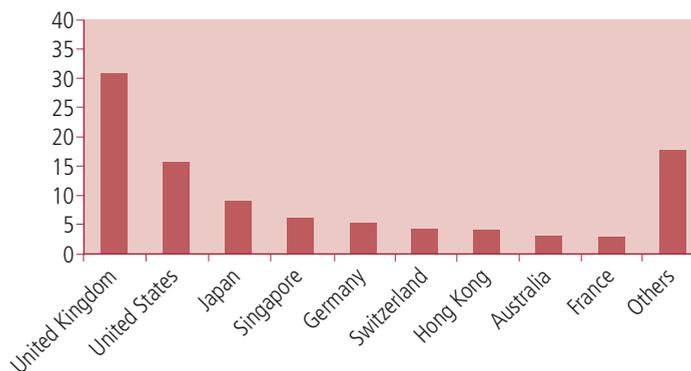
Figure 2.1 Daily turnover in the foreign exchange market (USD billion)



Source: BIS.

Figures 2.2–2.4 are based on information collected from the 2001 survey. As for the geographical distribution of turnover, London remains the most important foreign exchange centre in the world (commanding over 30 per cent of the total daily turnover), as shown in Figure 2.2. This is followed by New York (15.7 per cent) and Tokyo (9.1 per cent). The Australian foreign exchange market is in eighth place with about 3.2 per cent of the total, ahead of France (3 per cent).

Figure 2.2 The geographical distribution of foreign exchange market turnover (per cent)

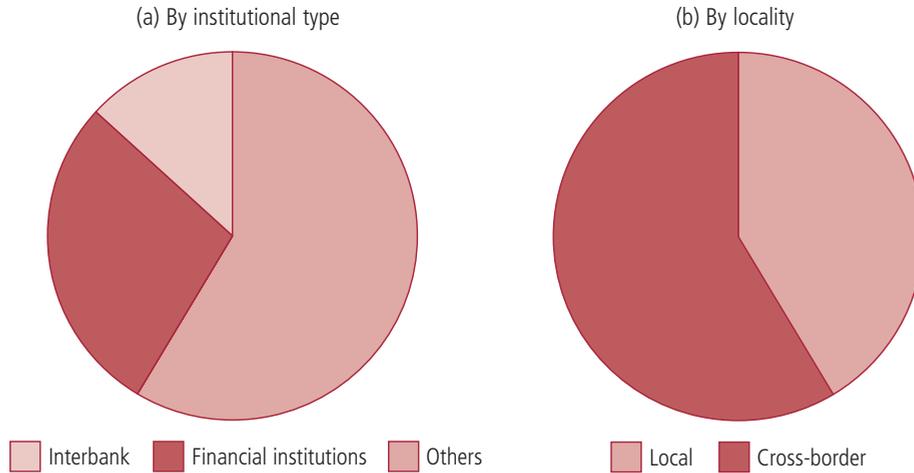


Source: BIS.

Figure 2.3 shows the size of the interbank market, which comprises more than half of the operations in the foreign exchange market. Dealings of commercial banks with other financial institutions constitute about 28 per cent, whereas the smallest part is attributed to non-financial institutions and other customers. Figure 2.3 also shows that 60 per cent of the

transactions are conducted with cross-border counterparties. In Chapter 1, this was taken to be an indicator of the extent of the internationalisation of finance.

Figure 2.3 Foreign exchange market turnover by counterparty (per cent)

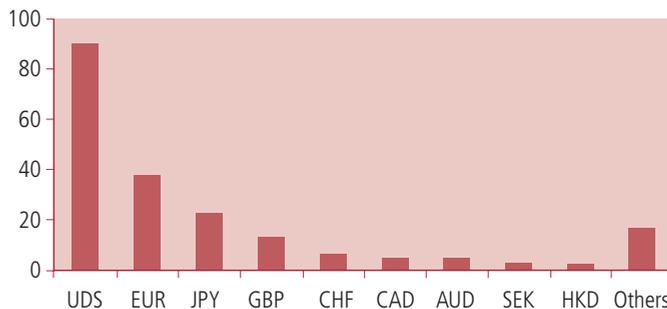


Source: BIS.

Figure 2.4 portrays the currency composition of foreign exchange market turnover. In Figure 2.4(a) the currency composition is shown by single currencies, in which case the maximum percentage would be 200 per cent owing to double counting (a USD100 transaction against the euro is counted for both the dollar and for the euro). Obviously, the US dollar is the most actively traded currency, with over 90 per cent of transactions involving this currency. The dollar is followed by the euro, the Japanese yen and the British pound. The Australian dollar is the seventh most actively traded currency, commanding 4.2 per cent of total trading. Figure 2.4(b) shows the currency composition between currency pairs, in which case the maximum percentage is 100 per cent. About 30 per cent of total trading consists of buying the US dollar against the euro, and vice versa. This is followed by transactions involving the US dollar and the Japanese yen, and then those involving the US dollar and the British pound. Transactions involving US and Australian dollars come in sixth place, commanding about 4 per cent of total trading. Finally, 17 per cent of the trading involves the US dollar against minor currencies, and only 9 per cent of the transactions do not involve the US dollar, which are sometimes called **cross transactions**.

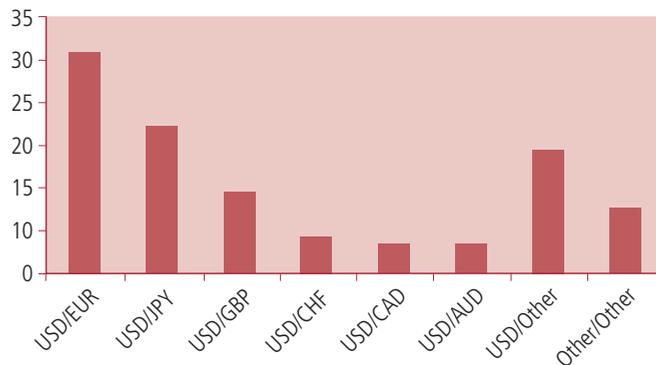
Figure 2.4 Currency composition of foreign exchange market turnover (per cent)

(a) By single currencies



Continues...

(b) By currency pairs



Source: BIS.

Traded currencies may be classified into the following groups:

- The US dollar, which is the most heavily traded currency for the following reasons: (i) the US financial markets are very large; (ii) the US dollar is predominantly used as a means of settling international transactions; (iii) it is a major component of international reserves; and (iv) it is the most widely accepted currency on the retail level internationally.



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The international status of the US dollar

In addition to the reasons listed in the text to explain the international status of the US dollar and its heavy trading, there are some less conventional reasons. In a report in *International Currency Review*, two unconventional reasons were suggested for the love affair with the US dollar.¹ The first of these reasons is that the holders of US dollar-denominated assets know that the full faith of the United States underpins the US currency. This, the report says, compares with the euro, which is not issued by a government, but rather by 'a dodgy experimental political collective with dictatorial tendencies' (that is, the EU). The second reason, described as politically incorrect and universally ignored, is that 'the most valuable commodity in the world is drugs; and the drug currency is the US dollar'.

The present author experienced the international status of the US dollar while on a visit to Hanoi, Vietnam, in November 1994. While attending a function in the Australian Embassy, the author failed miserably to convince some Embassy officials (who were working behind the bar) to accept the Australian dollar in payment for two stubbies of VB, and who insisted instead on receiving payment in the US currency. This author felt that the Embassy staff were 'unpatriotic' in refusing to accept the Australian currency in exchange for Australian beer!

Another trivial but interesting incident supporting the international status of the US dollar happened in Japan during the 2002 World Cup soccer tournament. As potential spectators joined long lines to buy tickets for the semi-final match between Brazil and Turkey, they were told (by the Japanese organisers) that only US dollars would be accepted for payment (the Japanese national currency was not accepted). The people waiting in line were furious, because they were supposed to leave their places in the line, change their yens into dollars and rejoin the line. Strangely, it took the efforts of a Brazilian diplomat to make the Japanese organisers change their mind, reluctantly accepting their national currency for payment!

¹ The Introduction of Euro Notes and Coins Did Nothing at all to Rescue the Collective Currency', *International Currency Review*, 27, 2002, pp. 3–5.

- The euro and the yen, which are heavily traded because of the economic, financial and trade importance of Europe and Japan. However, the trading of the yen does not reflect the relative size of the Japanese economy or the big role Japan plays in international trade.

The internationalisation of the yen

Although the use of the Japanese yen in international transactions has been increasing, it is still modest compared to the US dollar and the euro. This does not seem to be consistent with the role of Japan in the world economy.

Two economists at the International Monetary Fund have identified the factors that are necessary for a currency to be used internationally, attempting to apply them to the yen.¹ These factors include the following:

- The notion that the top currency is provided by the top power.
- The need to have confidence in the value of the currency and therefore in the issuing country's inflation performance.
- The issuing country should have deep, open and broad domestic financial markets.
- The greater the country's share of world exports and the greater the extent to which these exports are denominated in the exporter's currency, the greater would be the demand for that currency to pay for imports.

Japan seems to have performed well in relation to these factors:

- Japan's strong economic performance (at least up to the 1990s) has allowed the country to emerge as a world economic and political power.
- Japan has achieved low and stable inflation.
- Japan has carried out a number of measures to broaden its financial markets and to ease the access of foreigners to these markets.
- Japan has achieved a larger increase in its share of world exports than any other major industrial country.

However, some problems remain:

- Despite efforts to liberalise Japanese financial markets, some areas are still subject to restrictions (for example, the Treasury bill market is not very active).
- Japan's exports to developed countries are predominantly denominated in these countries' currencies. The absolute level of Japanese exports to non-Asian developing countries fell during the 1980s, causing a reduced role for the yen in international trade.
- The bankers' acceptances market is not well developed, making it difficult for Japanese firms to obtain trade financing in yen.
- Japan's international intermediary function has not contributed to the willingness of foreigners to hold liquid liabilities denominated in yen.

¹ G. S. Tavalas and Y. Ozeki, 'The Internationalization of the Yen', *Finance and Development*, June 1991, pp. 2–5.



- The pound, which is still heavily traded despite the decline of the United Kingdom as a major economic and financial power. This may reflect the historical importance of the British currency, which played a more important role in the international monetary system under the gold standard than the dollar played under the Bretton Woods system (see Chapter 5).
- Currencies that are heavily traded in certain centres but lack liquidity in others. These include the currencies of Switzerland and Canada.

- Currencies that are heavily traded locally, but are traded internationally for the purpose of financing exports and imports. These include the currencies of Australia, New Zealand and Hong Kong.
- Third World currencies that are traded almost entirely on a local basis. These are sometimes called **soft currencies** or **exotic currencies** to indicate that they are not widely traded or used as common settlement currencies.



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Currency symbols and nicknames

Many currencies have traditional symbols that are still used. These include the US dollar (\$), the pound (£), the yen (¥) and the Australian dollar (\$A). The problem of encoding such symbols for telecommunication purposes has led to the adoption of alphanumeric acronyms (see the list of currency symbols). These symbols consist of three letters, the first two of which refer to the country of the issue while the last is usually the initial of the currency (the euro being an exception, perhaps because there is no single issuing country). The Swiss franc has the symbol CHF because the first two letters refer to Confederation Helvetia (that is, Switzerland). The former Spanish peseta had the symbol ESP because the first two letters referred to España (Spain). But then the former European currency unit (ECU) had the symbol XEU. The Australian dollar's symbol, AUD, is obvious.

Some of the currencies also have nicknames that are used by foreign exchange dealers. For example, the Australian dollar is Aussie or Oz, the former French franc was Paris, the pound is Cable, the New Zealand dollar is Kiwi, and the Swiss franc is Swissi.

2.4

The mechanics and technology of foreign exchange trading

A foreign exchange transaction consists of the following sequential processes:

- **Price discovery:** the dealer judges the exchange rate at which the transaction can be executed. This requires an assessment of the liquidity of the market and the expectation held by others about future changes in the exchange rate.
- *Decision making:* the dealer seeks information to support the decision to execute the transaction. Execution, which is the transaction itself, is initially conducted via the telephone or other means of telecommunication.
- **Settlement:** this involves completing the transaction by making payments in one currency and receiving payments in another. This function is performed by the so-called **back office** rather than by the dealers to allow an independent check on their activities.
- **Position keeping:** the dealer monitors the resulting position, calculating profit and loss. A decision may be taken to close the position subsequently.

Foreign exchange market technology applies to all of these processes. The following is a brief outline of the historical development of foreign exchange technology. Prior to World War I, the foreign exchange market had physical locations, where pre-transaction processes and execution were carried out manually. Post-transaction processes were also settled manually with a physical delivery of bills. Physical delivery in foreign exchange persisted until

quite recently: cheques and mail transfers were used until the 1970s. In continental European centres some form of physical location continued to exist until the 1980s, as commercial banks met daily with the central bank to fix the rate at which to settle customer orders.

The following are the main technological devices used in conducting foreign exchange business:

- The first means of telecommunication used in the foreign exchange market was the telegraph. Some USD/GBP transactions were executed by using the trans-Atlantic cable laid in 1858 between London and New York (hence the pound's nickname, Cable).
- Although telephone deals may be traced back to 1926, it was not until the late 1970s that reliable international networks were installed in banks' dealing rooms.
- Then there was the telex, which is a telephone line with an automatic typewriter. It largely supplanted the telegraph after World War II.
- In decision making and settlement the successor to the telex was the fax.
- A breakthrough for price discovery and decision making was the **screen-based information system** carrying news and prices from other banks. The first was the Reuters' Monitor, which was introduced in 1973. This was followed by other vendors such as Telerate. By 1984, there were some 40 electronic information services in London.
- By the second half of the 1980s the major part of communication in the foreign exchange market had shifted to **screen-based automated dealing systems** (also known as **conversational dealing systems**), which are networks that connect terminals. A dealer with a terminal can use it to call another dealer with a terminal on the same network.
- The next stage in the development of screen-based systems involved the automation of the execution process, which materialised in 1992 when Reuters introduced its automatic matching system. **Automatic order matching systems** are networks of terminals where dealers enter orders in the form of a buying and/or selling price for a given amount of currency. The network selects and displays the best buying and selling orders for each currency pair.
- The Internet is another development. Open access to the Internet removes the need to build dedicated connections to counterparties or customers. In 1997 an Internet-based foreign exchange dealing service (aimed mainly at wealthy individuals) was established in the United Kingdom by the Currency Management Corporation.
- More recent developments pertain to **online foreign exchange trading**, including the emergence of Internet-based multidealer foreign exchange services, such as Currenex (April 2000), Fxall (May 2001) and Atrix (August 2000). For more details, see the box below.

2.5

The spot exchange rate

The function of a market is the determination of the price of the commodity in which it is traded. The commodity that is traded on the foreign exchange market is 'foreign exchange', currencies and bank deposits denominated in various currencies. For simplicity, we will just call them currencies.

The bilateral spot exchange rate

A foreign exchange market participant would normally want to buy one currency and sell another, typically (but not necessarily) the domestic and a foreign currency. The price of one currency in terms of another is called a **bilateral exchange rate**, because two currencies are involved in the transaction. Confusion may arise because the exchange rate is the price of one kind of money in terms of another kind of money.



The new technology of foreign exchange trading

The development of online foreign exchange trading has lagged behind the e-trading of other financial assets. Developing online foreign exchange facilities has been held up by a lack of consensus among leading banks as to how to develop the sites and reluctance to undertake the necessary (costly) investment. While some banks believe that online trading could undermine the profitability of their foreign exchange operations, benefits would accrue to customers in terms of easier access to research and analysis, quicker and more comprehensive price discovery, and more efficient processing and transparency. Getting exposed to the information provided by many banks simultaneously (without having to phone each of them, or even log on to their individual web sites) gives customers a choice. This can be done by using multibank portals, which some banks do not view favourably for fear of losing customers to their competitors.

As a result of increasing demand from customers for the introduction of online trading via multibank portals, banks started to feel compelled to respond positively. In August 2000 the three largest participants in the foreign exchange market (Deutsche Bank, Chase Manhattan and Citigroup) teamed up with Reuters (an information provider) to offer a range of foreign exchange services over the Internet. The venture (known as Atrix) collapsed in March 2002. Other ventures have also emerged, including Currenex, State Street's Global Link, FX Connect System, Fxall, Forexster and Northern Trust FX Passport. Still, the pressure remains for the establishment of multibank sites. State Street ran its FX Connect system for more than three years before opening it to other banks. Currenex is such a multibank web site.

As a result of these developments, it is expected that 70 per cent of the market will be e-trading by 2004, and by 2012 it will be about 95 per cent. In this way, e-trading provides disintermediation, allowing users of foreign exchange services to trade currencies directly with each other.

Multibank portals allow the provision of **straight through processing (STP)**, which is the end-to-end automation of the trading process from order to settlement. It is estimated that STP could result in about a USD12 billion cost reduction for the foreign exchange industry as a whole. In the conventional dealing environment, two traders agree on the details of the trade over the telephone. Each one of them types these details into a dealing system and sends a fax to the other. Each one reads the other's fax to check that they have the same record of what was agreed. With STP, the trader begins by uploading the trade requirements from an order management system. Subsequently, the trade record is enriched with additional information and sent electronically to the trader needing it.

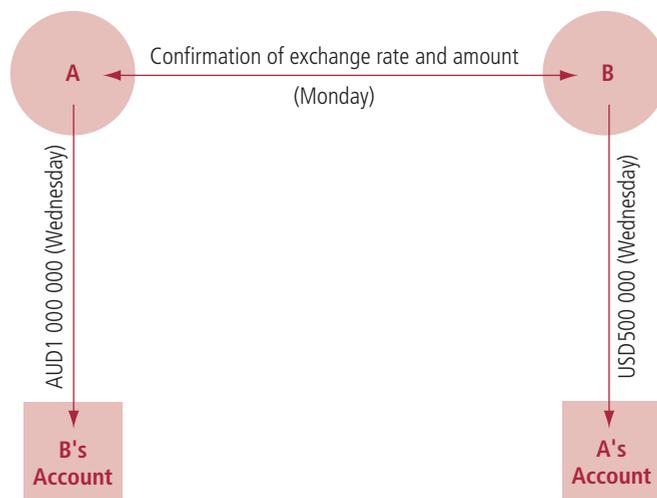
When the exchange of currencies takes place immediately, the underlying operation is called a spot transaction, and so we define the **spot exchange rate** as the rate applicable to transactions involving immediate exchange of the currencies. The word 'immediate' means different things. When you use the services of a moneychanger at Melbourne Airport to exchange some Australian dollars for Hong Kong dollars because you are about to board a plane to Hong Kong, you obtain the Hong Kong dollars that you have bought immediately, meaning at once. This is also called a **cash transaction**. In an **interbank transaction**, on the other hand, the exchange of currencies does not take place at once, but rather in two business days (where a business day is a day on which banks and other foreign exchange market participants are open for business). When a transaction between two bank dealers is concluded today, each bank will in two business days credit the other's account with the prescribed currency and amount agreed upon. This is still

regarded as an **immediate delivery**, and so the underlying exchange rate is a spot exchange rate. If the delivery takes place some time in the future, then the underlying operation is a *forward transaction*.

Two dates are involved in such a transaction. The first (called the **contract date**, the **dealing date**, the **done date** or the **trade date**) is the date on which the transaction is concluded at the exchange rate prevailing on the same date. The second date, which falls two business days later, is called the **delivery date** or **value date**. The exchange rate prevailing in the market may actually change between the two dates, but, no matter what happens, the exchange of the currencies takes place at the exchange rate agreed upon when the transaction is concluded. However, it is often possible to exchange currencies on the business day following the transaction date (called a **value-tomorrow transaction** or **next-day transaction**) and sometimes on the transaction date itself (called a value-today or same-day transaction).

Suppose that two dealers, A and B, agree on Monday on a deal whereby A sells to B AUD1 million at a spot exchange rate of 0.50 US cents per Australian dollar. The two dealers nominate bank accounts to which the proceeds of the transaction will be credited. On Wednesday, A credits B's nominated account with AUD1 000 000, whereas B credits A's account with USD500 000. This exchange of currencies is described in Figure 2.5. The settlement of interbank transactions normally takes place via an electronic settlement system such as SWIFT, the **Society for Worldwide Financial Telecommunication**. This system began operations in 1977, connecting over 3000 commercial and investment banks in over 60 countries.

Figure 2.5 A spot foreign exchange transaction



Spot rate quotations

The spot exchange rate is the price of one currency in terms of another for immediate delivery. The commodity that is traded is a currency, but the price is expressed in terms of another currency, which serves as the unit of account or the measure of value. Like the price of any commodity, the exchange rate is an expression of the value of one unit of a currency (the commodity) in terms of another currency (the unit of account). Sometimes, the currency whose unit is being priced is called the **base currency**, whereas the currency doing the pricing is called the **quoted currency**.



Dealing with risk in foreign exchange transactions

Transactions in the foreign exchange market take place at all hours of the day and night, invariably involving institutions in different national jurisdictions. The cross-border, cross-time zone nature of foreign exchange transactions poses a challenge for the efficient settlement of hundreds of thousands of deals struck on a daily basis.

There are two kinds of settlement risks: **Herstatt risk** and **liquidity risk**, arising from insolvency and liquidity problems, respectively. Herstatt risk got its name from an historical incident involving failure to settle a transaction. In 1974, Bankhaus Herstatt failed to deliver US dollars to counterparties after it was ordered into liquidation by the German authorities. Defaults have since occurred in the cases of the Bank of Credit and Commerce International (BCCI) and Barings Bank.

Liquidity risk arises from the possibility that a counterparty will default because of an operational or system problem that leaves it with insufficient liquidity to make payment. This problem is particularly common in emerging markets where the physical infrastructure for payment and settlement may not be adequate to accommodate transactions that are increasing in size and number.

Default that occurs either because of insolvency or liquidity could trigger system-wide problems. The failure of one large bank may cause a second bank to fail, in turn causing a third bank to fail, such that a 'domino effect' will arise. Two solutions have been suggested to solve

The spot exchange rate between two currencies, x and y , can be expressed as $S(x/y)$. This expression reads as follows: the spot exchange rate measured as the price of one unit of y in terms of x (the number of units of x per one unit of y). Thus, currency y is the traded commodity (the base currency) and currency x is the unit of account (the quoted currency). We will use this notation throughout this book, but sometimes we drop S or x/y for simplicity and convenience.

What is important to remember here is that if $S(x/y)$ rises, then this would indicate appreciation of y and depreciation of x , and vice versa. This is because a larger number indicates that one unit of y after its appreciation is worth more than before in terms of units of x . Thus, we refer to the rise and fall of exchange rates but the **appreciation** and **depreciation** of currencies (never say that an exchange rate has appreciated because any change in the exchange rate involves appreciation of one currency and depreciation of the other). When $S(x/y)$ changes between two points in time (0 and 1) from $S_0(x/y)$ to $S_1(x/y)$, then the rate of appreciation or depreciation of currency y (expressed as a decimal) is given by

$$\dot{S}(x/y) = \frac{S_1(x/y)}{S_0(x/y)} - 1 \quad (2.1)$$

where $\dot{S}(x/y)$ is the percentage change in the exchange rate measured as the x price of a unit of y , and hence it is the percentage change in the value of currency y . Remember that S is the variable whose value changes between time 0 and time 1, but (x/y) is the unit (or units) of measurement.

this problem: (i) eliminating the delay between the two legs of a transaction (simultaneity); and (ii) reducing the number and size of payments requiring settlement. Simultaneity here refers to the delivery of currencies, but this requires closing the gaps in the operating hours of the major wholesale domestic payment systems and the development of some sort of linked payment systems or verification of payments to guarantee intraday 'finality of payment'. Reducing the number and size of payments can be achieved through bilateral and multilateral netting systems. It is estimated that multilateral netting reduces settlement risk by about 73 per cent for a group of about 20 participants and by as much as 95 per cent for a bigger group.¹

One of the developments in this field was the establishment of the Exchange Clearing House (ECHO) in August 1995. The problem with netting is the difficulty of making the netted amounts legally enforceable. A more recent development is the **continuous linked settlement (CLS)**,² which enables member banks to settle foreign exchange transactions through a central service provider, CLS Bank. The idea is that this system would eliminate settlement risk by implementing payment-versus-payment methodology and by providing multilateral netting of foreign exchange transactions. By utilising technology developed by IBM, CLS provides market participants with same-day payments and settlement (T+0 rather than T+2, where T stands for 'transaction').

¹ L. A. Kodres, 'Foreign Exchange Markets: Structure and Systemic Risks', *Finance and Development*, December 1996, pp. 22–5.

² Foreign Exchange Revolution, *The Banker Supplement*, September 2000.

The question is, how do we calculate the corresponding change in the value of currency x ? This can be done in two ways. The first is to calculate it as the percentage change of the reciprocal rate, $S(y/x)$. The reciprocal rate is expressed as

$$S(y/x) = \frac{1}{S(x/y)} \quad (2.2)$$

which says that the spot exchange rate measured as the price of one unit of x is the reciprocal of the spot rate measured as the price of one unit of y . Then we calculate the appreciation (positive change) or depreciation (negative change) of x as the percentage change of $S(y/x)$ as

$$\dot{S}(y/x) = \frac{S_1(y/x)}{S_0(y/x)} - 1 \quad (2.3)$$

The other method that can be used for the same purpose is to calculate the percentage appreciation or depreciation of x directly from the percentage change in the value of currency y as

$$\dot{S}(y/x) = \frac{1}{1 + \dot{S}(x/y)} - 1 \quad (2.4)$$

Remember that these formulae produce decimals that have to be multiplied by 100 to obtain the percentage changes.

Example

Suppose that currency x is the US dollar and currency y is the Australian dollar. Now assume that the exchange rate between the two currencies measured as the price of one Australian dollar, $S(\text{USD}/\text{AUD})$, rises from 0.52 to 0.56. This obviously means appreciation of the Australian dollar and depreciation of the US dollar, because the price of one Australian dollar has risen from 52 to 56 US cents. Thus, we have $S_0(\text{USD}/\text{AUD}) = 0.52$ and $S_1(\text{USD}/\text{AUD}) = 0.56$. By employing Equation (2.1) we can calculate the percentage appreciation of the AUD as

$$\dot{S}(\text{USD}/\text{AUD}) = \frac{S_1(\text{USD}/\text{AUD})}{S_0(\text{USD}/\text{AUD})} - 1 = \frac{0.56}{0.52} - 1 = 0.077$$

or 7.7 per cent. To calculate the percentage depreciation of the US dollar by using the first method, we have

$$S_0(\text{AUD}/\text{USD}) = \frac{1}{S_0(\text{USD}/\text{AUD})} = \frac{1}{0.52} = 1.9231$$

which means that the value of one US dollar has fallen from AUD1.9231 to AUD1.7857. Hence, the percentage depreciation of the US dollar can be calculated as

$$S_1(\text{AUD}/\text{USD}) = \frac{1}{S_1(\text{USD}/\text{AUD})} = \frac{1}{0.56} = 1.7857$$

which means that the US dollar has depreciated by 7.2 per cent.

The same result can be obtained without calculating the reciprocal exchange rates by using Equation (2.3) as follows

$$\dot{S}(\text{AUD}/\text{USD}) = \frac{S_1(\text{AUD}/\text{USD})}{S_0(\text{AUD}/\text{USD})} - 1 = \frac{1.7857}{1.9231} - 1 = -0.072$$

or 7.2 per cent, which is the same answer as the one obtained by using the first method.

Note that when the exchange rate is expressed as $S(x/y)$, the following rules should be applied to convert an amount of y into x , and vice versa:

- To convert from y to x we multiply the y amount by the exchange rate.
- To convert from x to y we divide the x amount by the exchange rate.

Example

Again, assume that x is the USD and y is the AUD, such that the exchange rate is $S(\text{USD}/\text{AUD}) = 0.52$. If we convert AUD1000 into USD, we get

$$1000 \times 0.52 = \text{USD}520$$

and if we convert USD1000 into AUD, we get

$$\frac{1000}{0.52} = \text{AUD}1923.08$$

Exchange rates, physics and mathematics

In the previous examples the exchange rate between the Australian dollar and the US dollar was given two values, depending on how it is measured: 0.52 if it is the price of one Australian dollar; and 1.9231 if it is the price of one US dollar. Both of these values are right, but we have to be very careful as to the expression assigned to the exchange rate. The first value is $S(USD/AUD)$, whereas the second is $S(AUD/USD)$.

A look at the media explains this. In its issue of 4 June 2002, the *Australian Financial Review* reported the exchange rate between the Australian dollar and the pound as 0.3891 ('Wholesale Market', p. 50). This is fine, except for one problem: this exchange rate is portrayed to be $S(AUD/GBP)$ (or \$A/E, as the table says). This cannot be right, because the number clearly means that one Australian dollar is worth 38.91 British pence, and it cannot mean that the pound is worth 38.91 Australian cents. In other words, the number must refer the value of one Australian dollar, or $S(GBP/AUD)$.

Now, try to detect the flaw in this argument. It has been brought to the attention of the present author that, in at least one major Australian university, students are told that if the exchange rate between the British and Australian currencies is 0.39, then this corresponds to the expression AUD/GBP (dropping S for the purpose of this argument). This is because, the argument goes, if $AUD/GBP = 0.39$, then by manipulating this 'equation' we get $AUD = 0.39GBP$, which looks right. Hence, the *Australian Financial Review* must be right in the way it reports the exchange rates, unless we detect the flaw in this argument. The flaw arises because AUD and GBP are units of measurement, not variables. Mathematically, we cannot multiply or divide by units of measurement, and so the manipulation of this 'equation' is wrong (in fact, it is not an equation at all).

We need to remember that the exchange rate is a price, like any other price. We say that the price of tomatoes is five dollars per kilo, the price of labour (the wage rate) is 20 dollars per hour of work, and the price of capital (interest rate) is 5 per cent per one unit of the capital borrowed. In all cases, we are pricing a 'commodity', which is one kilo of tomatoes, one hour of labour and one unit of capital. The exchange rate is a price like any other price: $S(GBP/AUD)$ is the price of one Australian dollar in terms of the pound, whereas $S(AUD/GBP)$ is the price of one pound in terms of the Australian dollar. Thus, the first expression must assume the value of 0.3891, as reported in the *Australian Financial Review*, whereas the second expression must assume its reciprocal, that is 2.5700.

In physics, things are measured in a similar manner. Density is measured in grams per cubic centimetre (the mass of one cubic centimetre of something, such as beer), and speed is measured in kilometres per hour (the distance travelled in one hour). If we follow the same flawed argument in physics, then we can say that if the speed of a car is 90, then $km/h = 90$, and by manipulation we obtain the result that one kilometre is equal to 90 hours (or any number of hours, depending on the speed). Obviously, you do not need to be a physicist to realise that this is nonsense! For detailed arguments, see the article by Moosa and Pereira.¹

¹ I. A. Moosa and R. Pereira, 'Pitfalls in Measuring and Quoting Bilateral Exchange Rates', *Accounting Research Journal*, 13, 2000, pp. 106–11.



INSIGHT

What is used in practice?

Obviously, it can be confusing if two foreign exchange dealers trying to conclude a transaction to exchange two currencies express the exchange rate differently from each other. In other markets, prices are expressed as the number of units of money per one unit of the commodity (which could be a dozen, a kilo, a portion, etc.). Therefore, we say that the price of a glass of beer is AUD2. We never say that the price of one Australian dollar is half a glass of beer. In the

foreign exchange market, the underlying commodity is foreign exchange or foreign currency. So, it makes a lot of sense to express the exchange rate as the domestic currency price of one unit of the foreign currency, which we may write as $S(d/f)$. This is called a **direct quotation** of the spot exchange rate (the number representing the value of the exchange rate is called a direct quote). It is also called **normal quotation** or **price quotation** because it gives the domestic currency price of one unit of the foreign currency. When the direct quotation is used, a higher level of the exchange rate implies appreciation of the foreign currency and depreciation of the domestic currency. The reciprocal of this exchange rate, $S(f/d)$, gives the price of one unit of the domestic currency in terms of the foreign currency. This is called **indirect quotation**. It may also be called **quantity quotation** or **volume quotation**, because it gives the quantity of foreign currency that can be obtained in exchange for one unit of the domestic currency.

We must bear in mind that the words 'domestic' and 'foreign' are relative. What is domestic relative to one country is foreign relative to another. Thus, a direct quotation from the perspective of one country is an indirect quotation from the perspective of another. For example, if the exchange rate between the Australian and New Zealand currencies is expressed as $S(AUD/NZD)$, then this is a direct quotation from an Australian perspective but it is an indirect quotation from a New Zealand perspective. The opposite is valid if the exchange rate is expressed as $S(NZD/AUD)$. Notice that the indirect quotation is the reciprocal of the direct quotation, that is

$$S(d/f) = \frac{1}{S(f/d)} \quad (2.5)$$

Since the US dollar is the most important currency, exchange rates are normally expressed as the price of one US dollar, which is the number of units of the other currency per one unit of the US dollar, or $S(x/USD)$, where x is any other currency. This is indirect quotation from a US perspective. There are some exceptions to this rule, however. The most notable exception is the pound, whose exchange rate against the US dollar is quoted as $S(USD/GBP)$. There is an historical reason for this anomaly. Before 25 February 1971, the pound was not a decimal currency as it is now (equal to 100 pence). Instead, each pound was equal to 20 shillings and each shilling was equal to 12 old pennies. It would have been rather awkward to express the exchange rate as $S(GBP/USD)$. For example, an exchange rate of 1.60 (USD/GBP) would have been equal to 12 shillings and 6 (old) pennies, which is rather cumbersome. Another story is that expressing the pound exchange rate in this way makes the Brits feel better as it is a reflection of the importance of London, the home of the pound, as the most important foreign exchange centre in the world (this story is less credible).

The Australian dollar exchange rates are also reported in indirect quotation from an Australian perspective, both in the media and in foreign exchange transactions. For example, the exchange rates on 2 May 2002 as reported by the *Australian Financial Review* were as follows: 0.5393 against the US dollar, 68.53 against the yen, 0.5946 against the euro and 0.3679 against the pound. These rates obviously represent the price of one Australian dollar in terms of other currencies, and so they must represent the rates expressed as $S(USD/AUD)$, $S(JPY/AUD)$, $S(EUR/AUD)$ and $S(GBP/AUD)$, respectively. The direct quotations are the reciprocals of these rates. Hence, the values of these exchange rates expressed in direct quotations (from an Australian perspective) are $S(AUD/USD) = 1.8543$, $S(AUD/JPY) = 0.0146$, $S(AUD/EUR) = 1.6818$ and $S(AUD/GBP) = 2.7181$. In this book, both ways of expressing the Australian dollar exchange rates are used. The objective is not, of course, to create confusion but rather to teach and train you to be flexible enough to deal with exchange rates no matter how they are expressed.

The bid and offer rates

When dealers attempt to strike a deal, they quote exchange rates in terms of two numbers, the so-called **two-way quote** or **two-way rate**. For example, a dealer may quote an exchange rate of the Australian dollar against the US dollar in direct quotation from an Australian perspective as 1.8525–1.8575. The first number is the **bid rate**, the rate at which the dealer, or the market maker (who quotes this rate), is willing to buy the US dollar. The second number is the **offer** (or **ask**) **rate**, the rate at which this dealer is willing to sell the US dollar. The offer rate is higher than the bid rate by an amount called the **bid-offer spread**, the **dealing spread** or the **bid-offer margin**, m . It is calculated as

$$m = S_a - S_b \quad (2.6)$$

where S_a and S_b are the offer and the bid rates, respectively. In our example the bid-offer spread is calculated as

$$m = 1.8575 - 1.8525 = 0.0027$$

Alternatively, the spread may be calculated as a percentage of the bid rate, or

$$m = \frac{S_a}{S_b} - 1 \quad (2.7)$$

which in our example is

$$m = \frac{1.8575}{1.8525} - 1 = 0.0027$$

or 0.27 per cent.

We also define the mid-rate as the average of the bid and offer rates. Hence

$$S = \frac{1}{2}(S_b + S_a) \quad (2.8)$$

In our example the mid-rate is

$$S = \frac{1}{2}(1.8525 + 1.8575) = 1.8550$$

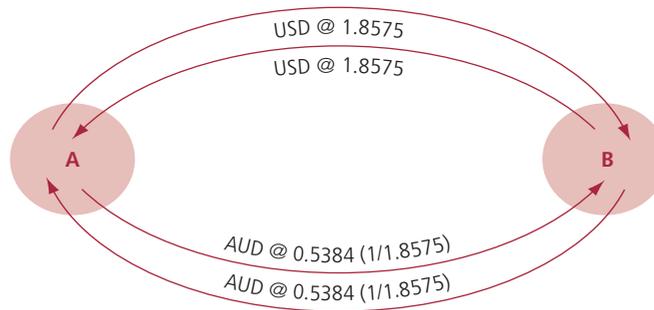
The spread is much higher in the retail business than in the interbank business because of the higher costs associated with small retail transactions. You may have noticed that the bid-offer spreads reported by newspapers are significantly narrower than those advertised by moneychangers at Melbourne Airport. In the interbank market, competition keeps the bid-offer spreads narrow.

Now, let us be more specific by referring to Figure 2.6. If Dealer A quotes to Dealer B 1.8525–1.8575 for $S(\text{AUD}/\text{USD})$, then this means that:

- A is willing to buy the US dollar at AUD1.8525 and sell it at AUD1.8575.
- If B wants to deal, then he or she can buy the US dollar at 1.8575 and sell it at 1.8525.

This means that A's bid rate is B's selling rate, and vice versa. In this case A is the market maker, whereas B is a price taker. Since buying one currency necessarily implies selling the other currency, the following is also valid:

- A is willing to buy the Australian dollar at the reciprocal of 1.8575 (that is, at USD0.5384) and sell it at the reciprocal of 1.8525 (that is, at USD0.5398).
- If B wants to deal, then he or she can buy the Australian dollar at the reciprocal of 1.8525 (that is, at USD0.5398) and sell it at the reciprocal of 1.8575 (that is, at USD0.5384).

Figure 2.6 A foreign exchange spot transaction with bid-offer spread

How the media report exchange rates

In its issue of 6 May 2002, the *Australian Financial Review* reported the following exchange rates ('Retail Market', p. 38), which were provided by Westpac Banking Corporation on 3 May 2002:

	Buy/sell
US dollar	0.5357/0.5291
British pound	0.3667/0.3592
Euro	0.5959/0.5793
Japanese yen	68.66/67.03
New Zealand dollar	1.2023/1.1791

These quotations are rather confusing. The 'buy' and 'sell' rates should correspond to the bid and offer rates of the Westpac Banking Corporation. Why is it, then, that the bid rates are higher than the offer rates, which is the opposite of what is stated in the text? Surely, a market maker such as Westpac wants to buy low and sell high.

To clarify this confusion, we have to determine how the exchange rates are expressed and to which currency the words 'buy' and 'sell' refer. The exchange rates are obviously expressed as the price of one Australian dollar, $S(x/AUD)$, but the 'buy' and 'sell' rates refer to the other currency, and this is the source of confusion. Thus, 0.5357/0.5291 means that Westpac is willing to buy the US dollar at the reciprocal of 0.5357 and sell it at the reciprocal of 0.5291. The confusion would certainly disappear if the exchange rates were expressed as $S(AUD/x)$, which gives the following:

	Buy/sell
US dollar	1.8667/1.8900
British pound	2.7270/2.7840
Euro	1.6781/1.7262
Japanese yen	0.01456/0.01492
New Zealand dollar	0.8317/0.8481

Hence, the exchange rates now represent the buying and selling rates of one unit of the foreign currency in terms of the Australian dollar (direct quotation). These rates mean that Westpac is willing to buy the US dollar at AUD1.8667 and sell it at AUD1.8900. Now, the bid rates are lower than the offer rates.

Alternatively, the exchange rates can be left as they appear in the first table, provided that the words 'buy' and 'sell' are switched around. It would also be useful if it said 'Sell/buy (Australian dollar)', so that there is no confusion about the rates representing the prices of one Australian dollar.



Now that we have distinguished between the bid and offer rates, we must be very careful when we convert exchange rates from direct into indirect quotations. In general, the following relationships hold:

$$S_b(y/x) = \frac{1}{S_a(x/y)} \quad (2.9)$$

$$S_a(y/x) = \frac{1}{S_b(x/y)} \quad (2.10)$$

If the exchange rate between the US dollar and the Australian dollar is 1.8525–1.8575, then this means the following:

$$S_a(AUD/USD) = 1.8575$$

$$S_b(AUD/USD) = 1.8525$$

$$S_b(USD/AUD) = \frac{1}{S_a(AUD/USD)} = \frac{1}{1.8575} = 0.5384$$

$$S_a(USD/AUD) = \frac{1}{S_b(AUD/USD)} = \frac{1}{1.8525} = 0.5398$$

Example

Now, we come to the definition of a **point** in exchange rate quotations. All major currencies are decimal in the sense that the unit is divided into 100 parts. Thus, a dollar is 100 cents and a pound is 100 pence. A hundredth (1/100) of a cent and a penny is called one basis point, or simply one point. Thus, the spread of Dealer A in the above example is 0.0050 or 50 points (1.8575 minus 1.8525). Because the spread is small, the offer exchange rate may be quoted as the number of points only (the last two decimals). Thus, A's quotation is 1.8525–75. Also, during short time intervals on a trading day, exchange rates move slightly, normally by a small number of points. It may in this case be more convenient to quote both the bid and offer rates in terms of points only (that is, 25–75). This is a shorthand quotation, which leaves out the so-called **big number**. Finally, a dealer may quote an exchange rate as '25–75 on 5'. This means that the dealer is quoting a bid rate of 1.8525 and an offer rate of 1.8575 applicable only to round amounts of USD5 million.

Exchange rates for major currencies, with the exception of the Japanese yen, are usually quoted to four decimal places in the interbank market. This is because the fourth decimal place is a point. Sometimes a fifth decimal place is used and is called a **pip**. The Japanese yen is quoted to two decimal places because it has a small par value. Whether four, five or two decimal places are used depends on the monetary significance involved (that is, the value of the point or the pip in a transaction).

Interbank dealing on two-way rates is carried out on the basis of the principle of reciprocity. When Dealer A asks Dealer B for a price, B may respond in an ascending order of 'generosity' by: (i) not quoting a two-way rate; (ii) quoting a two-way rate with a wide spread; and (iii) quoting a two-way rate with a narrow spread but only for small amounts. Dealer B will get a similar response at another time when he or she asks Dealer A for a quote.



Quoting the Australian dollar exchange rates

The Australian dollar exchange rates are quoted in indirect quotation from an Australian perspective. Thus, the exchange rate between the Australian dollar and the US dollar is quoted as USD/AUD, which takes values such as 0.55. It has been suggested that changing the quotation by expressing the exchange rate as AUD/USD will not only have the benefit of being in line with other currencies, but it will also have two additional advantages: it would reduce transaction costs (the bid-offer spread) and exchange rate volatility.¹

Let us start with the bid-offer spread. Banks like to quote 10-point spreads. Thus, if the bid rate were 0.5500, the offer rate would be 0.5510. The value of this spread is 0.1 US cents. If the exchange rate were expressed the other way round, the bid rate would be 1.8149. With a bid-offer spread of 10 points the offer rate would be 1.8159, but the value of these 10 points is 0.1 Australian cents. In percentage terms the bid-offer spread is 0.18 per cent if the exchange rate is expressed as USD/AUD and 0.06 per cent if the exchange rate is expressed as AUD/USD.

As for volatility, a similar line of reasoning is used. If a market maker quotes the exchange rate at 0.5500, then the next move (if the outlook for the Australian dollar is unfavourable) is to quote 0.5490, a depreciation of 0.18 per cent. If, on the other hand, the exchange rate was 1.8149, then the next quote would be 1.8159, a fall of 0.06 per cent only.

¹ 'Cut Volatility with New Quoting for \$A', *Australian Financial Review*, 18 June 2002, p. 24.

The situation is different when Dealer A acts on behalf of a customer who wants to buy a currency that is not actively traded. Dealer A does not seek a two-way rate from Dealer B because Dealer A does not want to reciprocate in this currency. Here, Dealer B treats Dealer A as a customer, in which case the former is not faced with uncertainty about whether the rate is for selling or buying.

The situation may also arise when a dealer makes a mistake in quoting rates (that is, when there is a **misquote**). In this case, market etiquette suggests that the calling dealer asks the quoting dealer to double-check the quote. If the quoting dealer decides to stand by the quote, the deal will go ahead even if there is a misquote.

Cross exchange rates

A **cross exchange rate** is the exchange rate between two currencies derived from their exchange rates against another currency. If x , y and z are three currencies, then

$$S(x/y) = \frac{S(x/z)}{S(y/z)} \quad (2.11)$$

In practice, z is the US dollar because exchange rates are normally expressed in terms of the US dollar. Thus, the cross exchange rate may be defined as an exchange rate between two currencies, neither of which is the US dollar. Alternatively, the cross exchange rate may be defined as an exchange rate between two currencies, neither of which is the domestic currency (in this case, z is the domestic currency). Analogously, **cross trading** is defined as the exchange of two currencies, neither of which is the US dollar or the domestic currency. This kind of trading is less widespread, and is normally more expensive, particularly if it involves currencies that are not heavily traded. This is because this kind of trading involves two transactions rather than one. In direct trading, x is exchanged for y in one transaction.



The mechanics of foreign exchange trading

The mechanics of trading differs between brokered transactions and direct deals. In direct deals, the dealer receiving the call acts as a market maker for the currency to be traded. Hence, a direct deal between A and B on 12 February involving the Australian dollar and the US dollar may go as follows:

- A: Bank A calling. Price on US dollar, please.
 B: Twenty-five–eighty-five on five.
 A: Five yours at twenty-five.
 B: Confirming I buy five million US dollars at 1.8525, sell nine million, two hundred and sixty-two thousand and five hundred Australian dollars, value date 14 February.

The conversation is so brief because things move very quickly in the foreign exchange market. Dealer A identifies the calling bank and asks for a quote on the US dollar against the Australian dollar. Dealer B responds by quoting a bid rate of 1.8525 and an offer rate of 1.8585. Dealer A likes the bid rate of dealer B and accepts to sell USD5 million at this rate. Dealer B confirms the transaction, stating the relevant rate and the amount of Australian dollars equivalent to USD5 million at that rate, as well as the delivery date. On the delivery date (14 February) Bank B will be credited with USD5 million and Bank A with AUD9 262 500.

In a brokered deal the telephone conversation takes place between the dealer asking for a quote and a broker acting on behalf of other dealers. If the broker gets a price that is acceptable to another dealer, the broker confirms the deal and reports the second dealer to the first dealer. Payment arrangements will be made and confirmed separately by the respective back offices. The two dealers share the brokerage fees.

In cross trading, if a direct deal is unavailable, x is exchanged for z and z is exchanged for y . Two transactions are more costly because they involve brokerage fees and bid-offer spreads.

A bid-offer cross exchange rate may be calculated by assuming that two transactions take place, as shown in Figure 2.7(a). Assume that a customer (B) wants to convert x into y via z . This deal involves the following two transactions:

- Buying z and selling x at the rate $S_a(x/z)$ to obtain $1/S_a(x/z)$ units of z . In this case C is the market maker.
- Buying y and selling z at the rate $S_b(y/z)$ to obtain $S_b(y/z)/S_a(x/z)$ units of y . In this case A is the market maker.

This means that:

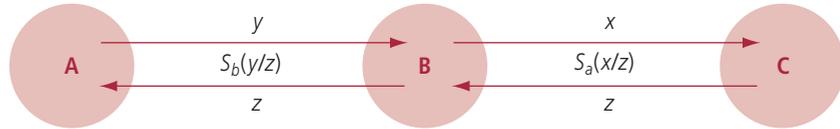
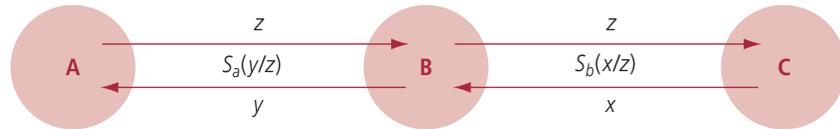
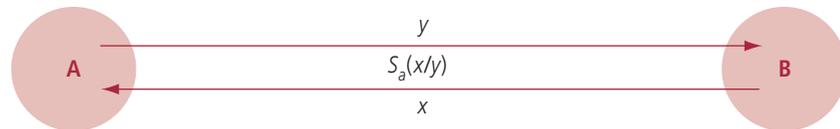
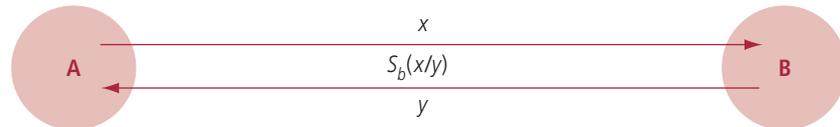
$$S_a(x/y) = \frac{S_a(x/z)}{S_b(y/z)} \quad (2.12)$$

Assume now that the customer (B) wants to convert y into x via z , which is described in Figure 2.7(b). This deal involves the following two transactions:

- Buying z and selling y at the rate $S_a(y/z)$, to obtain $1/S_a(y/z)$ units of z .
- Buying x and selling z at the rate $S_b(x/z)$, to obtain $S_b(x/z)/S_a(y/z)$ units of x .

This means that:

$$S_b(x/y) = \frac{S_b(x/z)}{S_a(y/z)} \quad (2.13)$$

Figure 2.7 Cross and direct trading(a) Cross $x \rightarrow z \rightarrow y$ (b) Cross $y \rightarrow z \rightarrow x$ (c) Direct $x \rightarrow y$ (d) Direct $y \rightarrow x$ **Example**

If $S(JPY/AUD) = 67.05 - 68.75$ and $S(GBP/AUD) = 0.3590 - 0.3670$, then a transaction to convert JPY1 000 000 to pounds via the Australian dollar works as follows:

- Buying AUD and selling JPY at 68.75 to obtain AUD14 546.
- Buying GBP and selling AUD at 0.3590 to obtain GBP5222.

This means that the offer cross exchange rate between the pound and the yen (the rate at which the customer buys) is

$$S_a(JPY/GBP) = \frac{1\,000\,000}{5222} = 191.50$$

On the other hand, a transaction to convert GBP1000 to yen via the Australian dollar works as follows:

- Buying AUD and selling GBP at 0.3670 to obtain AUD2725.
- Buying JPY and selling AUD at 67.05 to obtain JPY182 711.

This means that the bid cross exchange rate between the pound and the yen (the rate at which the customer sells) is

$$S_b(JPY/GBP) = \frac{182\,711}{1000} = 182.71$$

Continued...

These bid and offer rates can be calculated directly from Equations (2.9) and (2.10) as follows:

$$S_b(JPY/GBP) = \frac{S_b(JPY/AUD)}{S_a(GBP/AUD)} = \frac{67.05}{0.3670} = 182.70$$

$$S_a(JPY/GBP) = \frac{S_a(JPY/AUD)}{S_b(GBP/AUD)} = \frac{68.75}{0.3590} = 191.50$$

which gives the same results.

The *Australian Financial Review* and other financial newspapers report a matrix of cross exchange rates. This matrix is prepared for n currencies as follows. Suppose that we have n exchange rates expressed in direct quotation against the domestic currency, z . These exchange rates may be written as $S(x_1/z)$, $S(x_2/z)$, ..., $S(x_n/z)$. In general, the cross exchange rate $S(x_i/x_j)$ can be calculated as

$$S(x_i/x_j) = \frac{S(x_i/z)}{S(x_j/z)} \quad (2.14)$$

whereas the reciprocal of this rate is calculated as

$$S(x_j/x_i) = \frac{1}{S(x_i/x_j)} = \frac{S(x_j/z)}{S(x_i/z)} \quad (2.15)$$

A matrix of cross rates is a symmetrical matrix with diagonal elements equal to unity because they represent the exchange rates between each currency and itself. The half-matrix below the diagonal reports the reciprocals of the exchange rates above the diagonal.

To see how a cross rate matrix is constructed, consider the following exchange rates:

$$S(NZD/AUD) = 1.2023$$

$$S(GBP/AUD) = 0.3667$$

$$S(EUR/AUD) = 0.5959$$

The construction of the (3×3) matrix requires the calculation of three cross rates and their reciprocals, which would be placed in the matrix as follows:

	NZD	GBP	EUR
NZD	1	$S(GBP/NZD)$	$S(EUR/NZD)$
GBP	$S(NZD/GBP)$	1	$S(EUR/GBP)$
EUR	$S(NZD/EUR)$	$S(GBP/EUR)$	1

After calculating the cross rates, the matrix would look like this:

	NZD	GBP	EUR
NZD	1	0.3050	0.4956
GBP	3.2787	1	1.6250
EUR	2.0176	0.6153	1

Example

2.6

Spot foreign exchange position keeping

A foreign exchange transaction is a contract to buy one currency and sell another. As we have seen before, these transactions are settled by the exchange of deposits denominated in the two currencies. The deposits used for settlement are held with **correspondent banks**. A **nostro account** is an account that a dealer holds at a correspondent bank in a foreign country for the purpose of making and receiving payments in the currency of that country (for example, a pound account held by the Commonwealth Bank of Australia with National Westminster Bank in London). A **vostro account** is an account held by a bank on behalf of a foreign dealer. The words *nostro* and *vostro* are Latin for 'our' and 'yours'.

When dealers trade currencies they create short and long positions in various currencies. A **short position** on a particular currency is created when the dealer borrows an amount of that currency and sells it. This is normally done if the currency is expected to depreciate. Eventually, the dealer has to buy back the currency to close or square the position. Conversely, a **long position** is created when a currency is bought because it is expected to appreciate.

Position keeping is the monitoring of positions in each currency, which is the net cumulative total of currency holdings arising from various deals. Over time, dealers record the details of their individual transactions sequentially on a schedule called a **blotter**. The blotter lists the domestic and foreign currency amounts exchanged in each deal, which enables the dealer to calculate the resulting long and short positions in each currency from the individual amounts. A simple blotter (with five deals) may look like this:

AUD deal amount	AUD balance	AUD/USD rate	USD deal amount	USD balance
+10 000 000	+10 000 000	1.6525	-6 051 437	-6 051 437
+20 000 000	+30 000 000	1.6645	-12 015 620	-18 067 057
-10 000 000	+20 000 000	1.6725	+5 979 073	-12 087 983
+25 000 000	+45 000 000	1.6445	-15 202 189	-27 290 172
-50 000 000	-5 000 000	1.6500	+30 303 030	+3 012 858

This blotter records the following items (by column):

- The amounts of the domestic currency (AUD) bought (+) and sold (-).
- The balance of the domestic currency (AUD) after each individual deal.
- The exchange rate applicable to each individual deal.
- The amount of foreign currency (USD) bought (+) and sold (-).
- The balance of foreign currency (USD) after each individual deal.

Position keeping can be used to (i) measure exposure to the risk of future changes in exchange rates, and (ii) measure the potential or unrealised profit/loss that has been made on positions due to past exchange rate changes. Unrealised profit can be realised via **position squaring** at the current market exchange rate. This is done by buying the short position currency and selling the long position currency.

The calculation of unrealised profit/loss is called **valuation**. Currency positions can be valued by calculating the **average rate** at which a long position in the domestic currency has

been bought, or a short position has been sold, and comparing this average rate with the current market rate at which the dealer can square these positions. This process of comparison is called **marking to market**. A long position is profitable if the market rate is higher than the average rate, whereas a short position is profitable if the market rate is lower than the average rate.

The average rate is calculated by dividing the domestic currency balance by the foreign currency balance. Thus, at the end of the sequence of deals the average rate is

$$\frac{5\,000\,000}{3\,012\,858} = 1.6596$$

Because there is a long position on the US dollar, this position would be profitable if the market exchange rate is higher than the average rate. If the market rate is 1.700, the unrealised profit per unit of the foreign currency is

$$1.7000 - 1.6596 = \text{AUD}0.0404$$

which means that the overall profit on the long position is

$$3\,012\,858 \times 0.0404 = \text{AUD}121\,720$$

This can be realised by selling USD3 012 858 at the market rate of 1.700.

Allfirst's foreign exchange losses

By January 2002 a rogue trader named John Runsak had piled up losses amounting to USD691 million at Allfirst, the US subsidiary of Allied Irish Bank (AIB). He was hunted down on 30 January when Allfirst controllers called banks in Asia to find out that trades that Runsak claimed to have done with them were fictitious. This piece of news made big headlines in the media, and was considered the largest event of its kind since Nick Leeson brought about the collapse of Barings Bank in 1996. How could this have happened when traders are supposed to observe certain limits on their dealings? This particular trader had a limit of a few million dollars.

A report that was released subsequently showed that the poor structure and mismanagement at Allfirst created ideal conditions for what happened. Runsak was hired in 1993 as a foreign exchange dealer. In 1994 he breached his trading limits, but he was regarded as a star trader to the extent that this incident was dismissed as 'trader error'. The lack of supervision allowed him to hide increasing losses from foreign exchange operations by constructing bogus option transactions that presumably offset the real loss-making transactions. He managed to avoid scrutiny by the back office since these operations did not require net cash transfers. Moreover, he managed to have a 'running tab' with two big trading counterparties, Citibank and Bank of America, which allowed him to trade without having to report each trade internally. He even manipulated the prices at which he traded, not to mention the fact that he traded from home and when he was on holiday.

Bank chiefs everywhere demanded reassurance from their risk controllers that no such fiasco could visit their banks. It was thought that this sort of event was inconceivable, given that controls had been designed (following the collapse of Barings) to catch errors or fraud at every stage.



2.7

The forward exchange rate

The **forward exchange rate** is a rate contracted today for the delivery of a currency at a specified date in the future. This date in the future (called the **forward value date**) must be more than two business days away, otherwise the underlying transaction will be a spot transaction. If the delivery takes place one week after the transaction has been concluded, then the underlying rate is a one-week forward rate. Typically, forward contracts extend up to one year, in maturities of one month, two months, and so on. However, forward contracts of maturities longer than one year can also be found. A special kind of forward contract is called a **break forward contract**. This contract can be terminated at a predetermined date, thus providing protection against adverse exchange rate movements. It may also be called **forward with optional exit**, abbreviated as FOX.

The interval until a forward value date is calculated from the spot value date, not from the transaction date. For example, the forward value date of a sale of one week forward agreed on 16 June would be one week from the spot value date of 18 June, which would be 25 June. The forward value date is usually fixed, not by agreeing on a specific date, but by agreeing on a term, which is a whole number of weeks or months after the spot value date (for example, one month). The specific date is then fixed according to one of two conventions: (i) the **modified following business day convention**; and (ii) the **end/end rule**. The modified following business day convention works as follows: the maturity date is set to be the value date, but if that falls on a non-business day, the date is moved to the following day. If that falls in the next calendar month, it would be moved to the last business day of the current calendar month. The end/end rule is that if the value date is the last business day of the current calendar month, maturity will be the last business day of the final calendar month.

Forward transactions are classified by forward value date into:

- **short dates**: maturity of one month or less
- **round dates (fixed dates or straight dates)**: original terms to maturity of a whole number of months
- **broken dates (odd dates)**: original maturities of less than round dates

Forward transactions are of two types: **outright forward contracts** and **foreign exchange swaps (or spot-forward swaps)**. An outright forward contract involves the sale or purchase of a currency for delivery more than two business days into the future. Hence, the only difference between an outright forward transaction and a spot transaction is the value date. The word 'outright' indicates that no spot transaction is involved. On the other hand, a foreign exchange swap (which is different from a **currency swap**) involves a spot purchase against a matching outright forward sale (or vice versa). For example, a foreign exchange swap transaction is concluded when a trader agrees to sell a currency and simultaneously to repurchase it (thus reversing the operation) some time in the future at an exchange rate determined now (see Figure 2.8). When the reversal is on adjacent days, the term **rollover** is used.

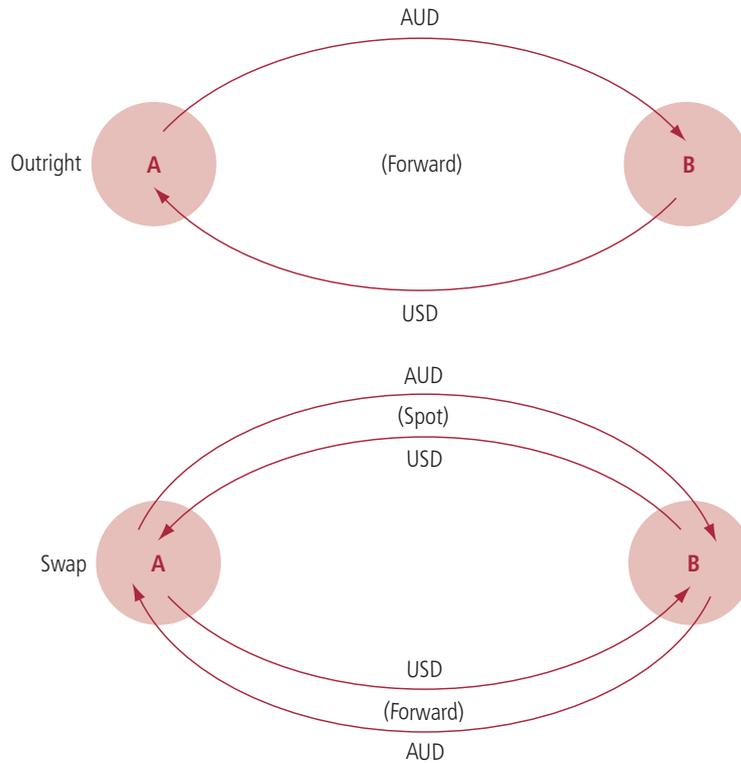
Three kinds of foreign exchange swaps can be distinguished:

- **forward swaps**, which start on the spot value date and end on a forward value date
- **forward-forward swaps**, which start on a forward value date and end on a later forward date
- **overnight swaps** and **tom/next swaps**, which end on or before the spot value date

The forward spread

Also called the **forward margin**, the **spot-forward spread** or the **forward pickup/markdown**, the **forward spread** is the difference between the forward rate and the spot

Figure 2.8 Outright and swap forward transactions



The following example illustrates the mechanics of a foreign exchange swap when a dealer sells USD1 million spot and buys it three months forward. Assume that the spot and three-month forward rates (AUD/USD) are 1.7850–1.7880 and 1.7870–1.7900, respectively. The cash flows involved in this operation are

	USD	AUD
Present	-1 000 000	+1 785 000
Future	+1 000 000	-1 790 000
Net	0	-5 000

If the spot rate changes to 1.7940–1.7970, the three-month forward rate becomes 1.7960–1.7990. The cash flows in this case will be

	USD	AUD
Present	-1 000 000	+1 794 000
Future	+1 000 000	-1 799 000
Net	0	-5 000

Obviously, the net cash flows are unaffected by the change in the spot rate.

Example

rate calculated as a percentage of the latter. When it is measured in per cent per annum, the spread, m , is calculated as

$$m = \frac{F(x/y) - S(x/y)}{S(x/y)} \times 100 \times \frac{12}{N} \quad (2.16)$$

where F is the forward rate, S is the spot rate and N is the maturity of the forward contract in months. Both the forward and spot rates are calculated as the number of units of x per one unit of y . The percentage difference is annualised by multiplying it by $12/N$. This annualisation makes it possible to compare the forward spread on various maturities and also to compare the spread with the interest rate differential.

Obviously, the forward spread can be positive or negative, depending on whether the forward rate is greater than, or less than, the spot rate. A positive spread is called a **forward premium**, whereas a negative spread is called a **forward discount**. Note, however, that the bilateral exchange rate is an expression of the price of one currency against another, and so if one currency is selling at a premium, the other must be selling at a discount. When the spot rate is equal to the forward rate, then the forward spread is zero. In this case, neither of the two currencies sells at a premium or a discount. Rather, they sell at par, or both currencies are said to be flat. To avoid confusion, the following rules summarise all of the possibilities:

- If $F(x/y) > S(x/y)$, then y is selling at a premium and x is selling at a discount.
- If $F(x/y) < S(x/y)$, then y is selling at a discount and x is selling at a premium.
- If $F(x/y) = S(x/y)$, then both currencies are selling at par.

In the previous example, the US dollar sells at a premium, whereas the Australian dollar sells at a discount. This is why the operation results in a negative cash flow (−5000).

Example

If the spot exchange rate between the Australian dollar and the US dollar, $S(AUD/USD)$, is 1.7800 and the three-month forward rate, $F(AUD/USD)$, is 1.7890, then the US dollar is selling at a premium. The forward spread is

$$\frac{1.7890 - 1.7800}{1.7800} \times 100 \times \frac{12}{3} = 2.02\%$$

Forward rate quotations

There are two ways of quoting forward rates. The first is the **outright rate**, which is expressed exactly as the spot rate, using two numbers to represent the bid and offer rates. The second is the **swap rate**, which is quoted in terms of the points of discount/premium (that is, the spread expressed as $a-b$ or a/b).

When the forward rate is expressed as a swap rate, the number of points corresponding to the bid and offer rates are given for a particular maturity. Converting a swap rate into a bid-offer outright rate is simple. Just follow these rules:

- If $a > b$, add the points to the spot bid and offer rates. This indicates that the forward rate is higher than the spot rate.
- If $a < b$, subtract the points from the spot bid and offer rates. This indicates that the forward rate is lower than the spot rate.

Consider the following spot and forward exchange rates (AUD/USD):

Spot	1.7800–1.7860
One month	10–20
Three months	20–30
Six months	50–40

The one- and three-month outright rates are calculated by adding the number of points to the spot rate. Conversely, the outright six-month rate is calculated by subtracting the number of points from the spot bid and offer rates. Thus, the outright bid and offer rates appear as follows:

Rate	Bid	Offer
Spot	1.7800	1.7860
One month	1.7810	1.7880
Three months	1.7820	1.7890
Six months	1.7750	1.7820

The bid-offer spread on a forward contract increases as the maturity of the contract lengthens. The reason for this is that the thinness of the market increases as the forward maturity increases. Increasing thinness means a smaller turnover, and hence it becomes difficult to offset positions in the interbank forward market. The difficulty of offsetting longer-maturity forward contracts makes them riskier than shorter-maturity contracts. The risk arises from uncertainty about the price of an offsetting forward contract immediately after quoting the forward rate.

2.8

The Australian dollar foreign exchange market

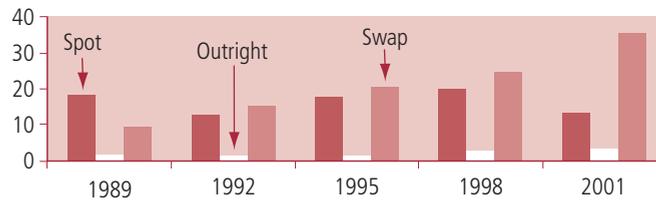
The core of the Australian foreign exchange market consists of the banking system and the non-bank dealers authorised by the Reserve Bank of Australia (RBA). The Australian foreign exchange market is highly integrated with the global foreign exchange market. This integration is indicated by the fact that about 40 per cent of foreign exchange transactions are conducted with foreign counterparties, most importantly foreign banks.

On 9 December 1983 the foreign exchange controls on the Australian dollar were lifted and the currency was allowed to float. The floating of the dollar was one of the first steps towards the deregulation of Australian financial markets. Since then the Australian dollar has become one of the most actively traded currencies, having been regarded previously as an 'exotic' currency.

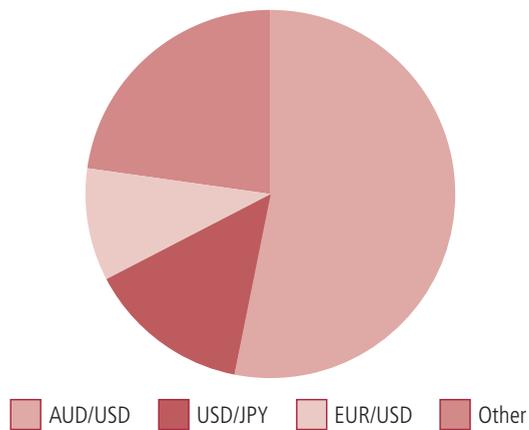
Figure 2.9 shows: (a) the size and growth of the Australian foreign exchange market as measured by daily turnover; (b) the currency composition of the turnover; and (c) the composition by counterparty. In 2001, daily turnover amounted to USD51.9 billion distributed among spot transactions (USD13.2 billion), outright forward (USD3.5 billion) and foreign exchange swaps (USD35.3 billion). More than half of the turnover (53.3 per cent) involved trading the Australian dollar against the US dollar. Most of the trading was done with foreign banks (USD33.7 billion).

Figure 2.9 The size and composition of the Australian foreign exchange market

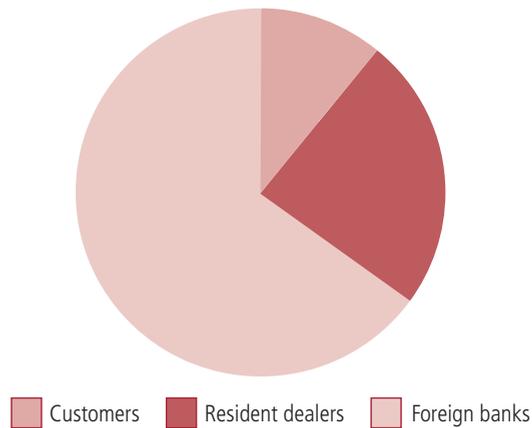
(a) Daily turnover (USD billion)



(b) Currency composition (2001)



(c) Composition by counterparty



Source: RBA.

There are several reasons for the impressive growth of the Australian foreign exchange market:

- Deregulation provided vast opportunities for foreign investment. This is because with no capital controls, direct investment can take place more readily, and because the resulting financial innovation provided the means of currency risk management.

- Australia's above-average level of real interest rates generated massive capital flows into the country from the mid-1980s onwards.
- Australia's time zone contributed significantly to market growth. Australian trading hours form a link between New York and early European trading.
- The high level of volatility in the Australian dollar exchange rates in the initial years of the float provided opportunities for speculation.

Summary

- The foreign exchange market is the market where currencies are bought and sold. It is the largest and most perfect market.
- Market participants include: (i) customers; (ii) commercial banks; (iii) other financial institutions; (iv) brokers; and (v) central banks. These participants may enter the market as arbitragers, hedgers and speculators.
- The US dollar is the most heavily traded currency, followed by the euro, the yen and the pound.
- A foreign exchange transaction consists of: (i) price discovery; (ii) decision making; (iii) settlement; and (iv) position keeping.
- Foreign exchange technology has developed significantly since the telegraph was first used to settle foreign exchange transactions between London and New York in 1858. More recent developments pertain to online foreign exchange trading.
- The bilateral spot exchange rate is the exchange rate between two currencies applicable to transactions involving immediate delivery. This may be expressed in direct quotation (domestic/foreign) or indirect quotation (foreign/domestic).
- The bid rate is the exchange rate at which a dealer is willing to buy a particular currency. The offer rate is the rate at which the dealer is willing to sell the currency. The difference between the offer and bid rates is the bid-offer spread. The spread may be expressed as a percentage of the bid rate.
- The cross exchange rate is the exchange rate between two currencies derived from their exchange rates against another currency, normally the US dollar or the domestic currency.
- The forward rate is the exchange rate applicable to transactions involving delivery in the future. It may be expressed as an outright rate or a swap rate.
- The forward spread is the difference between the forward rate and the spot rate expressed in per cent (relative to the bid rate) per annum. A currency sells at a premium (discount) if the forward rate is higher (lower) than the spot rate.
- Position keeping is the monitoring of positions in each currency, which is the net cumulative total of currency holdings arising from various deals. Details of individual transactions are recorded on a 'blotter'.
- The Australian foreign exchange market, which is highly integrated with the global foreign exchange market, consists of the banking system and the non-bank dealers authorised by the Reserve Bank.
- The Australian dollar was floated in December 1983 as a first step in the deregulation of financial markets.
- A number of factors have contributed to the growth of the Australian foreign exchange market, including: (i) deregulation; (ii) high real interest rates in the 1980s; (iii) Australia's time zone; and (iv) the volatility of the Australian dollar in the early years of the float.

Key terms

appreciation 000
arbitragers 000
ask rate 000
automatic order matching systems 000
average rate 000
back office 000
base currency 000
bid rate 000
bid-offer margin 000
bid-offer spread 000
big number 000
bilateral exchange rate 000
blotter 000
break forward contract 000
broken dates 000
broker 000
cash transaction 000
commission fees 000
continuous linked settlement (CLS) 000
contract date 000
conversational dealing systems 000
correspondent banks 000
cross exchange rate 000
cross trading 000
cross transactions 000
currency swaps 000
dealers 000
dealing date 000
dealing desk 000
dealing room 000
dealing spread 000
delivery date 000
depreciation 000
direct quotation 000
done date 000
end/end rule 000
exotic currencies 000
fixed dates 000
foreign exchange market 000
foreign exchange swaps 000
forward discount forward exchange rate 000
forward margin 000
forward pickup/markdown 000
forward premium 000
forward spread 000
forward swaps 000
forward transaction 000
forward value date 000
forward with optional exit 000
forward-forward swaps 000
hedgers 000
Herstatt risk 000
immediate delivery 000
indirect quotation 000
interbank market 000
interbank transaction 000
liquidity risk 000
long position 000
market makers 000
market participants 000
marking to market 000
misquote 000
modified following business day convention 000
next-day transaction 000
normal quotation 000
nostro account 000
odd date 000
offer rate 000
online foreign exchange trading 000
online trading systems 000
open positions 000
organised exchanges 000
outright forward contracts 000
outright operations 000
outright rate 000
overnight swaps 000
over-the-counter (OTC) market 000
pip 000
point 000
position keeping 000
position squaring 000
price discovery 000
price quotation 000
price takers 000
quantity quotation 000
quoted currency 000
reciprocity 000
rollover 000
round dates 000
screen-based automated dealing systems 000

screen-based information system 000	straight through processing (STP) 000
settlement 000	swap operations 000
short dates 000	swap rate 000
short position 000	tom/next swaps 000
Society for Worldwide Financial	trade date 000
Telecommunication 000	two-way quote 000
soft currencies 000	two-way rate 000
speculators 000	valuation 000
spot exchange rate 000	value date 000
spot transaction 000	value-tomorrow transaction 000
spot–forward spread 000	volume quotation 000
spot–forward swaps 000	vostro account 000
straight dates 000	wholesale market 000

Review questions

- 1 What is the meaning of ‘foreign exchange’?
- 2 In what sense is the foreign exchange market the most perfect of all markets?
- 3 The foreign exchange market is an OTC market. Why?
- 4 Describe the major categories of participants in the foreign exchange market. How do they operate with respect to their attitude towards risk?
- 5 What is (a) a price taker and (b) a market maker in the foreign exchange market?
- 6 What is the difference between a broker and a dealer?
- 7 Explain why each of the following categories of participants enters the foreign exchange market: (a) exporters; (b) importers; (c) tourists; (d) immigrants; and (e) investors.
- 8 Central banks are not profit-making institutions. Why, then, do they buy and sell currencies on the foreign exchange market?
- 9 Why is the US dollar the most heavily traded currency on the foreign exchange market?
- 10 Despite the importance of Japan as a super economic power, the Japanese yen’s role in international transactions is limited. Why?
- 11 The British pound is still heavily traded on the foreign exchange market despite the relative decline of the United Kingdom as a major economic and financial power. Why?
- 12 What are ‘exotic’ currencies?
- 13 What is the role of the ‘back office’ in settling foreign exchange transactions?
- 14 What is straight through processing? Why is it expected to reduce transaction costs in the foreign exchange industry?
- 15 What is the meaning of ‘immediate delivery’ in foreign exchange transactions?
- 16 What are Herstatt risk and liquidity risk? How can they be dealt with?
- 17 Distinguish between the contract date and the delivery date in foreign exchange transactions.
- 18 Distinguish between direct and indirect quotations of exchange rates. What happens to the domestic currency as the exchange rate rises if it is measured in direct quotation?

- 19 If the exchange rate between the Australian dollar and the Canadian dollar is quoted as AUD/CAD, what is this quotation from an Australian perspective and a Canadian perspective?
- 20 In actual trading, the exchange rates between the US and European currencies are expressed in direct quotation from a European perspective. Why is the pound a major exception to this rule?
- 21 Distinguish between a point and a pip in exchange rate quotation.
- 22 What is the principle of reciprocity in foreign exchange dealing?
- 23 Suppose that you are a foreign exchange dealer wishing to buy the Australian dollar against the US dollar. Given the market conditions, you are willing to buy at 0.5820. You phone another dealer who quotes 0.5480–0.5510. What would happen, assuming that you abide by the market etiquette?
- 24 Distinguish between nostro and vostro accounts.
- 25 How do you square a short position and a long position?
- 26 What is the meaning of 'marking to market' in spot foreign exchange transactions?
- 27 Distinguish between outright forward contracts and swaps.
- 28 What are the factors that have contributed to the growth of the Australian foreign exchange market?

Problems

- 1 On 12 August 2002, a Commonwealth Bank dealer in Melbourne concluded a transaction with a Citibank dealer in New York. The former agreed to buy from the latter USD5 000 000 at an exchange rate (AUD/USD) of 1.77 for delivery on 14 August. On the delivery date, the exchange rate rose to 1.83. How much would the Commonwealth Bank be required to pay to settle the transaction?
- 2 The exchange rate between the British pound and the Australian dollar (GBP/AUD) rose from 0.3780 to 0.3960 in one week.
 - (a) Calculate the percentage appreciation or depreciation of the Australian dollar.
 - (b) Using the result obtained in (a) above, calculate the percentage appreciation or depreciation of the pound.
 - (c) Calculate the corresponding values of the AUD/GBP exchange rate.
 - (d) Using the result obtained in (c) above, calculate the percentage appreciation or depreciation of the pound.
 - (e) Using the result obtained in (d) above, calculate the percentage appreciation or depreciation of the Australian dollar.
- 3 If the exchange rate between the British pound and the Australian dollar (GBP/AUD) is 0.3980, what is:
 - (a) The direct quote from an Australian perspective?
 - (b) The indirect quote from an Australian perspective?
 - (c) The direct quote from a British perspective?
 - (d) The indirect quote from a British perspective?
- 4 The USD/AUD exchange rate is quoted as 0.4977–0.5176.
 - (a) What is the bid-offer spread in points and in percentage terms? What is the monetary value of the point in this case?
 - (b) Calculate the AUD/USD exchange rate. What is the bid-offer spread in points and in percentage terms? What is the monetary value of the point in this case?

- 5 Dealer A quotes 1.6530–1.6580 for the EUR/AUD exchange rate to Dealer B. What are the following:
- The price at which A is willing to buy the Australian dollar?
 - The price at which A is willing to buy the euro?
 - The price at which B can buy the Australian dollar?
 - The price at which B can buy the euro?
 - The price at which A is willing to sell the Australian dollar?
 - The price at which A is willing to sell the euro?
 - The price at which B can sell the Australian dollar?
 - The price at which B can sell the euro?
- 6 If the exchange rate between the Australian dollar and the Japanese yen, expressed in indirect quotation from an Australian perspective, is 70.10–71.60, what is the direct quotation for this rate? What are the mid-rates in both cases?
- 7 At 9.30 a.m. Dealer A calls Dealer B and asks for a quote on the AUD/GBP exchange rate. Dealer B responds by quoting 2.5500–2.5540. Dealer A decides to buy GBP200 000 at the quoted rate. At 3.30 p.m., Dealer B quotes 50–90. Will dealer A make profit or loss by selling the pound at 3.30 p.m.?
- 8 The exchange rate between the Australian dollar and the euro, expressed in direct quotation from an Australian perspective, rises from 1.62405 to 1.62808. Calculate:
- The appreciation or depreciation of the euro in points and pips.
 - The appreciation or depreciation of the Australian dollar in points and pips.
- 9 On 4 June 2002 the following exchange rates were prevailing:
- | | |
|---------|--------|
| USD/AUD | 0.5674 |
| JPY/AUD | 70.43 |
| GBP/AUD | 0.3891 |
| EUR/AUD | 0.6075 |
- Calculate the following cross rates: JPY/USD, GBP/USD, EUR/USD, JPY/GBP, JPY/EUR and EUR/GBP.
- 10 The following exchange rates are quoted:
- | | |
|---------|-----------|
| GBP/AUD | 0.3820–90 |
| AUD/EUR | 1.6400–80 |
- Calculate the bid-offer spread on the exchange rate between the pound and the euro expressed in direct quotation from a British perspective.
- 11 On the basis of the following exchange rates, construct a cross exchange rate matrix that does not include the Australian dollar. All exchange rates must be expressed in bid-offer terms.
- | | |
|---------|---------------|
| GBP/AUD | 0.3820–0.3900 |
| EUR/AUD | 0.6020–0.6080 |
| CHF/AUD | 0.8800–0.8860 |
- 12 A German foreign exchange dealer trading the Australian dollar against the euro conducts the following transactions in November 2002:

Date	Exchange rate (EUR/AUD)	Amount (euro)
14 Nov	0.5563–0.5613	+5 000 000
15 Nov	0.5661–0.5711	+10 000 000
18 Nov	0.5581–0.5631	–7 000 000
19 Nov	0.5566–0.5616	+8 000 000
20 Nov	0.5562–0.5612	–12 000 000

- (a) Construct a blotter to show these transactions and the positions in both currencies.
- (b) Calculate the average exchange rate at which the dealer bought and sold the Australian dollar.
- (c) Calculate the unrealised profit/loss on the final position.
- (d) What would the dealer do to square the final position?
- 13** The spot and forward rates between the Australian dollar and the euro (AUD/EUR) are as follows:
- | | |
|---------------------|--------|
| Spot | 1.6030 |
| One-month forward | 1.6260 |
| Three-month forward | 1.5920 |
- Calculate the forward spread in per cent per annum for both maturities. State whether the Australian dollar sells at a premium or a discount.
- 14** The following are the spot and swap forward values of the EUR/AUD exchange rate:
- | | |
|---------------------|---------------|
| Spot | 0.6020–0.6100 |
| One-month forward | 20–40 |
| Three-month forward | 40–60 |
| Six-month forward | 80–40 |
- Calculate the outright forward rate for each maturity. State whether the euro sells at a premium or a discount.

Appendix 2.1

More foreign exchange jargon

This appendix contains some terms that are used in foreign exchange dealing or are related to the foreign exchange market. These terms do not appear in the body of the text.

Bears: Market participants who think that a particular currency is going to depreciate, so they sell it (they take a short position). Hence, bearish.

Book: A foreign exchange trader's book is his or her current position (that is, whether he or she is long or short on particular currencies). Traders 'talk their books' when they speak from a particular position.

Bottomish: The situation when the foreign exchange market has fallen to such a low level that a floor is imminent.

Bulls: Market participants who think that a particular currency is going to appreciate, so they buy it (they take a long position). Hence, bullish.

Fall out of bed: A currency falls out of bed if it depreciates suddenly and substantially.

Hit on the screen: When a dealer is hit on the screen, he or she has to deal at the rate displayed on the screen, even though it may not be the prevailing market rate.

How are you left? A question asked by a dealer to find out whether the counterparty wants to do more business after a sizeable transaction has just been concluded.

One-sided market: This situation arises when market participants hold the same views about future market trends, and so the market will be dominated by buyers with few wanting to sell, or vice versa.

Overbought: A currency is overbought when it has been pushed up to a level that is viewed as being too high to be sustainable.

Parity: One-to-one. An exchange rate of AUD1 = CAD1 indicates parity between the Australian dollar and the Canadian dollar.

Position: To take a position is to take a stand, preparing to execute a deal to become long or short on a particular currency. It also refers to the trader's balance of a particular currency.

Short covering: Buying currencies to cover a short (sold) position.

Technical correction: A discontinuity or a reversal in the market trend without any apparent change in the fundamental factors affecting the market.

Technical rally: A sudden rise in a currency without any apparent fundamental change.

Technical reaction: A sudden depreciation of a currency after appreciation.

Thin market: A market characterised by low activity reflecting lack of demand for and supply of currencies.

Topy: A market that has lost the tendency to rise, and so the next expected move is downwards.

Upside potential: The amount or percentage by which a currency is expected to rise. The opposite is downside risk.

Appendix 2.2

Types of trading orders

The following table contains a description of the types of orders on which a dealer may execute a customer's transactions:

Order	Description
Limit order	An exchange rate is set at which the order is to be executed.
At-the-market order	The transaction is to be executed immediately at the best available exchange rate.
Stop-loss order	Used to limit potential losses. It is triggered when a certain exchange rate prevails. The exchange rate at which it is executed is the next available.
Take-profit order	The opposite of the stop-loss order.
Open or good-until-cancelled order	Remains valid until it is executed or cancelled.
Good-until-specified-time order	Automatically cancelled if not executed by a certain time.
Day order	Valid until the end of the business day.
Night order	Valid until the start of the next business day.
Fill-or-kill order	All or any part of the order that can be filled at a specified exchange rate must be filled. If the remaining part is not filled within a short time, it is cancelled.
Any-part order	As above except that the remaining part is valid until filled or cancelled.
All-or-none order	At a specified rate either the whole order is filled or it is cancelled.
Either/or order	Two orders are given. If one is executed, the other is automatically cancelled.