The Fluctuating Value of the Yuan gives Chinese Business a Lesson in Foreign Exchange Risk

opening case

Between 2015 and early 2018, the Chinese currency, the yuan, fluctuated significantly in value against the U.S. dollar, giving Chinese businesses an object lesson in the importance of managing for foreign exchange risk.

From August 2015 through to December 2016, the value of the yuan in dollars *depreciated* by 12 percent from 6.2 to the dollar to 6.95 to the dollar. This depreciation was triggered by a slowdown in the Chinese economy, which led to an outflow of capital from China. Even though the Chinese government spent heavily to try to prop up the value of the yuan, using $1.5 trillion of dollar-denominated foreign exchange reserves to purchase yuan, they could not halt the decline in its value against the dollar.

While the depreciation in the yuan boosted exports, it also resulted in an unanticipated increase in the yuan price of key imports, which raised costs for a number of Chinese companies. About 980 listed Chinese companies reported combined foreign-exchange losses of 48.7 billion yuan in 2015, almost 13 times higher than 2014, according to data compiled by Bloomberg. Hardest hit were Chinese airlines, many of which imported aviation fuel that was paid for in dollars. As the cost of fuel in terms of yuan went up, their profits slumped. In total, the Chinese airline sector registered foreign exchange losses of 17.9 billion yuan for 2015, compared with 951.7 million a year earlier. The big three state-owned airlines—China Southern Airlines Co, China Eastern Airlines Corp, and Air China Ltd—suffered 15.85 billion yuan in foreign-exchange currency losses in 2015.

In 2017, conditions reversed. Between January 2017 and April 2018 the yuan *appreciated* in value by 10 percent against the dollar, increasing from 6.95 to the dollar to 6.27 to the dollar. The appreciation was due to a number of factors, including a return to stronger growth in China and the election of Donald Trump in the United States. The latter event seems to have reduced the confidence that foreign investors had in the United States and resulted in an outflow of capital as they sought to diversify their holdings of foreign assets and currency. The dollar also fell after members of the Trump administration made statements suggesting that they were happy to see it decline, since that boosted U.S. exports.

The appreciation in the value of the yuan against the dollar from January 2017 onward reduced the yuan costs for Chinese companies that imported goods priced in dollars, such as aviation fuel. Thus Air China noted in its 2017 annual report that a 1 percent gain in the yuan against the greenback can boost its net profits by about 280 million yuan, primarily due to reductions in the cost of aviation fuel.

On the other hand, the appreciation of the yuan raised the dollar price of Chinese exports. Many exporters saw their profits squeezed as a result. In early February 2018, Guangdong Goworld, a supplier to Apple, said in a stock exchange filing that it had suffered an estimated foreign exchange loss of 45 million yuan

continued

(US$7.2 million) in January 2018 owing to a stronger yuan. The January figure alone was equal to 94 percent of its foreign exchange losses for the first three quarters of 2017. It also translated into 34 percent of its net profits in the first nine months of 2017. The Shenzhen-listed company manufactures and sells printed circuit boards, liquid crystal displays (LCDs), and ultrasonic electronic measuring instruments to developed markets including the U.S., Europe, Australia, and Japan.

In another example, a spokesperson for Zhejiang NHU Co, a producer of vitamins, said that even as the vitamin export market experienced a boom in 2017, the company suffered millions of yuan in foreign exchange losses. The basic problem was that the company negotiated dollar prices for its vitamins in 2016, but by the end of 2017, each dollar of sales was yielding less revenues when translated back into yuan (thanks to the appreciation of the yuan). To deal with this problem, the company set up a team to discuss the issue and employed means such as hedging and forward exchange transactions to try to minimize foreign exchange risks. ●

Sources: Maggie Zhang and Daniel Ren, "It Has Dealt Us Heavy Blow," *South China Morning Post*, April 7, 2018; Xie Yu, "Chinese Companies Foreign Exchange Losses Soared Last Year," *South China Morning Post*, April 6, 2016; and "Exporters Feel the Bite of a Stronger Yuan," *Global Times*, April 2, 2018.

Introduction

Like many enterprises in the global economy, the Chinese enterprises discussed in the opening case are affected by changes in the value of currencies on the foreign exchange market. As the yuan *depreciated* in value against the dollar during 2015 and 2016, the profits of big Chinese importers fell due to foreign exchange losses. In contrast, as the yuan *appreciated* in value against the dollar during 2017, some Chinese exporters saw their profits hurt by foreign exchange losses. The case illustrates that what happens in the foreign exchange market can have a fundamental impact on the sales profits of an enterprise. Accordingly, it is very important for managers to understand how the foreign exchange works and what the impact of changes in currency exchange rates might be for their enterprise and its strategy.

This chapter has three main objectives. The first is to explain how the foreign exchange market works. The second is to examine the forces that determine exchange rates and to discuss the degree to which it is possible to predict future exchange rate movements. The third objective is to map the implications for international business of exchange rate movements. This chapter is the first of three that deal with the international monetary system and its relationship to international business. Chapter 11 explores the institutional structure of the international monetary system. The institutional structure is the context within which the foreign exchange market functions. As we shall see, changes in the institutional structure of the international monetary system can exert a profound influence on the development of foreign exchange markets.

foreign exchange market
A market for converting the currency of one country into that of another country.

exchange rate
The rate at which one currency is converted into another.

The **foreign exchange market** is a market for converting the currency of one country into that of another country. An **exchange rate** is simply the rate at which one currency is converted into another. For example, Toyota uses the foreign exchange market to convert the dollars it earns from selling cars in the United States into Japanese yen. Without the foreign exchange market, international trade and international investment on the scale that we see today would be impossible; companies would have to resort to barter. The foreign exchange market is the lubricant that enables companies based in countries that use different currencies to trade with each other.

We know from earlier chapters that international trade and investment have their risks. Some of these risks exist because future exchange rates cannot be perfectly predicted. The rate at which one currency is converted into another can change over time. For example, at the start of 2001, 1 U.S. dollar bought 1.065 euros, but by early 2014, 1 U.S. dollar bought only 0.74 euro. The dollar had fallen sharply in value against the euro. This made American goods cheaper in Europe, boosting export sales. At the same time, it made European goods more expensive in the United States, which hurt the sales and profits of European companies that sold goods and services to the United States. The pricing advantage enjoyed by U.S. companies, however, disappeared during 2015 and 2016 as economic weakness in Europe and a stronger U.S. economy resulted in a

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The "global money system" can have a significant effect on how companies operate globally. Often companies have to deal with exchange rates, monetary systems, and the capital market on both country and regional levels. But the influences of countries on the regional and global money system are significant (i.e., countries set the tone for the parameters of the foreign exchange market and the international monetary system). The globalEDGE™ Database of International Business Statistics (DIBS) includes time-series data beginning in the 1990s until today and covers more than 200 countries and more than 5,000 data variables. Countries, regions, and the world use these types of data points to drive the global money system, and everyone who is interested in better understanding the global capital market needs to know about them! Register free on globalEDGE™ to gain access to the DIBS database right now; students have free access to DIBS, and DIBS can be found at globaledge.msu.edu/tools-and-data/dibs.

sharp fall in the value of the euro. By early 2017, 1 U.S. dollar bought 0.93 euro, meaning that American exports to the euro zone had become more expensive. Rapid changes in currency values such as these often take managers by surprise, and if they have not hedged against the possible risk, sales and profits can be significantly affected.

One function of the foreign exchange market is to provide some insurance against the risks that arise from such volatile changes in exchange rates, commonly referred to as *foreign exchange risk*. Although the foreign exchange market offers some insurance against foreign exchange risk, it cannot provide complete insurance. It is not unusual for international businesses to suffer losses (or gains) because of unpredicted changes in exchange rates. Currency fluctuations can make seemingly profitable trade and investment deals unprofitable, and vice versa.

We begin this chapter by looking at the functions and the form of the foreign exchange market. This includes distinguishing among spot exchanges, forward exchanges, and currency swaps. Then we consider the factors that determine exchange rates. We also look at how foreign trade is conducted when a country's currency cannot be exchanged for other currencies, that is, when its currency is not convertible. The chapter closes with a discussion of these things in terms of their implications for business.

The Functions of the Foreign Exchange Market

LO 10-1
Describe the functions of the foreign exchange market.

The foreign exchange market serves two main functions. The first is to convert the currency of one country into the currency of another. The second is to provide some insurance against **foreign exchange risk**, or the adverse consequences of unpredictable changes in exchange rates.[1]

foreign exchange risk
The risk that changes in exchange rates will hurt the profitability of a business deal.

CURRENCY CONVERSION Each country has a currency in which the prices of goods and services are quoted. In the United States, it is the dollar ($); in Great Britain, the pound (£); in France, Germany, and the other 17 members of the euro zone, it is the euro (€); in Japan, the yen (¥); and so on. In general, within the borders of a particular country, one must use the national currency. A U.S. tourist cannot walk into a store in Edinburgh, Scotland, and use U.S. dollars to buy a bottle of Scotch whisky. Dollars are not recognized as legal tender in Scotland; the tourist must use British pounds. Fortunately, the tourist can go to a bank and exchange her dollars for pounds. Then she can buy the whisky.

When a tourist changes one currency into another, she is participating in the foreign exchange market. The exchange rate is the rate at which the market converts one currency into another. For example, an exchange rate of €1 = $1.07 specifies that 1 euro buys 1.07 U.S. dollars. The exchange rate allows us to compare the relative prices of goods and services in different countries. A U.S. tourist wishing to buy a bottle of Scotch whisky in Edinburgh may find that she must pay £30 for the bottle, knowing that the same bottle costs $35 in the United States. Is this a good deal? Imagine the current pound/dollar exchange rate is £1.00 = $1.25 (i.e., 1 British pound buys $1.25). Our intrepid tourist takes out her calculator and converts £30 into dollars.

Tourists exchanging currency in Istanbul, Turkey.

(The calculation is 30 × 1.25.) She finds that the bottle of Scotch costs the equivalent of $37.50. She is surprised that a bottle of Scotch whisky could cost less in the United States than in Scotland despite shipping costs (alcohol is taxed heavily in Great Britain).

Tourists are minor participants in the foreign exchange market; companies engaged in international trade and investment are major ones. International businesses have four main uses of foreign exchange markets. First, the payments a company receives for its exports, the income it receives from foreign investments, or the income it receives from licensing agreements with foreign firms may be in foreign currencies. To use those funds in its home country, the company must convert them to its home country's currency. Consider the Scotch distillery that exports its whisky to the United States. The distillery is paid in dollars, but because those dollars cannot be spent in Great Britain, they must be converted into British pounds. Similarly, Toyota sells its cars in the United States for dollars; it must convert the U.S. dollars it receives into Japanese yen to use them in Japan.

Second, international businesses use foreign exchange markets when they must pay a foreign company for its products or services in its country's currency. For example, Dell buys many of the components for its computers from Malaysian firms. The Malaysian companies must be paid in Malaysia's currency, the ringgit, so Dell must convert money from dollars into ringgit to pay them.

Third, international businesses also use foreign exchange markets when they have spare cash that they wish to invest for short terms in money markets. For example, consider a U.S. company that has $10 million it wants to invest for three months. The best interest rate it can earn on these funds in the United States may be 2 percent. Investing in a South Korean money market account, however, may earn 6 percent. Thus, the company may change its $10 million into Korean won and invest it in South Korea. Note, however, that the rate of return it earns on this investment depends not only on the Korean interest rate but also on the changes in the value of the Korean won against the dollar in the intervening period.

currency speculation
Involves short-term movement of funds from one currency to another in hopes of profiting from shifts in exchange rates.

Currency speculation is the fourth use of foreign exchange markets. **Currency speculation** typically involves the short-term movement of funds from one currency to another in the hopes of profiting from shifts in exchange rates. Consider again a U.S. company with $10 million to invest for three months. Suppose the company suspects that the U.S. dollar is overvalued against the Japanese yen. That is, the company expects the value of the dollar to depreciate (fall) against that of the yen. Imagine the current dollar/yen exchange rate is $1 = ¥120. The company exchanges its $10 million into yen, receiving ¥1.2 billion ($10 million × 120 = ¥1.2 billion). Over the next three months, the value of the dollar depreciates against the yen until $1 = ¥100. Now the company exchanges its ¥1.2 billion back into dollars and finds that it has $12 million. The company has made a $2 million profit on currency speculation in three months on an initial investment of $10 million! In general, however, companies should beware, for speculation by definition is a very risky business. The company cannot know for sure what will happen to exchange rates. While a speculator may profit handsomely if his speculation about future currency movements turns out to be correct, he can also lose vast amounts of money if it turns out to be wrong.

carry trade
A kind of speculation that involves borrowing in one currency where interest rates are low and then using the proceeds to invest in another currency where interest rates are high.

A kind of speculation that has become more common in recent years is known as the **carry trade**. The carry trade involves borrowing in one currency where interest rates are low and then using the proceeds to invest in another currency where interest rates are high.[2] For example, if the interest rate on borrowings in Japan is 1 percent but the interest rate on deposits in American banks is 6 percent, it can make sense to borrow in Japanese yen, convert the money into U.S. dollars, and deposit it in an American bank. The trader can make a 5 percent margin by doing so, minus the transaction costs associated with changing one currency into another. The speculative element of this trade is that its success is based on a belief that there will be no adverse movement in exchange rates (or interest rates for that matter) that will make the trade unprofitable. However, if the yen were to rapidly increase in value against the dollar, then it would take more U.S. dollars to repay the original loan, and the trade could fast become unprofitable. The dollar/yen carry

trade was actually very significant during the mid-2000s, peaking at more than $1 trillion in 2007, when some 30 percent of trade on the Tokyo foreign exchange market was related to the carry trade.[3] This carry trade declined in importance during 2008–2009 because interest rate differentials were falling as U.S. rates came down, making the trade less profitable. By late 2016, there were signs that the dollar/yen carry trade was becoming important again as negative interest rates in Japan, coupled with rising interest rates in the United States, were making it profitable to borrow in yen again and convert the money into U.S. dollars.[4]

INSURING AGAINST FOREIGN EXCHANGE RISK

LO 10-2
Understand what is meant by spot exchange rates.

A second function of the foreign exchange market is to provide insurance against foreign exchange risk, which is the possibility that unpredicted changes in future exchange rates will have adverse consequences for the firm. When a firm insures itself against foreign exchange risk, it is engaging in *hedging*. To explain how the market performs this function, we must first distinguish among spot exchange rates, forward exchange rates, and currency swaps.

Spot Exchange Rates

When two parties agree to exchange currency and execute the deal immediately, the transaction is referred to as a spot exchange. Exchange rates governing such "on the spot" trades are referred to as spot exchange rates. The **spot exchange rate** is the rate at which a foreign exchange dealer converts one currency into another currency on a particular day. Thus, when our U.S. tourist in Edinburgh goes to a bank to convert her dollars into pounds, the exchange rate is the spot rate for that day.

spot exchange rate
The exchange rate at which a foreign exchange dealer will convert one currency into another that particular day.

Spot exchange rates are reported on a real-time basis on many financial websites. An exchange rate can be quoted in two ways: as the amount of foreign currency one U.S. dollar will buy or as the value of a dollar for one unit of foreign currency. Thus, on February 6, 2016, at 12:30 p.m., Eastern Standard Time, 1 U.S. dollar bought €0.93, and 1 euro bought $1.08.

Spot rates change continually, often on a minute-by-minute basis (although the magnitude of changes over such short periods is usually small). The value of a currency is determined by the interaction between the demand and supply of that currency relative to the demand and supply of other currencies. For example, if lots of people want U.S. dollars and dollars are in short supply, and few people want British pounds and pounds are in plentiful supply, the spot exchange rate for converting dollars into pounds will change. The dollar is likely to appreciate against the pound (or the pound will depreciate against the dollar). Imagine the spot exchange rate is £1 = $1.25 when the market opens. As the day progresses, dealers demand more dollars and fewer pounds. By the end of the day, the spot exchange rate might be £1 = $1.23. Each pound now buys fewer dollars than at the start of the day. The dollar has appreciated, and the pound has depreciated.

Forward Exchange Rates

LO 10-3
Recognize the role that forward exchange rates play in insuring against foreign exchange risk.

Changes in spot exchange rates can be problematic for an international business. For example, a U.S. company that imports high-end cameras from Japan knows that in 30 days it must pay yen to a Japanese supplier when a shipment arrives. The company will pay the Japanese supplier ¥200,000 for each camera, and the current dollar/yen spot exchange rate is $1 = ¥120. At this rate, each camera costs the importer $1,667 (i.e., 1,667 = 200,000/120). The importer knows she can sell the cameras the day they arrive for $2,000 each, which yields a gross profit of $333 on each ($2,000 – $1,667). However, the importer will not have the funds to pay the Japanese supplier until the cameras are sold. If, over the next 30 days, the dollar unexpectedly depreciates against the yen, say, to $1 = ¥95, the importer will still have to pay the Japanese company ¥200,000 per camera but in dollar terms that would be equivalent to $2,105 per camera, which is more than she can sell the cameras for. A depreciation in the value of the dollar against the yen from $1 = ¥120 to $1 = ¥95 would transform a profitable deal into an unprofitable one.

To *insure* or *hedge* against this risk, the U.S. importer might want to engage in a forward exchange. A **forward exchange** occurs when two parties agree to exchange currency and execute the deal at some specific date in the future. Exchange rates governing such future transactions are referred to as **forward exchange rates**. For most major currencies, forward exchange rates are quoted for 30 days, 90 days, and 180 days into the future. In some cases, it is possible to get forward exchange rates for several years into the future. Returning to our camera importer

forward exchange
When two parties agree to exchange currency and execute a deal at some specific date in the future.

forward exchange rate
The exchange rate governing a forward exchange transaction.

example, let us assume the 30-day forward exchange rate for converting dollars into yen is $1 = ¥110. The importer enters into a 30-day forward exchange transaction with a foreign exchange dealer at this rate and is guaranteed that she will have to pay no more than $1,818 for each camera (1,818 = 200,000/110). This guarantees her a profit of $182 per camera ($2,000 − $1,818). She also insures herself against the possibility that an unanticipated change in the dollar/yen exchange rate will turn a profitable deal into an unprofitable one.

In this example, the spot exchange rate ($1 = ¥120) and the 30-day forward rate ($1 = ¥110) differ. Such differences are normal; they reflect the expectations of the foreign exchange market about future currency movements. In our example, the fact that $1 bought more yen with a spot exchange than with a 30-day forward exchange indicates foreign exchange dealers expected the dollar to depreciate against the yen in the next 30 days. When this occurs, we say the dollar is selling at a discount on the 30-day forward market (i.e., it is worth less than on the spot market). Of course, the opposite can also occur. If the 30-day forward exchange rate were $1 = ¥130, for example, $1 would buy more yen with a forward exchange than with a spot exchange. In such a case, we say the dollar is selling at a premium on the 30-day forward market. This reflects the foreign exchange dealers' expectations that the dollar will appreciate against the yen over the next 30 days.

In sum, when a firm enters into a forward exchange contract, it is taking out insurance against the possibility that future exchange rate movements will make a transaction unprofitable by the time that transaction has been executed. Although many firms routinely enter into forward exchange contracts to hedge their foreign exchange risk, sometimes this can work against the company. An example is given in the accompanying Management Focus, which explains how the hedging strategy adopted by the Brazilian regional jet manufacturer, Embraer, backfired.

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Embraer and the Gyrations of the Brazilian Real

For many years, Brazil was a country battered by persistently high inflation. As a result, the value of its currency, the real, depreciated steadily against the U.S. dollar. This changed in the early 2000s, when the Brazilian government was successful in bringing down annual inflation rates into the single digits. Lower inflation, coupled with policies that paved the way for the expansion of the Brazilian economy, resulted in a steady appreciation of the real against the U.S. dollar. In May 2004, 1 real bought $0.3121; by August 2008, 1 real bought $0.65, an appreciation of more than 100 percent.

The appreciation of the real against the dollar was a mixed bag for Embraer, the world's largest manufacturer of regional jets of up to 110 seats and one of Brazil's most prominent industrial companies. Embraer purchases many of the parts that go into its jets, including the engines and electronics, from U.S. manufacturers. As the real appreciated against the dollar, these parts cost less when translated into reals, which benefited Embraer's profit margins. However, the company also prices its aircraft in U.S. dollars, as do all manufacturers in the global market for commercial jet aircraft. So, as the real appreciated against the dollar, Embraer's dollar revenues were compressed when exchanged back into reals.

*To try to deal with the impact of currency appreciation on its revenues, in the mid-2000s, Embraer started to hedge against future appreciation of the real by buying forward contracts (forward contracts give the holder the right to exchange one currency—in this case, dollars—for another—in this case, reals—at some point in the future at a predetermined exchange rate). If the real had continued to appreciate, this would have been a great strategy for Embraer because the company could have locked in the rate at which sales made in dollars were exchanged back into reals. Unfortunately for Embraer, as the global financial crisis unfolded in 2008, investors fled to the dollar, which they viewed as a safe haven, and the real *depreciated* against the dollar. Between August 2008 and November 2008, the value of the real fell by almost 40 percent against the dollar. But for the hedging, this depreciation would have actually increased Embraer's revenues in reals. Embraer, however, had locked itself into a much higher real/dollar exchange rate, and the company was forced to take a $121 million loss on what was essentially a bad currency bet.*

Since the shock of 2008, Embraer has cut back on currency hedging, and most of its dollar sales and purchases are not hedged. This makes Embraer's sales revenues very sensitive to the real/dollar exchange rate. By 2010, the Brazilian real was once more appreciating against the U.S. dollar, which pressured Embraer's revenues. By 2012, however, the Brazilian economy was stagnating, while inflation was starting to increase again. This led to a sustained fall in the value of the real, which fell from 1 real = $0.644 in July 2011 to 1 real = $0.32 by February 2017, a depreciation of 50 percent. What was bad for the Brazilian currency, however, was good for Embraer, whose stock price surged to the highest price since February 2008 on speculation that the decline on the real would lead to a boost in Embraer's revenues when expressed in reals.

Sources: D. Godoy, "Embraer Rallies as Brazilian Currency Weakens," *Bloomberg*, May 31, 2013; K. Kroll, "Embraer Fourth Quarter Profits Plunge 44% on Currency Woes," *Cleveland.com*, March 27, 2009; "A Fall from Grace: Brazil's Mediocre Economy," *The Economist*, June 8, 2013; and "Brazil's Economy: The Deterioration," *The Economist*, December 7, 2013.

Currency Swaps The preceding discussion of spot and forward exchange rates might lead you to conclude that the option to buy forward is very important to companies engaged in international trade—and you would be right. According to the most recent data, forward instruments account for almost two-thirds of all foreign exchange transactions, while spot exchanges account for about one-third.[5] However, the vast majority of these forward exchanges are not forward exchanges of the type we have been discussing but rather a more sophisticated instrument known as currency swaps.

A **currency swap** is the simultaneous purchase and sale of a given amount of foreign exchange for two different value dates. Swaps are transacted between international businesses and their banks, between banks, and between governments when it is desirable to move out of one currency into another for a limited period without incurring foreign exchange risk. A common kind of swap is spot against forward. Consider a company such as Apple. Imagine Apple assembles laptop computers in the United States, but the screens are made in Japan. Apple also sells some of the finished laptops in Japan. So, like many companies, Apple both buys from and sells to Japan. Imagine Apple needs to change $1 million into yen to pay its supplier of laptop screens today. Apple knows that in 90 days it will be paid ¥120 million by the Japanese importer that buys its finished laptops. It will want to convert these yen into dollars for use in the United States. Let us say today's spot exchange rate is $1 = ¥120 and the 90-day forward exchange rate is $1 = ¥110. Apple sells $1 million to its bank in return for ¥120 million. Now Apple can pay its Japanese supplier. At the same time, Apple enters into a 90-day forward exchange deal with its bank for converting ¥120 million into dollars. Thus, in 90 days Apple will receive $1.09 million (¥120 million/110 = $1.09 million). Because the yen is trading at a premium on the 90-day forward market, Apple ends up with more dollars than it started with (although the opposite could also occur). The swap deal is just like a conventional forward deal in one important respect: It enables Apple to insure itself against foreign exchange risk. By engaging in a swap, Apple knows today that the ¥120 million payment it will receive in 90 days will yield $1.09 million.

currency swap
Simultaneous purchase and sale of a given amount of foreign exchange for two different value dates.

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The Nature of the Foreign Exchange Market

The foreign exchange market is not located in any one place. It is a global network of banks, brokers, and foreign exchange dealers connected by electronic communications systems. When companies wish to convert currencies, they typically go through their own banks rather than entering the market directly. The foreign exchange market has been growing at a rapid pace, reflecting a general growth in the volume of cross-border trade and investment (see Chapter 1). In March 1986, the average total value of global foreign exchange trading was about $200 billion per day. By April 2016, the last date for which we have solid data, it had hit $5.1 trillion a day.[6] The most important trading centers are London (37 percent of activity); New York (18 percent of activity); and Zurich, Tokyo, and Singapore (all with around 5 to 6 percent of activity).[7] Major secondary trading centers include Frankfurt, Paris, Hong Kong, and Sydney.

London's dominance in the foreign exchange market is due to both history and geography. As the capital of the world's first major industrial trading nation, London had become the world's largest center for international banking by the end of the nineteenth century, a position it has retained. Today, London's central position between Tokyo and Singapore to the east and New York to the west has made it the critical link between the East Asian and New York markets. Due to the particular differences in time zones, London opens soon after Tokyo closes for the night and is still open for the first few hours of trading in New York. It is an open question, however, as to how the decision to exit from the EU (Brexit) will affect London's position as a global trading center.[8]

Two features of the foreign exchange market are of particular note. The first is that the market never sleeps. Tokyo, London, and New York are all shut for only three hours out of every 24. During these three hours, trading continues in a number of minor centers, particularly San Francisco and Sydney, Australia. The second feature of the market is the integration of the various trading centers. High-speed computer linkages among trading centers around the globe have effectively created a single market. The integration of financial centers implies there can be no significant difference in exchange rates quoted in the trading centers. For example, if the yen/dollar exchange rate quoted in London at 3 p.m. is ¥120 = $1, the yen/dollar exchange rate quoted in New York at the same time (10 a.m. New York time) will be identical. If the New York

arbitrage
The purchase of securities in one market for immediate resale in another to profit from a price discrepancy.

yen/dollar exchange rate were ¥125 = $1, a dealer could make a profit through **arbitrage**, buying a currency low and selling it high. For example, if the prices differed in London and New York as given, a dealer in New York could take $1 million and use that to purchase ¥125 million. She could then immediately sell the ¥125 million for dollars in London, where the transaction would yield $1.041666 million, allowing the trader to book a profit of $41,666 on the transaction. If all dealers tried to cash in on the opportunity, however, the demand for yen in New York would rise, resulting in an appreciation of the yen against the dollar such that the price differential between New York and London would quickly disappear. Because foreign exchange dealers are always watching their computer screens for arbitrage opportunities, the few that arise tend to be small, and they disappear in minutes.

Another feature of the foreign exchange market is the important role played by the U.S. dollar. Although a foreign exchange transaction can involve any two currencies, most transactions involve dollars on one side. This is true even when a dealer wants to sell a non-dollar currency and buy another. A dealer wishing to sell Mexican pesos for Japanese yen, for example, will usually sell the pesos for dollars and then use the dollars to buy yen. Although this may seem a roundabout way of doing things, it is actually cheaper than trying to find a holder of pesos who wants to buy yen. Because the volume of international transactions involving dollars is so great, it is not hard to find dealers who wish to trade dollars for pesos or yen.

Due to its central role in so many foreign exchange deals, the dollar is a vehicle currency. In 2013, 87 percent of all foreign exchange transactions involved dollars on one side of the transaction. After the dollar, the most important vehicle currencies were the euro (33 percent), the Japanese yen (23 percent), and the British pound (12 percent)—reflecting the historical importance of these trading entities in the world economy.

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LO 10-4
Understand the different theories explaining how currency exchange rates are determined and their relative merits.

Economic Theories of Exchange Rate Determination

At the most basic level, exchange rates are determined by the demand and supply of one currency relative to the demand and supply of another. For example, if the demand for dollars outstrips the supply of them and if the supply of Japanese yen is greater than the demand for them, the dollar/yen exchange rate will change (see the opening case). The dollar will appreciate against the yen (and the yen will depreciate against the dollar). However, while differences in relative demand and supply explain the determination of exchange rates, they do so only in a superficial sense. This simple explanation does not reveal what factors underlie the demand for and supply of a currency. Nor does it tell us when the demand for dollars will exceed the supply (and vice versa) or when the supply of Japanese yen will exceed demand for them (and vice versa). Neither does it show under what conditions a currency is in demand or under what conditions it is not demanded. In this section, we will review economic theory's answers to these questions. This will give us a deeper understanding of how exchange rates are determined.

If we understand how exchange rates are determined, we may be able to forecast exchange rate movements. Because future exchange rate movements influence export opportunities, the profitability of international trade and investment deals, and the price competitiveness of foreign imports, this is valuable information for an international business. Unfortunately, there is no simple explanation. The forces that determine exchange rates are complex, and no theoretical consensus exists, even among academic economists who study the phenomenon every day. Nonetheless, most economic theories of exchange rate movements seem to agree that three factors have an important impact on future exchange rate movements in a country's currency: the country's price inflation, its interest rate, and market psychology.[9]

PRICES AND EXCHANGE RATES

To understand how prices are related to exchange rate movements, we first need to discuss an economic proposition known as the law of one price. Then we will discuss the theory of purchasing power parity (PPP), which links changes in the exchange rate between two countries' currencies to changes in the countries' price levels.

The Law of One Price

The **law of one price** states that in competitive markets free of transportation costs and barriers to trade (such as tariffs), identical products sold in different countries must sell for the same price when their price is expressed in terms of the same currency.[10] For example, if the exchange rate between the British pound and the dollar is £1 = $2, a jacket that retails for $80 in New York should sell for £40 in London (because $80/$2 = £40). Consider what would happen if the jacket cost £30 in London ($60 in U.S. currency). At this price, it would pay a trader to buy jackets in London and sell them in New York (an example of *arbitrage*). The company initially could make a profit of $20 on each jacket by purchasing it for £30 ($60) in London and selling it for $80 in New York (we are assuming away transportation costs and trade barriers). However, the increased demand for jackets in London would raise their price in London, and the increased supply of jackets in New York would lower their price there. This would continue until prices were equalized. Thus, prices might equalize when the jacket cost £35 ($70) in London and $70 in New York (assuming no change in the exchange rate of £1 = $2).

law of one price
In competitive markets free of transportation costs and barriers to trade, identical products sold in different countries must sell for the same price when their price is expressed in the same currency.

Purchasing Power Parity

If the law of one price were true for all goods and services, the *purchasing power parity (PPP)* exchange rate could be found from any individual set of prices. By comparing the prices of identical products in different currencies, it would be possible to determine the "real," or PPP, exchange rate that would exist if markets were efficient. (An **efficient market** has no impediments to the free flow of goods and services, such as trade barriers.)

efficient market
A market where prices reflect all available information.

A less extreme version of the PPP theory states that given relatively efficient markets—that is, markets in which few impediments to international trade exist—the price of a "basket of goods" should be roughly equivalent in each country. To express the PPP theory in symbols, let $P_{\$}$ be the U.S. dollar price of a basket of particular goods and $P_{¥}$ be the price of the same basket of goods in Japanese yen. The PPP theory predicts that the dollar/yen exchange rate, $E_{\$/¥}$, should be equivalent to

$$E_{\$/¥} = P_{\$}/P_{¥}$$

Thus, if a basket of goods costs $200 in the United States and ¥20,000 in Japan, PPP theory predicts that the dollar/yen exchange rate should be $200/¥20,000 or $0.01 per Japanese yen (i.e., $1 = ¥100).

Every year, the news magazine *The Economist* publishes its own version of the PPP theorem, which it refers to as the "Big Mac Index." *The Economist* has selected McDonald's Big Mac as a proxy for a "basket of goods" because it is produced according to more or less the same recipe in about 120 countries. The Big Mac PPP is the exchange rate that would have hamburgers costing the same in each country. According to *The Economist,* comparing a country's actual exchange rate with the one predicted by the PPP theorem based on relative prices of Big Macs is a test of whether a currency is undervalued or not. This is not a totally serious exercise, as *The Economist* admits, but it does provide a useful illustration of the PPP theorem.

To calculate the index, *The Economist* converts the price of a Big Mac in a country into dollars at current exchange rates and divides that by the average price of a Big Mac in America. According to the PPP theorem, the prices should be the same. If they are not, it implies that the currency is either overvalued against the dollar or undervalued. For example, in January 2017, the average price of a Big Mac in the United States was $5.06, while it was $3.83 in China, and $5.67 in Norway. This suggests that the Chinese yuan is undervalued by 44 percent, while the Norwegian krona is overvalued by 12 percent!

The next step in the PPP theory is to argue that the exchange rate will change if relative prices change. For example, imagine there is no price inflation in the United States, while prices in Japan are increasing by 10 percent a year. At the beginning of the year, a basket of goods costs $200 in the United States and ¥20,000 in Japan, so the dollar/yen exchange rate, according to PPP theory, should be $1 = ¥100. At the end of the year, the basket of goods still costs $200 in the United States, but it costs ¥22,000 in Japan. PPP theory predicts that the exchange rate should change as a result. More precisely, by the end of the year

$$E_{\$/¥} = \$200/¥22{,}000$$

Thus, ¥1 = $0.0091 (or $1 = ¥110). Because of 10 percent price inflation, the Japanese yen has depreciated by 10 percent against the dollar. One dollar will buy 10 percent more yen at the end of the year than at the beginning.

Money Supply and Price Inflation

In essence, PPP theory predicts that changes in relative prices will result in a change in exchange rates. Theoretically, a country in which price inflation is running wild should expect to see its currency depreciate against that of countries in which inflation rates are lower. If we can predict what a country's future inflation rate is likely to be, we can also predict how the value of its currency relative to other currencies—its exchange rate—is likely to change. The growth rate of a country's money supply determines its likely future inflation rate.[11] Thus, in theory at least, we can use information about the growth in money supply to forecast exchange rate movements.

Inflation is a monetary phenomenon. It occurs when the quantity of money in circulation rises faster than the stock of goods and services—that is, when the money supply increases faster than output increases. Imagine what would happen if everyone in the country was suddenly given $10,000 by the government. Many people would rush out to spend their extra money on those things they had always wanted—new cars, new furniture, better clothes, and so on. There would be a surge in demand for goods and services. Car dealers, department stores, and other providers of goods and services would respond to this upsurge in demand by raising prices. The result would be price inflation.

A government increasing the money supply is analogous to giving people more money. An increase in the money supply makes it easier for banks to borrow from the government and for individuals and companies to borrow from banks. The resulting increase in credit causes increases in demand for goods and services. Unless the output of goods and services is growing at a rate similar to that of the money supply, the result will be inflation. This relationship has been observed time after time in country after country.

So now we have a connection between the growth in a country's money supply, price inflation, and exchange rate movements. Put simply, *when the growth in a country's money supply is faster than the growth in its output, price inflation is fueled*. The PPP theory tells us that a country with a high inflation rate will see depreciation in its currency exchange rate. In one of the clearest historical examples, in the mid-1980s, Bolivia experienced *hyperinflation*—an explosive and seemingly uncontrollable price inflation in which money loses value very rapidly. Table 10.1 presents data on Bolivia's money supply, inflation rate, and its peso's exchange rate with the U.S. dollar during the period of hyperinflation. The exchange rate is actually the "black market" exchange rate because the Bolivian government prohibited converting the peso to other currencies during the period. The data show that the growth in money supply, the rate of price inflation, and the depreciation of the peso against the dollar all moved in step with each other. This is just what PPP theory and monetary economics predict. Between April 1984 and July 1985, Bolivia's money supply increased by 17,433 percent, prices increased by 22,908 percent, and the value of the peso against the dollar fell by 24,662 percent! In October 1985, the Bolivian government instituted a dramatic stabilization plan—which included the introduction of a new currency and tight control of the money supply—and by 1987, the country's annual inflation rate was down to 16 percent.[12]

Another way of looking at the same phenomenon is that an increase in a country's money supply, which increases the amount of currency available, changes the relative demand-and-supply conditions in the foreign exchange market. If the U.S. money supply is growing more rapidly than U.S. output, dollars will be relatively more plentiful than the currencies of countries where monetary growth is closer to output growth. As a result of this relative increase in the supply of dollars, the dollar will depreciate on the foreign exchange market against the currencies of countries with slower monetary growth.

Government policy determines whether the rate of growth in a country's money supply is greater than the rate of growth in output. A government can increase the money supply simply by telling the country's central bank to issue more money. Governments tend to do this to finance public expenditure (building roads, paying government workers, paying for defense, etc.). A government could finance public expenditure by raising taxes, but because

Month	Money Supply (billions of pesos)	Price Level Relative to 1982 (average = 1)	Exchange Rate (pesos per dollar)
1984			
April	270	21.1	3,576
May	330	31.1	3,512
June	440	32.3	3,342
July	599	34.0	3,570
August	718	39.1	7,038
September	889	53.7	13,685
October	1,194	85.5	15,205
November	1,495	112.4	18,469
December	3,296	180.9	24,515
1985			
January	4,630	305.3	73,016
February	6,455	863.3	141,101
March	9,089	1,078.6	128,137
April	12,885	1,205.7	167,428
May	21,309	1,635.7	272,375
June	27,778	2,919.1	481,756
July	47,341	4,854.6	885,476
August	74,306	8,081.0	1,182,300
September	103,272	12,647.6	1,087,440
October	132,550	12,411.8	1,120,210

10.1 TABLE

Macroeconomic Data for Bolivia, April 1984 to October 1985

Source: Juan-Antonio Morales, "Inflation Stabilization in Bolivia," Inflation Stabilization: The Experience of Israel, Argentina, Brazil, Bolivia, and Mexico, ed. Michael Bruno et al. (Cambridge, MA: MIT Press, 1988).

nobody likes paying more taxes and because politicians do not like to be unpopular, they have a natural preference for expanding the money supply. Unfortunately, there is no magic money tree. The result of *excessive* growth in money supply is typically price inflation. However, this has not stopped governments around the world from expanding the money supply, with predictable results. If an international business is attempting to predict future movements in the value of a country's currency on the foreign exchange market, it should examine that country's policy toward monetary growth. If the government seems committed to controlling the rate of growth in money supply, the country's future inflation rate may be low (even if the current rate is high) and its currency should not depreciate too much on the foreign exchange market. If the government seems to lack the political will to control the rate of growth in money supply, the future inflation rate may be high, which is likely to cause its currency to depreciate. Historically, many Latin American governments have fallen into this latter category, including Argentina, Bolivia, and Brazil. More recently, many of the newly democratic states of eastern Europe made the same mistake. In late 2010, when the U.S. Federal Reserve decided to promote growth by expanding the U.S. money supply using a technique known as quantitative easing, critics charged that this too would lead to inflation and a decline in the value of the U.S. dollar on foreign exchange markets, but are they right? For a discussion of this, see the accompanying Country Focus.

An outdoor market in Bolivia.

©Noah Friedman-Rudovsky/Bloomberg/Getty Images

country FOCUS

Quantitative Easing, Inflation, and the Value of the U.S. Dollar

In fall 2010, the U.S. Federal Reserve (the Fed) decided to expand the U.S. money supply by entering the open market and purchasing $600 billion in U.S. government bonds from bondholders, a technique known as *quantitative easing*. Where did the $600 billion come from? The Fed simply created new bank reserves and used this cash to pay for the bonds. It had, in effect, printed money. The Fed took this action in an attempt to stimulate the U.S. economy, which, in the aftermath of the 2008–2009 global financial crisis, was struggling with low economic growth and high unemployment rates. The Fed had already tried to stimulate the economy by lowering short-term interest rates, but these were already close to zero, so it decided to lower medium- to longer-term rates; its tool for doing this was to pump $600 billion into the economy, increasing the supply of money and lowering its price, the interest rate. The Fed pursued further rounds of quantitative easing in 2011 through to 2013. In 2014, with the U.S. economy getting stronger and unemployment falling below 6 percent, the Fed progressively reduced its bond buying program. It ended the program in October 2014. By that time, the Fed had effectively pumped more than $3.5 trillion into the U.S. economy.

Critics were quick to attack the Fed's moves. Many claimed that the policy of expanding the money supply would fuel inflation and lead to a decline in the value of the U.S. dollar on the foreign exchange market. Some even called the policy a deliberate attempt by the Fed to debase the value of the U.S. currency, thereby driving down its value and promoting U.S. exports, which, if true, would be a form of mercantilism.

However, these charges may be unfounded for two reasons. First, at the time, the core U.S. inflation rate was the lowest in 50 years. In fact, the Fed actually feared the risk of deflation (a persistent fall in prices), which is a very damaging phenomenon. When prices are falling, people hold off their purchases because they know that goods will be cheaper tomorrow than they are today. This can result in a collapse in aggregate demand and high unemployment. The Fed felt that a little inflation—say, 2 percent per year—might be a good thing. Second, U.S. economic growth had been weak, unemployment was high, and there was excess productive capacity in the economy. Consequently, if the injection of money into the economy did stimulate demand, this would not translate into price inflation because the first response of businesses would be to expand output to utilize their excess capacity. Defenders of the Fed argued that the important point, which the critics seemed to be missing, was that expanding the money supply leads to only higher price inflation when unemployment is relatively low and there is not much excess capacity in the economy, a situation that did not exist in fall 2010. As for the currency market, its reaction was muted. At the beginning of November 2010, just before the Fed announced its policy, a trade-weighted index of the value of the dollar against a basket of other major currencies stood at 72. At the end of January 2014, it stood at 78—a slight appreciation. In short, currency traders did not seem to be selling off the dollar or reflecting worries about high inflation rates.

By March 2016, with the program over, there was no sign of a surge in price inflation in the U.S. economy. Indeed, inflation rates remained near historic lows. Moreover, far from weakening, the U.S. dollar had increased in value against most currencies, and the index value stood at 92. The Fed, it would seem, had been right and the critics were wrong.

Sources: P. Wallsten and S. Reddy, "Fed's Bond Buying Plan Ignites Growing Criticism," *The Wall Street Journal*, November 15, 2010; S. Chan, "Under Attack, the Fed Defends Policy of Buying Bonds," *International Herald Tribune*, November 17, 2010; "What QE Means for the World; Positive Sum Currency Wars," *The Economist*, February 14, 2013.

Empirical Tests of PPP Theory

PPP theory predicts that exchange rates are determined by relative prices and that changes in relative prices will result in a change in exchange rates. A country in which price inflation is running wild should expect to see its currency depreciate against that of countries with lower inflation rates. This is intuitively appealing, but is it true in practice? There are several good examples of the connection between a country's price inflation and exchange rate position (such as Bolivia). However, extensive empirical testing of PPP theory has yielded mixed results.[13] While PPP theory seems to yield relatively accurate predictions in the long run, it does not appear to be a strong predictor of short-run movements in exchange rates covering time spans of five years or less.[14] In addition, the theory seems to best predict exchange rate changes for countries with high rates of inflation and underdeveloped capital markets. The theory is less useful for predicting short-term exchange rate movements between the currencies of advanced industrialized nations that have relatively small differentials in inflation rates.

The failure to find a strong link between relative inflation rates and exchange rate movements has been referred to as the purchasing power parity puzzle. Several factors may explain the failure of PPP theory to predict exchange rates more accurately.[15] PPP theory assumes away transportation costs and barriers to trade. In practice, these factors are significant, and they tend to create significant price differentials between countries. Transportation costs are certainly not trivial for many goods. Moreover, as we saw in Chapter 7, governments routinely intervene in international trade, creating tariff and nontariff barriers to cross-border trade. Barriers to trade limit the ability of traders to use arbitrage to equalize prices for the same product in different countries, which is required for the law of one price to hold. Government intervention in cross-border trade, by violating the assumption of efficient markets, weakens the link between relative price changes and changes in exchange rates predicted by PPP theory.

PPP theory may not hold if many national markets are dominated by a handful of multinational enterprises that have sufficient market power to be able to exercise some influence over prices, control distribution channels, and differentiate their product offerings between nations.[16] In fact, this situation seems to prevail in a number of industries. In such cases, dominant enterprises may be able to exercise a degree of pricing power, setting different prices in different markets to reflect varying demand conditions. This is referred to as price discrimination. For price discrimination to work, arbitrage must be limited. According to this argument, enterprises with some market power may be able to control distribution channels and therefore limit the unauthorized resale (arbitrage) of products purchased in another national market. They may also be able to limit resale (arbitrage) by differentiating otherwise identical products among nations along some line, such as design or packaging.

For example, even though the version of Microsoft Office sold in China may be less expensive than the version sold in the United States, the use of arbitrage to equalize prices may be limited because few Americans would want a version that was based on Chinese characters. The design differentiation between Microsoft Office for China and for the United States means that the law of one price would not work for Microsoft Office, even if transportation costs were trivial and tariff barriers between the United States and China did not exist. If the inability to practice arbitrage were widespread enough, it would break the connection between changes in relative prices and exchange rates predicted by the PPP theorem and help explain the limited empirical support for this theory.

Another factor of some importance is that governments also intervene in the foreign exchange market in attempting to influence the value of their currencies. We look at why and how they do this in Chapter 11. For now, the important thing to note is that governments regularly intervene in the foreign exchange market, and this further weakens the link between price changes and changes in exchange rates. One more factor explaining the failure of PPP theory to predict short-term movements in foreign exchange rates is the impact of investor psychology and other factors on currency purchasing decisions and exchange rate movements. We discuss this issue in more detail later in this chapter.

INTEREST RATES AND EXCHANGE RATES

Economic theory tells us that interest rates reflect expectations about likely future inflation rates. In countries where inflation is expected to be high, interest rates also will be high, because investors want compensation for the decline in the value of their money. This relationship was first formalized by economist Irvin Fisher and is referred to as the Fisher effect. The **Fisher effect** states that a country's "nominal" interest rate (i) is the sum of the required "real" rate of interest (r) and the expected rate of inflation over the period for which the funds are to be lent (I). More formally,

$$i = r + I$$

Fisher effect
Nominal interest rates (i) in each country equal the required real rate of interest (r) and the expected rate of inflation over the period of time for which the funds are to be lent (I). That is, $i = r + I$.

For example, if the real rate of interest in a country is 5 percent and annual inflation is expected to be 10 percent, the nominal interest rate will be 15 percent. As predicted by the Fisher effect, a strong relationship seems to exist between inflation rates and interest rates.[17]

We can take this one step further and consider how it applies in a world of many countries and unrestricted capital flows. When investors are free to transfer capital between countries, real interest rates will be the same in every country. If differences in real interest rates did emerge between countries, arbitrage would soon equalize them. For example, if the real interest rate in Japan was 10 percent and only 6 percent in the United States, it would pay investors to borrow money in the United States and invest it in Japan. The resulting increase in the demand for money in the United States would raise the real interest rate there, while the increase in the supply of foreign money in Japan would lower the real interest rate there. This would continue until the two sets of real interest rates were equalized.

It follows from the Fisher effect that if the real interest rate is the same worldwide, any difference in interest rates between countries reflects differing expectations about inflation rates. Thus, if the expected rate of inflation in the United States is greater than that in Japan, U.S. nominal interest rates will be greater than Japanese nominal interest rates.

Because we know from PPP theory that there is a link (in theory, at least) between inflation and exchange rates and because interest rates reflect expectations about inflation, it follows that there must also be a link between interest rates and exchange rates. This link is known as the international Fisher effect. The **international Fisher effect (IFE)** states that for any two countries, the spot exchange rate should change in an equal amount but in the opposite direction to the difference

international Fisher effect (IFE)
For any two countries, the spot exchange rate should change in an equal amount but in the opposite direction to the difference in nominal interest rates between countries.

in nominal interest rates between the two countries. Stated more formally, the change in the spot exchange rate between the United States and Japan, for example, can be modeled as follows:

$$\frac{S_1 - S_2}{S_2} \times 100 = i_{\$} - i_{¥}$$

where $i_{\$}$ and $i_{¥}$ are the respective nominal interest rates in the United States and Japan, S_1 is the spot exchange rate at the beginning of the period, and S_2 is the spot exchange rate at the end of the period. If the U.S. nominal interest rate is higher than Japan's, reflecting greater expected inflation rates, the value of the dollar against the yen should fall by that interest rate differential in the future. So if the interest rate in the United States is 10 percent and in Japan it is 6 percent, we would expect the value of the dollar to depreciate by 4 percent against the Japanese yen.

Do interest rate differentials help predict future currency movements? The evidence is mixed; as in the case of PPP theory, in the long run, there seems to be a relationship between interest rate differentials and subsequent changes in spot exchange rates. However, considerable short-run deviations occur. Like PPP, the international Fisher effect is not a good predictor of short-run changes in spot exchange rates.[18]

INVESTOR PSYCHOLOGY AND BANDWAGON EFFECTS

Empirical evidence suggests that neither PPP theory nor the international Fisher effect is particularly good at explaining short-term movements in exchange rates. One reason may be the impact of investor psychology on short-run exchange rate movements. Evidence reveals that various psychological factors play an important role in determining the expectations of market traders as to likely future exchange rates.[19] In turn, expectations have a tendency to become self-fulfilling prophecies.

A particularly famous example of this mechanism occurred in September 1992, when the international financier George Soros made a huge bet against the British pound. Soros borrowed billions of pounds, using the assets of his investment funds as collateral, and immediately sold those pounds for German deutsche marks (this was before the advent of the euro). This technique, known as short selling, can earn the speculator enormous profits if he can subsequently buy back the pounds he sold at a much better exchange rate and then use those pounds, purchased cheaply, to repay his loan. By selling pounds and buying deutsche marks, Soros helped start pushing down the value of the pound on the foreign exchange markets. More importantly, when Soros started shorting the British pound, many foreign exchange traders, knowing Soros's reputation, jumped on the bandwagon and did likewise. This triggered a classic **bandwagon effect** with traders moving as a herd in the same direction at the same time. As the bandwagon effect gained momentum, with more traders selling British pounds and purchasing deutsche marks in expectation of a decline in the pound, their expectations became a self-fulfilling prophecy. Massive selling forced down the value of the pound against the deutsche mark. In other words, the pound declined in value not so much because of any major shift in macroeconomic fundamentals but because investors followed a bet placed by a major speculator, George Soros.

bandwagon effect
Movement of traders like a herd, all in the same direction and at the same time, in response to each other's perceived actions.

According to a number of studies, investor psychology and bandwagon effects play an important role in determining short-run exchange rate movements.[20] However, these effects can be hard to predict. Investor psychology can be influenced by political factors and by microeconomic events, such as the investment decisions of individual firms, many of which are only loosely linked to macroeconomic fundamentals, such as relative inflation rates. Also, bandwagon effects can be both triggered and exacerbated by the idiosyncratic behavior of politicians. Something like this seems to have occurred in Southeast Asia during 1997 when, one after another, the currencies of Thailand, Malaysia, South Korea, and Indonesia lost between 50 and 70 percent of their value against the U.S. dollar in a few months.

SUMMARY OF EXCHANGE RATE THEORIES

Relative monetary growth, relative inflation rates, and nominal interest rate differentials are all moderately good predictors of long-run changes in exchange rates. They are poor predictors of short-run changes in exchange rates, however, perhaps because of the impact of psychological factors, investor expectations, and bandwagon effects on short-term currency movements. This information is useful for an international business. Insofar as the long-term profitability of foreign investments, export opportunities, and the price competitiveness of foreign imports are all influenced by long-term movements in exchange rates, international businesses would be advised to pay attention to countries' differing monetary

growth, inflation, and interest rates. International businesses that engage in foreign exchange transactions on a day-to-day basis could benefit by knowing some predictors of short-term foreign exchange rate movements. Unfortunately, short-term exchange rate movements are difficult to predict.

Exchange Rate Forecasting

A company's need to predict future exchange rate variations raises the issue of whether it is worthwhile for the company to invest in exchange rate forecasting services to aid decision making. Two schools of thought address this issue. The efficient market school argues that forward exchange rates do the best possible job of forecasting future spot exchange rates and, therefore, investing in forecasting services would be a waste of money. The other school of thought, the inefficient market school, argues that companies can improve the foreign exchange market's estimate of future exchange rates (as contained in the forward rate) by investing in forecasting services. In other words, this school of thought does not believe the forward exchange rates are the best possible predictors of future spot exchange rates.

THE EFFICIENT MARKET SCHOOL

Forward exchange rates represent market participants' collective predictions of likely spot exchange rates at specified future dates. If forward exchange rates are the best possible predictor of future spot rates, it would make no sense for companies to spend additional money trying to forecast short-run exchange rate movements. Many economists believe the foreign exchange market is efficient at setting forward rates.[21] An efficient market is one in which prices reflect all available public information. (If forward rates reflect all available information about likely future changes in exchange rates, a company cannot beat the market by investing in forecasting services.)

If the foreign exchange market is efficient, forward exchange rates should be unbiased predictors of future spot rates. This does not mean the predictions will be accurate in any specific situation. It means inaccuracies will not be consistently above or below future spot rates; they will be random. Many empirical tests have addressed the efficient market hypothesis. Although most of the early work seems to confirm the hypothesis (suggesting that companies should not waste their money on forecasting services), some studies have challenged it.[22] There is some evidence that forward rates are not unbiased predictors of future spot rates and that more accurate predictions of future spot rates can be calculated from publicly available information.[23]

THE INEFFICIENT MARKET SCHOOL

Citing evidence against the efficient market hypothesis, some economists believe the foreign exchange market is inefficient. An **inefficient market** is one in which prices do not reflect all available information. In an inefficient market, forward exchange rates will not be the best possible predictors of future spot exchange rates.

If this is true, it may be worthwhile for international businesses to invest in forecasting services (as many do). The belief is that professional exchange rate forecasts might provide better predictions of future spot rates than forward exchange rates do. However, the track record of professional forecasting services is not that good.[24] For example, forecasting services did not predict the 1997 currency crisis that swept through Southeast Asia, nor did they predict the rise in the value of the dollar that occurred during late 2008, a period when the United States fell into a deep financial crisis that some thought would lead to a decline in the value of the dollar (it appears that the dollar rose because it was seen as a relatively safe currency in a time when many nations were experiencing economic trouble).

APPROACHES TO FORECASTING

Assuming the inefficient market school is correct that the foreign exchange market's estimate of future spot rates can be improved, on what basis should forecasts be prepared? Here again, there are two schools of thought. One adheres to fundamental analysis, while the other uses technical analysis.

Fundamental Analysis

Fundamental analysis draws on economic theory to construct sophisticated econometric models for predicting exchange rate movements. The variables contained in these models typically include those we have discussed, such as relative money supply growth rates, inflation rates, and interest rates. In addition, they may include variables related to balance-of-payments positions.

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LO 10-5

Identify the merits of different approaches toward exchange rate forecasting.

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Did you know that the U.S. dollar has been one of the strongest currencies in the world since the great recession of 2008–2009?

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inefficient market

One in which prices do not reflect all available information.

Running a deficit on a balance-of-payments current account (a country is importing more goods and services than it is exporting) creates pressures that may result in the depreciation of the country's currency on the foreign exchange market.[25] Consider what might happen if the United States were running a persistent current account balance-of-payments deficit (as it has been). Because the United States would be importing more than it was exporting, people in other countries would be increasing their holdings of U.S. dollars. If these people were willing to hold their dollars, the dollar's exchange rate would not be influenced. However, if these people converted their dollars into other currencies, the supply of dollars in the foreign exchange market would increase (as would demand for the other currencies). This shift in demand and supply would create pressures that could lead to the depreciation of the dollar against other currencies.

This argument hinges on whether people in other countries are willing to hold dollars. This depends on such factors as U.S. interest rates, the return on holding other dollar-denominated assets such as stocks in U.S. companies, and, most important, inflation rates. So, in a sense, the balance-of-payments situation is not a fundamental predictor of future exchange rate movements. But what makes financial assets such as stocks and bonds attractive? The answer is prevailing interest rates and inflation rates, both of which affect underlying economic growth and the real return to holding U.S. financial assets. Given this, we are back to the argument that the fundamental determinants of exchange rates are monetary growth, inflation rates, and interest rates.

Technical Analysis Technical analysis uses price and volume data to determine past trends, which are expected to continue into the future. This approach does not rely on a consideration of economic fundamentals. Technical analysis is based on the premise that there are analyzable market trends and waves and that previous trends and waves can be used to predict future trends and waves. Since there is no theoretical rationale for this assumption of predictability, many economists compare technical analysis to fortune-telling. Despite this skepticism, technical analysis has gained favor in recent years.[26]

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Currency Convertibility

Until this point, we have assumed that the currencies of various countries are freely convertible into other currencies. Due to government restrictions, a significant number of currencies are not freely convertible into other currencies. A country's currency is said to be **freely convertible** when the country's government allows both residents and nonresidents to purchase unlimited amounts of a foreign currency with it. A currency is said to be **externally convertible** when only nonresidents may convert it into a foreign currency without any limitations. A currency is **nonconvertible** when neither residents nor nonresidents are allowed to convert it into a foreign currency.

freely convertible currency
A country's currency is freely convertible when the government of that country allows both residents and nonresidents to purchase unlimited amounts of foreign currency with the domestic currency.

externally convertible currency
Limitations on the ability of residents to convert domestic currency, though nonresidents can convert their holdings of domestic currency into foreign currency.

nonconvertible currency
A currency is not convertible when both residents and nonresidents are prohibited from converting their holdings of that currency into another currency.

Free convertibility is not universal. Many countries place some restrictions on their residents' ability to convert the domestic currency into a foreign currency (a policy of external convertibility). Restrictions range from the relatively minor (such as restricting the amount of foreign currency they may take with them out of the country on trips) to the major (such as restricting domestic businesses' ability to take foreign currency out of the country). External convertibility restrictions can limit domestic companies' ability to invest abroad, but they present few problems for foreign companies wishing to do business in that country. For example, even if the Japanese government tightly controlled the ability of its residents to convert the yen into U.S. dollars, all U.S. businesses with deposits in Japanese banks may at any time convert all their yen into dollars and take them out of the country. Thus, a U.S. company with a subsidiary in Japan is assured that it will be able to convert the profits from its Japanese operation into dollars and take them out of the country.

Serious problems arise, however, under a policy of nonconvertibility. This was the practice of the former Soviet Union, and it continued to be the practice in Russia for several years after the collapse of the Soviet Union. When strictly applied, nonconvertibility means that although a U.S. company doing business in a country such as Russia may be able to generate significant ruble profits, it may not convert those rubles into dollars and take them out of the country. Obviously, this is not desirable for international business.

Governments limit convertibility to preserve their foreign exchange reserves. A country needs an adequate supply of these reserves to service its international debt commitments and to purchase imports. Governments typically impose convertibility restrictions on their currency when they fear

that free convertibility will lead to a run on their foreign exchange reserves. This occurs when residents and nonresidents rush to convert their holdings of domestic currency into a foreign currency—a phenomenon generally referred to as **capital flight**. Capital flight is most likely to occur when the value of the domestic currency is depreciating rapidly because of hyperinflation or when a country's economic prospects are shaky in other respects. Under such circumstances, both residents and nonresidents tend to believe that their money is more likely to hold its value if it is converted into a foreign currency and invested abroad. Not only will a run on foreign exchange reserves limit the country's ability to service its international debt and pay for imports, but it will also lead to a precipitous depreciation in the exchange rate as residents and nonresidents unload their holdings of domestic currency on the foreign exchange markets (thereby increasing the market supply of the country's currency). Governments fear that the rise in import prices resulting from currency depreciation will lead to further increases in inflation. This fear provides another rationale for limiting convertibility.

capital flight
Converting domestic currency into a foreign currency.

Companies can deal with the nonconvertibility problem by engaging in countertrade. **Countertrade** refers to a range of barter-like agreements by which goods and services can be traded for other goods and services. Countertrade can make sense when a country's currency is nonconvertible. For example, consider the deal that General Electric struck with the Romanian government when that country's currency was nonconvertible. When General Electric won a contract for a $150 million generator project in Romania, it agreed to take payment in the form of Romanian goods that could be sold for $150 million on international markets. In a similar case, the Venezuelan government negotiated a contract with Caterpillar under which Venezuela would trade 350,000 tons of iron ore for Caterpillar heavy construction equipment. Caterpillar subsequently traded the iron ore to Romania in exchange for Romanian farm products, which it then sold on international markets for dollars.[27]

countertrade
The trade of goods and services for other goods and services.

How important is countertrade? Twenty years ago, a large number of nonconvertible currencies existed in the world, and countertrade was quite significant. However, in recent years, many governments have made their currencies freely convertible, and the percentage of world trade that involves countertrade is probably significantly below 5 percent.[28]

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Focus on Managerial Implications

FOREIGN EXCHANGE RATE RISK

This chapter contains a number of clear implications for business. First, it is critical that international businesses understand the influence of exchange rates on the profitability of trade and investment deals. Adverse changes in exchange rates can make apparently profitable deals unprofitable. As noted, the risk introduced into international business transactions by changes in exchange rates is referred to as foreign exchange risk. Foreign exchange risk is usually divided into three main categories: transaction exposure, translation exposure, and economic exposure.

LO 10-6
Compare and contrast the differences among translation, transaction, and economic exposure, and explain the implications for management practice.

Transaction Exposure

Transaction exposure is the extent to which the income from individual transactions is affected by fluctuations in foreign exchange values. Such exposure includes obligations for the purchase or sale of goods and services at previously agreed prices and the borrowing or lending of funds in foreign currencies. For example, suppose in 2004, an American airline agreed to purchase 10 Airbus 330 aircraft for €120 million each for a total price of €1.20 billion, with delivery scheduled for 2008 and payment due then. When the contract was signed in 2004, the dollar/euro exchange rate stood at $1 = €1.10, so the American airline anticipated paying $1.09 billion for the 10 aircraft when they were delivered (€1.2 billion/1.1 = $1.09 billion). However, imagine that the value of the dollar depreciates against the euro over the intervening period, so that a dollar buys only €0.80 in 2008 when payment was due ($1 = €0.80). Now the total cost in U.S. dollars is $1.5 billion (€1.2 billion/0.80 = $1.5 billion), an increase of $0.41 billion! The transaction exposure here is $0.41 billion, which is the money lost due to an adverse movement in exchange rates between the time when the deal was signed and when the aircraft were paid for.

transaction exposure
The extent to which income from individual transactions is affected by fluctuations in foreign exchange values.

Translation Exposure

Translation exposure is the impact of currency exchange rate changes on the reported financial statements of a company. Translation exposure is concerned with the present measurement of past events. The resulting accounting gains or losses are said to

translation exposure
The extent to which the reported consolidated results and balance sheets of a corporation are affected by fluctuations in foreign exchange values.

be unrealized—they are "paper" gains and losses—but they are still important. Consider a U.S. firm with a subsidiary in Mexico. If the value of the Mexican peso depreciates significantly against the dollar, this would substantially reduce the dollar value of the Mexican subsidiary's equity. In turn, this would reduce the total dollar value of the firm's equity reported in its consolidated balance sheet. This would raise the apparent leverage of the firm (its debt ratio), which could increase the firm's cost of borrowing and potentially limit its access to the capital market. Similarly, if an American firm has a subsidiary in the European Union and the value of the euro depreciates rapidly against that of the dollar over a year, this will reduce the dollar value of the euro profit made by the European subsidiary, resulting in negative translation exposure. In fact, many U.S. firms suffered from significant negative translation exposure in Europe during 2000, precisely because the euro did depreciate rapidly against the dollar. In 2002–2007, the euro rose in value against the dollar. This positive translation exposure boosted the dollar profits of American multinationals with significant operations in Europe. Between mid-2014 and early 2015, the euro slumped in value against the dollar, compressing the dollar profits of American multinationals with significant European exposure.

Economic Exposure

economic exposure
The extent to which a firm's future international earning power is affected by changes in exchange rates.

Economic exposure is the extent to which a firm's future international earning power is affected by changes in exchange rates. Economic exposure is concerned with the long-run effect of changes in exchange rates on future prices, sales, and costs. This is distinct from transaction exposure, which is concerned with the effect of exchange rate changes on individual transactions, most of which are short-term affairs that will be executed within a few weeks or months. Consider the effect of wide swings in the value of the dollar on many U.S. firms' international competitiveness. The rapid rise in the value of the dollar on the foreign exchange market in the 1990s hurt the price competitiveness of many U.S. producers in world markets. U.S. manufacturers that relied heavily on exports saw their export volume and world market share decline. The reverse phenomenon occurred in 2000–2009, when the dollar declined against most major currencies. The fall in the value of the dollar helped increase the price competitiveness of U.S. manufacturers in world markets. Between mid-2014 and early 2015, the dollar increased significantly in value against most major currencies, decreasing the price competitiveness of U.S. exporters. Since early 2017 the opposite has occurred, with the dollar falling in value, increasing the price competitiveness of U.S. exporters.

REDUCING TRANSLATION AND TRANSACTION EXPOSURE

A number of tactics can help firms minimize their transaction and translation exposure. These tactics primarily protect short-term cash flows from adverse changes in exchange rates. We have already discussed two of these tactics at length in the chapter, entering into forward exchange rate contracts and buying swaps. In addition to buying forward and using swaps, firms can minimize their foreign exchange exposure through leading and lagging payables and receivables—that is, paying suppliers and collecting payment from customers early or late depending on expected exchange rate movements. A **lead strategy** involves attempting to collect foreign currency receivables (payments from customers) early when a foreign currency is expected to depreciate and paying foreign currency payables (to suppliers) before they are due when a currency is expected to appreciate. A **lag strategy** involves delaying collection of foreign currency receivables if that currency is expected to appreciate and delaying payables if the currency is expected to depreciate. Leading and lagging involve accelerating payments from weak-currency to strong-currency countries and delaying inflows from strong-currency to weak-currency countries.

lead strategy
Collecting foreign currency receivables early when a foreign currency is expected to depreciate and paying foreign currency payables before they are due when a currency is expected to appreciate.

lag strategy
Delaying the collection of foreign currency receivables if that currency is expected to appreciate and delaying payables if that currency is expected to depreciate.

Lead and lag strategies can be difficult to implement, however. The firm must be in a position to exercise some control over payment terms. Firms do not always have this kind of bargaining power, particularly when they are dealing with important customers who are in a position to dictate payment terms. Also, because lead and lag strategies can put pressure on a weak currency, many governments limit leads and lags. For example, some countries set 180 days as a limit for receiving payments for exports or making payments for imports.

REDUCING ECONOMIC EXPOSURE

Reducing economic exposure requires strategic choices that go beyond the realm of financial management. The key to reducing economic exposure is to distribute the firm's productive assets to various locations so the firm's long-term financial well-being is not severely affected by adverse changes in exchange rates. This is a strategy that firms both large and small sometimes pursue. For example, during the 2000s, fearing that the euro would continue to strengthen against the U.S. dollar, some European firms that did significant business in the United States set up local production facilities in that market to ensure that a rising euro did not put them at a competitive disadvantage relative to their local rivals. Similarly, Toyota has production plants distributed around the world in part to make sure that a rising yen does not price Toyota cars out of local markets. Caterpillar has also pursued this strategy, setting up factories around the world that can act as a hedge against the possibility that a strong dollar will price Caterpillar's exports out of foreign markets. In 2008, 2009, and 2014–2015, all periods of dollar strength, this real hedge proved to be very useful.

OTHER STEPS FOR MANAGING FOREIGN EXCHANGE RISK

A firm needs to develop a mechanism for ensuring it maintains an appropriate mix of tactics and strategies for minimizing its foreign exchange exposure. Although there is no universal agreement as to the components of this mechanism, a number of common themes stand out.[29] First, central control of exposure is needed to protect resources efficiently and ensure that each subunit adopts the correct mix of tactics and strategies. Many companies have set up in-house foreign exchange centers. Although such centers may not be able to execute all foreign exchange deals—particularly in large, complex multinationals where myriad transactions may be pursued simultaneously—they should at least set guidelines for the firm's subsidiaries to follow.

Second, firms should distinguish between, on one hand, transaction and translation exposure and, on the other, economic exposure. Many companies seem to focus on reducing their transaction and translation exposure and pay scant attention to economic exposure, which may have more profound long-term implications.[30] Firms need to develop strategies for dealing with economic exposure. For example, Stanley Black & Decker, the maker of power tools, has a strategy for actively managing its economic risk. The key to Stanley Black & Decker's strategy is flexible sourcing. In response to foreign exchange movements, Stanley Black & Decker can move production from one location to another to offer the most competitive pricing. Stanley Black & Decker manufactures in more than a dozen locations around the world—in Europe, Australia, Brazil, Mexico, and Japan. More than 50 percent of the company's productive assets are based outside North America. Although each of Stanley Black & Decker's factories focuses on one or two products to achieve economies of scale, there is considerable overlap. On average, the company runs its factories at no more than 80 percent capacity, so most are able to switch rapidly from producing one product to producing another or to add a product. This allows a factory's production to be changed in response to foreign exchange movements. For example, if the dollar depreciates against other currencies, the amount of imports into the United States from overseas subsidiaries can be reduced and the amount of exports from U.S. subsidiaries to other locations can be increased.[31]

Third, the need to forecast future exchange rate movements cannot be overstated, although as we saw earlier in the chapter this is a tricky business. No model comes close to perfectly predicting future movements in foreign exchange rates. The best that can be said is that in the short run, forward exchange rates provide the best predictors of exchange rate movements, and in the long run, fundamental economic factors—particularly relative inflation rates—should be watched because they influence exchange rate movements. Some firms attempt to forecast exchange rate movements in-house; others rely on outside forecasters. However, all such forecasts are imperfect attempts to predict the future.

Fourth, firms need to establish good reporting systems so the central finance function (or in-house foreign exchange center) can regularly monitor the firm's exposure positions. Such reporting systems should enable the firm to identify any exposed accounts, the exposed position by currency of each account, and the time periods covered.