Managing International Risks

The last chapter grappled with risks from changing interest rates and volatile commodity prices. Corporations that operate internationally face still more hazards from currency fluctuations and political risks.

To understand currency risk, you first have to understand how the foreign exchange market works and how currency exchange rates are determined. We cover those topics first, with special emphasis on the linkages between exchange rates and cross-country differences in interest rates and inflation. Then we describe how corporations assess and hedge their currency exposures.

We also review international capital investment decisions. Cash flows for an investment project in Germany, say, must be forecasted in euros, with attention to German inflation rates and taxes. But euro cash flows require a euro discount rate. How should that rate be estimated? Should it depend on whether the investing company is located in the U.S., Germany, or another country? Should the discount rate be adjusted for the risk that the euro may fall relative to other currencies? (The answer to the last question is no. The answers to the preceding questions are not so clear-cut.)

We conclude the chapter with a discussion of political risk. Political risk means possible adverse acts by a hostile foreign government, for example, discriminatory taxes or limits on the profits that can be taken out of the country. Sometimes governments expropriate businesses with minimal compensation. We explain how companies structure their operations and financing to reduce their exposure to political risks.

27-1 The Foreign Exchange Market

An American company that imports goods from France may need to buy euros to pay for the purchase. An American company exporting to France may receive euros, which it sells in exchange for dollars. Both firms make use of the foreign exchange market.

The foreign exchange market has no central marketplace. Business is conducted electronically. The principal dealers are the larger commercial banks and investment banks. A corporation that wants to buy or sell currency usually does so through a commercial bank. Turnover in the foreign exchange market is huge. In London in 2007 $1,359 billion of currency changed hands each day. That is equivalent to an annual turnover of about $340 trillion ($340,000,000,000,000). New York and Tokyo together accounted for a further $902 billion of turnover per day.[1]

[1]The results of the triennial survey of foreign exchange business are published on www.bis.org/forum/research.htm.

		Forward Rate		
	Spot Rate*	1 Month	3 Month	1 Year
Europe:				
Euro	1.4201	1.4201	1.4200	1.4207
Norway (krone)	6.2452	6.2502	6.2603	6.3007
Sweden (krona)	7.4533	7.4523	7.4502	7.4313
Switzerland (franc)	1.0723	1.0719	1.0711	1.0643
United Kingdom (pound)	1.6414	1.6413	1.6411	1.6396
Americas:				
Canada (dollar)	1.0808	1.0807	1.0804	1.0801
Mexico (peso)	13.2155	13.2705	13.3805	13.8891
Pacific/Middle East/Africa:				
Hong Kong (dollar)	7.7501	7.7480	7.7437	7.7311
Japan (yen)	94.7050	94.6780	94.6161	94.0870
South Africa (rand)	7.7840	7.8330	7.9263	8.3283
South Korea (won)	1249.55	1249.10	1247.65	1241.05

TABLE 27.1

Spot and forward exchange rates, July 24, 2009.

* Rates show the number of units of foreign currency per U.S. dollar, except for the euro and the U.K. pound, which show the number of U.S. dollars per unit of foreign currency.

Source: Financial Times, July 24, 2009, online edition © Financial Times 2009.

Table 27.1 is adapted from the table of exchange rates in the *Financial Times*. Exchange rates are generally expressed in terms of the number of units of the foreign currency needed to buy one U.S. dollar. This is termed an *indirect quote.* In the first column of Table 27.1, the indirect quote for the Mexican peso shows that you can buy 13.2155 pesos for $1. This is often written as peso 13.2155/$.

A *direct* exchange rate quote states how many dollars you can buy for one unit of foreign currency. The euro and the British pound sterling are usually shown as direct quotes.[2] For example, Table 27.1 shows that £1 is equivalent to $1.6414 or, more concisely, $1.6414/£. If £1 buys $1.6414, then $1 must buy 1/1.6414 = £.6092. Thus the indirect quote for the pound is £.6092/$.[3]

The exchange rates in the first column of Table 27.1 are the prices of currency for immediate delivery. These are known as **spot rates of exchange.** The spot rate for the peso is peso 13.2155/$, and the spot rate for the pound is $1.6414/£.

In addition to the spot exchange market, there is a *forward market.* In the forward market you buy and sell currency for future delivery. If you know that you are going to pay out or receive foreign currency at some future date, you can insure yourself against loss by buying or selling forward. Thus, if you need one million pesos in three months, you can enter into a three-month *forward contract.* The **forward rate** on this contract is the price you agree to pay in three months when the one million pesos are delivered. If you look again at Table 27.1, you will see that the three-month forward rate for the peso is quoted at peso 13.3805/$. If you buy pesos for three months' delivery, you get more pesos for your dollar than if you buy them spot. In this case the peso is said to trade at a forward *discount* relative

[2] The euro is the common currency of the European Monetary Union. The 16 members of the Union are Austria, Belgium, Cyprus, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovenia, Slovakia, and Spain.

[3] Foreign exchange dealers usually refer to the exchange rate between pounds and dollars as *cable.* In Table 27.1 cable is 1.6414.

to the dollar, because forward pesos are cheaper than spot ones. Expressed as an annual rate, the forward discount is[4]

$$4 \times \left(\frac{13.2155}{13.3805} - 1 \right) = -.049, \text{ or } -4.9\%$$

You could also say that the *dollar* was selling at a *forward premium.*

A forward purchase or sale is a made-to-measure transaction between you and the bank. It can be for any currency, any amount, and any delivery day. You could buy, say, 99,999 Vietnamese dong or Haitian gourdes for a year and a day forward as long as you can find a bank ready to deal. Most forward transactions are for six months or less, but the long-term currency swaps that we described in Chapter 26 are equivalent to a bundle of forward transactions. When firms want to enter into long-term forward contracts, they usually do so through a currency swap.[5]

There is also an organized market for currency for future delivery known as the currency *futures* market. Futures contracts are highly standardized; they are for specified amounts and for a limited choice of delivery dates.[6]

When you buy a forward or futures contract, you are committed to taking delivery of the currency. As an alternative, you can take out an *option* to buy or sell currency in the future at a price that is fixed today. Made-to-measure currency options can be bought from the major banks, and standardized options are traded on the options exchanges.

27-2 Some Basic Relationships

You can't develop a consistent international financial policy until you understand the reasons for the differences in exchange rates and interest rates. We consider the following four problems:

- *Problem 1.* Why is the dollar rate of interest ($r_{\$}$) different from, say, the peso rate (r_{peso})?
- *Problem 2.* Why is the forward rate of exchange ($f_{\text{peso}/\$}$) different from the spot rate ($s_{\text{peso}/\$}$)?
- *Problem 3.* What determines next year's expected spot rate of exchange between dollars and pesos [$E(s_{\text{peso}/\$})$]?
- *Problem 4.* What is the relationship between the inflation rate in the United States ($i_{\$}$) and the inflation rate in Mexico (i_{peso})?

Suppose that individuals were not worried about risk and that there were no barriers or costs to international trade on capital flows. In that case the spot exchange rates, forward exchange rates, interest rates, and inflation rates would stand in the following simple relationship to one another:

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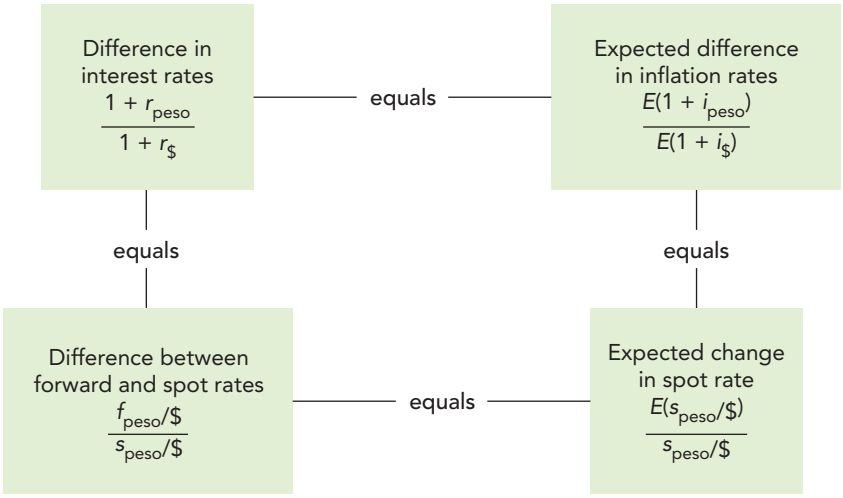
[4] Here is an occasional point of confusion. Since the quote for the peso is indirect, we calculate the premium by taking the ratio of the spot rate to the forward rate. If we use *direct* quotes, then we need to calculate the ratio of the forward rate to the spot rate. In the case of the peso, the forward discount with direct quotes is $4 \times [(1/13.3805)/(1/13.2155) - 1] = -.049$, or -4.9%.

[5] Notice that spot and short-term forward trades are sometimes undertaken together. For example, a company might need the use of Mexican pesos for one month. In this case it would buy pesos spot and simultaneously sell them forward. Dealers refer to this as a *swap* trade. But do not confuse it with the longer term currency swaps that we described in Chapter 26.

[6] See Chapter 26 for a further discussion of the difference between forward and futures contracts.



Why should this be so?

Interest Rates and Exchange Rates

It is July 2009 and you have $1 million to invest for one year. U.S. dollar deposits are offering an interest rate of about 1.50%; Mexican peso deposits are offering an (attractive?) 6.67%. Where should you put your money? Does the answer sound obvious? Let's check:

- *Dollar loan.* The rate of interest on one-year dollar deposits is 1.50%. Therefore at the end of the year you get 1,000,000 × 1.0150 = $1,015,000.
- *Peso loan.* The current exchange rate is 13.2155/$. For $1 million, you can buy 1,000,000 × 13.2155 = peso 13,215,500. The rate of interest on a one-year peso deposit is 6.67%. Therefore at the end of the year you get 13,215,500 × 1.0667 = peso 14,096,974. Of course, you don't know what the exchange rate is going to be in one year's time. But that doesn't matter. You can fix today the price at which you sell your pesos. The one-year forward rate is peso 13.8891/$. Therefore, by selling forward, you can make sure that you will receive 14,096,974/13.8891 = $1,014,967 at the end of the year.

Thus, the two investments offer almost exactly the same rate of return. They have to—they are both risk-free. If the domestic interest rate were different from the *covered* foreign rate, you would have a money machine.

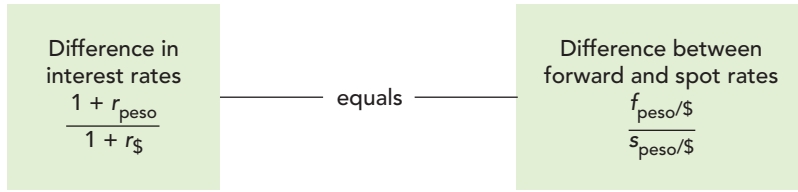
When you make the peso loan, you receive a higher interest rate. But you get an offsetting loss because you sell pesos forward at a lower price than you pay for them today. The interest rate differential is

$$\frac{1 + r_{peso}}{1 + r_{\$}}$$

And the differential between the forward and spot exchange rates is

$$\frac{f_{peso/\$}}{s_{peso/\$}}$$

Interest rate parity theory says that the difference in interest rates must equal the difference between the forward and spot exchange rates:



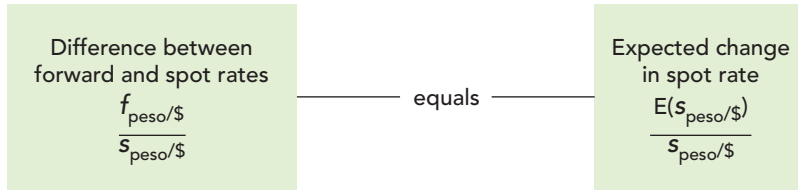
In our example,

$$\frac{1.0667}{1.0150} \approx \frac{13.8891}{13.2155}$$

The Forward Premium and Changes in Spot Rates

Now let's consider how the forward premium is related to changes in spot rates of exchange. If people didn't care about risk, the forward rate of exchange would depend solely on what people expected the spot rate to be. For example, if the one-year forward rate on pesos is peso 13.8891/$, that could only be because traders expect the spot rate in one year's time to be peso 13.8891/$. If they expected it to be, say, peso 14.0/$, nobody would be willing to buy pesos forward. They could get more pesos for their dollar by waiting and buying spot.

Therefore the *expectations theory* of exchange rates tells us that the percentage difference between the forward rate and today's spot rate is equal to the expected change in the spot rate:



Of course, this assumes that traders don't care about risk. If they do care, the forward rate can be either higher or lower than the expected spot rate. For example, suppose that you have contracted to receive one million pesos in three months. You can wait until you receive the money before you change it into dollars, but this leaves you open to the risk that the price of the peso may fall over the next three months. Your alternative is to sell the peso forward. In this case, you are fixing today the price at which you will sell your pesos. Since you avoid risk by selling forward, you may be willing to do so even if the forward price of pesos is a little *lower* than the expected spot price.

Other companies may be in the opposite position. They may have contracted to pay out pesos in three months. They can wait until the end of the three months and then buy pesos, but this leaves them open to the risk that the price of the peso may rise. It is safer for these companies to fix the price today by *buying* pesos forward. These companies may, therefore, be willing to buy forward even if the forward price of the peso is a little *higher* than the expected spot price.

Thus some companies find it safer to *sell* the peso forward, while others find it safer to *buy* the peso forward. When the first group predominates, the forward price of pesos is likely to be less than the expected spot price. When the second group predominates, the forward price is likely to be greater than the expected spot price. On average you would expect the forward price to underestimate the expected spot price just about as often as it overestimates it.

Changes in the Exchange Rate and Inflation Rates

Now we come to the third side of our quadrilateral—the relationship between changes in the spot exchange rate and inflation rates. Suppose that you notice that silver can be bought in Mexico for 120 pesos a troy ounce and sold in the United States for $15.00. You think you may be on to a good thing. You take $9,080 and exchange it for $9,080 × peso 13.2155/$ = peso 120,000. That's enough to buy 1,000 ounces of silver. You put this silver on the first plane to the United States, where you sell it for $15,000. You have made a gross profit of just under $6,000. Of course, you have to pay transportation and insurance costs out of this, but there should still be something left over for you.

Money machines don't exist—not for long, anyway. As others notice the disparity between the price of silver in Mexico and the price in the United States, the price will be forced up in Mexico and down in the United States until the profit opportunity disappears. Arbitrage ensures that the dollar price of silver is about the same in the two countries. Of course, silver is a standard and easily transportable commodity, but the same forces should act to equalize the domestic and foreign prices of other goods. Those goods that can be bought more cheaply abroad will be imported, and that will force down the price of domestic products. Similarly, those goods that can be bought more cheaply in the United States will be exported, and that will force down the price of the foreign products.

This is often called *purchasing power parity*.[7] Just as the price of goods in Safeway supermarkets must be roughly the same as the price of goods in A&P, so the price of goods in Mexico when converted into dollars must be roughly the same as the price in the United States:

$$\text{Dollar price of goods in the USA} = \frac{\text{peso price of goods in Mexico}}{\text{number of pesos per dollar}}$$

Purchasing power parity implies that any differences in the rates of inflation will be offset by a change in the exchange rate. For example, if prices are rising by 1.0% in the United States and by 6.0% in Mexico, the number of pesos that you can buy for $1 must rise by 1.06/1.01 − 1, or about 5.0%. Therefore purchasing power parity says that to estimate changes in the spot rate of exchange, you need to estimate differences in inflation rates:[8]

$$\text{Expected difference in inflation rates } \frac{E(1+i_{peso})}{E(1+i_{\$})} \quad \text{equals} \quad \text{Expected change in spot rate } \frac{E(s_{peso/\$})}{s_{peso/\$}}$$

In our example,

Current spot rate × expected difference in inflation rates = expected spot rate

$$13.2155 \times \frac{1.060}{1.010} = 13.87$$

[7] Economists use the term *purchasing power parity* to refer to the notion that the level of prices of goods in general must be the same in the two countries. They tend to use the phrase *law of one price* when they are talking about the price of a single good.

[8] In other words, the *expected* difference in inflation rates equals the *expected* change in the exchange rate. Strictly interpreted, purchasing power parity also implies that the *actual* difference in the inflation rates always equals the *actual* change in the exchange rate.

Interest Rates and Inflation Rates

Now for the fourth leg! Just as water always flows downhill, so capital tends to flow where returns are greatest. But investors are not interested in *nominal* returns; they care about what their money will buy. So, if investors notice that real interest rates are higher in Mexico than in the United States, they will shift their savings into Mexico until the expected real returns are the same in the two countries. If the expected real interest rates are equal, then the difference in money rates must be equal to the difference in the expected inflation rates:[9]

$$\text{Difference in interest rates } \frac{1 + r_{peso}}{1 + r_{\$}} \quad \text{equals} \quad \text{Expected difference in inflation rates } \frac{E(1 + i_{peso})}{E(1 + i_{\$})}$$

In Mexico the real one-year interest rate is .6%:

$$r_{peso}(\text{real}) = \frac{1 + r_{peso}}{E(1 + i_{peso})} - 1 = \frac{1.0667}{1.060} - 1 = .006$$

In the United States it is close at .5%:

$$r_{\$}(\text{real}) = \frac{1 + r_{\$}}{E(1 + i_{\$})} - 1 = \frac{1.015}{1.010} - 1 = .005$$

Is Life Really That Simple?

We have described above four theories that link interest rates, forward rates, spot exchange rates, and inflation rates. Of course, such simple economic theories are not going to provide an exact description of reality. We need to know how well they predict actual behavior. Let's check.

1. Interest Rate Parity Theory Interest rate parity theory says that the peso rate of interest covered for exchange risk should be the same as the dollar rate. As long as money can be moved easily between deposits in different currencies, interest rate parity almost always holds. In fact, dealers *set* the forward price of pesos by looking at the difference between the interest rates on deposits of dollars and pesos.

2. The Expectations Theory of Forward Rates How well does the expectations theory explain the level of forward rates? Scholars who have studied exchange rates have found that forward rates typically exaggerate the likely change in the spot rate. When the forward rate appears to predict a sharp rise in the spot rate (a forward premium), the forward rate tends to overestimate the rise in the spot rate. Conversely, when the forward rate appears to predict a fall in the currency (a forward discount), it tends to overestimate this fall.[10]

This finding is *not* consistent with the expectations theory. Instead it looks as if sometimes companies are prepared to give up return to *buy* forward currency and other times they are prepared to give up return to *sell* forward currency. In other words, forward rates seem to contain a risk premium, but the sign of this premium swings backward and

[9] In Section 3-5 we discussed Irving Fisher's theory that over time money interest rates change to reflect changes in anticipated inflation. Here we argue that international differences in money interest rates also reflect differences in anticipated inflation. This theory is sometimes known as the *international Fisher effect.*

[10] Many researchers have even found that, when the forward rate predicts a rise, the spot rate is more likely to fall, and vice versa. For a readable discussion of this puzzling finding, see K. A. Froot and R. H. Thaler, "Anomalies: Foreign Exchange," *Journal of Economic Perspectives* 4 (1990), pp. 179–192.

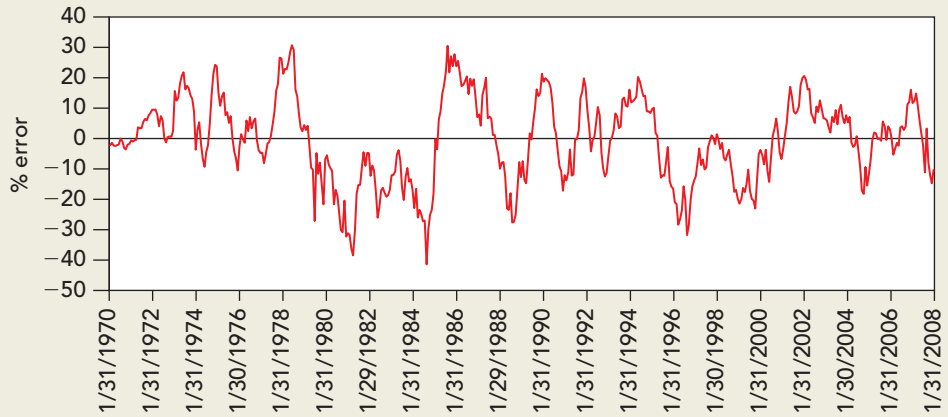


FIGURE 27.1

Percentage error from using the one-year forward rate for Swiss francs to forecast next year's spot rate. Note that the forward rate overestimates and underestimates the spot rate with about equal frequency.

forward.[11] You can see this from Figure 27.1. Almost half the time the forward rate for the Swiss franc *overstates* the likely future spot rate and half the time it *understates* the likely spot rate. *On average* the forward rate and future spot rate are almost identical. This is important news for the financial manager; it means that a company that always uses the forward market to protect against exchange rate movements does not pay any extra for this insurance.

3. Purchasing Power Parity Theory What about the third side of our quadrilateral—purchasing power parity theory? No one who has compared prices in foreign stores with prices at home really believes that prices are the same throughout the world. Look, for example, at Table 27.2, which shows the price of a Big Mac in different countries. Notice that at current rates of exchange a Big Mac costs $5.98 in Switzerland but only $3.57 in the United States. To equalize prices in the two countries, the number of Swiss francs that you could buy for your dollar would need to increase by 5.98/3.57 − 1 = .68, or 68%.

This suggests a possible way to make a quick buck. Why don't you buy a hamburger-to-go in (say) China for the equivalent of $1.83 and take it for resale in Switzerland, where the price in dollars is $5.98? The answer, of course, is that the gain would not cover the costs. The same good can be sold for different prices in different countries because transportation is costly and inconvenient.[12]

Country	Local Price Converted to U.S. Dollars
Canada	3.35
China	1.83
Denmark	5.53
Euro area	4.62
Japan	3.46
Mexico	2.39
Philippines	2.05
Russia	2.04
South Africa	2.17
Switzerland	5.98
United Kingdom	3.69
United States	3.57

TABLE 27.2

Price of Big Mac hamburgers in different countries.

Source: "The Big Mac Index," *The Economist*, July 16, 2009, online edition, The Economist Newspaper Group, Inc. Reprinted with permission. Further reproduction prohibited (www.economist.com).

[11] For evidence that forward exchange rates contain risk premiums that are sometimes positive and sometimes negative, see, for example, E. F. Fama, "Forward and Spot Exchange Rates," *Journal of Monetary Economics* 14 (1984), pp. 319–338.

[12] Of course, even within a currency area there may be considerable price variations. The price of a Big Mac, for example, differs substantially from one part of the United States to another.

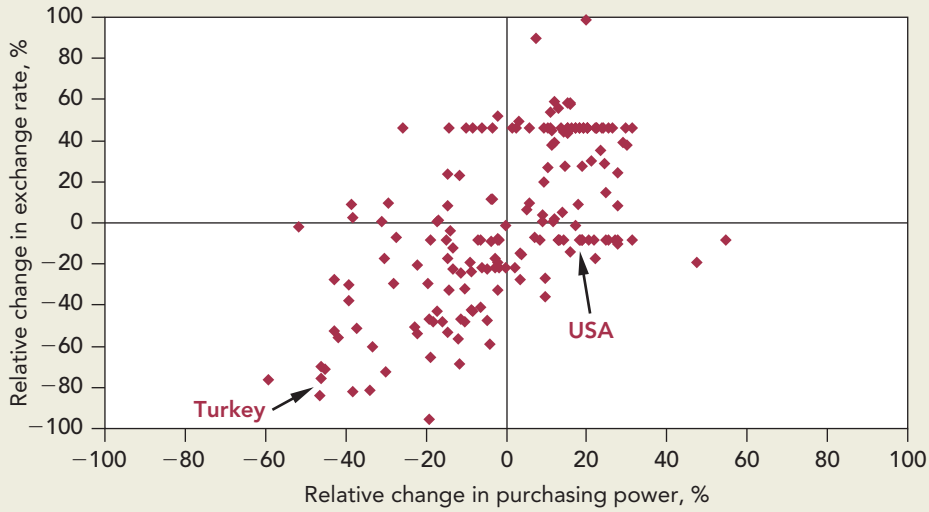


FIGURE 27.2

A decline in the exchange rate and a decline in a currency's purchasing power tend to go hand in hand. In this diagram each of the 179 points represents the experience of a different country in the eight years to 2007. The vertical axis shows the change in the value of the foreign currency relative to the average. The horizontal axis shows the change in the purchasing power relative to the average. The point in the lower left is Turkey. The plot for the USA shows that the dollar did not fully reflect the relatively low inflation rate in the USA.

On the other hand, there is clearly some relationship between inflation and changes in exchange rates. For example, between the beginning of 2000 and the end of 2007 prices in Turkey rose 5.9 times. Or, to put it another way, you could say that the purchasing power of money in Turkey declined by about 83%. If exchange rates had not adjusted, Turkish exporters would have found it impossible to sell their goods. But, of course, exchange rates did adjust. In fact, the value of the Turkish currency declined by 52% relative to the U.S. dollar.

Turkey is a fairly extreme case, but in Figure 27.2 we have plotted the relative change in purchasing power for a sample of countries against the change in the exchange rate. Turkey is tucked in the bottom left-hand corner; the United States is closer to the top right.[13] You can see that although the relationship is far from exact, large differences in inflation rates are generally accompanied by an offsetting change in the exchange rate.[14]

Strictly speaking, purchasing power parity theory implies that the differential inflation rate is always identical to the change in the spot rate. But we don't need to go as far as that. We should be content if the *expected* difference in the inflation rates equals the *expected* change in the spot rate. That's all we wrote on the third side of our quadrilateral. Look, for example, at Figure 27.3. The blue line in the first plot shows that in 2008 £1 sterling bought about 30% of the dollars that it did at the start of the twentieth century. But this decline in the value of sterling was largely matched by the higher inflation rate in the U.K. The red line shows that the inflation-adjusted, or *real*, exchange rate ended

[13] Turkey did not have the highest inflation rate or the most rapidly depreciating currency. That honor belonged to Angola, followed closely by Belarus. These are shown by the two points in the extreme bottom left of Figure 27.2.

[14] Note that some of the countries represented in Figure 27.2 have highly controlled economies, so that their exchange rates are not those that would exist in an unrestricted market. The interest rates shown in Figure 27.4 are subject to a similar caveat.

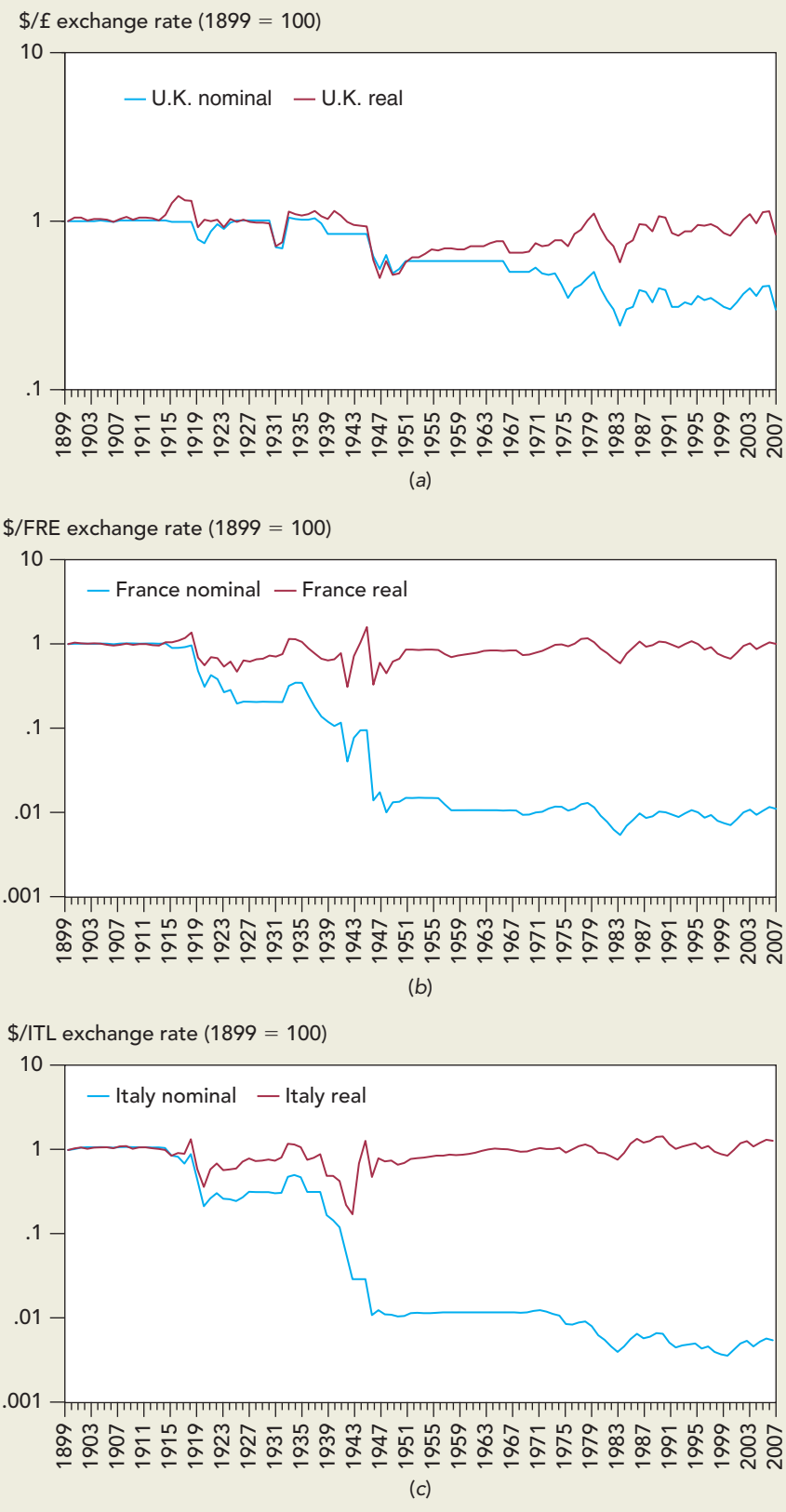


FIGURE 27.3

Nominal versus real exchange rates in the U.K., France, and Italy. December 1899 = 1. (Values are shown on log scale.)

Source: E. Dimson, P. R. Marsh, and M. Staunton, *Triumph of the Optimist: 101 Years of Global Investment Returns* (Princeton, NJ: Princeton University Press, 2002). Reprinted by permission of Princeton University Press, with updates provided by the authors.

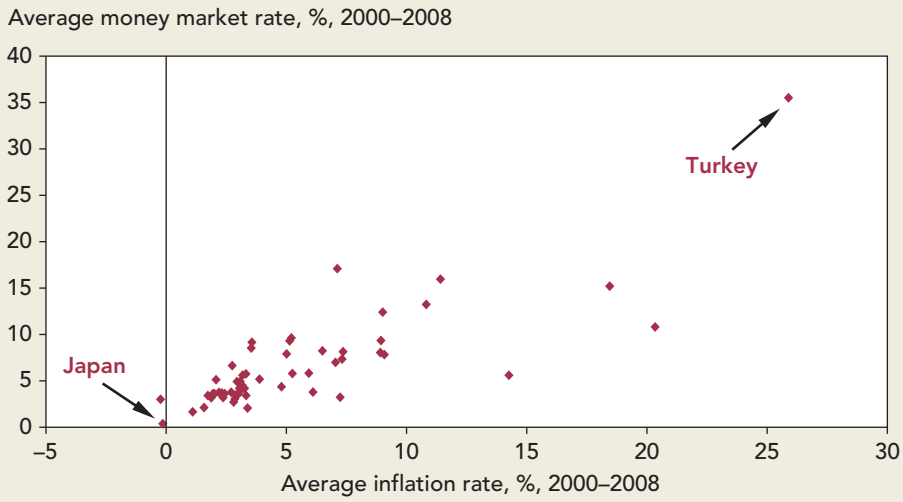


FIGURE 27.4

Countries with the highest interest rates generally have the highest inflation. In this diagram each of the 55 points represents the experience of a different country.

Source: Global Insight, WRDS (Wharton Research Data Services), http://wrds.wharton.upenn.edu

the century at roughly the same level as it began.[15] The second and third plots show the experiences of France and Italy, respectively. The fall in nominal exchange rates for both countries is much greater. Adjusting for changes in currency units, the equivalent of one French franc in 2008 bought about 1% of the dollars that it did at the start of 1900. The equivalent of one Italian lira bought about .4% of the number of dollars. In both cases the real exchange rates in 2008 are not much different from those at the beginning of the twentieth century. Of course, real exchange rates *do* change, sometimes quite sharply. For example, the real value of sterling rose by about 40% between the end of 2001 and the end of 2007. However, if you were a financial manager called on to make a long-term forecast of the exchange rate, you could not have done much better than to assume that changes in the value of the currency would offset the difference in inflation rates.

4. Equal Real Interest Rates Finally we come to the relationship between interest rates in different countries. Do we have a single world capital market with the same *real* rate of interest in all countries? Does the difference in money interest rates equal the difference in the expected inflation rates?

This is not an easy question to answer since we cannot observe *expected* inflation. However, in Figure 27.4 we have plotted the average interest rate in each of 55 countries against the inflation that subsequently occurred. Japan is tucked into the bottom-left corner of the chart, while Turkey is represented by the dot in the top-right corner. You can see that, in general, the countries with the highest interest rates also had the highest inflation rates.

[15] The real exchange rate is equal to the nominal exchange rate multiplied by the inflation differential. For example, suppose that the value of sterling falls from \$1.65 = £1 to \$1.50 = £1 at the same time that the price of goods rises 10% faster in the United Kingdom than in the United States. The inflation-adjusted, or real, exchange rate is unchanged at

$$\text{Nominal exchange rate} \times (1 + i_{£})/(1 + i_{\$}) = 1.5 \times 1.1 = \$1.65/£$$

There were much smaller differences between the real rates of interest than between the nominal (or money) rates.[16]

27-3 Hedging Currency Risk

Sharp exchange rate movements can make a large dent in corporate profits. To illustrate how companies cope with this problem, we look at a typical company in the United States, Outland Steel, and walk through its foreign exchange operations.

EXAMPLE 27.1 • Outland Steel

Outland Steel has a small but profitable export business. Contracts involve substantial delays in payment, but since the company has a policy of always invoicing in dollars, it is fully protected against changes in exchange rates. Recently the export department has become unhappy with this practice and believes that it is causing the company to lose valuable export orders to firms that are willing to quote in the customer's own currency.

You sympathize with these arguments, but you are worried about how the firm should price long-term export contracts when payment is to be made in foreign currency. If the value of that currency declines before payment is made, the company may suffer a large loss. You want to take the currency risk into account, but you also want to give the sales force as much freedom of action as possible.

Notice that Outland can insure against its currency risk by selling the foreign currency forward. This means that it can separate the problem of negotiating sales contracts from that of managing the company's foreign exchange exposure. The sales force can allow for currency risk by pricing on the basis of the forward exchange rate. And you, as financial manager, can decide whether the company *ought* to hedge.

What is the cost of hedging? You sometimes hear managers say that it is equal to the difference between the forward rate and *today's* spot rate. That is wrong. If Outland does not hedge, it will receive the spot rate at the time that the customer pays for the steel. Therefore, the cost of insurance is the difference between the forward rate and the expected spot rate when payment is received.

Insure or speculate? We generally vote for insurance. First, it makes life simpler for the firm and allows it to concentrate on its main business. Second, it does not cost much. (In fact, the cost is zero on average if the forward rate equals the expected spot rate, as the expectations theory of forward rates implies.) Third, the foreign currency market seems reasonably efficient, at least for the major currencies. Speculation should be a zero-NPV game, unless financial managers have information that is not available to the pros who make the market.

Is there any other way that Outland can protect itself against exchange loss? Of course. It can borrow foreign currency against its foreign receivables, sell the currency spot, and invest the proceeds in the United States. Interest rate parity theory tells us that in free markets the difference between selling forward and selling spot should be equal to the difference between the interest that you have to pay overseas and the interest that you can earn at home.

[16] In Chapter 3 we saw that in some countries the government has issued indexed bonds promising a fixed real return. The annual interest payment and the amount repaid at maturity increase with the rate of inflation. In these cases, therefore, we can observe and compare the real rate of interest. As we write this, real interest rates in Australia, Canada, France, Sweden, the U.K., and the United States cluster within the range of 0% to 2.5%.

Our discussion of Outland's export business illustrates four practical implications of our simple theories about forward exchange rates. First, you can use forward rates to adjust for exchange risk in contract pricing. Second, the expectations theory suggests that protection against exchange risk is usually worth having. Third, interest rate parity theory reminds us that you can hedge either by selling forward or by borrowing foreign currency and selling spot. Fourth, the cost of forward cover is not the difference between the forward rate and *today's* spot rate; it is the difference between the forward rate and the expected spot rate when the forward contract matures.

Perhaps we should add a fifth implication. You don't make money simply by buying currencies that go up in value and selling those that go down. For example, suppose that you buy Narnian leos and sell them after a year for 2% more than you paid for them. Should you give yourself a pat on the back? That depends on the interest that you have earned on your leos. If the interest rate on leos is 2 percentage points less than the interest rate on dollars, the profit on the currency is exactly canceled out by the reduction in interest income. Thus you make money from currency speculation only if you can predict whether the exchange rate will change by more or less than the interest rate differential. In other words, you must be able to predict whether the exchange rate will change by more or less than the forward premium or discount.

Transaction Exposure and Economic Exposure

The exchange risk from Outland Steel's export business is due to delays in foreign currency payments and is therefore referred to as *transaction exposure.* Transaction exposure can be easily identified and hedged. Since a 1% fall in the value of the foreign currency results in a 1% fall in Outland's dollar receipts, for every euro or yen that Outland is owed by its customers, it needs to sell forward one euro or one yen.[17]

However, Outland may still be affected by currency fluctuations even if its customers do not owe it a cent. For example, Outland may be in competition with Swedish steel producers. If the value of the Swedish krona falls, Outland will need to cut its prices in order to compete.[18] Outland can protect itself against such an eventuality by selling the krona forward. In this case the loss on Outland's steel business will be offset by the profit on its forward sale.

Notice that Outland's exposure to the krona is not limited to specific transactions that have already been entered into. Financial managers often refer to this broader type of exposure as *economic exposure.*[19] Economic exposure is less easy to measure than transaction exposure. For example, it is clear that the value of Outland Steel is positively related to the value of the krona, so to hedge its position it needs to sell kronor forward. But in practice it may be hard to say exactly how many kronor Outland needs to sell.

The automobile industry provides a good example of an industry with significant economic exposure. Table 27.3 shows global automotive sales and production in 2003.[20] Panel A shows sales and panel B production. Notice that most manufacturers have significant sales in more than one market and are therefore potentially exposed to the risk of exchange rate fluctuations.

One solution is for the company to undertake *operational hedging* by balancing production closely with sales. Look, for example, at Ford. Thirty-eight percent of its sales are

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[17] To put it another way, the hedge ratio is 1.0.

[18] Of course, if purchasing power parity always held, the fall in the value of the krona would be matched by higher inflation in Sweden. The risk for Outland is that the *real* value of the krona may decline, so that when measured in dollars Swedish costs are lower than previously. Unfortunately, it is much easier to hedge against a change in the *nominal* exchange rate than against a change in the *real* rate.

[19] Financial managers also refer to *translation exposure,* which measures the effect of an exchange rate change on the company's financial statements.

[20] See S. M. Bartram, G. W. Brown, and B. A. Minton, "Resolving the Exposure Puzzle: The Many Facets of Exchange Rate Exposure," *Journal of Financial Economics*, forthcoming.

	Home Country	Europe	North America	Japan	Other
Panel A: Sales, %					
Ford	United States	30.3%	62.3%	0.0%	7.4%
General Motors	United States	20.2	67.6	0.0	12.2
Hyundai	South Korea	17.5	31.1	0.0	51.4
Honda	Japan	7.5	54.8	25.6	12.1
Isuzu	Japan	1.8	14.0	27.8	56.4
Mazda	Japan	23.5	34.6	29.7	12.2
Mitsubishi	Japan	14.5	22.8	37.1	25.7
Nissan	Japan	18.8	40.2	31.5	9.5
Suzuki	Japan	14.2	4.5	41.9	39.4
Toyota	Japan	13.2	32.8	36.8	17.2
Fiat	Italy	80.1	0.0	0.0	19.8
BMW	Germany	64.6	30.6	0.0	4.9
DaimlerChrysler	Germany	28.4	68.4	0.0	3.2
Volkswagen	Germany	62.9	13.4	0.0	23.7
Peugeot	France	92.8	0.5	0.0	6.7
Renault	France	90.6	0.8	0.0	8.6
Panel B: Production, %					
Ford	United States	35.2%	56.1%	0.0%	8.7%
General Motors	United States	24.2	64.5	0.0	11.3
Hyundai	South Korea	1.3	0.0	0.0	98.7
Honda	Japan	6.7	43.2	40.2	9.9
Isuzu	Japan	1.0	7.2	56.2	35.6
Mazda	Japan	0.0	16.9	80.2	2.9
Mitsubishi	Japan	6.0	10.7	64.6	18.6
Nissan	Japan	15.3	27.8	51.5	5.4
Suzuki	Japan	6.7	0.5	59.3	33.5
Toyota	Japan	6.9	18.8	62.6	11.6
Fiat	Italy	79.4	0.0	0.0	20.6
BMW	Germany	80.3	14.8	0.0	4.9
DaimlerChrysler	Germany	34.6	63.0	0.0	2.4
Volkswagen	Germany	68.1	5.8	0.0	26.1
Peugeot	France	94.3	0.0	0.0	5.7
Renault	France	95.7	0.8	0.0	3.6

TABLE 27.3 Percentage sales and production of major automotive companies by geographic region for 2003.

Source: Adapted from Table 1 in S. M. Bartram, G. W. Brown, and B. A. Minton, "Resolving the Exposure Puzzle: The Many Facets of Exchange Rate Exposure," Working paper, *Journal of Financial Economics*, forthcoming, with original data from WARD'S *World Motor Vehicle Data Book* (2003).

outside North America, but so is 44% of its production. Because its costs and revenues in each currency are reasonably closely balanced, exchange rate changes do not affect its profits nearly as much as would be the case if its production were concentrated in one country.

Other manufacturers, particularly the Japanese firms, have less operational hedging. For example, Toyota produces 63% of its output in Japan, but only 37% is sold there. Exchange rate fluctuations are potentially a more serious risk for Toyota. On the other hand, the Japanese companies operate in a wider range of markets than U.S. firms. They have therefore diversified away a good part of their currency risk.

Operational hedging rarely eliminates all exchange risk. Look again at Ford. It is a net importer of autos and components into North America and is therefore exposed to a decline in the value of the dollar. Of course, Ford could try to pass some of the higher dollar cost of imported autos on to the customer, but competition limits the extent to which this is possible. Thus Ford's 2006 Annual Report commented as follows on the effect of the dollar's depreciation:

> The U.S. dollar has depreciated against most major currencies since 2002. This created downward margin pressure on auto manufacturers that have U.S. dollar revenue with foreign currency cost. Because we produce vehicles in Europe . . . for sale in the United States and produce components in Europe (e.g., engines) for use in some of our North American vehicles, we experienced margin pressure. . . . We, like any other automotive manufacturers with sales in the United States, are not always able to price for depreciation of the U.S. dollar due to the extremely competitive pricing environment in the United States.

In addition to operational hedging, Ford and other automobile companies also control exchange rate risk by using *financial hedges*. They do this by borrowing in foreign currencies, selling currency forward, or using foreign currency derivatives such as swaps and options. Ford's Annual Report describes how its financing subsidiary minimizes currency risk:

> To meet funding objectives, Ford Credit issues debt or, for its international affiliates, draws on local credit lines in a variety of currencies. Ford Credit faces exposure to currency exchange rate changes if a mismatch exists between the currency of its receivables and the currency of the debt funding those receivables. When possible, receivables are funded with debt in the same currency, minimizing exposure to exchange rate movements. When a different currency is used, Ford Credit seeks to minimize its exposure to changes in currency exchange rates by executing foreign currency derivatives. These derivatives convert substantially all of its foreign currency debt obligations to the local country currency of the receivables. As a result, Ford Credit's market risk exposure relating to currency exchange rates is believed to be immaterial.

Bartram, Brown, and Minton estimate that financial hedges allow the automobile industry to reduce its exchange rate risk by 45–50%. Operational hedges provide a 10–15% risk reduction and a further 10–15% of the risk is passed through to the customer in the form of price adjustments. In total auto manufacturers are able to reduce their currency exposure by about three-quarters.

27-4 Exchange Risk and International Investment Decisions

Suppose that the Swiss pharmaceutical company, Roche, is evaluating a proposal to build a new plant in the United States. To calculate the project's net present value, Roche forecasts the following dollar cash flows from the project:

Cash Flows ($ millions)					
C_0	C_1	C_2	C_3	C_4	C_5
−1,300	400	450	510	575	650

These cash flows are stated in dollars. So to calculate their net present value Roche discounts them at the dollar cost of capital. (Remember dollars need to be discounted at a *dollar* rate, not the Swiss franc rate.) Suppose this cost of capital is 12%. Then

$$\text{NPV} = -1{,}300 + \frac{400}{1.12} + \frac{450}{1.12^2} + \frac{510}{1.12^3} + \frac{575}{1.12^4} + \frac{650}{1.12^5} = \$513 \text{ million}$$

To convert this net present value to Swiss francs, the manager can simply multiply the dollar NPV by the spot rate of exchange. For example, if the spot rate is SFr1.2/$, then the NPV in Swiss francs is

$$\text{NPV in francs} = \text{NPV in dollars} \times \text{SFr/\$} = 513 \times 1.2 = 616 \text{ million francs}$$

Notice one very important feature of this calculation. Roche does not need to forecast whether the dollar is likely to strengthen or weaken against the Swiss franc. No currency forecast is needed, because the company can hedge its foreign exchange exposure. In that case, the decision to accept or reject the pharmaceutical project in the United States is totally separate from the decision to bet on the outlook for the dollar. For example, it would be foolish for Roche to accept a poor project in the United States just because management is optimistic about the outlook for the dollar; if Roche wishes to speculate in this way it can simply buy dollars forward. Equally, it would be foolish for Roche to reject a good project just because management is pessimistic about the dollar. The company would do much better to go ahead with the project and sell dollars forward. In that way, it would get the best of both worlds.[21]

When Roche ignores currency risk and discounts the dollar cash flows at a dollar cost of capital, it is implicitly assuming that the currency risk is hedged. Let us check this by calculating the number of Swiss francs that Roche would receive if it hedged the currency risk by selling forward each future dollar cash flow.

We need first to calculate the forward rate of exchange between dollars and francs. This depends on the interest rates in the United States and Switzerland. For example, suppose that the dollar interest rate is 6% and the Swiss franc interest rate is 4%. Then interest rate parity theory tells us that the one-year forward exchange rate is

$$s_{\text{SFr/\$}} \times (1 + r_{\text{SFr}})/(1 + r_{\$}) = \frac{1.2 \times 1.04}{1.06} = 1.177$$

Similarly, the two-year forward rate is

$$s_{\text{SFr/\$}} \times (1 + r_{\text{SFr}})^2/(1 + r_{\$})^2 = \frac{1.2 \times 1.04^2}{1.06^2} = 1.155$$

So, if Roche hedges its cash flows against exchange rate risk, the number of Swiss francs it will receive in each year is equal to the dollar cash flow times the forward rate of exchange:

Cash Flows (millions of Swiss francs)					
C_0	C_1	C_2	C_3	C_4	C_5
$-1{,}300 \times 1.2$	400×1.177	450×1.555	510×1.133	575×1.112	650×1.091
$= -1{,}560$	$= 471$	$= 520$	$= 578$	$= 639$	$= 709$

[21] There is a general point here that is not confined to currency hedging. Whenever you face an investment that appears to have a positive NPV, decide what it is that you are betting on and then think whether there is a more direct way to place the bet. For example, if a copper mine looks profitable only because you are unusually optimistic about the price of copper, then maybe you would do better to buy copper futures or the shares of other copper producers rather than opening a copper mine.

These cash flows are in Swiss francs and therefore they need to be discounted at the risk-adjusted Swiss franc discount rate. Since the Swiss rate of interest is lower than the dollar rate, the risk-adjusted discount rate must also be correspondingly lower. The formula for converting from the required dollar return to the required Swiss franc return is[22]

$$(1 + \text{Swiss franc return}) = (1 + \text{dollar return}) \times \frac{(1 + \text{Swiss franc interest rate})}{(1 + \text{dollar interest rate})}$$

In our example,

$$(1 + \text{Swiss franc return}) = 1.12 \times \frac{1.04}{1.06} = 1.099$$

Thus the risk-adjusted discount rate in dollars is 12%, but the discount rate in Swiss francs is only 9.9%.

All that remains is to discount the Swiss franc cash flows at the 9.9% risk-adjusted discount rate:

$$\begin{aligned}\text{NPV} &= -1{,}560 + \frac{471}{1.099} + \frac{520}{1.099^2} + \frac{578}{1.099^3} + \frac{639}{1.099^4} + \frac{709}{1.099^5}\\ &= 616 \text{ million francs}\end{aligned}$$

Everything checks. We obtain exactly the same net present value by (a) ignoring currency risk and discounting Roche's dollar cash flows at the dollar cost of capital and (b) calculating the cash flows in francs on the assumption that Roche hedges the currency risk and then discounting these Swiss franc cash flows at the franc cost of capital.

To repeat: When deciding whether to invest overseas, separate out the investment decision from the decision to take on currency risk. This means that your views about future exchange rates should NOT enter into the investment decision. The simplest way to calculate the NPV of an overseas investment is to forecast the cash flows in the foreign currency and discount them at the foreign currency cost of capital. The alternative is to calculate the cash flows that you would receive if you hedged the foreign currency risk. In this case you need to translate the foreign currency cash flows into your own currency *using the forward exchange rate* and then discount these domestic currency cash flows at the domestic cost of capital. If the two methods don't give the same answer, you have made a mistake.

When Roche analyzes the proposal to build a plant in the United States, it is able to ignore the outlook for the dollar *only because it is free to hedge the currency risk.* Because investment in a pharmaceutical plant does not come packaged with an investment in the dollar, the opportunity for firms to hedge allows for better investment decisions.

The Cost of Capital for International Investments

Roche should discount dollar cash flows at a dollar cost of capital. But how should a Swiss company like Roche calculate a cost of capital in dollars for an investment in the U.S.? There is no simple, consensus procedure for answering this question, but we suggest the following procedure as a start.

First you need to decide on the risk of a U.S. pharmaceutical investment to a Swiss investor. You could look at the betas of a sample of U.S. pharmaceutical companies *relative to the Swiss market index.*

[22] The following example should give you a feel for the idea behind this formula. Suppose the spot rate for Swiss francs is SFr1.2 = $1. Interest rate parity tells us that the forward rate must be 1.2 × 1.04/1.06 = SFr 1.177/$. Now suppose that a share costs $100 and will pay an expected $112 at the end of the year. The cost to Swiss investors of buying the share is 100 × 1.2 = SFr 120. If the Swiss investors sell forward the expected payoff, they will receive an expected 112 × 1.177 = SFr 131.9. The expected return in Swiss francs is 131.9/120 − 1 = .099, or 9.9%. More simply, the Swiss franc return is 1.12 × 1.04/1.06 − 1 = .099.

Why measure betas relative to the Swiss index, while a U.S. counterpart such as Merck would measure betas relative to the U.S. index? The answer lies in Section 7-4, where we explained that risk cannot be considered in isolation; it depends on the other securities in the investor's portfolio. Beta measures risk *relative to the investor's portfolio.* If U.S. investors already hold the U.S. market, an additional dollar invested at home is just more of the same. But if Swiss investors hold the Swiss market, an investment in the U.S. can reduce their risk because the Swiss and U.S. markets are not perfectly correlated. That explains why an investment in the U.S. can be lower risk for Roche's shareholders than for Merck's shareholders. It also explains why Roche's shareholders may be willing to accept a relatively low expected return from a U.S. investment.[23]

Suppose that you decide that the investment's beta relative to the Swiss market is .8 and that the market risk premium in Switzerland is 7.4%. Then the required return on the project can be estimated as

$$\begin{aligned}\text{Required return} &= \text{Swiss interest rate} + (\text{beta} \times \text{Swiss market risk premium})\\ &= 4 + (.8 \times 7.4) = 9.9\end{aligned}$$

This is the project's cost of capital measured in Swiss francs. We used it above to discount the expected *Swiss franc* cash flows if Roche hedged the project against currency risk. We cannot use it to discount the *dollar* cash flows from the project.

To discount the expected *dollar* cash flows, we need to convert the Swiss franc cost of capital to a dollar cost of capital. This means running our earlier calculation in reverse:

$$(1 + \text{dollar return}) = (1 + \text{Swiss franc return}) \times \frac{(1 + \text{dollar interest rate})}{(1 + \text{Swiss franc interest rate})}$$

In our example,

$$(1 + \text{dollar return}) = 1.099 \times \frac{1.06}{1.04} = 1.12$$

We used this 12% dollar cost of capital to discount the forecasted dollar cash flows from the project.

When a company measures risk relative to its domestic market as in our example, its managers are implicitly assuming that shareholders hold simply domestic stocks. That is not a bad approximation, particularly in the U.S. Although U.S. investors can reduce their risk by holding an internationally diversified portfolio of shares, they generally invest only a small proportion of their money overseas. Why they are so shy is a puzzle. It looks as if they are worried about the costs of investing overseas, such as the extra costs involved in identifying which stocks to buy, or the possibility of unfair treatment by foreign companies or governments.

The world is getting smaller and "flatter," however, and investors everywhere are increasing their holdings of foreign securities. Pension funds and other institutional investors have diversified internationally, and dozens of mutual funds have been set up for people who want to invest abroad. If investors throughout the world held the world portfolio, then costs of capital would converge. The cost of capital would still depend on the risk of the investment, but not on the domicile of the investing company. There is some evidence that for large U.S. firms it does not make much difference whether a U.S. or global beta is used.

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[23] When an investor holds an efficient portfolio, the expected reward for risk on each stock in the portfolio is proportional to its beta *relative to the portfolio.* So if the Swiss market index is an efficient portfolio for Swiss investors, then these investors will want Roche to invest in the U.S. if the expected rate of return more than compensates for the investment's beta relative to the Swiss index.

For smaller countries the evidence is not so clear-cut and sometimes a global beta may be more appropriate.[24]

Do Some Countries Have a Lower Interest Rate?

Some countries enjoy much lower interest rates than others. For example, in early 2007, before the recent financial crisis, the long-term interest rate in Japan was about 1.4% and in Australia it was 5.9%. People often conclude from this kind of comparison that Japan has a low cost of capital.

This view is one part confusion and one part probable truth. The confusion arises because the interest rate in Japan is measured in yen and the rate in Australia is measured in Australian dollars. You would not say that a 10-inch-high rabbit was taller than a 9-foot elephant. In the same way it makes no sense to compare interest rates for different currencies.

But suppose that you measure the interest rate in real terms. Then you are comparing like with like, and it does make sense to ask whether the *real* cost of capital is lower in Japan. Real interest rates do sometimes diverge and, when that happens, investors may see a profit opportunity. For example, in early 2007, financial institutions had borrowed an estimated $200 billion in Japan and reinvested it at higher rates in other countries such as Australia.[25] These trades are known as *carry trades*. This huge volume of carry trades suggested that investors believed that the real cost of capital was indeed lower in Japan than in Australia and some other countries.

27-5 Political Risk

So far we have focused on the management of exchange rate risk, but managers also worry about political risk. By this they mean the threat that a government will change the rules of the game—that is, break a promise or understanding—*after* the investment is made. Of course political risks are not confined to overseas investments. Businesses in every country are exposed to the risk of unanticipated actions by governments or the courts. But in some parts of the world foreign companies are particularly vulnerable.

A number of consultancy services offer analyses of political and economic risks and draw up country rankings.[26] For example, Table 27.4 is an extract from the 2008 political risk rankings provided by the PRS Group. You can see that each country is scored on 12 separate dimensions. Finland comes top of the class overall, while Somalia languishes at the bottom.

Some managers dismiss political risk as an act of God, like a hurricane or earthquake. But the most successful multinational companies structure their business to reduce political risk. Foreign governments are not likely to expropriate a local business if it cannot operate without the support of its parent. For example, the foreign subsidiaries of American computer manufacturers or pharmaceutical companies would have relatively little value if they were cut off from the know-how of their parents. Such operations are much less likely to be expropriated than, say, a mining operation that can be operated as a stand-alone venture.

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[24] See R. M. Stulz, "The Cost of Capital in Internationally Integrated Markets: The Case of Nestlé," *European Financial Management* 1, no. 1 (1995), pp. 11–22; R. S. Harris, F. C. Marston, D. R. Mishra, and T. J. O'Brien, "Ex Ante Cost of Capital Estimates of S&P 500 Firms: The Choice Between Global and Domestic CAPM," *Financial Management* (Autumn 2003), pp. 51–66; and Standard & Poor's, "Domestic vs Global CAPM," *Global Cost of Capital Report,* 4th Quarter 2003.

[25] See "Yen Low Sparks Carry Trade Alert," *Financial Times,* January 30, 2007. This carry trade proved profitable until August 2008, but in the following three months it went very sour, as the Australian dollar slumped by over 40% against the yen.

[26] For a discussion of these services see C. Erb, C. R. Harvey, and T. Viskanta, "Political Risk, Financial Risk, and Economic Risk," *Financial Analysts Journal* 52 (1996), pp. 28–46. Also, Campbell Harvey's Web page (**www.duke.edu/~charvey**) is a useful source of information on political risk.

	A	B	C	D	E	F	G	H	I	J	K	L	Total
Maximum	12	12	12	12	12	6	6	6	6	6	6	4	100
Finland	9.5	9.5	12.0	11.0	11.5	6.0	6.0	6.0	6.0	6.0	6.0	4.0	93.5
Sweden	7.5	9.0	12.0	11.5	11.0	5.0	5.5	6.0	6.0	5.0	6.0	4.0	88.5
Switzerland	9.0	10.5	12.0	12.0	11.0	4.5	6.0	4.5	5.0	4.0	6.0	4.0	88.5
Australia	10.0	10.5	12.0	10.0	9.5	4.5	6.0	6.0	5.5	4.0	6.0	4.0	88.0
Germany	10.0	8.0	12.0	11.0	10.5	5.0	6.0	5.0	5.0	4.0	6.0	4.0	86.5
Singapore	11.0	9.5	12.0	10.5	10.5	4.5	5.0	4.5	5.0	6.0	2.0	4.0	84.5
U.K.	8.0	9.5	12.0	9.5	7.0	4.0	6.0	6.0	5.5	4.0	6.0	4.0	81.5
France	9.5	8.0	12.0	10.0	10.0	5.0	5.5	4.0	5.0	2.5	6.0	3.0	80.5
Japan	6.5	8.0	11.5	10.5	9.5	3.0	5.0	5.5	5.0	5.5	5.0	4.0	79.0
U.S.	6.0	8.0	12.0	10.0	7.0	4.0	4.0	5.5	5.0	5.0	6.0	4.0	76.5
China, P.R.	11.0	9.0	7.0	10.0	10.0	2.5	3.0	5.0	4.5	4.5	1.5	2.0	70.0
Russian Fed.	11.5	7.0	9.5	8.0	8.5	2.0	4.5	5.5	4.0	3.0	2.5	1.0	67.0
Brazil	8.5	6.0	7.5	10.0	10.5	2.0	4.0	6.0	2.0	3.0	5.0	2.0	66.5
Turkey	9.0	6.5	8.0	8.0	7.5	2.5	2.0	4.5	4.5	2.5	5.0	2.0	62.0
India	6.0	5.5	8.5	6.5	10.0	2.5	4.0	2.5	4.0	2.5	6.0	3.0	61.0
Pakistan	4.0	5.0	7.5	5.5	8.5	2.0	1.0	1.0	3.0	1.0	1.0	2.0	41.5
Somalia	5.5	0.0	2.0	4.0	4.0	1.0	1.0	3.0	0.5	2.0	1.0	0.0	24.0

TABLE 27.4 Political risk scores for a sample of countries, January 2008.

Key:
A Government stability
B Socioeconomic conditions
C Investment profile
D Internal conflict
E External conflict
F Corruption
G Military in politics
H Religious tensions
I Law and order
J Ethnic tensions
K Democratic accountability
L Bureaucracy quality

Source: International Country Risk Guide, a publication of The PRS Group, Inc. (www.prsgroup.com), 2008.

We are not recommending that you turn your silver mine into a pharmaceutical company, but you may be able to plan your overseas manufacturing operations to improve your bargaining position with foreign governments. For example, Ford has integrated its overseas operations so that the manufacture of components, subassemblies, and complete automobiles is spread across plants in a number of countries. None of these plants would have much value on its own, and Ford can switch production between plants if the political climate in one country deteriorates.

Multinational corporations have also devised financing arrangements to help keep foreign governments honest. For example, suppose your firm is contemplating an investment of $500 million to reopen the San Tomé silver mine in Costaguana with modern machinery, smelting equipment, and shipping facilities.[27] The Costaguanan government agrees to invest in roads and other infrastructure and to take 20% of the silver produced by the mine in lieu of taxes. The agreement is to run for 25 years.

The project's NPV on these assumptions is quite attractive. But what happens if a new government comes into power five years from now and imposes a 50% tax on "any precious metals exported from the Republic of Costaguana"? Or changes the government's share of output from 20% to 50%? Or simply takes over the mine "with fair compensation to be determined in due course by the Minister of Natural Resources of the Republic of Costaguana"?

[27] The early history of the San Tomé mine is described in Joseph Conrad's *Nostromo*.

No contract can absolutely restrain sovereign power. But you can arrange project financing to make these acts as painful as possible for the foreign government. For example, you might set up the mine as a subsidiary corporation, which then borrows a large fraction of the required investment from a consortium of major international banks. If your firm guarantees the loan, make sure the guarantee stands only if the Costaguanan government honors its contract. The government will be reluctant to break the contract if that causes a default on the loans and undercuts the country's credit standing with the international banking system.

If possible, you should arrange for the World Bank (or one of its affiliates) to finance part of the project or to guarantee your loans against political risk.[28] Few governments have the guts to take on the World Bank. Here is another variation on the same theme. Arrange to borrow, say, $450 million through the Costaguanan Development Agency. In other words, the development agency borrows in international capital markets and relends to the San Tomé mine. Your firm agrees to stand behind the loan as long as the government keeps its promises. If it does keep them, the loan is your liability. If not, the loan is *its* liability.

Political risk is not confined to the risk of expropriation. Multinational companies are always exposed to the criticism that they siphon funds out of countries in which they do business, and, therefore, governments are tempted to limit their freedom to repatriate profits. This is most likely to happen when there is considerable uncertainty about the rate of exchange, which is usually when you would most like to get your money out. Here again a little forethought can help. For example, there are often more onerous restrictions on the payment of dividends to the parent than on the payment of interest or principal on debt. Royalty payments and management fees are less sensitive than dividends, particularly if they are levied equally on all foreign operations. A company can also, within limits, alter the price of goods that are bought or sold within the group, and it can require more or less prompt payment for such goods.

Calculating NPVs for investment projects becomes exceptionally difficult when political risks are significant. You have to estimate cash flows and project life with extra caution. You may want to take a peek at the discounted payback period (see Chapter 5), on the theory that quick-payback projects are less exposed to political risks. But do not try to compensate for political risks by adding casual fudge factors to discount rates. Fudge factors spawn bias and confusion, as we explained in Chapter 9.

[28] In Section 24-7 we described how the World Bank provided the Hubco power project with a guarantee against political risk.

SUMMARY

The international financial manager has to cope with different currencies, interest rates, and inflation rates. To produce order out of chaos, the manager needs some model of how they are related. We described four very simple but useful theories.

Interest rate parity theory states that the interest differential between two countries must be equal to the difference between the forward and spot exchange rates. In the international markets, arbitrage ensures that parity almost always holds. There are two ways to hedge against exchange risk: One is to take out forward cover; the other is to borrow or lend abroad. Interest rate parity tells us that the costs of the two methods should be the same.

The expectations theory of exchange rates tells us that the forward rate equals the expected spot rate. In practice forward rates seem to incorporate a risk premium, but this premium is about equally likely to be negative as positive.

In its strict form, purchasing power parity states that $1 must have the same purchasing power in every country. That doesn't square well with the facts, for differences in inflation rates are not perfectly related to changes in exchange rates. This means that there may be some

genuine exchange risks in doing business overseas. On the other hand, the difference in inflation rates is just as likely to be above as below the change in the exchange rate.

Finally, we saw that in an integrated world capital market real rates of interest would have to be the same. In practice government regulation and taxes can cause differences in real interest rates. But do not simply borrow where interest rates are lowest. Those countries are also likely to have the lowest inflation rates and the strongest currencies.

With these precepts in mind we showed how you can use forward markets or the loan markets to hedge transactions exposure, which arises from delays in foreign currency payments and receipts. But the company's financing choices also need to reflect the impact of a change in the exchange rate on the value of the entire business. This is known as economic exposure. Companies protect themselves against economic exposure either by hedging in the financial markets or by building plants overseas.

Because companies can hedge their currency risk, the decision to invest overseas does not involve currency forecasts. There are two ways for a company to calculate the NPV of an overseas project. The first is to forecast the foreign currency cash flows and to discount them at the foreign currency cost of capital. The second is to translate the foreign currency cash flows into domestic currency assuming that they are hedged against exchange rate risk. These domestic currency flows can then be discounted at the domestic cost of capital. The answers should be identical.

In addition to currency risk, overseas operations may be exposed to extra political risk. However, firms may be able to structure the financing to reduce the chances that government will change the rules of the game.

FURTHER READING

There are a number of useful textbooks in international finance. Here is a small selection:

P. Sercu, *International Finance: Theory into Practice* (Princeton: Princeton University Press, 2009).

D. K. Eiteman, A. I. Stonehill, and M. H. Moffett, *Multinational Business Finance,* 11th ed. (Reading, MA: Pearson Addison Wesley, 2007).

A. C. Shapiro, *Multinational Financial Management,* 8th ed. (New York: John Wiley & Sons, 2006).

Here are some general discussions of international investment decisions and associated exchange risks:

G. Allayanis, J. Ihrig, and J. P. Weston, "Exchange-Rate Hedging: Financial versus Operational Strategies," *American Economic Review* 91 (May 2001), pp. 391–395.

D. R. Lessard, "Global Competition and Corporate Finance in the 1990s," *Journal of Applied Corporate Finance* 3 (Winter 1991), pp. 59–72.

M. D. Levi and P. Sercu, "Erroneous and Valid Reasons for Hedging Foreign Exchange Exposure," *Journal of Multinational Financial Management* 1 (1991), pp. 25–37.

Listed below are a few of the articles on the relationship between interest rates, exchange rates, and inflation:

Forward and spot exchange rates

M. D. Evans and K. K. Lewis, "Do Long-Term Swings in the Dollar Affect Estimates of the Risk Premia?" *Review of Financial Studies* 8 (1995), pp. 709–742.

Interest rate parity

K. Clinton, "Transaction Costs and Covered Interest Arbitrage: Theory and Evidence," *Journal of Political Economy* 96 (April 1988), pp. 358–370.

Purchasing power parity

K. Froot and K. Rogoff, "Perspectives on PPP and Long-run Real Exchange Rates," in G. Grossman and K. Rogoff (eds.), *Handbook of International Economics* (Amsterdam: North-Holland Publishing Company, 1995).

K. Rogoff, "The Purchasing Power Parity Puzzle," *Review of Economic Literature* 34 (June 1996), pp. 667–668.

A. M. Taylor and M. P. Taylor, "The Purchasing Power Parity Debate," *Journal of Economic Perspectives* 18 (Autumn 2004), pp. 135–158.

Select problems are available in McGraw-Hill Connect. Please see the preface for more information.

PROBLEM SETS

BASIC

1. Look at Table 27.1.

a. How many Japanese yen do you get for your dollar?

b. What is the one-month forward rate for yen?

c. Is the yen at a forward discount or premium on the dollar?

d. Use the one-year forward rate to calculate the annual percentage discount or premium on yen.

e. If the one-year interest rate on dollars is 1.5% annually compounded, what do you think is the one-year interest rate on yen?

f. According to the expectations theory, what is the expected spot rate for yen in three months' time?

g. According to purchasing power parity theory, what then is the expected difference in the three-month rate of price inflation in the United States and Japan?

2. Define each of the following theories in a sentence or simple equation:

a. Interest rate parity.

b. Expectations of forward rates.

c. Purchasing power parity.

d. International capital market equilibrium (relationship of real and nominal interest rates in different countries).

3. In March 1997 the exchange rate for the Indonesian rupiah was R 2,419 = $1. Inflation in the year to March 1998 was about 30% in Indonesia and 2% in the United States.

a. If purchasing power parity held, what should have been the nominal exchange rate in March 1998?

b. The actual exchange rate in March 1998 (in the middle of the Asian currency crisis) was R 8,325 = $1. What was the change in the *real* exchange rate?

4. The following table shows interest rates and exchange rates for the U.S. dollar and the Philippine peso in 2007. The spot exchange rate is 47.46 pesos = $1. Complete the missing entries:

	1 Month	3 Months	1 Year
Dollar interest rate (annually compounded)	5.3	5.3	?
Peso interest rate (annually compounded)	4.15	?	4.95
Forward pesos per dollar	?	?	47.482
Forward premium on peso (% per year)	?	+0.19	?

5. An importer in the United States is due to take delivery of clothing from Mexico in six months. The price is fixed in Mexican pesos. Which of the following transactions could eliminate the importer's exchange risk?

a. Sell six-month call options on pesos.
b. Buy pesos forward.
c. Sell pesos forward.
d. Sell pesos in the currency futures market.
e. Borrow pesos; buy dollars at the spot exchange rate.
f. Sell pesos at the spot exchange rate; lend dollars.

6. A U.S. company has committed to pay 10 million kronor to a Swedish company in one year. What is the cost (in present value) of covering this liability by buying kronor forward? The Swedish interest rate is .6%, and exchange rates are shown in Table 27.1. Briefly explain.

7. A firm in the United States is due to receive payment of €1 million in eight years' time. It would like to protect itself against a decline in the value of the euro, but finds it difficult to get forward cover for such a long period. Is there any other way in which it can protect itself?

8. Suppose that two-year interest rates are 5.2% in the United States and 1.0% in Japan. The spot exchange rate is ¥120.22/$. Suppose that one year later interest rates are 3% in both countries, while the value of the yen has appreciated to ¥115.00/$.

a. Benjamin Pinkerton from New York invested in a U.S. two-year zero-coupon bond at the start of the period and sold it after one year. What was his return?
b. Madame Butterfly from Osaka bought some dollars. She also invested in the two-year U.S. zero-coupon bond and sold it after one year. What was her return *in yen?*
c. Suppose that Ms. Butterfly had correctly forecasted the price at which she sold her bond and that she hedged her investment against currency risk. How could she have done so? What would have been her return in yen?

9. It is the year 2018 and Pork Barrels Inc. is considering construction of a new barrel plant in Spain. The forecasted cash flows in millions of euros are as follows:

C_0	C_1	C_2	C_3	C_4	C_5
−80	+10	+20	+23	+27	+25

The spot exchange rate is $1.2 = €1. The interest rate in the United States is 8% and the euro interest rate is 6%. You can assume that pork barrel production is effectively risk-free.

a. Calculate the NPV of the euro cash flows from the project. What is the NPV in dollars?
b. What are the dollar cash flows from the project if the company hedges against exchange rate changes?
c. Suppose that the company expects the euro to depreciate by 5% a year. How does this affect the value of the project?

INTERMEDIATE

10. Table 27.1 shows the 90-day forward rate on the South African rand.

a. Is the dollar at a forward discount or premium on the rand?
b. What is the annual *percentage* discount or premium?
c. If you have no other information about the two currencies, what is your best guess about the spot rate on the rand three months hence?
d. Suppose that you expect to receive 100,000 rand in three months. How many dollars is this likely to be worth?

TABLE 27.5
Interest rates and exchange rates.

* Number of units of foreign currency that can be exchanged for $1.

	Interest Rate (%)	Spot Exchange Rate*	1-Year Forward Exchange Rate*
United States (dollar)	3	—	—
Costaguana (pulga)	23	10,000	11,942
Westonia (ruple)	5	2.6	2.65
Gloccamorra (pint)	8	17.1	18.2
Anglosaxophonia (wasp)	4.1	2.3	2.28

11. Look at Table 27.1. If the three-month interest rate on dollars is 0.2%, what do you think is the three-month interest rate on South African rand? Explain what would happen if the rate were substantially above your figure.

12. Ms. Rosetta Stone, the treasurer of International Reprints, Inc., has noticed that the interest rate in Japan is below the rates in most other countries. She is, therefore, suggesting that the company should make an issue of Japanese yen bonds. Does this make sense?

13. Suppose you are the treasurer of Lufthansa, the German international airline. How is company value likely to be affected by exchange rate changes? What policies would you adopt to reduce exchange rate risk?

14. Companies may be affected by changes in the nominal exchange rate or in the real exchange rate. Explain how this can occur. Which risks are easiest to hedge against?

15. A Ford dealer in the United States may be exposed to a devaluation of the yen if this leads to a cut in the price of Japanese cars. Suppose that the dealer estimates that a 1% decline in the value of the yen would result in a permanent decline of 5% in the dealer's profits. How should she hedge against this risk, and how should she calculate the size of the hedge position? (*Hint:* You may find it helpful to refer back to Section 26-6.)

16. You have bid for a possible export order that would provide a cash inflow of €1 million in six months. The spot exchange rate is $1.3549 = €1 and the six-month forward rate is $1.3620 = €1. There are two sources of uncertainty: (1) the euro could appreciate or depreciate and (2) you may or may not receive the export order. Illustrate in each case the final payoffs if (a) you sell one million euros forward, and (b) you buy a six-month option to sell euros with an exercise price of $1.3620/€.

17. In July 2009, an American investor buys 1,000 shares in a Mexican company at a price of 500 pesos each. The share does not pay any dividend. A year later she sells the shares for 550 pesos each. The exchange rates when she buys the stock are shown in Table 27.1. Suppose that the exchange rate at the time of sale is peso 16.0/$.

a. How many dollars does she invest?

b. What is her total return in pesos? In dollars?

c. Do you think that she has made an exchange rate profit or loss? Explain.

18. Table 27.5 above shows the annual interest rate (annually compounded) and exchange rates against the dollar for different currencies. Are there any arbitrage opportunities? If so, how would you secure a positive cash flow today, while zeroing out all future cash flows?

19. "Last year we had a substantial income in sterling, which we hedged by selling sterling forward. In the event sterling appreciated. So our decision to sell forward cost us a lot of money. I think that in the future we should either stop hedging our currency exposure or just hedge when we think sterling is overvalued." As financial manager, how would you respond to your chief executive's comment?

20. Carpet Baggers, Inc., is proposing to construct a new bagging plant in a country in Europe. The two prime candidates are Germany and Switzerland. The forecasted cash flows from the proposed plants are as follows:

	C_0	C_1	C_2	C_3	C_4	C_5	C_6	IRR(%)
Germany (millions of euros)	−60	+10	+15	+15	+20	+20	+20	18.8
Switzerland (millions of Swiss francs)	−120	+20	+30	+30	+35	+35	+35	12.8

The spot exchange rate for euros is \$1.3/€, while the rate for Swiss francs is SFr 1.5/\$. The interest rate is 5% in the United States, 4% in Switzerland, and 6% in the euro countries. The financial manager has suggested that, if the cash flows were stated in dollars, a return in excess of 10% would be acceptable.

Should the company go ahead with either project? If it must choose between them, which should it take?

CHALLENGE

21. If investors recognize the impact of inflation and exchange rate changes on a firm's cash flows, changes in exchange rates should be reflected in stock prices. How would the stock price of each of the following Swiss companies be affected by an unanticipated appreciation of the Swiss franc of 10%? Assume that only 2% of the appreciation can be attributed to increased inflation in the rest of the world (relative to the Swiss inflation rate).

a. *A Swiss airline:* More than two-thirds of its employees are Swiss. Most revenues come from international fares set in U.S. dollars.

b. *Nestlé:* Fewer than 5% of its employees are Swiss. Most revenues are derived from sales of consumer goods in a wide range of countries with competition from local producers.

c. *UBS:* Forty percent of the employees work in Switzerland. The bank's Group Treasury periodically hedges any non-Swiss franc monetary positions.

22. Alpha and Omega are U.S. corporations. Alpha has a plant in Hamburg that imports components from the United States, assembles them, and then sells the finished product in Germany. Omega is at the opposite extreme. It also has a plant in Hamburg, but it buys its raw material in Germany and exports its output back to the United States. How is each firm likely to be affected by a fall in the value of the euro? How could each firm hedge itself against exchange risk?

REAL-TIME DATA ANALYSIS

1. Find the foreign exchange rate tables in the online versions of *The Wall Street Journal* (www.wsj.com) or the *Financial Times* (www.ft.com).

a. How many U.S. dollars are worth one Canadian dollar today?

b. How many Canadian dollars are worth one U.S. dollar today?

c. Suppose that you arrange today to buy Canadian dollars in 90 days. How many Canadian dollars could you buy for each U.S. dollar?

d. If forward rates simply reflect market expectations, what is the likely spot exchange rate for the Canadian dollar in 90 days' time?

e. Look at the table of money rates in the same issue. What is the three-month interest rate on dollars?

f. Can you deduce the likely three-month interest rate for the Canadian dollar?

g. You can also buy currency for future delivery in the financial futures market. Look at the table of futures prices. What is the rate of exchange for Canadian dollars to be delivered in approximately six months' time?

2. Find the foreign exchange rate tables in the online versions of *The Wall Street Journal* (**www.wsj.com**) or the *Financial Times* (**www.ft.com**). How many Swiss francs can you buy for $1? How many Hong Kong dollars can you buy? What rate do you think a Swiss bank would quote for buying or selling Hong Kong dollars? Explain what would happen if it quoted a rate that was substantially above your figure.

MINI-CASE

Exacta, s.a.

Exacta, s.a., is a major French producer, based in Lyons, of precision machine tools. About two-thirds of its output is exported. The majority of these sales is within the European Union. However, the company also has a thriving business in the United States, despite strong competition from several U.S. firms. Exacta usually receives payment for exported goods within two months of the invoice date, so that at any point in time only about one-sixth of annual exports to the United States is exposed to currency risk.

The company believes that its North American business is now large enough to justify a local manufacturing operation, and it has recently decided to establish a plant in South Carolina. Most of the output from this plant will be sold in the United States, but the company believes that there should also be opportunities for future sales in Canada and Mexico.

The South Carolina plant will involve a total investment of $380 million and is expected to be in operation by the year 2012. Annual revenues from the plant are expected to be about $420 million and the company forecasts net profits of $52 million a year. Once the plant is up and running, it should be able to operate for several years without substantial additional investment.

Although there is widespread enthusiasm for the project, several members of the management team have expressed anxiety about possible currency risk. M. Pangloss, the finance director, reassured them that the company was not a stranger to currency risk; after all, the company is already exporting about $320 million of machine tools each year to the United States and has managed to exchange its dollar revenue for euros without any major losses. But not everybody was convinced by this argument. For example, the CEO, M. B. Bardot, pointed out that the $380 million to be invested would substantially increase the amount of money at risk if the dollar fell relative to the euro. M. Bardot was notoriously risk-averse on financial matters and would push for complete hedging if practical.

M. Pangloss attempted to reassure the CEO. At the same time, he secretly shared some of the anxieties about exchange rate risk. Nearly all the revenues from the South Carolina plant would be in U.S. dollars and the bulk of the $380 million investment would likewise be incurred in the United States. About two-thirds of the operating costs would be in dollars, but the remaining one-third would represent payment for components brought in from Lyons plus the charge by the head office for management services and use of patents. The company has yet to decide whether to invoice its U.S. operation in dollars or euros for these purchases from the parent company.

M. Pangloss is optimistic that the company can hedge itself against currency risk. His favored solution is for Exacta to finance the plant by a $380 million issue of dollar bonds. That way the dollar investment would be offset by a matching dollar liability. An alternative is for the company to sell forward at the beginning of each year the expected revenues from the U.S. plant. But

he realizes from experience that these simple solutions might carry hidden dangers. He decides to slow down and think more systematically about the additional exchange risk from the U.S. operation.

QUESTIONS

1. What would Exacta's true exposure be from its new U.S. operations, and how would it change from the company's current exposure?
2. Given that exposure, what would be the most effective and inexpensive approach to hedging?