



11: Managing Transaction Exposure

Recall from the previous chapter that a multinational corporation (MNC) is exposed to exchange rate fluctuations in three ways: (1) transaction exposure, (2) economic exposure, and (3) translation exposure. This chapter focuses on the management of transaction exposure, while the following chapter focuses on the management of economic and translation exposure. By managing transaction exposure, financial managers may be able to increase cash flows and enhance the value of their MNCs.

The specific objectives of this chapter are to:

- compare the techniques commonly used to hedge payables,
- compare the techniques commonly used to hedge receivables,
- explain how to hedge long-term transaction exposure, and
- suggest other methods of reducing exchange rate risk when hedging techniques are not available.

Transaction Exposure

Transaction exposure exists when the anticipated future cash transactions of a firm are affected by exchange rate fluctuations. A U.S. firm that purchases Mexican goods may need pesos to buy the goods. Though it may know exactly how many pesos it will need, it doesn't know how many dollars will be needed to be exchanged for those pesos. This uncertainty occurs because the exchange rate between pesos and dollars fluctuates over time. A U.S.-based MNC that will be receiving a foreign currency is exposed because it does not know how many dollars it will obtain when it exchanges the foreign currency for dollars.

If transaction exposure exists, the firm faces three major tasks. First, it must identify its degree of transaction exposure. Second, it must decide whether to hedge this exposure. Finally, if it decides to hedge part or all of the exposure, it must choose among the various hedging techniques available. Each of these tasks is discussed in turn.

Identifying Net Transaction Exposure

Before an MNC makes any decisions related to hedging, it should identify the individual **net transaction exposure** on a currency-by-currency basis. The term *net* here refers to the consolidation of all expected inflows and outflows for a particular time and currency. The management at each subsidiary plays a vital role in reporting its expected inflows and outflows. Then a centralized group consolidates the subsidiary reports to identify, for the MNC as a whole, the expected net positions in each foreign currency during several upcoming periods.

The MNC can identify its exposure by reviewing this consolidation of subsidiary positions. For example, one subsidiary may have net receivables in Mexican pesos 3 months from now, while a different subsidiary has net payables in pesos. If the peso appreciates, this will be favorable to the first subsidiary and unfavorable to the second

subsidiary. For the MNC as a whole, however, the impact is at least partially offset. Each subsidiary may desire to hedge its net currency position in order to avoid the possible adverse impacts on its performance due to fluctuation in the currency's value. The overall performance of the MNC, however, may already be insulated by the offsetting positions between subsidiaries. Therefore, hedging the position of each individual subsidiary may not be necessary.

EXAMPLE

Eastman Kodak Co. uses a centralized currency management approach to manage its transaction exposure. Kodak bills its subsidiaries in their local currencies. The rationale behind this strategy is to shift the foreign exchange exposure from the subsidiaries to the parent company. The parent receives foreign currencies from its subsidiaries overseas and converts them to U.S. dollars. It can maintain the currencies as foreign deposits if it believes the currencies will strengthen against the U.S. dollar in the near future. ■

Adjusting the Invoice Policy to Manage Exposure

In some circumstances, the U.S. firm may be able to modify its pricing policy to hedge against transaction exposure. That is, the firm may be able to invoice (price) its exports in the same currency that will be needed to pay for imports.

EXAMPLE

Stovall, Inc., has continual payables in Mexican pesos because a Mexican exporter sends goods to Stovall under the condition that the goods be invoiced in Mexican pesos. Stovall also exports products (invoiced in U.S. dollars) to other corporations in Mexico. If Stovall changes its invoicing policy from U.S. dollars to pesos, it can use the peso receivables from its exports to pay off its future payables in pesos. It is unlikely, however, that Stovall would be able to (1) invoice the precise amount of peso receivables to match the peso payables and (2) perfectly time the inflows and outflows to match each other. ■

Because the matching of inflows and outflows in foreign currencies does have its limitations, an MNC will normally be exposed to some degree of exchange rate risk and, therefore, should consider the various hedging techniques identified next.

GOVERNANCE

Aligning Manager Compensation with Hedging Goals

If managers of a subsidiary are compensated according to the subsidiary's earnings, the managers will want to hedge some currency positions that could adversely affect their earnings. For an MNC with many subsidiaries, some currency positions at subsidiaries will offset each other, so that a hedge by one subsidiary could actually increase the MNC's overall exposure. An MNC can use a centralized system for assessing and hedging exposure to ensure that its subsidiaries do not hedge. However, this system can affect the cash flows and performance of each subsidiary and, therefore, may affect the compensation to the managers of each subsidiary. The MNC's parent can implement a compensation system that does not penalize the managers of subsidiaries if their cash flows are reduced due to adverse currency movements. ■

Hedging Exposure to Payables

An MNC may decide to hedge part or all of its known payables transactions so that it is insulated from possible appreciation of the currency. It may select from the following hedging techniques to hedge its payables:

- Futures hedge
- Forward hedge
- Money market hedge
- Currency option hedge

Before selecting a hedging technique, MNCs normally compare the cash flows that would be expected from each technique. The proper hedging technique can vary over time, as the relative advantages of the various techniques may change over time. Each technique is discussed in turn, with examples provided. The techniques can be compared to determine the appropriate technique to hedge a particular position.

Forward or Futures Hedge on Payables

Forward contracts and futures contracts allow an MNC to lock in a specific exchange rate at which it can purchase a specific currency and, therefore, allow it to hedge payables denominated in a foreign currency. A forward contract is negotiated between the firm and a financial institution such as a commercial bank and, therefore, can be tailored to meet the specific needs of the firm. The contract will specify the:

- currency that the firm will pay
- currency that the firm will receive
- amount of currency to be received by the firm
- rate at which the MNC will exchange currencies (called the forward rate)
- future date at which the exchange of currencies will occur

EXAMPLE

Coleman Co. is a U.S.-based MNC that will need 100,000 euros in one year. It could obtain a forward contract to purchase the euros in one year. The one-year forward rate is \$1.20, the same rate as currency futures contracts on euros. If Coleman purchases euros one year forward, its dollar cost in one year is:

$$\begin{aligned}\text{Cost in \$} &= \text{Payables} \times \text{Forward rate} \\ &= 100,000 \text{ euros} \times \$1.20 \\ &= \$120,000\end{aligned}$$

HTTP://

<http://www.bmonsbittburns.com/economics/fxrates>

Forward rates for the euro, British pound, Canadian dollar, and Japanese yen for 1-month, 3-month, 6-month, and 12-month maturities. These forward rates indicate the exchange rates at which positions in these currencies can be hedged for specific time periods.

The same process would apply if futures contracts were used instead of forward contracts. The futures rate is normally very similar to the forward rate, so the main difference would be that the futures contracts are standardized and would be purchased on an exchange, while the forward contract would be negotiated between the MNC and a commercial bank.

Forward contracts are commonly used by large corporations that desire to hedge. For example, DuPont Co. often has the equivalent of \$300 million to \$500 million in forward contracts at any one time to cover open currency positions, while Union Carbide has more than \$100 million in forward contracts.

Money Market Hedge on Payables

A **money market hedge** involves taking a money market position to cover a future payables or receivables position. If a firm has excess cash, it can create a simplified money market hedge.

EXAMPLE

Recall that Coleman Co. needs 100,000 euros in one year. If it has cash, it could convert dollars into euros and deposit them in a bank for one year. Assuming that it could earn 5 percent on this deposit, it would need to deposit euros today, as shown here:

$$\text{Deposit amount to hedge payables} = \frac{100,000 \text{ euros}}{1 + .05} = 95,238 \text{ euros}$$

Assuming a spot rate today of \$1.18, the dollars needed to make the deposit today are estimated below:

$$\text{Deposit amount in dollars} = 95,238 \text{ euros} \times \$1.18 = \$112,381$$

In many cases, MNCs prefer to hedge payables without using their cash balances. A money market hedge can still be used in this situation, but it requires two money market positions: (1) borrowed funds in the home currency and (2) a short-term investment in the foreign currency.

EXAMPLE

If Coleman Co. did not have cash available, it could borrow the funds that it needs. Assuming that Coleman can borrow dollars at an interest rate of 8 percent, it would borrow the funds needed to make the deposit, and at the end of the year it would repay the loan:

$$\text{Dollar amount of loan repayment} = \$112,381 \times (1 + .08) = \$121,371 \quad \blacksquare$$

Hedging with a Money Market Hedge versus a Forward Hedge. Should an MNC implement a forward contract hedge or a money market hedge? Since the results of both hedges are known beforehand, the firm can implement the one that is more feasible. If interest rate parity (IRP) exists, and transaction costs do not exist, the money market hedge will yield the same results as the forward hedge. This is so because the forward premium on the forward rate reflects the interest rate differential between the two currencies. The hedging of future payables with a forward purchase will be similar to borrowing at the home interest rate and investing at the foreign interest rate.

The hedging of future receivables with a forward sale is similar to borrowing at the foreign interest rate and investing at the home interest rate. Even if the forward premium generally reflects the interest rate differential between countries, the existence of transaction costs may cause the results from a forward hedge to differ from those of the money market hedge.

Call Option Hedge

Firms recognize that hedging techniques such as the forward hedge and money market hedge can backfire when a payables currency depreciates or a receivables currency appreciates over the hedged period. In these situations, an unhedged strategy would likely outperform the forward hedge or money market hedge. The ideal hedge would insulate the firm from adverse exchange rate movements but allow the firm to benefit from favorable exchange rate movements. Currency options exhibit these attributes. However, a firm must assess whether the advantages of a currency option hedge are worth the price (premium) paid for it. Details on currency options are provided in Chapter 5. The following discussion illustrates how they can be used in hedging.

Hedging Payables with Currency Call Options. A currency call option provides the right to buy a specified amount of a particular currency at a specified price (called the strike price, or exercise price) within a given period of time. Yet, unlike a futures or forward contract, the currency call option *does not obligate* its owner to buy the currency at that price. If the spot rate of the currency remains lower than the exercise price throughout the life of the option, the firm can let the option expire and simply purchase the currency at the existing spot rate. On the other hand, if the spot rate of the currency appreciates over time, the call option allows the firm to purchase the currency at the exercise price. That is, the firm owning a call option has locked in a maximum price (the exercise price) to pay for the currency. Yet, it also has the flexibility to let the option expire and obtain the currency at the existing spot rate when the currency is to be sent for payment.

HTTP://

<http://www.phlx.com/products/currency/currency.html>

Provides various currency option contracts that can be used to hedge positions.

Cost of Hedging with Call Options Based on a Contingency Graph. The cost of hedging with call options is not known with certainty at the time that the options are purchased. It is only known once the

payables are due and the spot rate at that time is known. For this reason, an MNC attempts to determine what the cost of hedging with call options would be based on various possible spot rates that could exist for the foreign currency at the time that payables are due.

This cost of hedging includes the price paid for the currency, along with the premium paid for the call option. If the spot rate of the currency at the time payables are due is less than the exercise price, the MNC would let the option expire because it could purchase the currency in the foreign exchange market at the spot rate. If the spot rate is equal to or above the exercise price, the MNC would exercise the option and pay the exercise price for the currency.

An MNC can develop a contingency graph that determines the cost of hedging with call options for each of several possible spot rates when payables are due. It may be especially useful when a MNC would like to assess the cost of hedging for a wide range of possible spot rate outcomes.

EXAMPLE

Recall that Coleman Co. considers hedging its payables of 100,000 euros in one year. It could purchase call options on 100,000 euros so that it can hedge its payables. Assume that the call options have an exercise price of \$1.20, a premium of \$.03, and an expiration date of one year from now (when the payables are due). Coleman can create a contingency graph for the call option hedge, as shown in Exhibit 11.1. The horizontal axis shows several possible spot rates of the euro that could occur at the time payables are due, while the vertical axis shows the cost of hedging per euro for each of those possible spot rates.

At any spot rate less than the exercise price of \$1.20, Coleman would not exercise the call option, so the cost of hedging would be equal to the spot rate at that time, along with the premium. For example, if the spot rate was \$1.16 at the time payables were due, Coleman would pay that spot rate along with the \$.03 premium per unit. At any spot rate more than or equal to the exercise price of \$1.20, Coleman would exercise the call option, and the cost of hedging would be equal to the price paid per euro (\$1.20) along with the premium of \$.03 per euro. Thus, the cost of hedging is \$1.23 for all spot rates beyond the exercise price of \$1.20. ■

Exhibit 11.1 Contingency Graph for Hedging Payables with Call Options

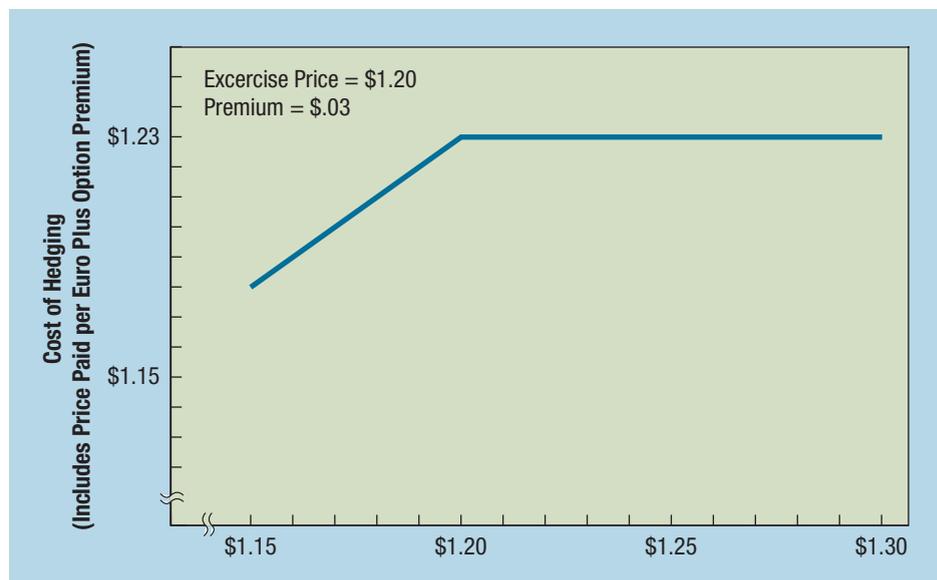


Exhibit 11.1 illustrates the advantages and disadvantages of a call option for hedging payables. The advantage is that the call option provides an effective hedge, while also allowing the MNC to let the option expire if the spot rate at the time payables are due is lower than the exercise price. However, the obvious disadvantage of the call option is that a premium must be paid for it.

To compare a hedge with a call option to a hedge with a forward contract, recall from a previous example that Coleman Co. could purchase a forward contract on euros for \$1.20, which would result in a cost of hedging of \$1.20 per euro, regardless of what the spot rate is at the time payables are due because a forward contract, unlike a call option, creates an irrevocable obligation to execute. This could be reflected on the same contingency graph in Exhibit 11.1 as a horizontal line beginning at the \$1.20 point on the vertical axis and extending straight across for all possible spot rates. In general, the forward rate would result in a lower cost of hedging than currency call options if the spot rate is relatively high at the time payables are due, while currency call options would result in a lower cost of hedging than the forward rate if the spot rate is relatively low at the time payables are due.

Cost of Hedging with Call Options Based on Currency Forecasts. While the contingency graph can determine the cost of hedging for various possible spot rates when payables are due, it does not consider an MNC's currency forecasts. Thus, it does not necessarily lead the MNC to a clear decision about whether to hedge with currency options. An MNC may wish to incorporate its own forecasts of the spot rate at the time payables are due, so that it can more accurately estimate the cost of hedging with call options.

EXAMPLE

Recall that Coleman Co. considers hedging its payables of 100,000 euros with a call option that has an exercise price of \$1.20, a premium of \$.03, and an expiration date of one year from now. Also assume that Coleman's forecast for the spot rate of the euro at the time payables are due is as follows:

- \$1.16 (20 percent probability)
- \$1.22 (70 percent probability)
- \$1.24 (10 percent probability)

The effect of each of these scenarios on Coleman's cost of payables is shown in Exhibit 11.2. Columns 1 and 2 simply identify the scenario to be analyzed. Column 3 shows the premium per unit paid on the option, which is the same regardless of the spot rate that occurs when payables are due. Column 4 shows the amount that Coleman would pay per euro for the payables under each scenario, assuming that it owned call options. If Scenario 1 occurs, Coleman will let the options expire and purchase euros in the spot market for \$1.16 each.

Exhibit 11.2 Use of Currency Call Options for Hedging Euro Payables (Exercise Price = \$1.20, Premium = \$.03)

(1)	(2)	(3)	(4)	(5) = (4) + (3)	(6)
Scenario	Spot Rate When Payables Are Due	Premium per Unit Paid on Call Options	Amount Paid per Unit When Owning Call Options	Total Amount Paid per Unit (Including the Premium) When Owning Call Options	\$ Amount Paid for 100,000 Euros When Owning Call Options
1	\$1.16	\$.03	\$1.16	\$1.19	\$119,000
2	1.22	.03	1.20	1.23	123,000
3	1.24	.03	1.20	1.23	123,000

If Scenario 2 or 3 occurs, Coleman will exercise the options and therefore purchase euros for \$1.20 per unit, and it will use the euros to make its payment. Column 5, which is the sum of columns 3 and 4, shows the amount paid per unit when the \$.03 premium paid on the call option is included. Column 6 converts column 5 into a total dollar cost, based on the 100,000 euros hedged. ■

Consideration of Alternative Call Options. Several different types of call options may be available, with different exercise prices and premiums for a given currency and expiration date. The tradeoff is that an MNC can obtain a call option with a lower exercise price but would have to pay a higher premium. Alternatively, it can select an option that has a lower premium but then must accept a higher exercise price. Whatever call option is perceived to be most desirable for hedging a particular payables position would be analyzed as explained in the example above, so that it could then be compared to the other hedging techniques.

Summary of Techniques Used to Hedge Payables

The techniques that can be used to hedge payables are summarized in Exhibit 11.3, with an illustration of how the cost of each hedging technique was measured for Coleman Co. (based on the previous examples). Notice that the cost of the forward

Exhibit 11.3 Comparison of Hedging Alternatives for Coleman Co.

Forward Hedge

Purchase euros 1 year forward.

$$\begin{aligned}\text{Dollars needed in 1 year} &= \text{payables in } \text{€} \times \text{forward rate of euro} \\ &= 100,000 \text{ euros} \times \$1.20 \\ &= \$120,000\end{aligned}$$

Money Market Hedge

Borrow \$, convert to €, invest €, repay \$ loan in 1 year.

$$\begin{aligned}\text{Amount in } \text{€} \text{ to be invested} &= \text{€} \frac{100,000}{1 + .05} \\ &= 95,238 \text{ euros} \\ \text{Amount in } \$ \text{ needed to convert into } \text{€} \text{ for deposit} &= \text{€}95,238 \times \$1.18 \\ &= \$112,381 \\ \text{Interest and principal owed on } \$ \text{ loan after 1 year} &= \$112,381 \times (1 + .08) \\ &= \$121,371\end{aligned}$$

Call Option

Purchase call option. (The following computations assume that the option is to be exercised on the day euros are needed, or not at all. Exercise price = \$1.20, premium = \$.03.)

Possible Spot Rate in One Year	Premium per Unit Paid for Option	Exercise Option?	Total Price (Including Option Premium) Paid per Unit	Total Price Paid for 100,000 Euros	Probability
\$1.16	\$.03	No	\$1.19	\$119,000	20%
1.22	.03	Yes	1.23	123,000	70
1.24	.03	Yes	1.23	123,000	10

hedge or money market hedge can be determined with certainty, while the currency call option hedge has different outcomes depending on the future spot rate at the time payables are due.

Selecting the Optimal Technique for Hedging Payables

An MNC can select the optimal technique for hedging payables by following these steps. First, since the futures and forward hedge are very similar, the MNC only needs to consider whichever one of these techniques it prefers. Second, when comparing the forward (or futures) hedge to the money market hedge, the MNC can easily determine which hedge is more desirable because the cost of each hedge can be determined with certainty. Once that comparison is completed, the MNC can assess the feasibility of the currency call option hedge. The distribution of the estimated cash outflows resulting from the currency call option hedge can be assessed by estimating its expected value and by determining the likelihood that the currency call option hedge will be less costly than an alternative hedging technique.

EXAMPLE

Recall that Coleman Co. needs to hedge payables of 100,000 euros. Coleman's costs of different hedging techniques can be compared to determine which technique is optimal for hedging the payables. Exhibit 11.4 provides a graphic comparison of the cost of hedging resulting from using different techniques (which were determined in the previous examples in this chapter). For Coleman, the forward hedge is preferable to the money market hedge because it results in a lower cost of hedging payables.

The cost of the call option hedge is described by a probability distribution because it is dependent on the exchange rate at the time that payables are due. The expected value of the cost if using the currency call option hedge is:

$$\begin{aligned}\text{Expected value of cost} &= (\$119,000 \times 20\%) + (\$123,000 \times 80\%) \\ &= \$122,200\end{aligned}$$

The probability of the future spot rate being \$1.22 (70 percent) and probability of the future spot rate being \$1.24 (10 percent) are combined in the calculation because they result in the same cost. The expected value of the cost when hedging with call options exceeds the cost of the forward rate hedge.

When comparing the distribution of the cost of hedging with call options to the cost of the forward hedge, there is a 20 percent chance that the currency call option hedge will be cheaper than the forward hedge. There is an 80 percent chance that the currency call option hedge will be more expensive than the forward hedge. Overall, the forward hedge is the optimal hedge. ■

The optimal technique to hedge payables may vary over time depending on the prevailing forward rate, interest rates, call option premium, and the forecast of the future spot rate at the time payables are due.

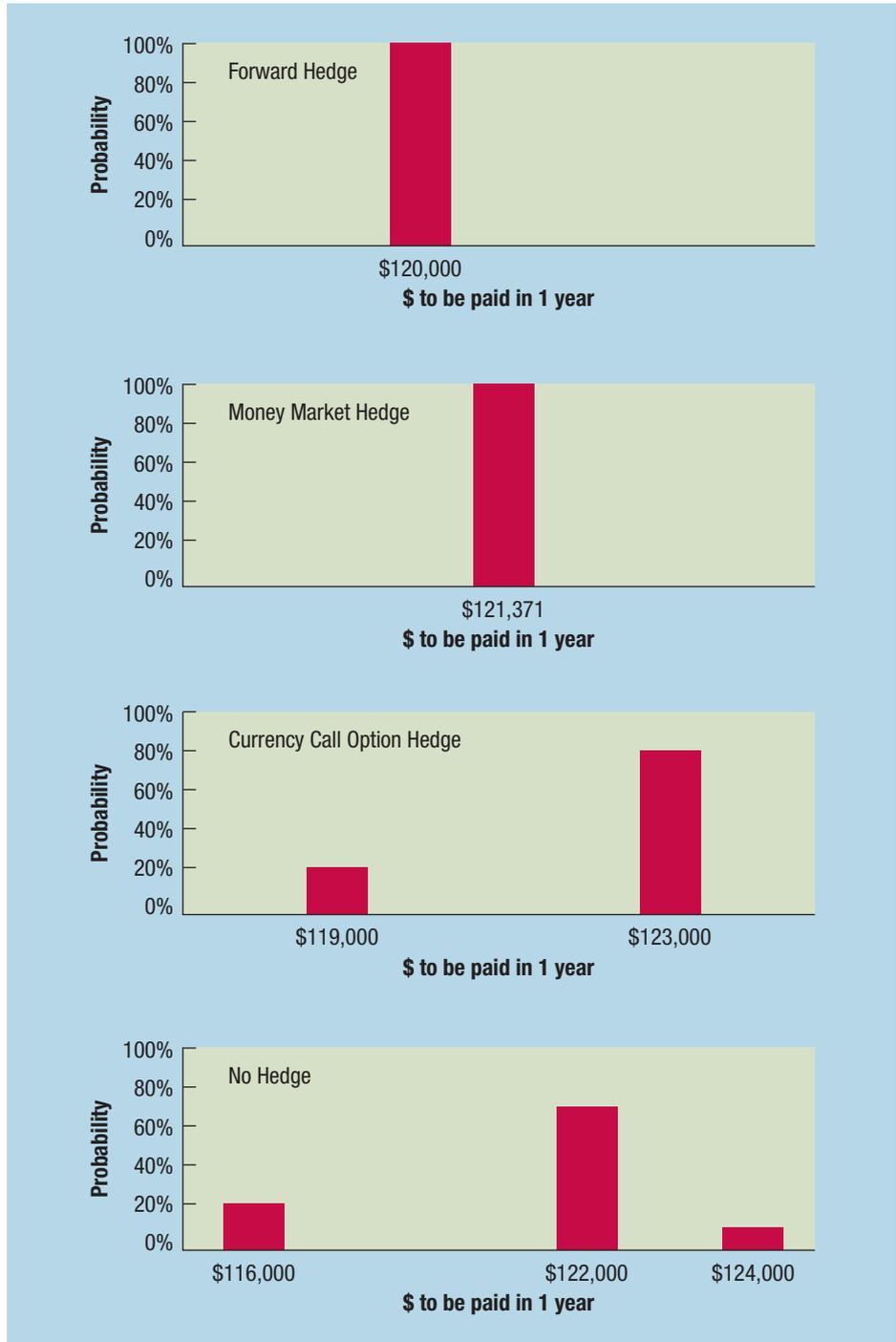
Optimal Hedge versus No Hedge

Even when an MNC knows what its future payables will be, it may decide not to hedge in some cases. It needs to determine the probability distribution of its cost of payables when not hedging as explained next.

EXAMPLE

Coleman Co. has already determined that the forward rate is the optimal hedging technique if it decides to hedge its payables position. Now it wants to compare the forward hedge to no hedge.

Exhibit 11.4 Graphic Comparison of Techniques to Hedge Payables



Based on its expectations of the euro's spot rate in one year (as described earlier), Coleman Co. can estimate its cost of payables when unhedged:

Possible Spot Rate of Euro in One Year	Dollar Payments When Not Hedging = 100,000 Euros × Possible Spot Rate	Probability
\$1.16	\$116,000	20%
\$1.22	\$122,000	70%
\$1.24	\$124,000	10%

This probability distribution of costs when not hedging is shown in the bottom graph of Exhibit 11.4 and can be compared to the cost of the forward hedge in that exhibit.

The expected value of the payables when not hedging is estimated as:

$$\begin{aligned} \text{Expected value of payables} &= (\$116,000 \times 20\%) + (\$122,000 \times 70\%) \\ &\quad + (\$124,000 \times 10\%) \\ &= \$121,000 \end{aligned}$$

This expected value of the payables is \$1,000 more than if Coleman uses a forward hedge. In addition, the probability distribution suggests an 80 percent probability that the cost of the payables when unhedged will exceed the cost of hedging with a forward contract. Therefore, Coleman decide to hedge its payables position with a forward contract. ■

Evaluating the Hedge Decision

MNCs can evaluate hedging decisions that they made in the past by estimating the **real cost of hedging payables**, which is measured as:

$$RCH_p = \text{Cost of hedging payables} - \text{Cost of payables if not hedged}$$

After the payables transaction has occurred, an MNC may assess the outcome of its decision to hedge.

EXAMPLE

Recall that Coleman Co. decided to hedge its payables with a forward contract, resulting in a dollar cost of \$120,000. Assume that on the day that it makes its payment (one year after it hedged its payables), the spot rate of the euro is \$1.18. Notice that this spot rate is different from any of the three possible spot rates that Coleman Co. predicted. This is not unusual, as it is difficult to predict the spot rate, even when creating a distribution of possible outcomes. If Coleman Co. had not hedged, its cost of the payables would have been \$118,000 (computed as 100,000 euros × \$1.18). Thus, Coleman's real cost of hedging is:

$$\begin{aligned} RCH_p &= \text{Cost of hedging payables} - \text{Cost of payables if not hedged} \\ &= \$120,000 - \$118,000 \\ &= \$2,000 \end{aligned} \quad \blacksquare$$

In this example, Coleman's cost of hedging payables turned out to be \$2,000 more than if it had not hedged. However, Coleman is not necessarily disappointed in its decision to hedge. That decision allowed it to know exactly how many dollars it would need to cover its payables position and insulated the payment from movements in the euro.

Hedging Exposure to Receivables

An MNC may decide to hedge part or all of its receivables transactions denominated in foreign currencies so that it is insulated from the possible depreciation of those currencies. It can apply the same techniques available for hedging payables to hedge

receivables. The manner by which each technique is applied to hedge receivables is slightly different from its application to hedge payables. The application of each hedging technique to receivables is discussed next.

Forward or Futures Hedge on Receivables

Forward contracts and futures contracts allow an MNC to lock in a specific exchange rate at which it can sell a specific currency and, therefore, allow it to hedge receivables denominated in a foreign currency.

EXAMPLE Viner Co. is a U.S.-based MNC that will receive 200,000 Swiss francs in 6 months. It could obtain a forward contract to sell SF200,000 in 6 months. The 6-month forward rate is \$.71, the same rate as currency futures contracts on Swiss francs. If Viner sells Swiss francs 6 months forward, it can estimate the amount of dollars to be received in 6 months:

$$\begin{aligned}\text{Cash inflow in \$} &= \text{Receivables} \times \text{Forward rate} \\ &= \text{SF200,000} \times \text{\$.71} \\ &= \text{\$142,000}\end{aligned}$$

The same process would apply if futures contracts were used instead of forward contracts. The futures rate is normally very similar to the forward rate, so the main difference would be that the futures contracts are standardized and would be sold on an exchange, while the forward contract would be negotiated between the MNC and a commercial bank.

Money Market Hedge on Receivables

A money market hedge on receivables involves borrowing the currency that will be received and using the receivables to pay off the loan.

EXAMPLE Recall that Viner Co. will receive SF200,000 in 6 months. Assume that it can borrow funds denominated in Swiss francs at a rate of 3 percent over a 6-month period. The amount that it should borrow so that it can use all of its receivables to repay the entire loan in 6 months is:

$$\begin{aligned}\text{Amount to borrow} &= \text{SF200,000}/(1 + .03) \\ &= \text{SF194,175}\end{aligned}$$

If Viner Co. obtains a 6-month loan of SF194,175 from a bank, it will owe the bank SF200,000 in 6 months. It can use its receivables to repay the loan. The funds that it borrowed can be converted to dollars and used to support existing operations. ■

If the MNC does not need any short-term funds to support existing operations, it can still obtain a loan as explained above, convert the funds to dollars, and invest the dollars in the money market.

EXAMPLE If Viner Co. does not need any funds to support existing operations, it can convert the Swiss francs that it borrowed into dollars. Assume the spot exchange rate is presently \$.70. When Viner Co. converts the Swiss francs, it will receive:

$$\text{Amount of dollars received from loan} = \text{SF194,175} \times \text{\$.70} = \text{\$135,922}$$

Then the dollars can be invested in the money market. Assume that Viner Co. can earn 2 percent interest over a 6-month period. In 6 months, the investment will be worth:

$$\text{\$135,922} \times (1.02) = \text{\$138,640}$$

Thus, if Viner Co. uses a money market hedge, its receivables will be worth \$138,640 in 6 months. ■

Put Option Hedge

A put option allows an MNC to sell a specific amount of currency at a specified exercise price by a specified expiration date. An MNC can purchase a put option on the currency denominating its receivables and lock in the minimum amount that it would receive when converting the receivables into its home currency. However, the put option differs from a forward or futures contract in that it is an option and not an obligation. If the currency denominating the receivables is higher than the exercise price at the time of expiration, the MNC can let the put option expire and can sell the currency in the foreign exchange market at the prevailing spot rate. The MNC must also consider the premium that it must pay for the put option.

Cost of Hedging with Put Options Based on a Contingency Graph. The cost of hedging with put options is not known with certainty at the time that they are purchased. It is only known once the receivables are due and the spot rate at that time is known. For this reason, an MNC attempts to determine the amount of cash it will receive from the put option hedge based on various possible spot rates at the time that receivables arrive.

An estimate of the cash to be received from a put option hedge is the estimated cash received from selling the currency minus the premium paid for the put option. If the spot rate of the currency at the time receivables arrive is less than the exercise price, the MNC would exercise the option and receive the exercise price when selling the currency. If the spot rate at that time is equal to or above the exercise price, the MNC would let the option expire and would sell the currency at the spot rate in the foreign exchange market.

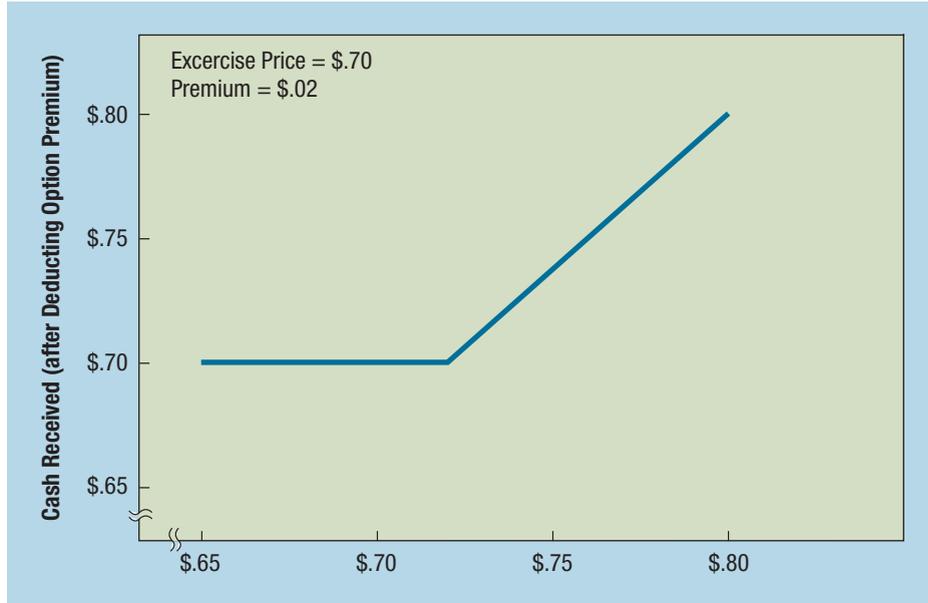
An MNC can develop a contingency graph that determines the cash received from hedging with put options depending on each of several possible spot rates when receivables arrive. It may be especially useful when an MNC would like to estimate the cash received from hedging based on a wide range of possible spot rate outcomes.

EXAMPLE

Recall that Viner Co. considers hedging its receivables of SF200,000 in 6 months. It could purchase put options on SF200,000, so that it can hedge its receivables. Assume that the put options have an exercise price of \$.70, a premium of \$.02, and an expiration date of 6 months from now (when the receivables arrive). Viner can create a contingency graph for the put option hedge, as shown in Exhibit 11.5. The horizontal axis shows several possible spot rates of the Swiss franc that could occur at the time receivables arrive, while the vertical axis shows the cash to be received from the put option hedge based on each of those possible spot rates.

At any spot rate less than or equal to the exercise price of \$.70, Viner would exercise the put option and would sell the Swiss francs at the exercise price of \$.70. After subtracting the \$.02 premium per unit, Viner would receive \$.68 per unit from selling Swiss francs. At any spot rate more than the exercise price, Viner would let the put option expire and would sell the francs at the spot rate in the foreign exchange market. For example, if the spot rate was \$.75 at the time receivables were due, Viner would sell the Swiss francs at that rate. It would receive \$.73 after subtracting the \$.02 premium per unit. ■

Exhibit 11.5 illustrates the advantages and disadvantages of a put option for hedging receivables. The advantage is that the put option provides an effective hedge, while also allowing the MNC to let the option expire if the spot rate at the time receivables arrive is higher than the exercise price.

Exhibit 11.5 Contingency Graph for Hedging Receivables with Put Options

However, the obvious disadvantage of the put option is that a premium must be paid for it. Recall from a previous example that Viner Co. could sell a forward contract on Swiss francs for \$.71, which would allow it to receive \$.71 per Swiss franc, regardless of what the spot rate is at the time receivables arrive. This could be reflected on the same contingency graph in Exhibit 11.5 as a horizontal line beginning at the \$.71 point on the vertical axis and extending straight across for all possible spot rates. In general, the forward rate hedge would provide a larger amount of cash than the put option hedge if the spot rate is relatively low at the time Swiss francs are received, while currency put options would provide a larger amount of cash than the forward rate if the spot rate is relatively high at the time Swiss francs are received.

Cost of Hedging with Put Options Based on Currency Forecasts. While the contingency graph can determine the cash to be received from hedging based on various possible spot rates when receivables will arrive, it does not consider an MNC's currency forecasts. Thus, it does not necessarily lead the MNC to a clear decision about whether to hedge receivables with currency put options. An MNC may wish to incorporate its own forecasts of the spot rate at the time receivables will arrive, so that it can more accurately estimate the dollar cash inflows to be received when hedging with put options.

EXAMPLE

Viner Co. considers purchasing a put option contract on Swiss francs, with an exercise price of \$.72 and a premium of \$.02. It has developed the following probability distribution for the spot rate of the Swiss franc in 6 months:

- \$.71 (30 percent probability)
- \$.74 (40 percent probability)
- \$.76 (30 percent probability)

The expected dollar cash flows to be received from purchasing the put options on Swiss francs are shown in Exhibit 11.6. The second column discloses the possible spot rates that may occur in 6 months according to Viner's expectations. The third column shows the option premium that is the same regardless of what happens to the spot rate in the future. The fourth column shows the amount to be received per unit as a result of owning the put options. If the spot rate is \$.71 in the future (see the first row), the put option will be exercised at the exercise price of \$.72. If the spot rate is more than \$.72 in 6 months (as reflected in rows 2 and 3), Viner will not exercise the option, and it will sell the Swiss francs at the prevailing spot rate. Column 5 shows the cash received per unit, which adjusts the figures in column 4 by subtracting the premium paid per unit for the put option. Column 6 shows the amount of dollars to be received, which is equal to cash received per unit (shown in column 5) multiplied by the amount of units (200,000 Swiss francs). ■

Consideration of Alternative Put Options. Several different types of put options may be available, with different exercise prices and premiums for a given currency and expiration date. An MNC can obtain a put option with a higher exercise price, but the tradeoff is that it would have to pay a higher premium. Alternatively, it can select a put option that has a lower premium but then must accept a lower exercise price. Whatever put option is perceived to be most desirable for hedging a particular receivables position would be analyzed as explained in the example above, so that it could then be compared to the other hedging techniques.

Selecting the Optimal Technique for Hedging Receivables

The techniques that can be used to hedge receivables are summarized in Exhibit 11.7, with an illustration of how the cash inflow from each hedging technique was measured for Viner Co. (based on previous examples).

The optimal technique to hedge receivables may vary over time depending on the specific quotations, such as the forward rate quoted on a forward contract, the interest rates quoted on a money market loan, and the premium quoted on a put option. The optimal technique for hedging a specific receivables position at a future point in time can be determined by comparing the cash to be received among the hedging techniques. First, since the futures and forward hedge are very similar, the MNC only needs to consider whichever one of these techniques it prefers. For our example,

Exhibit 11.6 Use of Currency Put Options for Hedging Swiss Franc Receivables (Exercise Price = \$.72; Premium = \$.02)

(1)	(2)	(3)	(4)	(5) = (4) - (3)	(6)
Scenario	Spot Rate When Payment on Receivables Is Received	Premium per Unit on Put Options	Amount Received per Unit When Owning Put Options	Net Amount Received per Unit (after Accounting for Premium Paid)	Dollar Amount Received from Hedging SF200,000 Receivables with Put Options
1	\$.71	\$.02	\$.72	\$.70	\$140,000
2	.74	.02	.74	.72	144,000
3	.76	.02	.76	.74	148,000

the forward hedge will be considered. Second, when comparing the forward (or futures) hedge to the money market hedge, the MNC can easily determine which hedge is more desirable because the cash to be received from either hedge can be determined with certainty.

Once that comparison is completed, the MNC can assess the feasibility of the currency put option hedge. Since the amount of cash to be received from the currency put option is dependent on the spot rate that exists when receivables arrive, this amount can best be described with a probability distribution. This probability distribution of cash to be received when hedging with put options can be assessed by estimating the expected value and determining the likelihood that the currency put option hedge will result in more cash than an alternative hedging technique.

EXAMPLE

Viner Co. can compare the cash to be received as the result of applying different hedging techniques to hedge receivables of SF200,000 in order to determine the optimal technique. Exhibit 11.8 provides a graphic summary of the cash to be received from each hedging technique, based on the previous examples for Viner Co. In this example, the forward hedge is better than the money market hedge because it will generate more cash.

Exhibit 11.7 Comparison of Hedging Alternatives for Viner Co.

Forward Hedge

Sell Swiss francs 6 months forward.

$$\begin{aligned} \text{Dollars to be received in 6 months} &= \text{receivables in SF} \times \text{forward rate of SF} \\ &= \text{SF}200,000 \times \$0.71 \\ &= \$142,000 \end{aligned}$$

Money Market Hedge

Borrow SF, convert to \$, invest \$, use receivables to pay off loan in 6 months.

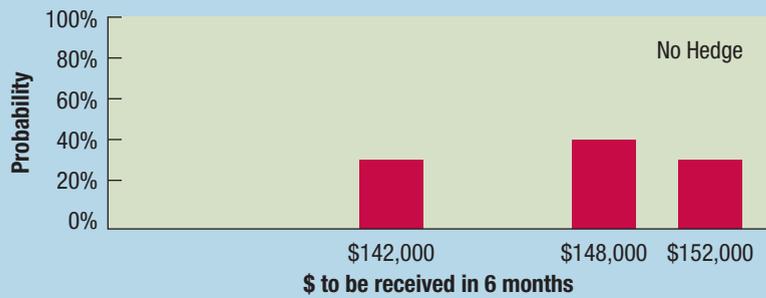
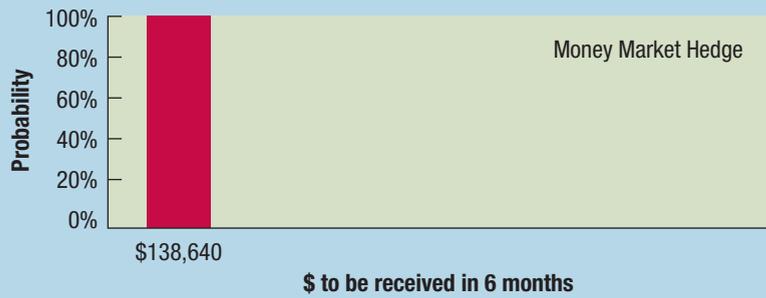
$$\begin{aligned} \text{Amount in SF borrowed} &= \frac{\text{SF}200,000}{1 + .03} \\ &= \text{SF}194,175 \\ \$ \text{ received from converting SF} &= \text{SF}194,175 \times \$0.70 \text{ per SF} \\ &= \$135,922 \\ \$ \text{ accumulated after 6 months} &= \$135,922 \times (1 + .02) \\ &= \$138,640 \end{aligned}$$

Put Option Hedge

Purchase put option. (Assume the options are to be exercised on the day SF are to be received, or not at all. Exercise price = \$.72, premium = \$.02.)

Possible Spot Rate in 6 Months	Premium per Unit Paid for Option	Exercise Option?	Received per Unit (after Accounting for the Premium)	Total Dollars Received from Converting SF200,000	Probability
.71	\$.02	Yes	\$.70	\$140,000	30%
.74	.02	No	.72	144,000	40
.76	.02	No	.74	148,000	30

Exhibit 11.8 Graph Comparison of Techniques to Hedge Receivables



The graph for the put option hedge shows that the cash to be received is dependent on the exchange rate at the time that receivables are due. The expected value of the cash to be received from the put option hedge is:

$$\begin{aligned}\text{Expected value of cash to be received} &= (\$140,000 \times 30\%) \\ &\quad + (\$144,000 \times 40\%) \\ &\quad + (\$148,000 \times 30\%) \\ &= \$144,000\end{aligned}$$

The expected value of the cash to be received when hedging with put options exceeds the cash amount that would be received from the forward rate hedge. ■

When comparing the distribution of cash to be received from the put option to the cash when using the forward hedge (see Exhibit 11.8), there is a 30 percent chance that the currency put option hedge will result in less cash than the forward hedge. There is a 70 percent chance that the put option hedge will result in more cash than the forward hedge. Viner decides that the put option hedge is the optimal hedge.

Optimal Hedge versus No Hedge

Even when an MNC knows what its future receivables will be, it may decide not to hedge in some cases. It needs to determine the probability distribution of its revenue from receivables when not hedging as shown in the following example.

EXAMPLE

Viner Co. has already determined that the put option hedge is the optimal technique for hedging its receivables position. Now it wants to compare the put option hedge to no hedge. Based on its expectations of the Swiss franc's spot rate in one year (as described earlier), Viner Co. can estimate the cash to be received if it remains unhedged:

Possible Spot Rate of Swiss Franc in One Year	Dollar Payments When Not Hedging = SF200,000 × Possible Spot Rate	Probability
\$.71	\$142,000	30%
\$.74	\$148,000	40%
\$.76	\$152,000	30%

The expected value of cash that Viner Co. will receive when not hedging is estimated as:

$$\begin{aligned}\text{Expected value of cash to be received} &= (\$142,000 \times 30\%) \\ &\quad + (\$148,000 \times 40\%) \\ &\quad + (\$152,000 \times 30\%) \\ &= \$147,400\end{aligned}$$

When comparing this expected value to the expected value of cash that Viner Co. would receive from its put option hedge (\$144,000), Viner decides to remain unhedged. In this example, Viner's decision to remain unhedged creates a tradeoff in which it hopes to benefit from the appreciation of the Swiss franc against the U.S. dollar over the next 6 months but is susceptible to adverse effects if the franc depreciates. ■

Evaluating the Hedge Decision

Once the receivables transaction has occurred, an MNC can assess its decision to hedge or not hedge.

E X A M P L E

Recall that Viner Co. decided not to hedge its receivables. Assume that 6 months later when the receivables arrive, the spot rate of the Swiss franc is \$.75. Notice that this spot rate is different from any of the three possible spot rates that Viner Co. predicted. This is not unusual, as it is difficult to predict the spot rate, even when creating a distribution of possible outcomes. Since Viner did not hedge, it receives:

$$\begin{aligned}\text{Cash received} &= \text{Spot rate of SF} \times \text{SF200,000 at time of receivables transaction} \\ &= \$.75 \times \text{SF200,000} \\ &= \$150,000\end{aligned}$$

Now consider what the results would have been if Viner Co. had hedged the receivables position. Recall that Viner would have used the put option hedge if it hedged. Given the spot rate of \$.75 when the receivables arrived, Viner would not have exercised the put option. Thus, it would have exchanged the Swiss francs in the spot market for \$.75 per unit, minus the \$.02 premium per unit that it would have paid for the put option. Its cash received from the put option hedge would have been:

$$\begin{aligned}\text{Cash received} &= \$.73 \times \text{SF200,000} \\ &= \$146,000\end{aligned}$$

In this example, Viner's decision to remain unhedged generated \$4,000 more than if it had hedged its receivables. The difference of \$4,000 is the premium that Viner would have paid to obtain put options. While Viner benefited from remaining unhedged in this example, it recognizes the risk from not hedging.

Comparison of Hedging Techniques

Each of the hedging techniques is briefly summarized in Exhibit 11.9. When using a futures hedge, forward hedge, or money market hedge, the firm can estimate the funds (denominated in its home currency) that it will need for future payables, or the funds that it will receive after converting foreign currency receivables. The outcome is certain. Thus, it can compare the costs or revenue and determine which of these hedging techniques is appropriate. In contrast, the cash flow associated with the currency option hedge cannot be determined with certainty because the costs of purchasing payables and the revenue generated from receivables are not known ahead of time. Therefore, firms need to forecast cash flows from the option hedge based on possible exchange rate outcomes. A fee (premium) must be paid for the option, but the option offers flexibility because it does not have to be exercised.

Exhibit 11.9 Review of Techniques for Hedging Transaction Exposure

Hedging Technique	To Hedge Payables	To Hedge Receivables
1. Futures hedge	Purchase a currency futures contract (or contracts) representing the currency and amount related to the payables.	Sell a currency futures contract (or contracts) representing the currency and amount related to the receivables.
2. Forward hedge	Negotiate a forward contract to purchase the amount of foreign currency needed to cover the payables.	Negotiate a forward contract to sell the amount of foreign currency that will be received as a result of the receivables.
3. Money market hedge	Borrow local currency and convert to currency denominating payables. Invest these funds until they are needed to cover the payables.	Borrow the currency denominating the receivables, convert it to the local currency, and invest it. Then pay off the loan with cash inflows from the receivables.
4. Currency option hedge	Purchase a currency call option (or options) representing the currency and amount related to the payables.	Purchase a currency put option (or options) representing the currency and amount related to the receivables.

Hedging Policies of MNCs

In general, hedging policies vary with the MNC management's degree of risk aversion. An MNC may choose to hedge most of its exposure, to hedge none of its exposure, or to selectively hedge.

Hedging Most of the Exposure. Some MNCs hedge most of their exposure so that their value is not highly influenced by exchange rates. MNCs that hedge most of their exposure do not necessarily expect that hedging will always be beneficial. In fact, such MNCs may even use some hedges that will likely result in slightly worse outcomes than no hedges at all, just to avoid the possibility of a major adverse movement in exchange rates. They prefer to know what their future cash inflows or outflows in terms of their home currency will be in each period because this improves corporate planning. A hedge allows the firm to know the future cash flows (in terms of the home currency) that will result from any foreign transactions that have already been negotiated.

Hedging None of the Exposure. MNCs that are well diversified across many countries may consider not hedging their exposure. This strategy may be driven by the view that a diversified set of exposures will limit the actual impact that exchange rates will have on the MNC during any period.

HTTP://

<http://www.ibm.com/us/>
The websites of various MNCs provide financial statements such as annual reports that disclose the use of financial derivatives for the purpose of hedging interest rate risk and foreign exchange rate risk.

Selective Hedging. Many MNCs, such as Black & Decker, Eastman Kodak, and Merck choose to hedge only when they expect the currency to move in a direction that will make hedging feasible. Zenith hedges its imports of Japanese components only when it expects the yen to appreciate. Merck has worldwide sales of over \$6 billion per year with substantial receivables denominated in foreign currencies as a result of exporting. Since Merck wants to capitalize on the possible appreciation of these foreign currencies (weakening of the dollar), it uses put options to hedge its receivables denominated in foreign currencies. If the dollar weakens, Merck lets the put options expire because the receivables are worth more at the prevailing spot rate. Meanwhile, the put options provide insurance in case the dollar strengthens. If Merck feels very confident that the dollar will strengthen, it uses forward or futures contracts instead of put options because it must pay a premium for the put options.

The following quotations from annual reports illustrate the strategy of selective hedging:

The purpose of the Company's foreign currency hedging activities is to reduce the risk that the eventual dollar net cash inflows resulting from sales outside the U.S. will be adversely affected by exchange rates.

—The Coca-Cola Co.

Decisions regarding whether or not to hedge a given commitment are made on a case-by-case basis by taking into consideration the amount and duration of the exposure, market volatility, and economic trends.

—DuPont Co.

We selectively hedge the potential effect of the foreign currency fluctuations related to operating activities.

—General Mills Co.

Selective hedging implies that the MNC prefers to exercise some control over its exposure and makes decisions based on conditions that may affect the currency's future value.

Limitations of Hedging

Although hedging transaction exposure can be effective, there are some limitations that deserve to be mentioned here.

Limitation of Hedging an Uncertain Amount

Some international transactions involve an uncertain amount of goods ordered and therefore involve an uncertain transaction amount in a foreign currency. Consequently, an MNC may create a hedge for a larger number of units than it will actually need, which causes the opposite form of exposure.

EXAMPLE

Recall the previous example on hedging receivables, which assumed that Viner Co. will receive SF200,000 in 6 months. Now assume that the receivables amount could actually be much lower. If Viner uses the money market hedge on SF200,000 and the receivables amount to only SF120,000, it will have to make up the difference by purchasing SF80,000 in the spot market to achieve the SF200,000 needed to pay off the loan. If the Swiss franc appreciates over the 6-month period, Viner will need a large amount in dollars to obtain the SF80,000. ■

This example shows how **overhedging** (hedging a larger amount in a currency than the actual transaction amount) can adversely affect a firm. A solution to avoid overhedging is to hedge only the minimum known amount in the future transaction. In our example, if the future receivables could be as low as SF120,000, Viner could hedge this amount. Under these conditions, however, the firm may not have completely hedged its position. If the actual transaction amount turns out to be SF200,000 as expected, Viner will be only partially hedged and will need to sell the extra SF80,000 in the spot market.

Alternatively, Viner may consider hedging the minimum level of receivables with a money market hedge and hedging the additional amount of receivables that may occur with a put option hedge. In this way, it is covered if the receivables exceed the minimum amount. It can let the put option expire if the receivables do not exceed the minimum, or if it is better off exchanging the additional Swiss francs received in the spot market.

Firms commonly face this type of dilemma because the precise amount to be received in a foreign currency at the end of a period can be uncertain, especially for firms heavily involved in exporting. Based on this example, it should be clear that most MNCs cannot completely hedge all of their transactions. Nevertheless, by hedging a portion of those transactions that affect them, they can reduce the sensitivity of their cash flows to exchange rate movements.

Limitation of Repeated Short-Term Hedging

The continual hedging of repeated transactions that are expected to occur in the near future has limited effectiveness over the long run.

EXAMPLE

Winthrop Co. is a U.S. importer that specializes in importing particular CD players in one large shipment per year and then selling them to retail stores throughout the year. Assume that today's exchange rate of the Japanese yen is \$.005 and that the CD players are worth ¥60,000, or \$300. The forward rate of the yen generally exhibits a premium of 2 percent. Exhibit 11.10 shows the yen/dollar exchange rate to be paid by the importer over time. As the spot rate changes, the forward rate will often change by a similar amount. Thus, if the spot rate increases by 10 percent over the year, the forward rate may increase by about the same amount, and the importer will pay 10 percent more for next year's shipment (assuming no change in the yen price quoted by the Japanese exporter). The use of a one-year forward contract during a strong-yen cycle is preferable to no hedge in this case but will still result in

subsequent increases in prices paid by the importer each year. This illustrates that the use of short-term hedging techniques does not completely insulate a firm from exchange rate exposure, even if the hedges are used repeatedly over time. ■

If the hedging techniques can be applied to longer-term periods, they can more effectively insulate the firm from exchange rate risk over the long run. That is, Winthrop Co. could, as of time 0, create a hedge for shipments to arrive at the end of each of the next several years. The forward rate for each hedge would be based on the spot rate as of today, as shown in Exhibit 11.11. During a strong-yen cycle, such a strategy would save a substantial amount of money.

Exhibit 11.10 Illustration of Repeated Hedging of Foreign Payables When the Foreign Currency is Appreciating

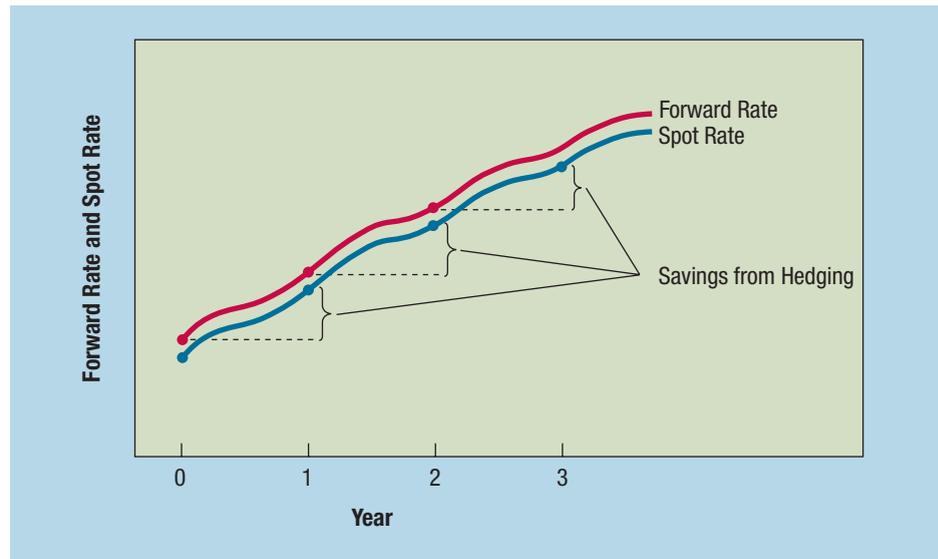
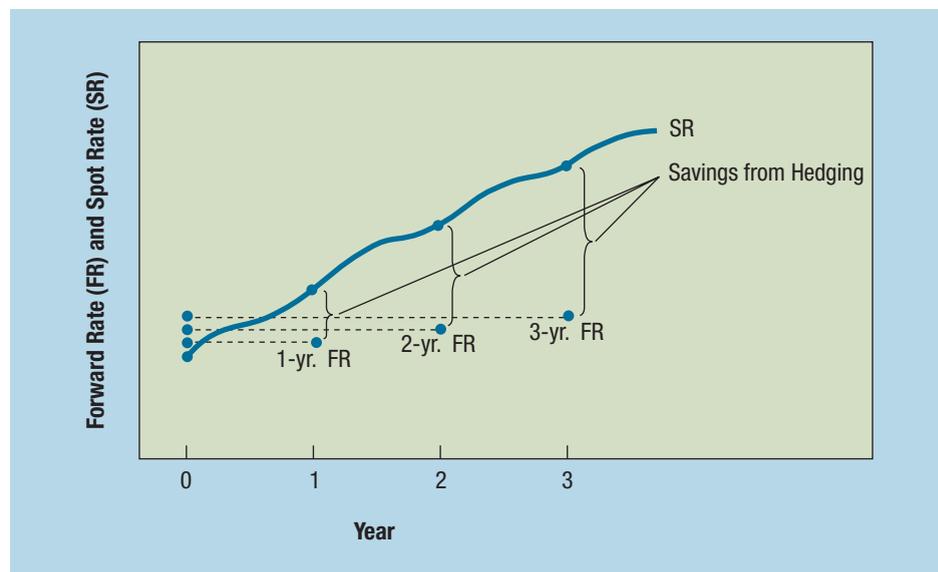


Exhibit 11.11 Long-Term Hedging of Payables When the Foreign Currency Is Appreciating



This strategy faces a limitation, however, in that the amount in yen to be hedged further into the future is more uncertain because the shipment size will be dependent on economic conditions or other factors at that time. If a recession occurs, Winthrop Co. may reduce the number of CD players ordered, but the amount in yen to be received by the importer is dictated by the forward contract that was created. If the CD player manufacturer goes bankrupt, or simply experiences stockouts, Winthrop Co. is still obligated to purchase the yen, even if a shipment is not forthcoming.

Given the greater uncertainty surrounding the amount of currency to be hedged, some MNCs focus more on hedging receivables or payables that will occur in the near future. Symantec commonly has forward contracts valued at more than \$100 million to hedge transaction exposure, and all or most of the contracts have maturities of less than 35 days. Conversely, Procter & Gamble commonly uses forward contracts with maturities up to 18 months. In some cases Procter & Gamble hedges exposure 5 years ahead.

Hedging Long-Term Transaction Exposure

Some MNCs are certain of having cash flows denominated in foreign currencies for several years and attempt to use long-term hedging. For example, Walt Disney Co. hedged its Japanese yen cash flows that will be remitted to the United States (from its Japanese theme park) 20 years ahead. Eastman Kodak Co. and General Electric Co. incorporate foreign exchange management into their long-term corporate planning. Thus, techniques for hedging long-term exchange rate exposure are needed.

Firms that can accurately estimate foreign currency payables or receivables that will occur several years from now commonly use two techniques to hedge such long-term transaction exposure:

- Long-term forward contract
- Parallel loan

Each technique is discussed in turn.

Long-Term Forward Contract

Until recently, **long-term forward contracts**, or long forwards, were seldom used. Today, the long forward is quite popular. Most large international banks routinely quote forward rates for terms of up to 5 years for British pounds, Canadian dollars, Japanese yen, and Swiss francs. Long forwards are especially attractive to firms that have set up fixed-price exporting or importing contracts over a long period of time and want to protect their cash flow from exchange rate fluctuations.

Like a short-term forward contract, the long forward can be tailored to accommodate the specific needs of the firm. Maturities of up to 10 years or more can sometimes be set up for the major currencies. Because a bank is trusting that the firm will fulfill its long-term obligation specified in the forward contract, it will consider only very creditworthy customers.

Parallel Loan

A **parallel loan** (or “back-to-back loan”) involves an exchange of currencies between two parties, with a promise to reexchange currencies at a specified exchange rate on a future date. It represents two swaps of currencies, one swap at the inception of the loan contract and another swap at the specified future date. A parallel loan is interpreted by accountants as a loan and is therefore recorded on financial statements. It is covered in more detail in Chapter 18.

Alternative Hedging Techniques

When a perfect hedge is not available (or is too expensive) to eliminate transaction exposure, the firm should consider methods to at least reduce exposure. Such methods include the following:

- Leading and lagging
- Cross-hedging
- Currency diversification

Each method is discussed in turn.

Leading and Lagging

Leading and lagging strategies involve adjusting the timing of a payment request or disbursement to reflect expectations about future currency movements.

EXAMPLE

Corvalis Co. is based in the United States and has subsidiaries dispersed around the world. The focus here will be on a subsidiary in the United Kingdom that purchases some of its supplies from a subsidiary in Hungary. These supplies are denominated in Hungary's currency (the forint). If Corvalis Co. expects that the pound will soon depreciate against the forint, it may attempt to expedite the payment to Hungary before the pound depreciates. This strategy is referred to as **leading**.

As a second scenario, assume that the British subsidiary expects the pound to appreciate against the forint soon. In this case, the British subsidiary may attempt to stall its payment until after the pound appreciates. In this way it could use fewer pounds to obtain the forint needed for payment. This strategy is referred to as **lagging**. ■

General Electric and other well-known MNCs commonly use leading and lagging strategies in countries that allow them. In some countries, the government limits the length of time involved in leading and lagging strategies so that the flow of funds into or out of the country is not disrupted. Consequently, an MNC must be aware of government restrictions in any countries where it conducts business before using these strategies.

Cross-Hedging

Cross-hedging is a common method of reducing transaction exposure when the currency cannot be hedged.

EXAMPLE

Greeley Co., a U.S. firm, has payables in zloty (Poland's currency) 90 days from now. Because it is worried that the zloty may appreciate against the U.S. dollar, it may desire to hedge this position. If forward contracts and other hedging techniques are not possible for the zloty, Greeley may consider cross-hedging. In this case, it needs to first identify a currency that can be hedged and is highly correlated with the zloty. Greeley notices that the euro has recently been moving in tandem with the zloty and decides to set up a 90-day forward contract on the euro. If the movements in the zloty and euro continue to be highly correlated relative to the U.S. dollar (that is, they move in a similar direction and degree against the U.S. dollar), then the exchange rate between these two currencies should be somewhat stable over time. By purchasing euros 90 days forward, Greeley Co. can then exchange euros for the zloty. ■

This type of hedge is sometimes referred to as a proxy hedge because the hedged position is in a currency that serves as a proxy for the currency in which the MNC is exposed. The effectiveness of this strategy depends on the degree to which these two currencies are positively correlated. The stronger the positive correlation, the more effective will be the cross-hedging strategy.

Currency Diversification

A third method for reducing transaction exposure is **currency diversification**, which can limit the potential effect of any single currency's movements on the value of an MNC. Some MNCs, such as The Coca-Cola Co., PepsiCo, and Altria, claim that their exposure to exchange rate movements is significantly reduced because they diversify their business among numerous countries.

The dollar value of future inflows in foreign currencies will be more stable if the foreign currencies received are *not* highly positively correlated. The reason is that lower positive correlations or negative correlations can reduce the variability of the dollar value of all foreign currency inflows. If the foreign currencies were highly correlated with each other, diversifying among them would not be a very effective way to reduce risk. If one of the currencies substantially depreciated, the others would do so as well, given that all these currencies move in tandem.

SUMMARY

- To hedge payables, a futures or forward contract on the foreign currency can be purchased. Alternatively, a money market hedge strategy can be used; in this case, the MNC borrows its home currency and converts the proceeds into the foreign currency that will be needed in the future. Finally, call options on the foreign currency can be purchased.

- To hedge receivables, a futures or forward contract on the foreign currency can be sold. Alternatively, a money market hedge strategy can be used. In this case, the MNC borrows the foreign currency to be received and converts the funds into its home currency; the loan is to be repaid by the receivables. Finally, put options on the foreign currency can be purchased.

- Futures contracts and forward contracts normally yield similar results. Forward contracts are more flexible because they are not standardized. The money

market hedge yields results similar to those of the forward hedge if interest rate parity exists. The currency options hedge has an advantage over the other hedging techniques in that the options do not have to be exercised if the MNC would be better off unhedged. A premium must be paid to purchase the currency options, however, so there is a cost for the flexibility they provide.

- Long-term hedging can be accomplished by using long-term forward contracts that match the date of the payables or receivables. Alternatively, a parallel loan involves the exchange of currencies between two parties, with a promise to reexchange currencies at a specified exchange rate on a future date.

- When hedging techniques are not available, there are still some methods of reducing transaction exposure, such as leading and lagging, cross-hedging, and currency diversification.

POINT COUNTER-POINT

Should an MNC Risk Overhedging?

Point Yes. MNCs have some “unanticipated” transactions that occur without any advance notice. They should attempt to forecast the net cash flows in each currency due to unanticipated transactions based on the previous net cash flows for that currency in a previous period. Even though it would be impossible to forecast the volume of these unanticipated transactions per day, it may be possible to forecast the volume on a monthly basis. For example, if an MNC has net cash flows between 3 million and 4 million Philippine pesos every month, it may presume that it will receive at

least 3 million pesos in each of the next few months unless conditions change. Thus, it can hedge a position of 3 million in pesos by selling that amount of pesos forward or buying put options on that amount of pesos. Any amount of net cash flows beyond 3 million pesos will not be hedged, but at least the MNC was able to hedge the minimum expected net cash flows.

Counter-Point No. MNCs should not hedge unanticipated transactions. When they overhedge the expected net cash flows in a foreign currency, they are

still exposed to exchange rate risk. If they sell more currency as a result of forward contracts than their net cash flows, they will be adversely affected by an increase in the value of the currency. Their initial reasons for hedging were to protect against the weakness of the currency, but the overhedging described here would cause a shift in their exposure. Overhedg-

ing does not insulate an MNC against exchange rate risk. It just changes the means by which the MNC is exposed.

Who Is Correct? Use the Internet to learn more about this issue. Offer your own opinion on this issue.

SELF TEST

Answers are provided in Appendix A at the back of the text.

1. Montclair Co., a U.S. firm, plans to use a money market hedge to hedge its payment of 3 million Australian dollars for Australian goods in one year. The U.S. interest rate is 7 percent, while the Australian interest rate is 12 percent. The spot rate of the Australian dollar is \$.85, while the one-year forward rate is \$.81. Determine the amount of U.S. dollars needed in one year if a money market hedge is used.
2. Using the information in the previous question, would Montclair Co. be better off hedging the payables with a money market hedge or with a forward hedge?
3. Using the information about Montclair from the first question, explain the possible advantage of a currency option hedge over a money market hedge for Montclair Co. What is a possible disadvantage of the currency option hedge?
4. Sanibel Co. purchases British goods (denominated in pounds) every month. It negotiates a one-month forward contract at the beginning of every month to hedge its payables. Assume the British pound appreciates consistently over the next 5 years. Will Sanibel be affected? Explain.
5. Using the information from question 4, suggest how Sanibel Co. could more effectively insulate itself from the possible long-term appreciation of the British pound.
6. Hopkins Co. transported goods to Switzerland and will receive 2 million Swiss francs in 3 months. It believes the 3-month forward rate will be an accurate forecast of the future spot rate. The 3-month forward rate of the Swiss franc is \$.68. A put option is available with an exercise price of \$.69 and a premium of \$.03. Would Hopkins prefer a put option hedge to no hedge? Explain.

QUESTIONS AND APPLICATIONS

1. **Consolidated Exposure.** Quincy Corp. estimates the following cash flows in 90 days at its subsidiaries as follows:

Net Position in Each Currency Measured in the Parent's Currency (in 1,000s of Units)			
Subsidiary	Currency 1	Currency 2	Currency 3
A	+200	-300	-100
B	+100	-40	-10
C	-180	+200	-40

Determine the consolidated net exposure of the MNC to each currency.

2. **Money Market Hedge on Receivables.** Assume that Stevens Point Co. has net receivables of 100,000 Singapore dollars in 90 days. The spot rate of the S\$ is \$.50, and the Singapore interest rate is 2 percent over 90 days. Suggest how the U.S. firm could implement a money market hedge. Be precise.
3. **Money Market Hedge on Payables.** Assume that Vermont Co. has net payables of 200,000 Mexican pesos in 180 days. The Mexican interest rate is 7 percent over 180 days, and the spot rate of the Mexican peso is \$.10. Suggest how the U.S. firm could implement a money market hedge. Be precise.
4. **Invoicing Strategy.** Assume that Citadel Co. purchases some goods in Chile that are denominated in Chilean pesos. It also sells goods denominated in U.S. dollars to some firms in Chile. At the end of each month, it has a large net payables position in Chilean pesos. How can it use an invoicing strategy to reduce this transaction exposure? List any limitations on the effectiveness of this strategy.
5. **Hedging with Futures.** Explain how a U.S. corporation could hedge net receivables in euros with futures contracts. Explain how a U.S. corporation

could hedge net payables in Japanese yen with futures contracts.

6. **Hedging with Forward Contracts.** Explain how a U.S. corporation could hedge net receivables in Malaysian ringgit with a forward contract. Explain how a U.S. corporation could hedge payables in Canadian dollars with a forward contract.
7. **Real Cost of Hedging Payables.** Assume that Loras Corp. imported goods from New Zealand and needs 100,000 New Zealand dollars 180 days from now. It is trying to determine whether to hedge this position. Loras has developed the following probability distribution for the New Zealand dollar:

Possible Value of New Zealand Dollar in 180 Days	Probability
\$.40	5%
.45	10
.48	30
.50	30
.53	20
.55	5

The 180-day forward rate of the New Zealand dollar is \$.52. The spot rate of the New Zealand dollar is \$.49. Develop a table showing a feasibility analysis for hedging. That is, determine the possible differences between the costs of hedging versus no hedging. What is the probability that hedging will be more costly to the firm than not hedging? Determine the expected value of the additional cost of hedging.

8. **Benefits of Hedging.** If hedging is expected to be more costly than not hedging, why would a firm even consider hedging?
9. **Real Cost of Hedging Payables.** Assume that Suffolk Co. negotiated a forward contract to purchase 200,000 British pounds in 90 days. The 90-day forward rate was \$1.40 per British pound. The pounds to be purchased were to be used to purchase British supplies. On the day the pounds were delivered in accordance with the forward contract, the spot rate of the British pound was \$1.44. What was the real cost of hedging the payables for this U.S. firm?
10. **Forward Hedge Decision.** Kayla Co. imports products from Mexico, and it will make payment in pesos in 90 days. Interest rate parity holds. The prevailing interest rate in Mexico is very high, which reflects the high expected inflation there. Kayla expects that the Mexican peso will depreciate over the next 90 days. Yet, it plans to hedge its payables with

a 90-day forward contract. Why may Kayla believe that it will pay a smaller amount of dollars when hedging than if it remains unhedged?

11. **Forward versus Money Market Hedge on Payables.** Assume the following information:

90-day U.S. interest rate	4%
90-day Malaysian interest rate	3%
90-day forward rate of Malaysian ringgit	\$.400
Spot rate of Malaysian ringgit	\$.404

Assume that the Santa Barbara Co. in the United States will need 300,000 ringgit in 90 days. It wishes to hedge this payables position. Would it be better off using a forward hedge or a money market hedge? Substantiate your answer with estimated costs for each type of hedge.

12. **Forward versus Money Market Hedge on Receivables.** Assume the following information:

180-day U.S. interest rate	8%
180-day British interest rate	9%
180-day forward rate of British pound	\$1.50
Spot rate of British pound	\$1.48

Assume that Riverside Corp. from the United States will receive 400,000 pounds in 180 days. Would it be better off using a forward hedge or a money market hedge? Substantiate your answer with estimated revenue for each type of hedge.

13. **Currency Options.** Relate the use of currency options to hedging net payables and receivables. That is, when should currency puts be purchased, and when should currency calls be purchased? Why would Cleveland, Inc., consider hedging net payables or net receivables with currency options rather than forward contracts? What are the disadvantages of hedging with currency options as opposed to forward contracts?
14. **Currency Options.** Can Brooklyn Co. determine whether currency options will be more or less expensive than a forward hedge when considering both hedging techniques to cover net payables in euros? Why or why not?
15. **Long-Term Hedging.** How can a firm hedge long-term currency positions? Elaborate on each method.
16. **Leading and Lagging.** Under what conditions would Zona Co.'s subsidiary consider using a leading strategy to reduce transaction exposure? Under what conditions would Zona Co.'s subsidiary consider using a lagging strategy to reduce transaction exposure?

17. **Cross-Hedging.** Explain how a firm can use cross-hedging to reduce transaction exposure.
18. **Currency Diversification.** Explain how a firm can use currency diversification to reduce transaction exposure.
19. **Hedging with Put Options.** As treasurer of Tucson Corp. (a U.S. exporter to New Zealand), you must decide how to hedge (if at all) future receivables of 250,000 New Zealand dollars 90 days from now. Put options are available for a premium of \$.03 per unit and an exercise price of \$.49 per New Zealand dollar. The forecasted spot rate of the NZ\$ in 90 days follows:

Future Spot Rate	Probability
\$.44	30%
.40	50
.38	20

Given that you hedge your position with options, create a probability distribution for U.S. dollars to be received in 90 days.

20. **Forward Hedge.** Would Oregon Co.'s real cost of hedging Australian dollar payables every 90 days have been positive, negative, or about zero on average over a period in which the dollar weakened consistently? What does this imply about the forward rate as an unbiased predictor of the future spot rate? Explain.
21. **Implications of IRP for Hedging.** If interest rate parity exists, would a forward hedge be more favorable, the same as, or less favorable than a money market hedge on euro payables? Explain.
22. **Real Cost of Hedging.** Would Montana Co.'s real cost of hedging Japanese yen receivables have been positive, negative, or about zero on average over a period in which the dollar weakened consistently? Explain.
23. **Forward versus Options Hedge on Payables.** If you are a U.S. importer of Mexican goods and you believe that today's forward rate of the peso is a very accurate estimate of the future spot rate, do you think Mexican peso call options would be a more appropriate hedge than the forward hedge? Explain.
24. **Forward versus Options Hedge on Receivables.** You are an exporter of goods to the United Kingdom, and you believe that today's forward rate of the British pound substantially underestimates the future spot rate. Company policy requires you to hedge your British pound receivables in some way. Would a forward hedge or a put option hedge be more appropriate? Explain.
25. **Forward Hedging.** Explain how a Malaysian firm can use the forward market to hedge periodic purchases of U.S. goods denominated in U.S. dollars. Explain how a French firm can use forward contracts to hedge periodic sales of goods sold to the United States that are invoiced in dollars. Explain how a British firm can use the forward market to hedge periodic purchases of Japanese goods denominated in yen.
26. **Continuous Hedging.** Cornell Co. purchases computer chips denominated in euros on a monthly basis from a Dutch supplier. To hedge its exchange rate risk, this U.S. firm negotiates a 3-month forward contract 3 months before the next order will arrive. In other words, Cornell is always covered for the next three monthly shipments. Because Cornell consistently hedges in this manner, it is not concerned with exchange rate movements. Is Cornell insulated from exchange rate movements? Explain.
27. **Hedging Payables with Currency Options.** Malibu, Inc., is a U.S. company that imports British goods. It plans to use call options to hedge payables of 100,000 pounds in 90 days. Three call options are available that have an expiration date 90 days from now. Fill in the number of dollars needed to pay for the payables (including the option premium paid) for each option available under each possible scenario in the following table:

Scenario	Spot Rate of Pound 90 Days from Now	Exercise Price = \$1.74; Premium = \$.06	Exercise Price = \$1.76; Premium = \$.05	Exercise Price = \$1.79; Premium = \$.03
1	\$1.65			
2	1.70			
3	1.75			
4	1.80			
5	1.85			

If each of the five scenarios had an equal probability of occurrence, which option would you choose? Explain.

28. **Forward Hedging.** Wedco Technology of New Jersey exports plastics products to Europe. Wedco decided to price its exports in dollars. Telematics International, Inc. (of Florida), exports computer network systems to the United Kingdom (denominated in British pounds) and other countries. Telematics decided to use hedging techniques such as forward contracts to hedge its exposure.
- a. Does Wedco's strategy of pricing its materials for European customers in dollars avoid economic exposure? Explain.
- b. Explain why the earnings of Telematics International, Inc., were affected by changes in the value of the pound. Why might Telematics leave its exposure unhedged sometimes?
29. **The Long-Term Hedge Dilemma.** St. Louis, Inc., which relies on exporting, denominates its exports in pesos and receives pesos every month. It expects the peso to weaken over time. St. Louis recognizes the limitation of monthly hedging. It also recognizes that it could remove its transaction exposure by denominating its exports in dollars, but it would still be subject to economic exposure. The long-term hedging techniques are limited, and the firm does not know how many pesos it will receive in the future, so it would have difficulty even if a long-term hedging method was available. How can this business realistically reduce its exposure over the long term?
30. **Long-Term Hedging.** Since Obispo, Inc., conducts much business in Japan, it is likely to have cash flows in yen that will periodically be remitted by its Japanese subsidiary to the U.S. parent. What are the limitations of hedging these remittances one year in advance over each of the next 20 years? What are the limitations of creating a hedge today that will hedge these remittances over each of the next 20 years?
31. **Hedging during the Asian Crisis.** Describe how the Asian crisis could have reduced the cash flows of a U.S. firm that exported products (denominated in U.S. dollars) to Asian countries. How could a U.S. firm that exported products (denominated in U.S. dollars) to Asia, and anticipated the Asian crisis before it began, have insulated itself from any currency effects while continuing to export to Asia?

Advanced Questions

32. Comparison of Techniques for Hedging Receivables.

a. Assume that Carbondale Co. expects to receive S\$500,000 in one year. The existing spot rate of the Singapore dollar is \$.60. The one-year forward rate of the Singapore dollar is \$.62. Carbondale created a probability distribution for the future spot rate in one year as follows:

Future Spot Rate	Probability
\$.61	20%
.63	50
.67	30

Assume that one-year put options on Singapore dollars are available, with an exercise price of \$.63 and a premium of \$.04 per unit. One-year call options on Singapore dollars are available with an exercise price of \$.60 and a premium of \$.03 per unit. Assume the following money market rates:

	U.S.	Singapore
Deposit rate	8%	5%
Borrowing rate	9	6

Given this information, determine whether a forward hedge, a money market hedge, or a currency options hedge would be most appropriate. Then compare the most appropriate hedge to an unhedged strategy, and decide whether Carbondale should hedge its receivables position.

b. Assume that Baton Rouge, Inc., expects to need S\$1 million in one year. Using any relevant information in part (a) of this question, determine whether a forward hedge, a money market hedge, or a currency options hedge would be most appropriate. Then, compare the most appropriate hedge to an unhedged strategy, and decide whether Baton Rouge should hedge its payables position.

33. Comparison of Techniques for Hedging Payables.

SMU Corp. has future receivables of 4 million New Zealand dollars (NZ\$) in one year. It must decide whether to use options or a money market hedge to hedge this position. Use any of the following information to make the decision. Verify your answer by determining the estimate (or probability distribution) of dollar revenue to be received in one year for each type of hedge.

Spot rate of NZ\$	\$.54	
One-year call option	Exercise price = \$.50; premium = \$.07	
One-year put option	Exercise price = \$.52; premium = \$.03	
	U.S.	New Zealand
One-year deposit rate	9%	6%
One-year borrowing rate	11	8
	Rate	Probability
Forecasted spot rate of NZ\$	\$.50	20%
	.51	50
	.53	30

34. **Exposure to September 11.** If you were a U.S. importer of products from Europe, explain whether the September 11, 2001, terrorist attacks on the United States would have caused you to hedge your payables (denominated in euros) due a few months later. Keep in mind that the attack was followed by a reduction in U.S. interest rates.
35. **Hedging with Forward versus Option Contracts.** As treasurer of Tempe Corp., you are confronted with the following problem. Assume the one-year forward rate of the British pound is \$1.59. You plan to receive 1 million pounds in one year. A one-year put option is available. It has an exercise price of \$1.61. The spot rate as of today is \$1.62, and the option premium is \$.04 per unit. Your forecast of the percentage change in the spot rate was determined from the following regression model:

$$e_t = a_0 + a_1 DINF_{t-1} + a_2 DINT_t + \mu$$

where

e_t = percentage change in British pound value over period t

$DINF_{t-1}$ = differential in inflation between the United States and the United Kingdom in period $t - 1$

$DINT_t$ = average differential between U.S. interest rate and British interest rate over period t

a_0 , a_1 , and a_2 = regression coefficients

μ = error term

The regression model was applied to historical annual data, and the regression coefficients were estimated as follows:

$$a_0 = 0.0$$

$$a_1 = 1.1$$

$$a_2 = 0.6$$

Assume last year's inflation rates were 3 percent for the United States and 8 percent for the United Kingdom. Also assume that the interest rate differential ($DINT_t$) is forecasted as follows for this year:

Forecast of $DINT_t$	Probability
1%	40%
2	50
3	10

Using any of the available information, should the treasurer choose the forward hedge or the put option hedge? Show your work.

36. **Hedging Decision.** You believe that IRP presently exists. The nominal annual interest rate in Mexico is 14 percent. The nominal annual interest rate in the United States is 3 percent. You expect that annual inflation will be about 4 percent in Mexico and 5 percent in the United States. The spot rate of the Mexican peso is \$.10. Put options on pesos are available with a one-year expiration date, an exercise price of \$.1008, and a premium of \$.014 per unit.

You will receive 1 million pesos in one year.

- Determine the expected amount of dollars that you will receive if you use a forward hedge.
- Determine the expected amount of dollars that you will receive if you do not hedge and believe in purchasing power parity (PPP).
- Determine the amount of dollars that you will expect to receive if you believe in PPP and use a currency put option hedge. Account for the premium you would pay on the put option.

37. **Forecasting with IFE and Hedging.** Assume that Calumet Co. will receive 10 million pesos in 15 months. It does not have a relationship with a bank at this time and, therefore, cannot obtain a forward contract to hedge its receivables at this time. However, in 3 months, it will be able to obtain a one-year (12-month) forward contract to hedge its receivables. Today the 3-month U.S. interest rate is 2 percent (not annualized), the 12-month U.S. interest rate is 8 percent, the 3-month Mexican peso interest rate is 5 percent (not annualized), and the 12-month peso interest rate is 20 percent. Assume that interest rate parity exists. Assume the international Fisher effect exists.

Assume that the existing interest rates are expected to remain constant over time. The spot rate of the Mexican peso today is \$.10. Based on this information, estimate the amount of dollars that Calumet Co. will receive in 15 months.

- 38. Forecasting from Regression Analysis and Hedging.** You apply a regression model to annual data in which the annual percentage change in the British pound is the dependent variable, and *INF* (defined as annual U.S. inflation minus U.K. inflation) is the independent variable. Results of the regression analysis show an estimate of 0.0 for the intercept and +1.4 for the slope coefficient. You believe that your model will be useful to predict exchange rate movements in the future.

You expect that inflation in the United States will be 3 percent, versus 5 percent in the United Kingdom. There is an 80 percent chance of that scenario. However, you think that oil prices could rise, and if so, the annual U.S. inflation rate will be 8 percent instead of 3 percent (and the annual U.K. inflation will still be 5 percent). There is a 20 percent chance that this scenario will occur. You think that the inflation differential is the only variable that will affect the British pound's exchange rate over the next year.

The spot rate of the pound as of today is \$1.80. The annual interest rate in the United States is 6 percent versus an annual interest rate in the United Kingdom of 8 percent. Call options are available with an exercise price of \$1.79, an expiration date of one year from today, and a premium of \$.03 per unit.

Your firm in the United States expects to need 1 million pounds in one year to pay for imports. You can use any one of the following strategies to deal with the exchange rate risk:

- a. Unhedged strategy
- b. Money market hedge
- c. Call option hedge

Estimate the dollar cash flows you will need as a result of using each strategy. If the estimate for a particular strategy involves a probability distribution, show the distribution. Which hedge is optimal?

- 39. Forecasting Cash Flows and Hedging Decision.** Virginia Co. has a subsidiary in Hong Kong and in Thailand. Assume that the Hong Kong dollar is pegged at \$.13 per Hong Kong dollar and it will remain pegged. The Thai baht fluctuates against the U.S. dollar, and is presently worth \$.03. Virginia Co. expects that during this year, the U.S. inflation rate will be 2 percent, the Thailand inflation rate will be 11 percent, while the Hong Kong inflation

rate will be 3 percent. Virginia Co. expects that purchasing power parity will hold for any exchange rate that is not fixed (pegged). The parent of Virginia Co. will receive 10 million Thai baht and 10 million Hong Kong dollars at the end of one year from its subsidiaries.

- a. Determine the expected amount of dollars to be received by the U.S. parent from the Thai subsidiary in one year when the baht receivables are converted to U.S. dollars.
 - b. The Hong Kong subsidiary will send HK\$1 million to make a payment for supplies to the Thai subsidiary. Determine the expected amount of baht that will be received by the Thai subsidiary when the Hong Kong dollar receivables are converted to Thai baht.
 - c. Assume that interest rate parity exists. Also assume that the real one-year interest rate in the United States is presumed to be 1.0 percent, while the real interest rate in Thailand is presumed to be 3.0 percent. Determine the expected amount of dollars to be received by the U.S. parent if it uses a one-year forward contract today to hedge the receivables of 10 million baht that will arrive in one year.
- 40. Hedging Decision.** Chicago Co. expects to receive 5 million euros in one year from exports. It can use any one of the following strategies to deal with the exchange rate risk. Estimate the dollar cash flows received as a result of using the following strategies:
- a. Unhedged strategy
 - b. Money market hedge
 - c. Option hedge

The spot rate of the euro as of today is \$1.10. Interest rate parity exists. Chicago uses the forward rate as a predictor of the future spot rate. The annual interest rate in the United States is 8 percent versus an annual interest rate of 5 percent in the euro zone. Put options on euros are available with an exercise price of \$1.11, an expiration date of one year from today, and a premium of \$.06 per unit. Estimate the dollar cash flows it will receive as a result of using each strategy. Which hedge is optimal?

- 41. Overhedging.** Denver Co. is about to order supplies from Canada that are denominated in Canadian dollars (C\$). It has no other transactions in Canada and will not have any other transactions in the future. The supplies will arrive in one year and payment is due at that time. There is only one supplier in Canada. Denver submits an order for three loads of supplies, which will be priced at C\$3 million. Denver Co. purchases C\$3 million one year forward, since it anticipates that the Canadian dollar will appreciate substantially over the year.

The existing spot rate is \$.62, while the one-year forward rate is \$.64. The supplier is not sure if it will be able to provide the full order, so it only guarantees Denver Co. that it will ship one load of supplies. In this case, the supplies will be priced at C\$1 million. Denver Co. will not know whether it will receive one load or three loads until the end of the year.

Determine Denver's total cash outflows in U.S. dollars under the scenario that the Canadian supplier only provides one load of supplies and that the spot rate of the Canadian dollar at the end of one year is \$.59. Show your work.

42. **Long-Term Hedging with Forward Contracts.** Tampa Co. will build airplanes and export them to Mexico for delivery in 3 years. The total payment to be received in 3 years for these exports is 900 million pesos. Today the peso's spot rate is \$.10. The annual U.S. interest rate is 4 percent, regardless of the debt maturity. The annual peso interest rate is 9 percent regardless of the debt maturity. Tampa plans to hedge its exposure with a forward contract that it will arrange today. Assume that interest rate parity exists. Determine the dollar amount that Tampa will receive in 3 years.
43. **Timing the Hedge.** Red River Co. (a U.S. firm) purchases imports that have a price of 400,000 Singapore dollars, and it has to pay for the imports in 90 days. It will use a 90-day forward contract to cover its payables. Assume that interest rate parity exists. This morning, the spot rate of the Singapore dollar was \$.50. At noon, the Federal Reserve reduced U.S. interest rates, while there was no change in interest rates in Singapore. The Fed's actions immediately increased the degree of uncertainty surrounding the future value of the Singapore dollar over the next 3 months. The Singapore dollar's spot rate remained at \$.50 throughout the day. Assume that the U.S. and Singapore interest rates were the same as of this morning. Also assume that the international Fisher effect holds. If Red River Co. purchased a currency call option contract at the money this morning to hedge its exposure, would its total U.S. dollar cash outflows be *more than*, *less than*, or *the same as* the total U.S. dollar cash outflows if it had negotiated a forward contract this morning? Explain.
44. **Hedging with Forward versus Option Contracts.** Assume interest rate parity exists. Today, the one-year interest rate in Canada is the same as the one-year interest rate in the United States. Utah Co. uses the forward rate to forecast the future spot rate of the Canadian dollar that will exist in one year. It needs to purchase Canadian dollars in one year.
- Will the expected cost of its payables be lower if it hedges its payables with a one-year forward contract on Canadian dollars or a one-year at-the-money call option contract on Canadian dollars? Explain.
45. **Hedging with a Bull Spread.** (See the chapter appendix.) Evar Imports, Inc., buys chocolate from Switzerland and resells it in the United States. It just purchased chocolate invoiced at SF62,500. Payment for the invoice is due in 30 days. Assume that the current exchange rate of the Swiss franc is \$.74. Also assume that three call options for the franc are available. The first option has a strike price of \$.74 and a premium of \$.03; the second option has a strike price of \$.77 and a premium of \$.01; the third option has a strike price of \$.80 and a premium of \$.006. Evar Imports is concerned about a modest appreciation in the Swiss franc.
- a. Describe how Evar Imports could construct a bull spread using the first two options. What is the cost of this hedge? When is this hedge most effective? When is it least effective?
- b. Describe how Evar Imports could construct a bull spread using the first option and the third option. What is the cost of this hedge? When is this hedge most effective? When is it least effective?
- c. Given your answers to parts (a) and (b), what is the tradeoff involved in constructing a bull spread using call options with a higher exercise price?
46. **Hedging with a Bear Spread.** (See the chapter appendix.) Marson, Inc., has some customers in Canada and frequently receives payments denominated in Canadian dollars (C\$). The current spot rate for the Canadian dollar is \$.75. Two call options on Canadian dollars are available. The first option has an exercise price of \$.72 and a premium of \$.03. The second option has an exercise price of \$.74 and a premium of \$.01. Marson, Inc., would like to use a bear spread to hedge a receivable position of C\$50,000, which is due in one month. Marson is concerned that the Canadian dollar may depreciate to \$.73 in one month.
- a. Describe how Marson, Inc., could use a bear spread to hedge its position.
- b. Assume the spot rate of the Canadian dollar in one month is \$.73. Was the hedge effective?
47. **Hedging with Straddles.** (See the chapter appendix.) Brooks, Inc., imports wood from Morocco. The Moroccan exporter invoices in Moroccan dirham. The current exchange rate of the dirham is \$.10. Brooks just purchased wood for 2 million dirham and should pay for the wood in 3 months. It is also possible that Brooks will receive 4 million dirham in 3 months from the sale of refinished

wood in Morocco. Brooks is currently in negotiations with a Moroccan importer about the refined wood. If the negotiations are successful, Brooks will receive the 4 million dirham in 3 months, for a net cash inflow of 2 million dirham. The following option information is available:

- Call option premium on Moroccan dirham = \$.003.
 - Put option premium on Moroccan dirham = \$.002.
 - Call and put option strike price = \$.098.
 - One option contract represents 500,000 dirham.
- a. Describe how Brooks could use a straddle to hedge its possible positions in dirham.
 - b. Consider three scenarios. In the first scenario, the dirham's spot rate at option expiration is equal to the exercise price of \$.098. In the second scenario, the dirham depreciates to \$.08. In the third scenario, the dirham appreciates to \$.11. For each scenario, consider both the case when the negotiations are successful and the case when the nego-

tiations are not successful. Assess the effectiveness of the long straddle in each of these situations by comparing it to a strategy of using long call options to hedge.

48. **Hedging with Straddles versus Strangles.** (See the chapter appendix.) Refer to the previous problem. Assume that Brooks believes the cost of a long straddle is too high. However, call options with an exercise price of \$.105 and a premium of \$.002 and put options with an exercise price of \$.09 and a premium of \$.001 are also available on Moroccan dirham. Describe how Brooks could use a long strangle to hedge its possible dirham positions. What is the tradeoff involved in using a long strangle versus a long straddle to hedge the positions?

Discussion in the Boardroom

This exercise can be found in Appendix E at the back of this textbook.

Running Your Own MNC

This exercise can be found on the Xtra! website at <http://maduraxtra.swlearning.com>.

BLADES, INC. CASE

Management of Transaction Exposure

Blades, Inc., has recently decided to expand its international trade relationship by exporting to the United Kingdom. Jogs, Ltd., a British retailer, has committed itself to the annual purchase of 200,000 pairs of "Speedos," Blades' primary product, for a price of £80 per pair. The agreement is to last for 2 years, at which time it may be renewed by Blades and Jogs.

In addition to this new international trade relationship, Blades continues to export to Thailand. Its primary customer there, a retailer called Entertainment Products, is committed to the purchase of 180,000 pairs of Speedos annually for another 2 years at a fixed price of 4,594 Thai baht per pair. When the agreement terminates, it may be renewed by Blades and Entertainment Products.

Blades also incurs costs of goods sold denominated in Thai baht. It imports materials sufficient to manufacture 72,000 pairs of Speedos annually from Thailand. These imports are denominated in baht, and the price depends on current market prices for the rubber and plastic components imported.

Under the two export arrangements, Blades sells quarterly amounts of 50,000 and 45,000 pairs of Speedos to Jogs and Entertainment Products, respectively. Payment for these sales is made on the first of January, April, July, and October. The annual amounts

are spread over quarters in order to avoid excessive inventories for the British and Thai retailers. Similarly, in order to avoid excessive inventories, Blades usually imports materials sufficient to manufacture 18,000 pairs of Speedos quarterly from Thailand. Although payment terms call for payment within 60 days of delivery, Blades generally pays for its Thai imports upon delivery on the first day of each quarter in order to maintain its trade relationships with the Thai suppliers. Blades feels that early payment is beneficial, as other customers of the Thai supplier pay for their purchases only when it is required.

Since Blades is relatively new to international trade, Ben Holt, Blades' chief financial officer (CFO), is concerned with the potential impact of exchange rate fluctuations on Blades' financial performance. Holt is vaguely familiar with various techniques available to hedge transaction exposure, but he is not certain whether one technique is superior to the others. Holt would like to know more about the forward, money market, and option hedges and has asked you, a financial analyst at Blades, to help him identify the hedging technique most appropriate for Blades. Unfortunately, no options are available for Thailand, but British call and put options are available for £31,250 per option.

Ben Holt has gathered and provided you with the following information for Thailand and the United Kingdom:

	Thailand	United Kingdom
Current spot rate	\$.0230	\$1.50
90-day forward rate	\$.0215	\$1.49
Put option premium	Not available	\$.020 per unit
Put option exercise price	Not available	\$1.47
Call option premium	Not available	\$.015 per unit
Call option exercise price	Not available	\$1.48
90-day borrowing rate (nonannualized)	4%	2%
90-day lending rate (nonannualized)	3.5%	1.8%

In addition to this information, Ben Holt has informed you that the 90-day borrowing and lending rates in the United States are 2.3 and 2.1 percent, respectively, on a nonannualized basis. He has also identified the following probability distributions for the exchange rates of the British pound and the Thai baht in 90 days:

Probability	Spot Rate for the British Pound in 90 Days	Spot Rate for the Thai Baht in 90 Days
5%	\$1.45	\$.0200
20	1.47	\$.0213
30	1.48	\$.0217
25	1.49	\$.0220
15	1.50	\$.0230
5	1.52	\$.0235

Blades' next sales to and purchases from Thailand will occur one quarter from now. If Blades decides to hedge, Holt will want to hedge the entire amount subject to exchange rate fluctuations, even if it requires overhedging (i.e., hedging more than the needed amount). Currently, Holt expects the imported components from Thailand to cost approximately 3,000 baht per pair of Speedos. Holt has asked you to answer the following questions for him:

- Using a spreadsheet, compare the hedging alternatives for the Thai baht with a scenario under which Blades remains unhedged. Do you think Blades should hedge or remain unhedged? If Blades should hedge, which hedge is most appropriate?
- Using a spreadsheet, compare the hedging alternatives for the British pound receivables with a scenario under which Blades remains unhedged. Do you think Blades should hedge or remain unhedged? Which hedge is the most appropriate for Blades?
- In general, do you think it is easier for Blades to hedge its inflows or its outflows denominated in foreign currencies? Why?
- Would any of the hedges you compared in question 2 for the British pounds to be received in 90 days require Blades to overhedge? Given Blades' exporting arrangements, do you think it is subject to overhedging with a money market hedge?
- Could Blades modify the timing of the Thai imports in order to reduce its transaction exposure? What is the tradeoff of such a modification?
- Could Blades modify its payment practices for the Thai imports in order to reduce its transaction exposure? What is the tradeoff of such a modification?
- Given Blades' exporting agreements, are there any long-term hedging techniques Blades could benefit from? For this question only, assume that Blades incurs all of its costs in the United States.

SMALL BUSINESS DILEMMA

Hedging Decisions by the Sports Exports Company

Jim Logan, owner of the Sports Exports Company, will be receiving about 10,000 British pounds about one month from now as payment for exports produced and sent by his firm. Jim is concerned about his exposure because he believes that there are two possible scenar-

ios: (1) the pound will depreciate by 3 percent over the next month or (2) the pound will appreciate by 2 percent over the next month. There is a 70 percent chance that Scenario 1 will occur. There is a 30 percent chance that Scenario 2 will occur.

Jim notices that the prevailing spot rate of the pound is \$1.65, and the one-month forward rate is about \$1.645. Jim can purchase a put option over the counter from a securities firm that has an exercise (strike) price of \$1.645, a premium of \$.025, and an expiration date of one month from now.

1. Determine the amount of dollars received by the Sports Exports Company if the receivables to be received in one month are not hedged under each of the two exchange rate scenarios.
2. Determine the amount of dollars received by the Sports Exports Company if a put option is used to

hedge receivables in one month under each of the two exchange rate scenarios.

3. Determine the amount of dollars received by the Sports Exports Company if a forward hedge is used to hedge receivables in one month under each of the two exchange rate scenarios.
4. Summarize the results of dollars received based on an unhedged strategy, a put option strategy, and a forward hedge strategy. Select the strategy that you prefer based on the information provided.

INTERNET/EXCEL EXERCISES

1. The following website contains annual reports of many MNCs: <http://www.reportgallery.com>. Review the annual report of your choice. Look for any comments in the report that describe the MNC's hedging of transaction exposure. Summarize the MNC's hedging of transaction exposure based on the comments in the annual report.
2. The following website provides exchange rate movements against the dollar over recent months: <http://www.federalreserve.gov/releases/>. Based on the exposure of the MNC you assessed in question 1, determine whether the exchange rate movements of whatever currency (or currencies) it is exposed to moved in a favorable or unfavorable direction over the last few months.

Nontraditional Hedging Techniques

While traditional hedging techniques were covered in the chapter, many other techniques may be appropriate for an MNC's particular situation. Some of these nontraditional techniques are described in this appendix.

Hedging with Currency Straddles

In reality, some MNCs do not know whether they will have net cash inflows or outflows as a result of their transactions in a specific currency over a particular period of time. A long straddle (purchase of a call option and put option with the same exercise price) is an effective tool to hedge under these conditions.

EXAMPLE

Houston Co. conducts business in Mexico and expects to need 4 million Mexican pesos (MXP) to cover specific expenses. If it is unable to renew a business deal with the Mexican government (its biggest customer), it will receive a total of MXP3 million in revenue in one month, which will result in net cash flows of $-MXP1$ million. Conversely, if it is able to renew the business deal with the government, it will receive a total of MXP5 million, which will result in net cash flows of $+MXP1$ million. The prevailing spot rate of the Mexican peso is \$.09. If Houston has excess pesos in one month, it will convert them to dollars. Conversely, if Houston does not have enough pesos in one month, it will use dollars to obtain the amount that it needs. Houston would like to hedge its exchange rate risk, regardless of which scenario occurs.

Currently, call options for Mexican pesos with expiration dates in one month are available with an exercise price of \$.09 and a premium of \$.004 per peso. Put options for Mexican pesos with an expiration date of one month are available with an exercise price of \$.09 and a premium of \$.005 per peso. Options for Mexican pesos are denominated in 250,000 pesos per option contract.

Houston could hedge its possible position of having positive net cash flows of MXP1 million by purchasing put options. It would pay a premium of \$5,000 ($1,000,000 \text{ units} \times \$.005$). It could hedge its possible position of needing MXP1 million by purchasing call options. It would pay a premium of \$4,000 ($1,000,000 \text{ units} \times \$.004$). Assume that Houston constructs a straddle to hedge both possible outcomes and pays \$9,000 for the call options and put options on pesos. Assume that Houston exercises the options in one month, if at all.

Consider the following scenarios that could occur one month from now:

1. If Houston has net cash flows of $+MXP1$ million and the peso's value is \$.10, it would let its put options expire and would convert its pesos to dollars in the spot market, receiving \$100,000 ($1,000,000 \text{ units} \times \$.10$) from this transaction. It would also exercise its call option by purchasing 1 million pesos at \$.09 and selling them in the spot market for \$.10. This transaction would generate a gain of \$10,000. Overall, Houston would receive \$110,000, minus the \$9,000 in premiums paid for the options.

2. If Houston has net cash flows of +MXP1 million and the peso depreciates to \$.08, it would exercise its put options and let the call options expire. Overall, Houston would receive \$90,000 ($1,000,000 \text{ units} \times \$.09$) from exercising the options, minus the \$9,000 in premiums paid for the options.
3. If Houston has net cash flows of +MXP1 million and the peso is \$.09, it would let its call and put options expire. It would receive \$90,000 ($1,000,000 \times \$.09$) from selling pesos in the spot market, minus the \$9,000 in premiums paid for the options.
4. If Houston has net cash flows of -MXP1 million, and the peso's value is \$.10, it would exercise its call options and let its put options expire. Overall, Houston would pay a total of \$99,000, which consists of the \$90,000 ($1,000,000 \times \$.09$) from exercising the call option and the \$9,000 in premiums paid for the options.
5. If Houston has net cash flows of -MXP1 million and the peso's value is \$.08, it would let its call options expire and buy pesos in the spot market. It would also buy 1 million pesos and then sell them by exercising its put options. This transaction would generate a gain of \$10,000. Overall, Houston would pay a total of \$79,000, which consists of the \$80,000 paid to obtain the pesos it needs, plus the \$9,000 in premiums paid for the options, minus the \$10,000 gain generated from its put options.
6. If Houston has net cash flows of -MXP1 million and the peso's value is \$.09, it would let its call and put options expire. It would pay a total of \$99,000, which consists of the \$90,000 paid to obtain pesos and the \$9,000 in premiums paid for the options.

Many other scenarios could also occur, but a summary of the possible scenarios and the actions taken by Houston appears in Exhibit 11A.1. ■

Hedging with Currency Strangles

In the hedging example just provided for Houston Co., consider that the expected value of the amount that Houston would pay or receive based on today's spot rate is \$90,000 ($\text{MXP}1,000,000 \times \$.09$). The option premiums paid for the options

Exhibit 11A.1 Possible Scenarios for Houston Co. When Hedging with a Straddle

Panel A: Houston has net cash flows of +MXP1,000,000 in one month.	
MXP value > \$.09 in one month	<ul style="list-style-type: none"> • Houston converts excess pesos to dollars in the spot market. • It lets the put options expire. • It exercises its call options and sells the pesos obtained from this transaction in the spot market; the proceeds recapture part of the premiums that were paid for the options.
MXP value < \$.09 in one month	<ul style="list-style-type: none"> • Houston converts excess pesos to dollars at \$.09, by exercising its put options. • It lets the call options expire.
MXP value = \$.09 in one month	<ul style="list-style-type: none"> • Houston converts excess pesos to dollars in the spot market. • It lets its call options and put options expire.
Panel B: Houston has net cash flows of -MXP1,000,000 in one month.	
MXP value > \$.09 in one month	<ul style="list-style-type: none"> • Houston converts dollars to pesos by exercising its call options. • It lets the put options expire.
MXP value < \$.09 in one month	<ul style="list-style-type: none"> • It lets the call options expire. • It buys pesos in the spot market and sells pesos obtained by exercising the put options; the proceeds recapture part of the premiums that were paid for the options.
MXP value = \$.09 in one month	<ul style="list-style-type: none"> • Houston converts dollars to pesos in the spot market. • It lets its call and put options expire.

(\$9,000) represent 10 percent of that expected value. Thus, the straddle is an expensive means of hedging. The exercise price at which Houston hedged was equal to the spot rate (“at the money”). If Houston is willing to accept exposure to small exchange rate movements in the peso, it could reduce the premiums paid for the options. Specifically, it would use a *long strangle* by purchasing a call option and a put option that have different exercise prices. By purchasing a call option that has an exercise price higher than \$.09, and a put option that has an exercise price lower than \$.09, Houston can reduce the premiums it will pay on the options.

E X A M P L E

Reconsider the example in which Houston Co. expects that it will have net cash flows of either +MXP1 million or –MXP1 million in one month. To reduce the premiums it pays for hedging with options, it can purchase options that are out of the money. Assume that it can obtain call options for Mexican pesos with an expiration date of one month, an exercise price of \$.095, and a premium of \$.002 per peso. It can also obtain put options for Mexican pesos with an expiration date of one month, an exercise price of \$.085, and a premium of \$.003 per peso.

Houston Co. could hedge its possible position of needing MXP1 million by purchasing call options. It would pay a premium of \$2,000 (1,000,000 units \times \$.002). It could also hedge its possible position of having positive net cash flows of MXP1 million by purchasing put options. It would pay a premium of \$3,000 (1,000,000 units \times \$.003). Overall, Houston would pay \$5,000 for the call options and put options on pesos, which is substantially less than the \$9,000 it would pay for the straddle in the previous example. However, the options do not offer protection until the spot rate deviates by more than \$.005 from its existing level. If the spot rate remains within the range of the two exercise prices (from \$.085 to \$.095), Houston will not exercise either option.

This example of hedging with a strangle is a compromise between hedging with the straddle in the previous example and no hedge. For the range of possible spot rates between \$.085 and \$.095, there is no hedge. For scenarios in which the spot rate moves outside the range, Houston is hedged. It will have to pay no more than \$.095 if it needs to obtain pesos and will be able to sell pesos for at least \$.085 if it has pesos to sell. ■

Hedging with Currency Bull Spreads

In certain situations, MNCs can use currency bull spreads to hedge their cash outflows denominated in a foreign currency, as the following example illustrates.

E X A M P L E

Peak, Inc., needs to order Canadian raw materials to use in its production process. The Canadian exporter typically invoices Peak in Canadian dollars. Assume that the current exchange rate for the Canadian dollar (C\$) is \$.73 and that Peak needs C\$100,000 in 3 months. Two call options for Canadian dollars with expiration dates in 3 months and the following additional information are available:

- Call option 1 premium on Canadian dollars = \$.015.
- Call option 2 premium on Canadian dollars = \$.008.
- Call option 1 strike price = \$.73.
- Call option 2 strike price = \$.75.
- One option contract represents C\$50,000.

To lock into a future price for the C\$100,000, Peak could buy two option 1 contracts, paying $2 \times \text{C}\$50,000 \times \$.015 = \$1,500$. This would effectively lock in a maximum price of \$.73 that Peak would pay in 3 months, for a total maximum outflow of \$74,500 (C\$100,000 \times \$.73 + \$1,500). If the spot price for Canadian dollars at option expiration is below \$.73, Peak has the right to let the options expire and buy the C\$100,000 in the open market for the lower price. Naturally, Peak would still have paid the \$1,500 total premium in this case.

Historically, the Canadian dollar has been relatively stable against the U.S. dollar. If Peak believes that the Canadian dollar will appreciate in the next 3 months but is very unlikely to appreciate above the higher exercise price of \$.75, it should consider constructing a bull spread to hedge its Canadian dollar payables. To do so, Peak would purchase two option 1 contracts and write two option 2 contracts. The total cash outflow necessary to construct this bull spread is $2 \times \text{C}\$50,000 \times (\$.015 - \$.008) = \700 , since Peak would receive the premiums from writing the two option 2 contracts. Constructing the bull spread has reduced the cost of hedging by \$800 ($\$1,500 - \700).

If the spot price of the Canadian dollar at option expiration is below the \$.75 strike price, the bull spread will have provided an effective hedge. For example, if the spot price at option expiration is \$.74, Peak will exercise the two option 1 contracts it purchased, for a total maximum outflow of \$73,700 ($\text{C}\$100,000 \times \$.73 + \700). The buyer of the two option 2 contracts Peak wrote would let those options expire. If the Canadian dollar depreciates substantially below the lower strike price of \$.73, the hedge will also be effective, as both options will expire worthless. Peak would purchase the Canadian dollars at the prevailing spot rate, having paid the difference in option premiums.

Now consider what will happen if the Canadian dollar appreciates above the higher exercise price of \$.75 prior to option expiration. In this case, the bull spread will still reduce the total cash outflow and therefore provide a partial hedge. However, the hedge will be less effective.

To illustrate, assume the Canadian dollar appreciates to a spot price of \$.80 in 3 months. Peak will still exercise the two option 1 contracts it purchased. However, the two option 2 contracts it wrote will also be exercised. Recall that this is a situation in which the maximum profit from the bull spread is realized, which is equal to the difference in exercise prices less the difference in the two premiums, or $2 \times \text{C}\$50,000 \times (\$.75 - \$.73 - \$.015 + \$.008) = \$1,300$. Importantly, Peak will now have to purchase the $\text{C}\$100,000$ it needs in the open market, since it needs to sell the Canadian dollars purchased by exercising the option 1 contracts to the buyer of the option 2 contracts it wrote. Therefore, Peak's total cash outflow in 3 months when it needs the Canadian dollars will be \$78,700 ($\text{C}\$100,000 \times \$.80 - \$1,300$). While Peak has successfully reduced its cash outflow in 3 months by \$1,300, it would have fared much better by only buying two option 1 contracts to hedge its payables, which would have resulted in a maximum cash outflow of \$74,500. Consequently, MNCs should hedge using bull spreads only for relatively stable currencies that are not expected to appreciate drastically prior to option expiration. ■

Hedging with Currency Bear Spreads

In certain situations, MNCs can use currency bear spreads to hedge their receivables denominated in a foreign currency.

EXAMPLE

Weber, Inc., has some Canadian customers. Weber typically bills these customers in Canadian dollars. Assume that the current exchange rate for the Canadian dollar (C\$) is \$.73 and that Weber expects to receive $\text{C}\$50,000$ in 3 months. The following options for Canadian dollars are available.

- Call option 1 premium on Canadian dollars = \$.015.
- Call option 2 premium on Canadian dollars = \$.008.
- Call option 1 strike price = \$.73.
- Call option 2 strike price = \$.75.
- One option contract represents $\text{C}\$50,000$.

If Weber believes the Canadian dollar will not depreciate much below the lower exercise price of \$.75, it can construct a bear spread to hedge the receivable. Weber will buy call option 2 and write call option 1 to establish this bear spread. The total cash *inflow* resulting from this

bear spread is $C\$50,000 \times (\$.015 - \$.008) = \350 . Constructing a bear spread will always result in a net cash inflow, since the spreader writes the call option with the lower exercise price and, therefore, the higher premium.

What will happen if the Canadian dollar appreciates above the higher exercise price of \$.75 prior to option expiration? For example, assume that the spot rate for the Canadian dollar is \$.80 at option expiration. In this case, the bear spread would result in the maximum loss of \$.013 ($\$.75 - \$.73 - \$.015 + \$.008$) per Canadian dollar, for a total maximum loss of \$650. However, Weber can now sell the receivables at the prevailing spot rate of \$.80, netting \$39,350 ($C\$50,000 \times \$.80 - \$650$). Furthermore, while the maximum loss remains at \$650 for the bear spread, Weber can benefit if the Canadian dollar appreciates even more.

The bear spread also provides an effective hedge if the spot price of the Canadian dollar at option expiration is above the lower strike price of \$.73 but below the higher strike price of \$.75. In this case, however, the benefit is reduced. For instance, if the spot price at option expiration is \$.74, Weber will let option 2 expire. The buyer of option 1 will exercise it, and Weber will sell the receivables at the exercise price of \$.73 to fulfill its obligation. This will result in a total cash inflow of \$36,850 ($C\$50,000 \times \$.73 + \350) after including the net premium received from establishing the spread.

If the Canadian dollar depreciates below the lower strike price of \$.73, Weber will realize the maximum gain from the bear spread but will have to sell the receivables at the low prevailing spot rate. For example, if the spot rate at option expiration is \$.70, both options will expire worthless, but Weber would have received \$350 from establishing the spread. If Weber sells the receivables at the spot rate, the net cash inflow will be \$35,350 ($C\$50,000 \times \$.70 + \350). ■

In summary, MNCs should hedge receivables using bear spreads only for relatively stable currencies that are expected to depreciate modestly, but not drastically, prior to option expiration.