Chapter 11

Managing Transaction Exposure

Lecture Outline

Transaction Exposure
- Identifying Net Transaction Exposure
- Adjusting the Invoice Policy to Manage Exposure

Hedging Payables
- Forward or Futures Hedge
- Money Market Hedge
- Call Option Hedge
- Summary of Hedging Techniques Used to Hedge Payables
- Selecting the Optimal Technique for Hedging Payables
- Optimal Hedge Versus No Hedge
- Evaluating the Hedge Decision

Hedging Receivables
- Forward or Futures Hedge
- Money Market Hedge
- Call Option Hedge
- Selecting the Optimal Technique for Hedging Receivables
- Optimal Hedge Versus No Hedge
- Evaluating the Hedge Decision
- Comparison of Hedging Techniques
- Hedging Policies of MNCs

Limitations of Hedging
- Limitation of Hedging an Uncertain Amount
- Limitation of Repeated Short-term Hedging

Hedging Long-Term Transaction Exposure
- Long-Term Forward Contract
- Parallel Loan

Alternative Hedging Techniques
- Leading and Lagging
- Cross-Hedging
- Currency Diversification
Chapter Theme

A primary objective of the chapter is to provide an overview of hedging techniques. Yet, transaction exposure cannot always be hedged in all cases. Even when it can be hedged, the firm must decide whether a hedge is feasible. While a firm will only know for sure whether hedging is worthwhile after the period of concern, it can incorporate its expectations about future exchange rates, future inflows and outflows, as well as its degree of risk aversion to make hedging decisions.

Topics to Stimulate Class Discussion

1. Is transaction exposure relevant?

2. Why should a firm bother identifying net transaction exposure?

3. Should management of transaction exposure be conducted at the subsidiary level or at the centralized level? Why?

4. Assume that you decided to hedge future payables of 1 million Swiss francs using the forward hedge. Go through the specific steps required for you to use the forward hedge of 1 million francs.

5. Assume that you decided to hedge future receivables of 1 million Canadian dollars using currency options. Go through the specific steps required for you to use currency options to hedge this position.

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 3,000,000 and 4,000,000 Philippine pesos every month, it may presume that it will receive at least 3,000,000 pesos in each of the next few months unless conditions change. Thus, it can hedge a position of 3,000,000 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 3,000,000 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. Overhedging 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.

ANSWER: If the MNC is confident that it will receive net cash flows in a currency that will likely depreciate, it should hedge at least the minimum amount of cash flows to be received. If it overhedges, and the currency’s spot rate declines below the forward rate that was negotiated at the time of the hedge, the MNC may even benefit from the overhedged position. The MNC should try to avoid overhedging the net cash flows of a currency that it would expect to strengthen. It may be better off by hedging a smaller amount or not hedging at all.

Answers to End of Chapter Questions

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

<table>
<thead>
<tr>
<th>Subsidiary</th>
<th>Currency 1</th>
<th>Currency 2</th>
<th>Currency 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>+200</td>
<td>−300</td>
<td>−100</td>
</tr>
<tr>
<td>B</td>
<td>+100</td>
<td>−40</td>
<td>−10</td>
</tr>
<tr>
<td>C</td>
<td>−180</td>
<td>+200</td>
<td>−40</td>
</tr>
</tbody>
</table>

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

ANSWER: The net exposure to Currency 1 is 120,000 units; the net exposure to Currency 2 is −140,000 units; the net exposure to Currency 3 is −150,000 units.

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% over 90 days. Suggest how the U.S. firm could implement a money market hedge. Be precise.

ANSWER: The firm could borrow the amount of Singapore dollars so that the 100,000 Singapore dollars to be received could be used to pay off the loan. This amounts to \((100,000/1.02) = \text{about S$98,039}\), which could be converted to about $49,020 and invested. The borrowing of Singapore dollars has offset the transaction exposure due to the future receivables in Singapore dollars.

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% 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.

ANSWER: If the firm deposited MXP186,916 (computed as MXP200,000/1.07) into a Mexican bank earning 7% over 6 months, the deposit would be worth 200,000 pesos at the end of the six-month period. This amount would then be used to take care of the net payables. To make the initial deposit of 186,916 pesos, the firm would need about $18,692 (computed as 186,916 × $.10). It could borrow these funds.
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.

**ANSWER:** It could invoice its exports to Chile in pesos; the pesos received would then be used to make payment on the imports from firms in Chile. One limitation is that the Chilean firms may not agree to this (although they likely would); if they are willing, limitations of the invoicing strategy occur if (1) the timing does not perfectly match up, or (2) the amounts received versus paid do not perfectly match up.

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.

**ANSWER:** The U.S. corporation could agree to a futures contract to sell euros at a specified date in the future and at a specified price. This locks in the exchange rate at which the euros could be sold.

The U.S. corporation could purchase yen futures contracts that provide for yen to be received in exchange for dollars at a specified future date and at a specified price. The firm has locked in the rate at which it will exchange dollars for yen.

6. **Hedging with Forward Contracts.** Explain how a U.S. corporation could hedge net receivables in Malaysian ringgit with a forward contract.

**ANSWER:** The U.S. corporation could sell ringgit forward using a forward contract. This is accomplished by negotiating with a bank to provide the bank ringgit in exchange for dollars at a specified exchange rate (the forward rate) for a specified future date.

The U.S. corporation could purchase Canadian dollars forward using a forward contract. This is accomplished by negotiating with a bank to provide the bank U.S. dollars in exchange for Canadian dollars at a specified exchange rate (the forward rate) for a specified future date.

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:
Chapter 11: Managing Transaction Exposure

The 180-day forward rate of the New Zealand dollar is $0.52. The spot rate of the New Zealand dollar is $0.49. 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.

**ANSWER:**

<table>
<thead>
<tr>
<th>Possible Spot Rate of New Zealand Dollar</th>
<th>Probability</th>
<th>Nominal Cost of Hedging 100,000 NZ$</th>
<th>Amount of U.S. Dollars Needed to Buy 100,000 NZ$ if Firm Remains Unhedged</th>
<th>Real Cost of Hedging</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.40</td>
<td>5%</td>
<td>$52,000</td>
<td>$40,000</td>
<td>$12,000</td>
</tr>
<tr>
<td>$0.45</td>
<td>10%</td>
<td>$52,000</td>
<td>$45,000</td>
<td>$7,000</td>
</tr>
<tr>
<td>$0.48</td>
<td>30%</td>
<td>$52,000</td>
<td>$48,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>$0.50</td>
<td>30%</td>
<td>$52,000</td>
<td>$50,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>$0.53</td>
<td>20%</td>
<td>$52,000</td>
<td>$53,000</td>
<td>–$1,000</td>
</tr>
<tr>
<td>$0.55</td>
<td>5%</td>
<td>$52,000</td>
<td>$55,000</td>
<td>–$3,000</td>
</tr>
</tbody>
</table>

**ANSWER:** There is a 75% probability that hedging will be more costly than no hedge.

\[
5\%(12,000) + 10\%(7,000) + 30\%(4,000) + 30\%(2,000) + 20\%(–1,000) + 5\%(–3,000)
\]

\[
= 600 + 700 + 1200 + 600 – 200 – 150
\]

\[
= 2,750
\]

**8. Benefits of Hedging.** If hedging is expected to be more costly than not hedging, why would a firm even consider hedging?

**ANSWER:** Firms often prefer knowing what their future cash flows will be as opposed to the uncertainty involved with an open position in a foreign currency. Thus, they may be willing to hedge even if they expect that the real cost of hedging will be positive.

**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?
ANSWER: The U.S. dollars paid when hedging = $1.40(200,000) = $280,000. The dollars paid if unhedged = $1.44(200,000) = $288,000. The real cost of hedging payables = $280,000 – $288,000 = –$8,000.

The U.S. dollars paid when hedging = $1.40(200,000) = $280,000. The dollars paid if unhedged = $1.34(200,000) = $268,000. The real cost of hedging payables = $280,000 – $268,000 = $12,000.

10. Hedging 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?

ANSWER: Since Mexico presently has a very high interest rate, the forward rate of the peso would exhibit a discount according to interest rate parity. Kayla Co. may believe that today’s 90-day forward rate of the peso is lower than the expected spot rate in 90 days, which means that it will pay a smaller amount of dollar cash flows if it hedges 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.

ANSWER: If the firm uses the forward hedge, it will pay out 300,000($0.400) = $120,000 in 90 days.

If the firm uses a money market hedge, it will invest (300,000/1.03) = 291,262 ringgit now in a Malaysian deposit that will accumulate to 300,000 ringgit in 90 days. This implies that the number of U.S. dollars to be borrowed now is (291,262 × $.404) = $117,670. If this amount is borrowed today, Santa Barbara will need $122,377 to repay the loan in 90 days (computed as $117,670 × 1.04 = $122,377).

In comparison, the firm will pay out $120,000 in 90 days if it uses the forward hedge and $122,377 if it uses the money market hedge. Thus, it should use the forward 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.

ANSWER: If the firm uses a forward hedge, it will receive 400,000($1.50) = $600,000 in 180 days.

If the firm uses a money market hedge, it will borrow (400,000/$1.09) = 366,972 pounds, to be converted to U.S. dollars and invested in the U.S. The 400,000 pounds received in 180 days will pay off this loan. The 366,972 pounds borrowed convert to about $543,119 (computed as 366,972 × $1.48), which when invested at 8% interest will accumulate to be worth about $586,569.

In comparison, the firm will receive $600,000 in 180 days using the forward hedge, or about $586,569 in 180 days using the money market hedge. Thus, it should use the forward 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?

ANSWER: Currency call options should be purchased to hedge net payables. Currency put options should be purchased to hedge net receivables.

Currency options not only provide a hedge, but they provide flexibility since they do not require a commitment to buy or sell a currency (whereas the forward contract does).

A disadvantage of currency options is that a price (premium) is paid for the option itself. The only payment by a firm using a forward contract is the exchange of a currency as specified in the contract.

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?

ANSWER: No. The amount paid out when using a forward contract is known with certainty. However, the amount paid out when using currency options is not known until the period is over (since the firm has the flexibility to exercise the option only if it is feasible). Thus, the MNC cannot determine whether currency options will be more or less expensive than forward contracts when hedging net payables.


ANSWER: Long-term forward contracts are available to cover positions of five years or longer in some cases (for major currencies).

Parallel loans can be used to exchange currencies and re-exchange the currencies at a specified future exchange rate and date.
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?

**ANSWER:** If a subsidiary expected its currency to depreciate against an invoice currency on goods it imported, it may “lead” its payments (make payments early). If a subsidiary expected its currency to appreciate against an invoice currency on goods it imported, it may “lag” its payments (make a late payment).

17. **Cross-Hedging.** Explain how a firm can use cross-hedging to reduce transaction exposure.

**ANSWER:** If a firm cannot hedge a specific currency, it can use a forward contract on a currency that is highly correlated with the currency of concern.

18. **Currency Diversification.** Explain how a firm can use currency diversification to reduce transaction exposure.

**ANSWER:** If a firm has net inflows in a variety of currencies that are not highly correlated with each other, exposure is not as great as if the equivalent amount of funds were denominated in a single currency. This is because not all currencies will depreciate against the firm’s home currency simultaneously by the same degree. There may be a partial offsetting effect due to a diversified set of inflow currencies.

If the firm has net outflows in a variety of currencies, the same argument would apply.

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:

<table>
<thead>
<tr>
<th>Future Spot Rate</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>.44</td>
<td>30%</td>
</tr>
<tr>
<td>.40</td>
<td>50</td>
</tr>
<tr>
<td>.38</td>
<td>20</td>
</tr>
</tbody>
</table>

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

**ANSWER:**

<table>
<thead>
<tr>
<th>Possible Spot Rate</th>
<th>Put Option Premium</th>
<th>Exercise Option?</th>
<th>Amount per Unit Received Accounting for Premium</th>
<th>Total Amount Received for NZS250,000</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>.44</td>
<td>.03</td>
<td>Yes</td>
<td>.46</td>
<td>$115,000</td>
<td>30%</td>
</tr>
<tr>
<td>.40</td>
<td>.03</td>
<td>Yes</td>
<td>.46</td>
<td>$115,000</td>
<td>50%</td>
</tr>
<tr>
<td>.38</td>
<td>.03</td>
<td>Yes</td>
<td>.46</td>
<td>$115,000</td>
<td>20%</td>
</tr>
</tbody>
</table>

The probability distribution represents a 100% probability of receiving $115,000, based on the forecasts of the future spot rate of the NZ$. 

**International Financial Management**
Chapter 11: Managing Transaction Exposure

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.

**ANSWER:** The nominal cost when hedging Australian dollar payables would have been below the nominal cost of payables on an unhedged basis during the weak dollar period, because the Australian dollar substantially appreciated during this period. Thus, the real cost of hedging would have been negative during the period. This implies that the Australian dollar’s forward rate consistently underestimated the Australian dollar’s future spot rate during the period and was therefore biased.

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.

**ANSWER:** It would be equally favorable (assuming no transactions costs). If IRP exists, the forward premium on the forward rate would reflect the interest rate differential. The hedging of future payables with a forward purchase provides the same results as borrowing at the home interest rate and investing at the foreign interest rate to hedge euro payables.

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.

**ANSWER:** During the weak dollar period, the yen appreciated substantially against the dollar. Thus, the dollars received from hedging yen receivables would have been less than the dollars received if the yen receivables were not hedged. This implies that the real cost of hedging yen receivables would have been positive during the weak dollar period.

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.

**ANSWER:** If the forward rate is close to or exceeds today’s spot rate, the forward hedge would be preferable because the call option hedge would require a premium to achieve about the same locked-in exchange rate. If the forward rate was much lower than today’s spot rate, the call option could be preferable because the firm could let the option expire and be better off.

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.

**ANSWER:** A put option would be preferable because it gives you the flexibility to exchange pounds for dollars at the prevailing spot rate when receiving payment.

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.

ANSWER: A Malaysian firm can purchase dollars forward with ringgit, which locks in the exchange rate at which it trades its ringgit for dollars.

The French firm could purchase euros forward with dollars.

The British firm can negotiate a forward contract with a bank to exchange pounds for yen at a future point in time.

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 three-month forward contract three 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.

ANSWER: No! Cornell is exposed to exchange rate risk over time because the forward rate changes over time. If the euro appreciates, the forward rate of the euro will likely rise over time, which increases the necessary payment by Cornell.

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.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Spot Rate of Pound 90 Days from Now</th>
<th>Exercise Price = $1.74; Premium = $.06</th>
<th>Exercise Price = $1.76; Premium = $.05</th>
<th>Exercise Price = $1.79; Premium = $.03</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1.65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1.85</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Spot Rate of Pound 90 Days from Now</th>
<th>Exercise Price = $1.74; Premium = $ .06</th>
<th>Exercise Price = $1.76; Premium = $ .05</th>
<th>Exercise Price = $1.79; Premium = $ .03</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1.65</td>
<td>$171,000</td>
<td>$170,000</td>
<td>$168,000</td>
</tr>
<tr>
<td>2</td>
<td>1.70</td>
<td>176,000</td>
<td>175,000</td>
<td>173,000</td>
</tr>
<tr>
<td>3</td>
<td>1.75</td>
<td>180,000</td>
<td>180,000</td>
<td>178,000</td>
</tr>
<tr>
<td>4</td>
<td>1.80</td>
<td>180,000</td>
<td>181,000</td>
<td>182,000</td>
</tr>
<tr>
<td>5</td>
<td>1.85</td>
<td>180,000</td>
<td>181,000</td>
<td>182,000</td>
</tr>
</tbody>
</table>

The option with the $.03 premium is slightly better than the other two options, on average.

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.


ANSWER: Wedco avoids transaction exposure but not economic exposure. If the euro weakens against the dollar, European customers would have to pay more for Wedco’s materials. This may encourage the customers to purchase their materials from other firms.

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?

ANSWER: Telematics International, Inc. has sales to European customers, which are denominated in British pounds. While Telematics’ pound receivables are hedged, the forward rate changes over time and is somewhat dependent on the spot rate at the time. Telematics may consider remaining unhedged whenever it expects the pound to appreciate.

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 the exports in dollars but that it is still would 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 deal with this dilemma to reduce its exposure over the long-term?

ANSWER: If it expects that the weakness of the peso over time is attributed to high inflation in Mexico, it may be able to increase its price (in pesos) for its exports. That is, it may retain its sales at the higher peso price if its competitors have increased their prices. This strategy may offset the weakness of the peso, so that it could generate the same dollar cash flows.
If it is unable to increase its price due to competitive pressure, it should consider moving some of its production to Mexico. A portion of the peso revenue could be used to cover the expenses in pesos, so that it would have less exposure.

30. **Long-term Hedging.** Since Obisbo 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?

**ANSWER:** If Obisbo Inc. hedges one year in advance, the forward rate negotiated at the beginning of each year will be based on the spot rate of the yen (and the difference between the Japanese interest rate and U.S. interest rate) at the beginning of that year. Thus, the forward rate at which the hedge occurs each year could be quite volatile. Obisbo Inc. would remove uncertainty for one year in advance but there is still much uncertainty about 2 or 5 years in advance. The more distant the timing of remittances, the more uncertainty there is about the cash flows. It could create a hedge today (a currency swap agreement or a set of forward contract) to hedge the next 20 years, but it will have to estimate the earnings that need to be hedged in each of those years, which is very complicated and subject to much error.

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?

**ANSWER:** The weakness of the Asian currencies would cause the Asian importers to reduce their demand for U.S. products, because these imports from the U.S. would have cost more due to the Asian currency depreciation.

It might have invoiced the exports in the Asian currencies so that the Asian customers would not be subjected to higher costs when their currencies depreciated, but it would also have hedged its receivables over the Asian crisis period to insulate against the expected depreciation of the Asian currencies.

### 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:

<table>
<thead>
<tr>
<th>Future Spot Rate</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$.61</td>
<td>20%</td>
</tr>
<tr>
<td>.63</td>
<td>50</td>
</tr>
<tr>
<td>.67</td>
<td>30</td>
</tr>
</tbody>
</table>
Assume that one-year put options on Singapore dollars are available, with an exercise price of $0.63 and a premium of $0.04 per unit. One-year call options on Singapore dollars are available with an exercise price of $0.60 and a premium of $0.03 per unit. Assume the following money market rates:

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit rate</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td>Borrowing rate</td>
<td>9</td>
<td>6</td>
</tr>
</tbody>
</table>

Given this information, determine whether a forward hedge, 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.

**ANSWER:**

**Forward hedge**
Sell S$500,000 × $0.62 = $310,000

**Money market hedge**
1. Borrow S$471,698 (S$500,000/1.06 = S$471,698)
2. Convert S$471,698 to $283,019 (at $0.60 per S$)
3. Invest the $283,019 at 8% to earn $305,660 by the end of the year

**Put option hedge** (Exercise price = $0.63; premium = $0.04)

<table>
<thead>
<tr>
<th>Possible Spot Rate</th>
<th>Option Premium per Unit</th>
<th>Option Exercise</th>
<th>Amount Received per Unit (also accounting for premium)</th>
<th>Total Amount Received for S$500,000</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$.61</td>
<td>$.04</td>
<td>Yes</td>
<td>$.59</td>
<td>$295,000</td>
<td>20%</td>
</tr>
<tr>
<td>$.63</td>
<td>$.04</td>
<td>Yes or No</td>
<td>$.59</td>
<td>$295,000</td>
<td>50%</td>
</tr>
<tr>
<td>$.67</td>
<td>$.04</td>
<td>No</td>
<td>$.63</td>
<td>$315,000</td>
<td>30%</td>
</tr>
</tbody>
</table>

The forward hedge is superior to the money market hedge and has a 70% chance of outperforming the put option hedge. Therefore, the forward hedge is the optimal hedge.

**Unhedged Strategy**

<table>
<thead>
<tr>
<th>Possible Spot Rate</th>
<th>Total Amount Received for S$500,000</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$.61</td>
<td>$305,000</td>
<td>20%</td>
</tr>
<tr>
<td>$.63</td>
<td>$315,000</td>
<td>50%</td>
</tr>
<tr>
<td>$.67</td>
<td>$335,000</td>
<td>30%</td>
</tr>
</tbody>
</table>

When comparing the optimal hedge (the forward hedge) to no hedge, the unhedged strategy has an 80% chance of outperforming the forward hedge. Therefore, the firm may desire to remain unhedged.
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.

ANSWER:

**Forward hedge**
Purchase S$1,000,000 one year forward:
S$1,000,000 × $.62 = $620,000

**Money market hedge**
1. Need to invest S$952,381 (S$1,000,000/1.05 = S$952,381)
2. Need to borrow $571,429 (S$952,381 × $.60 = $571,429)
3. Will need $622,857 to repay the loan in one year ($571,429 × 1.09 = $622,857)

**Call option hedge** (Exercise price = $.60; premium = $.03)

<table>
<thead>
<tr>
<th>Possible Spot Rate</th>
<th>Option Premium per Unit</th>
<th>Exercise Option?</th>
<th>Amount Paid per Unit (including the premium)</th>
<th>Total Amount Paid for S$1,000,000</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$.61</td>
<td>$.03</td>
<td>Yes</td>
<td>$.63</td>
<td>$630,000</td>
<td>20%</td>
</tr>
<tr>
<td>.63</td>
<td>.03</td>
<td>Yes</td>
<td>.63</td>
<td>630,000</td>
<td>50</td>
</tr>
<tr>
<td>.67</td>
<td>.03</td>
<td>Yes</td>
<td>.63</td>
<td>630,000</td>
<td>30</td>
</tr>
</tbody>
</table>

The optimal hedge is the forward hedge.

**Unhedged Strategy**

<table>
<thead>
<tr>
<th>Possible Spot Rate</th>
<th>Total Amount Paid for S$500,000</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$.61</td>
<td>$610,000</td>
<td>20%</td>
</tr>
<tr>
<td>.63</td>
<td>630,000</td>
<td>50</td>
</tr>
<tr>
<td>.67</td>
<td>670,000</td>
<td>30</td>
</tr>
</tbody>
</table>

The forward hedge is preferable to the unhedged strategy because there is an 80 percent chance that it will outperform the unhedged strategy and may save the firm as much as $50,000.

33. Comparison of Techniques for Hedging Payables. SMU Corp. has future receivables of 4,000,000 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
Chapter 11: Managing Transaction Exposure

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>New Zealand</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-year deposit rate</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>One-year borrowing rate</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>

Forecasted spot rate of NZ$

<table>
<thead>
<tr>
<th>Rate</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$.50</td>
<td>20%</td>
</tr>
<tr>
<td>.51</td>
<td>50</td>
</tr>
<tr>
<td>.53</td>
<td>30</td>
</tr>
</tbody>
</table>

ANSWER:

**Put option hedge** (Exercise price = $.52; premium = $.03)

<table>
<thead>
<tr>
<th>Possible Spot Rate</th>
<th>Put Option Premium</th>
<th>Exercise Option?</th>
<th>Amount per Unit Received (also accounting for premium)</th>
<th>Total Amount Received for NZ$4,000,000</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$.50</td>
<td>$.03</td>
<td>Yes</td>
<td>$.49</td>
<td>$1,960,000</td>
<td>20%</td>
</tr>
<tr>
<td>$.51</td>
<td>$.03</td>
<td>Yes</td>
<td>$.49</td>
<td>$1,960,000</td>
<td>50%</td>
</tr>
<tr>
<td>$.53</td>
<td>$.03</td>
<td>No</td>
<td>$.50</td>
<td>$2,000,000</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Money market hedge**

1. Borrow NZ$3,703,704 (NZ$4,000,000/1.08 = NZ$3,703,704)
2. Convert NZ$3,703,704 to $2,000,000 (at $.54 per New Zealand dollar)
3. Invest $2,000,000 to accumulate $2,180,000 at the end of one year ($2,000,000 × 1.09 = $2,180,000)

The money market hedge is superior to the put option hedge.

34. **Exposure to September 11.** If you were a U.S. importer of products from Europe, explain whether the September 11, 2001 terrorist attack on the U.S. 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.

**ANSWER:** The attack would have caused expectations of weak U.S. stock prices and lowered U.S. interest rates, which could have reduced capital flows into the U.S. and reduced the value of the dollar. If the dollar weakened, this would adversely affect U.S. importing firms. If you expected that the dollar would strengthen as a result of the terrorist attack (due to a weak economy and lower inflation reducing the U.S. demand for foreign products), then U.S. importers would not be adversely affected by the exchange rate movements, and you would not have hedged your position.

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:

\[ e_t = a_0 + a_1 \text{DINF}_{t-1} + a_2 \text{DINT}_t + u \]

where \( e_t \) = percentage change in British pound value over period \( t \)

\( \text{DINF}_{t-1} \) = differential in inflation between the United States and the United Kingdom in period \( t-1 \)

\( \text{DINT}_t \) = average differential between U.S. interest rate and British interest rate over period \( t \)

\( a_0, a_1, \) and \( a_2 \) = regression coefficients

\( u \) = 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 (\( \text{DINT}_t \)) is forecasted as follows for this year:

<table>
<thead>
<tr>
<th>Forecast of DINT (_t)</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>40%</td>
</tr>
<tr>
<td>2%</td>
<td>50%</td>
</tr>
<tr>
<td>3%</td>
<td>10%</td>
</tr>
</tbody>
</table>

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

**Answer:**

\[ \text{Forecast of } e_t = 1.1(-5\%) + .6(1\%) = -4.9\% \]

\[ \text{Forecast of } e_t = 1.1(-5\%) + .6(2\%) = -4.3\% \]

\[ \text{Forecast of } e_t = 1.1(-5\%) + .6(3\%) = -3.7\% \]

<table>
<thead>
<tr>
<th>Forecast of DINT (_t)</th>
<th>Forecast of e (_t)</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>-4.9%</td>
<td>40%</td>
</tr>
<tr>
<td>2%</td>
<td>-4.3%</td>
<td>50%</td>
</tr>
<tr>
<td>3%</td>
<td>-3.7%</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Approximate Forecast of Pound in One Year**

\[ 1.62 \times [1 + (-4.9\%)] = $1.54 \]

\[ 1.62 \times [1 + (-4.3\%)] = $1.55 \]

\[ 1.62 \times [1 + (-3.7\%)] = $1.56 \]

<table>
<thead>
<tr>
<th>Forecast of e (_t)</th>
<th>Forecasted Spot Rate of Pound in One Year</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4.9%</td>
<td>$1.54</td>
<td>40%</td>
</tr>
<tr>
<td>-4.3%</td>
<td>$1.55</td>
<td>50%</td>
</tr>
<tr>
<td>-3.7%</td>
<td>$1.56</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Put option hedge** (Exercise price = $1.61; premium = $.04)
### Chapter 11: Managing Transaction Exposure

#### Table

<table>
<thead>
<tr>
<th>Possible Spot Rate of Pound in One Year (derived above)</th>
<th>Amount Received per Unit (accounting for premium)</th>
<th>Total Amount Received for One Million Pounds</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.54</td>
<td>$1.57</td>
<td>$1,570,000</td>
<td>40%</td>
</tr>
<tr>
<td>1.55</td>
<td>$1.57</td>
<td>1,570,000</td>
<td>50</td>
</tr>
<tr>
<td>1.56</td>
<td>$1.57</td>
<td>1,570,000</td>
<td>10</td>
</tr>
</tbody>
</table>

**Forward hedge**

Sell 1,000,000 pounds one year forward:

\[1,000,000 \text{ pounds} \times \$1.59 = \$1,590,000\]

The forward hedge is preferable to the put option hedge.

#### 36. Hedging Decision

You believe that IRP presently exists. The nominal annual interest rate in Mexico is 14%. The nominal annual interest rate in the U.S. is 3%. You expect that annual inflation will be about 4% in Mexico and 5% in the U.S. 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 $0.014 per unit.

You will receive 1 million pesos in one year.

a. Determine the amount of dollars that you will receive if you use a forward hedge.

**ANSWER:** According to IRP, the forward premium on the peso should be \((1.03)/(1.14) – 1 = –0.0965\) or \(-9.65\%\)

Thus, the forward rate is:

\[\$0.10 \times [1 + (-0.0965)] = \$0.09035\]. To hedge 1 million pesos, you would receive $90,350.

b. Determine the expected amount of dollars that you will receive if you do not hedge and believe in purchasing power parity (PPP).
ANSWER: The expected percentage change in the Mexican peso according to PPP is:

\[
\frac{1 + .05}{1 + .04} - 1 = 0.96\%.
\]
Thus, the peso’s spot rate is expected to be:

\[
.10 \times (1.0096) = .10096
\]

You would receive \(1,000,000 \times .10096 = 100,960\)

c. Determine the amount of dollars that you will expect to receive if you use a currency put option hedge. Account for the premium you would pay on the put option.

ANSWER: Since the expected spot rate is $.10096 based on PPP, you could receive $.10096 per unit when you receive the pesos. This amount is higher than the exercise price, so you would sell the pesos at this rate rather than exercise the option. You would have paid a premium of $.0014 per unit, so you would receive $.09956 per unit ($.10096 – $.0014). Your receivables would convert to \(1,000,000 \times .09956 = 99,560\).

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 can not obtain a forward contract to hedge its receivables at this time. However, in three months, it will be able to obtain a one-year (12-month) forward contract to hedge its receivables. Today the three-month U.S. interest rate is 2% (not annualized), the 12-month U.S. interest rate is 8%, the three-month Mexican peso interest rate is 5% (not annualized), and the 12-month peso interest rate is 20%. 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.

ANSWER:

Expected Peso value in 3 months = \(1.02/1.05 = .9714\) \(\Rightarrow\) 
\[.9714 \times .10 = .09714\]

Expected 1-year FR prem in 3 months = \((1.08/1.2) - 1 = -10\%\)

Expected one-year FR in 3 months = \(.09714 \times .9 = .087426\)

Expected amount to be received from hedging = \(.087426 \times 10\) million pesos = \$874,260

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 U.S. will be 3%, versus 5% in the U.K. There is an 80% chance of that scenario. However, you think that oil prices could rise, and if so, the annual U.S. inflation rate will be 8% instead of 3% (and the annual U.K. inflation will still be 5%). There is a 20% 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 U.S. is 6% versus an annual interest rate in the U.K. of 8%. 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 U.S. 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?

**ANSWER:** The results of the regression analysis and the forecasts of the future inflation rates can be used to derive the percentage change in the value of the British pound: \(0 + 1.4 \times (3\% - 5\%) = -2.8\% \text{ [80\% probability]}.\)

In this scenario, the exchange rate will be $1.7496.

In the second scenario, the forecast is \(0 + 1.4 \times (8\% - 5\%) = 4.2\% \text{ [20\% probability]}\). If this scenario occurs, exchange rate will be $1.8756.

**Unhedged strategy:**

<table>
<thead>
<tr>
<th>Possible Spot Rate in One Year</th>
<th>Probability</th>
<th>Cost of Payables</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.7496</td>
<td>80.00%</td>
<td>$1,496,600</td>
</tr>
<tr>
<td>$1.8756</td>
<td>20.00%</td>
<td>$1,875,600</td>
</tr>
</tbody>
</table>

**Money market hedge:**

To receive £1,000,000 at the end of the year, invest £935,926 now:

\[\text{£1,000,000}/(1 + 0.08) = £925,926}\]

Based on existing spot rate, need to borrow:

\[(£925,926 \times 1.8) = $1,666,667 \text{ from U.S. bank}\]

Repay the U.S. loan in one year plus interest:

\[1,666,667 \times 1.06 = $1,766,667\]

**Call option hedge:**

Scenario 1: Call options will not be exercised. When including the premium of $.03 per unit, the cost is $1.7796 per unit.

Scenario 2: Call options will be exercised at an exercise price of $1.79. When including the premium of $.03 per unit, the cost is $1.82 per unit.
Possible Spot Rate in One Year | Probability | Cost of Hedging £1,000,000 (including the option premium)
--- | --- | ---
1.7496 | 80.00% | $1,779,600
1.8756 | 20.00% | $1,820,000

Decision: The optimal hedge is the money market hedge.

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 dollar, and is presently worth $.03. Virginia Co. expects that during this year, the U.S. inflation rate will be 2%, the Thailand inflation rate will be 11%, while the Hong Kong inflation rate will be 3%. 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 U.S. is presumed to be 1.0%, while the real interest rate in Thailand is presumed to be 3.0%. 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.

**ANSWER:**

a. \((1.02/1.11) - 1 = -8.11\%\)

\[ .03 \times (1 - .0811) = .0275675 \]

10 million baht = $275,675

b. Cross rate of HK$ = $.13/$.0275675 = 4.7157baht per HK$ or HK$1m \times 4.7157 = 4,715,700 baht

c. \((1.03/1.14) - 1 = -.0964\) so FR = $.03 \times (1 - .0964) = .0271

Amount to be received = 10 million baht \times .0271 = $271,052

40. **Hedging Decision.** Chicago Company 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 U.S. is 8% versus an annual interest rate of 5% in the eurozone. 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?

**ANSWER:**

**Calculation of Forward Rate:**

<table>
<thead>
<tr>
<th>Calculation of Forward Rate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot Rate</td>
</tr>
<tr>
<td>U.S. Interest Rate</td>
</tr>
<tr>
<td>Euro Interest Rate</td>
</tr>
<tr>
<td>( p = 0.028571429 )</td>
</tr>
<tr>
<td>Forward Rate =</td>
</tr>
</tbody>
</table>

**Option a: Remain Unhedged**

<table>
<thead>
<tr>
<th>Option a: Remain Unhedged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future Spot Rate</td>
</tr>
<tr>
<td>Amount of Euros to Convert</td>
</tr>
<tr>
<td>Cash flow</td>
</tr>
</tbody>
</table>

**Option b: Money Market Hedge**

<table>
<thead>
<tr>
<th>Option b: Money Market Hedge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of Receivables</td>
</tr>
<tr>
<td>Interest Rate to Borrow Euros</td>
</tr>
<tr>
<td>Amount in Euros Borrowed</td>
</tr>
<tr>
<td>$ Received from Converting</td>
</tr>
<tr>
<td>U.S. Deposit Rate</td>
</tr>
<tr>
<td>$ Accumulated After 1 Year</td>
</tr>
<tr>
<td>Cash Flow</td>
</tr>
</tbody>
</table>

**Option c: Put Option Hedge**

<table>
<thead>
<tr>
<th>Option c: Put Option Hedge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Price</td>
</tr>
<tr>
<td>Future Spot Rate</td>
</tr>
<tr>
<td>Premium per Unit</td>
</tr>
<tr>
<td>Exercise Option?</td>
</tr>
<tr>
<td>Amount of Receivables</td>
</tr>
<tr>
<td>Received per Unit</td>
</tr>
<tr>
<td>Cash Flow</td>
</tr>
</tbody>
</table>

The money market hedge and unhedged strategy achieve the same outcome, which is more favorable than the put option strategy.
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 3 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, and 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.

**ANSWER:**

**Part b.**

<table>
<thead>
<tr>
<th>Price per Load of Supplies (C$)</th>
<th>1,000,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loads of Supplies Needed</td>
<td>3</td>
</tr>
<tr>
<td>Total C$ Needed</td>
<td>3,000,000</td>
</tr>
</tbody>
</table>

| Spot Rate                       | $0.62     |
| 1-Year Forward Rate             | $0.64     |
| Spot Rate at End of 1 Year      | $0.59     |

**Calculations:**

\[
\text{Cash Flows}
\]

\[
\text{Total C$ Needed} \times \text{Forward Rate} = \text{U.S. $ Needed}
\]

\[
3,000,000 \times 0.64 = 1,920,000
\]

\[
\text{C$ Left After 1 Load of Supplies} \times \text{Spot Rate at End of 1 Year} = \text{U.S. $ Left After Purchase}
\]

\[
2,000,000 \times 0.59 = 1,180,000
\]

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%, regardless of the debt maturity. The annual peso interest rate is 9% 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.
ANSWER: Since interest rate parity exists, determine the forward rate premium based on existing interest rates:

\[ p = \frac{(1 + i_h)}{(1 + i_f)} - 1 \]
\[ p = \frac{(1.04)^3}{(1.09)^3} - 1 \]
\[ = \frac{1.124864}{1.29503} - 1 \]
\[ = -0.1314 \text{ or } -13.14\% \]

The 3-year forward rate is $0.10 \times (1 - 0.1314) = 0.08686$

When the forward contract is executed in three years, Tampa co. will receive $900,000,000$ pesos $\times 0.0868 = 78,174,000$.

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 $0.50. 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 three months. The Singapore dollar’s spot rate remained at $0.50 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 you expect that 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.

ANSWER: More than, because there is an option premium on options and the expectation is that the future spot rate will be no higher than today’s forward rate. The option is at the money so the exercise price is same as expected spot rate but you have to pay option premium.

44. Hedging With Forward Versus Option Contracts. Assume that interest parity exists. Today, the one-year interest rate in Canada is the same as the one-year interest rate in the U.S. 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.

ANSWER: The forward contract does not require an option premium. The forward rate is same as exercise price in this example, so the forward rate will be cheaper. The option could have a lower expected cost if the future spot rate is lower than the forward rate by an amount that offsets the premium paid for the option.

45. Hedging With a Bullspread. (See the chapter appendix.) Evar Imports Inc. buys chocolate from Switzerland and resells it in the U.S. 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 $0.74. Also assume that three call options for the franc are available. The first option has a strike price of $0.74 and a premium of $0.03; the second option has a strike price of $0.77 and a premium of $0.01; the third option has a strike price of $0.80 and a premium of $0.006. Evar Imports is concerned about a modest appreciation in the Swiss franc.
a. Describe how Evar Imports could construct a bullspread 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 bullspread 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 bullspread using call options with a higher exercise price?

ANSWER:

a. Evar Imports Inc. would buy the first option and write the second option. It would pay SF62,500 × ($0.03 – $0.01) = $1,250. The hedge is the most effective if the future spot rate of the franc is between the two exercise prices of $0.74 and $0.77. In this range, Evar Imports Inc. would benefit from both options. The hedge is the least effective when the future spot price is greater than the higher exercise price of $0.77. In this case, Imports could have hedged more effectively by only purchasing options of the first type to hedge, which would minimize its opportunity costs.

b. Evar Imports Inc. would buy the first option and write the third option. It would pay SF62,500 × ($0.03 – $0.006) = $1,500. The hedge is the most effective if the future spot rate of the franc is between the two exercise prices of $0.74 and $0.80. In this range, Imports would benefit from both options. The hedge is the least effective when the future spot price is greater than the higher exercise price of $0.80. In this case, Imports could have hedged more effectively by only purchasing options of the first type to hedge, which would minimize its opportunity costs.

c. Constructing a bullspread with a higher exercise price is more expensive. However, the range in which the hedge is effective is wider and the opportunity costs are minimized.

46. Hedging with a Bearspread. (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 $0.75. Two call options on Canadian dollars are available. The first option has an exercise price of $0.72 and a premium of $0.03. The second option has an exercise price of $0.74 and a premium of $0.01. Marson Inc. would like to use a bearspread 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 $0.73 in one month.

a. Describe how Marson Inc. could use a bearspread to hedge its position.

b. Assume the spot rate of the Canadian dollar in one month is $0.73. Was the hedge effective?

ANSWER:

a. Marson Inc. would construct a bearspread by writing the option with the $0.72 exercise price and buying the option with the $0.74 exercise price to construct the bearspread.

b. If the spot rate of the Canadian dollar is $0.73 in one month, the hedge would have been successful. Marson would have received C$50,000 × ($0.03 – $0.01) = $1,000 from establishing the bearspread. However, the buyer of the first option would exercise it, and Marson would have to sell the receivables for the strike price of $0.72. This would result in a total cash flow of C$50,000 × $0.72 + $1,000 = $37,000. If Marson Inc. had not hedged, it would receive C$50,000 × $0.73 = $36,500 from selling the Canadian dollars at the spot rate.
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 three months. It is also possible that Brooks will receive 4 million dirham in three months from the sale of refinished wood in Morocco. Brooks is currently in negotiations with a Moroccan importer about the refinished wood. If the negotiations are successful, Brooks will receive 4 million dirham in three 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 negotiations 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.

**ANSWER:**

a. Brooks could construct a long straddle to hedge its positions in dirham. If the negotiations are successful, the put options will hedge the $2 million in receivables. If the negotiations are not successful, the call options will hedge the payables. To construct a long straddle, Brooks would buy four put options and four call options.

b. The net cash flow can be calculated as follows:

\[
\text{Net Cash Flow} = +2 \text{ million Dirham}
\]

<table>
<thead>
<tr>
<th>Dirham value = $.11 in three months</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{Net receipt} = (2 \text{ million} \times $.11) + (2 \text{ million} \times [$.11 - $.098]) - (2 \text{ million} \times [$.003 + $.002]) = $234,000)</td>
</tr>
</tbody>
</table>

* Brooks converts excess dirham to dollars in the spot market.
* It lets the put option expire.
* It exercises its call options and sells the dirham obtained from this transaction in the spot market; the proceeds recapture part of the premiums that were paid to for the options.
### Net Cash Flow = +2 million Dirham

<table>
<thead>
<tr>
<th>Dirham value = $.08 in three months</th>
<th>* Brooks converts excess dirham to dollars at $.098, by exercising its put options. *It lets the call option expire.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net receipt = (2 million × $.098) – (2 million × [.003 + .002]) = $186,000</td>
<td>*Brooks converts excess dirham to dollars in the spot market. *It lets its call options and its put options expire.</td>
</tr>
</tbody>
</table>

### Net Cash Flow = −2 million Dirham

<table>
<thead>
<tr>
<th>Dirham value = $.11 in three months</th>
<th>* Brooks converts dollars to dirham by exercising its call options. *It lets the put option expire.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net payment = (2 million × $.098) + (2 million × [.003 + .002]) = $206,000</td>
<td>* Brooks converts dirham to dollars in the spot market. *It lets the call option expire. *It buys dirham in the spot market and sells dirham obtained by exercising the put options; the proceeds recapture part of the premiums that were paid for the options.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dirham value = $.08 in three months</th>
<th>* Brooks converts dirham to dollars in the spot market. *It lets its call and put options expire.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net payment = (2 million × $.08) – (2 million × [.098 − .08]) + (2 million × [.003 + .002]) = $134,000</td>
<td>* Brooks converts dollars to dirham in the spot market. *Brooks lets its call and put options expire.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dirham value = $.098 in three months</th>
<th>* Brooks converts dollars to dirham by exercising its call options.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net payment = (2 million × $.098) + (2 million × [.003 + .002]) = $206,000</td>
<td>* Brooks converts dirham to dollars in the spot market.</td>
</tr>
</tbody>
</table>

### 48. Hedging with Straddles versus Strangles.

Refer to the previous problem. Assume that Brooks believes the cost of a long straddle is too high. However, call options on 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?

**Answer:**

Brooks could construct a long strangle in dirham by buying four call options and buying four put options with different exercise prices. Due to the relationship between the exercise price and option premiums, Brooks would pay less for the long strangle. For the straddle in the previous problem, Brooks paid 2 million × (.003 + .002) = $10,000. For the long strangle, it would pay 2 million × (.002 + .001) = $6,000.
The tradeoff in using a long strangle to hedge is that the strangle does not offer protection until the spot rate deviates substantially. If the spot rate remains between $.09 and $.105 by the expiration date, Brooks will not exercise either option. Thus, the long strangle does not hedge for future spot rates between $.09 and $.105. However, Brooks is hedged outside of this range; it will not have to pay more than $.105 for the dirham and will be able to sell the dirham for at least $.09 if the negotiations are successful and it has cash inflows.

**Solution to Continuing Case Problem: Blades, Inc.**

1. 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?

   ANSWER: (See spreadsheet attached.) Based on the analysis, it appears that Blades should hedge its baht exposure. The money market hedge appears to be the most appropriate for Blades because it results in the highest dollar value for the net baht inflows. There is only a 20 percent chance that remaining unhedged will result in a higher dollar amount to be received in 90 days.

**Calculation of Net Baht Paid or Received in 90 Days:**

Baht-denominated inflow:

- Pairs sold × Revenue per pair = Number of baht received in 90 days
  - 45,000 × 4,594 = 206,730,000

Baht-denominated outflow:

- Pairs manufactured × Estimated cost per pair = Number of baht needed in 90 days
  - 18,000 × 3,000 = 54,000,000

Net inflow (outflow) in baht anticipated in 90 days

152,730,000

**Forward Hedge:**

Sell baht 90 days forward:

- Baht-denominated revenue − Forward rate of baht = Dollars to be received in 90 days
  - 152,730,000 − 0.0215 = 3,283,695.00

**Money Market Hedge:**

Borrow baht, convert to $, invest $, use receivables to pay off loan in 90 days:

- Amount in baht borrowed (152,730,000/1.04) = 146,855,769.20
- Dollars received from converting baht (146,855,769.20 × $0.023) = 3,377,682.69
- Dollars accumulated after 90 days (3,377,682.69 × 1.021) = 3,448,614.03
**Remain Unhedged:**

<table>
<thead>
<tr>
<th>Possible Spot Rate in 90 Days ($)</th>
<th>Total Dollars Received from Converting Baht</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0200</td>
<td>3,054,600</td>
</tr>
<tr>
<td>0.0213</td>
<td>3,253,149</td>
</tr>
<tr>
<td>0.0217</td>
<td>3,314,241</td>
</tr>
<tr>
<td>0.0220</td>
<td>3,360,060</td>
</tr>
<tr>
<td>0.0230</td>
<td>3,512,790</td>
</tr>
<tr>
<td>0.0235</td>
<td>3,589,155</td>
</tr>
</tbody>
</table>

2. 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?

**ANSWER:** (See spreadsheet attached.) Based on the analysis, it appears that Blades should hedge its pound exposure. The money market hedge appears to be the most appropriate for Blades, because it results in the highest dollar value for the pound inflows. There is no chance that the option hedge will result in a higher dollar amount to be received in 90 days than the money market hedge, and only a 5 percent chance that remaining unhedged will result in a higher dollar amount than the money market hedge.

**Calculation of Pounds Received in 90 Days:**

Pound-denominated inflow:
- Pairs sold × Revenue per pair = Number of pounds received in 90 days
  - 50,000 × 80 = 4,000,000

**Forward Hedge:**

- Sell pounds 90 days forward:
  - Pound-denominated revenue × Forward rate of pound = Dollars to be received in 90 days
  - 4,000,000 × 1.4900 = 5,960,000.00

**Money Market Hedge:**

- Borrow pounds, convert to $, invest $, use receivables to pay off loan in 90 days:
  - Amount in pounds borrowed (4,000,000/1.02) × $1.50 = Dollars received from converting pounds
  - 3,921,568.63 × 1.50 = 5,882,352.94
  - Dollars accumulated after 90 days (5,882,352.94 × 1.021) = 6,005,882.35
**Put Option Hedge:**

Purchase put option:

<table>
<thead>
<tr>
<th>Possible Spot Rate in 90 Days ($)</th>
<th>Premium per Unit Paid for Option ($)</th>
<th>Exercise Option?</th>
<th>Total Dollars Received per Unit (after accounting for the premium)</th>
<th>Total Dollars Received from Converting 4,000,000 Pounds</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.45</td>
<td>$0.02</td>
<td>Y</td>
<td>$1.45</td>
<td>$5,800,000</td>
<td>5%</td>
</tr>
<tr>
<td>1.47</td>
<td>0.02</td>
<td>Y</td>
<td>1.45</td>
<td>5,800,000</td>
<td>20%</td>
</tr>
<tr>
<td>1.48</td>
<td>0.02</td>
<td>N</td>
<td>1.46</td>
<td>5,840,000</td>
<td>30%</td>
</tr>
<tr>
<td>1.49</td>
<td>0.02</td>
<td>N</td>
<td>1.47</td>
<td>5,880,000</td>
<td>25%</td>
</tr>
<tr>
<td>1.50</td>
<td>0.02</td>
<td>N</td>
<td>1.48</td>
<td>5,920,000</td>
<td>15%</td>
</tr>
<tr>
<td>1.52</td>
<td>0.02</td>
<td>N</td>
<td>1.50</td>
<td>6,000,000</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Remain Unhedged:**

<table>
<thead>
<tr>
<th>Possible Spot Rate in 90 Days ($)</th>
<th>Total Dollars Received from Converting Pounds</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.45</td>
<td>$5,800,000</td>
<td>5%</td>
</tr>
<tr>
<td>1.47</td>
<td>5,880,000</td>
<td>20%</td>
</tr>
<tr>
<td>1.48</td>
<td>5,920,000</td>
<td>30%</td>
</tr>
<tr>
<td>1.49</td>
<td>5,960,000</td>
<td>25%</td>
</tr>
<tr>
<td>1.50</td>
<td>6,000,000</td>
<td>15%</td>
</tr>
<tr>
<td>1.52</td>
<td>6,080,000</td>
<td>5%</td>
</tr>
</tbody>
</table>

3. In general, do you think it is easier for Blades to hedge its inflows or its outflows denominated in foreign currencies? Why?

**ANSWER:** In general, it is easier for Blades to hedge its inflows denominated in foreign currencies. This is because Blades’ outflows are subject to two uncertain variables, the amount of the payables denominated in the foreign currency due to fluctuations in market prices and the future exchange rate. Since Blades has export agreements with its major customers, its dollar inflows are uncertain only because of exchange rate changes.

4. 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?

**ANSWER:** In this case, none of the hedges would require Blades, Inc. to overhedge. Usually, the put option hedge would require Blades to overhedge, since Ben Holt wishes to hedge the entire exposure and there are 31,250 pounds in a put option. In this case, however, Blades will receive 4,000,000 pounds in 90 days and will need to purchase 128 put options in order to exactly cover this exposure.

Given Blades’ exporting arrangements, it is not subject to overhedging using the money market hedge. Both the British and Thai retailers have entered into arrangements with Blades under which prices are fixed. Consequently, it is unlikely that the actual amount received in the future will differ from the expected amount.
5. Could Blades modify the timing of the Thai imports in order to reduce its transaction exposure? What is the tradeoff of such a modification?

ANSWER: Blades could import sufficient materials to completely offset the baht-denominated inflows this period. Since Blades will generate baht-denominated revenue of 45,000 \times 4,594 = THB206,730,000 this quarter, it could import materials sufficient to manufacture 206,730,000/3,000 = 68,910 pairs of Speedos in the current quarter. It could then instruct its Thai customer to make payment directly to the Thai supplier.

The tradeoff of accelerating the purchases from Thailand in order to reduce Blades’ transaction exposure this quarter is that the transaction exposure in subsequent quarters will be correspondingly higher. Furthermore, Blades’ inventory position will be very high this quarter, and it may incur additional expenses in order to accommodate the higher inventory.

6. 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?

ANSWER: Yes, Blades could modify its payment practices in order to reduce its transaction exposure in Thailand. Currently, Blades pays the Thai suppliers sixty days earlier than its competitors. If the Thai baht depreciates over these sixty days, lagging payment would result in a lower dollar cost for Blades.

The tradeoff resulting from lagging payments to the Thai suppliers is that Blades cannot use the baht-denominated costs to offset the baht-denominated revenue. This is because baht will be received and needed at different times. Consequently, Blades may have to hedge its exposure more often.

7. 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.

ANSWER: Blades has fixed-price exporting arrangements with both the Thai and British customers for the next two years. Furthermore, the timing of the resulting foreign currency inflows is known. Since long-term hedging techniques are particularly appropriate for firms that can accurately estimate their foreign currency payables or receivables that will occur in the future, Blades could benefit from long-term hedging techniques. For example, it could enter into long-term forward contracts for Thai baht and/or British pounds, swap currencies with another firm in the future, or agree to a parallel loan.

**Solution to Supplemental Case: Blackhawk Company**

This case uses actual data to show how inaccurate forecasts can be.

a. Using the regression model in which FSR is the dependent variable and FR is the independent variable, the slope coefficient is about .857 and the standard error of the coefficient is .0825. Therefore, the t-statistic in testing for a bias is:
Chapter 11: Managing Transaction Exposure

\[
 t = \frac{.857 - 1}{.0825} = -1.733
\]

Using a .05 level of significance, the bias is not significant.

b. There appears to be a bias, in that the use of the forward rate resulted in negative forecast errors (overestimation) over 7 of the first 9 quarters and then positive forecast errors (under-estimation) over 7 of the next 11 quarters.

c. The average absolute forecast error when using the forward rate is .02963.

d. Using the regression model in which FSR is the dependent variable and SR is the independent variable, the slope coefficient is about .8635 and the standard error of the coefficient is about .081. Therefore, the t-statistic in testing for a bias is:

\[
 t = \frac{.8635 - 1}{.081} = -1.685
\]

Using a .05 level of significance, the bias is not significant.

e. There appears to be a bias, in that the use of the spot rate resulted in negative forecast errors (overestimation) over the first 9 quarters and then positive forecast errors (under-estimation) over 7 of the next 11 quarters.

f. The average absolute forecast error when using the spot rate is .029815. The forward rate was slightly better, based on a lower absolute forecast error.

g. Using regression analysis, \( b_0 = .791 \) and \( b_1 = 4.333 \). It should be mentioned that the forecast based on regression analysis is prone to error, as the inflation differential did not explain much of the variation in PNZ$ over the 20 quarters. Since DIFF is assumed to be 2%, then the forecast of PNZ$ using the regression coefficients is:

\[
 PNZ$ = b_0 + b_1 \text{DIFF} \\
 = .791% + 4.333 (2\%) \\
= 9.457\%
\]

If the NZ$ rises by 9.457%, the FSR will be $ .589 (1.09457) = about $ .645. 
h. The probability distribution for FSR is:

<table>
<thead>
<tr>
<th>Probability</th>
<th>FSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>$.6450</td>
</tr>
<tr>
<td>40%</td>
<td>$.5878</td>
</tr>
<tr>
<td>20%</td>
<td>$.5890</td>
</tr>
</tbody>
</table>

i. The probability distribution for payments if Blackhawk does not hedge is:

<table>
<thead>
<tr>
<th>Probability</th>
<th>$ Amount Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>$516,000</td>
</tr>
<tr>
<td>40%</td>
<td>$470,240</td>
</tr>
<tr>
<td>20%</td>
<td>$471,200</td>
</tr>
</tbody>
</table>

j. The probability distribution for the real cost of hedging is determined below:

<table>
<thead>
<tr>
<th>Probability</th>
<th>$ Amount Needed if Hedged</th>
<th>$ Amount Needed if Unhedged</th>
<th>Real Cost of Hedging</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>$470,240</td>
<td>$516,000</td>
<td>-$45,760</td>
</tr>
<tr>
<td>40%</td>
<td>$470,240</td>
<td>$470,240</td>
<td>$0</td>
</tr>
<tr>
<td>20%</td>
<td>$470,240</td>
<td>$471,200</td>
<td>-$960</td>
</tr>
</tbody>
</table>

k. The probability distribution of payments when owning a call option is shown below:

<table>
<thead>
<tr>
<th>Probability</th>
<th>FSR</th>
<th>Exercise Option</th>
<th>$ Needed (incl. prem.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>.6450</td>
<td>Yes</td>
<td>$488,000</td>
</tr>
<tr>
<td>40%</td>
<td>.5878</td>
<td>No</td>
<td>$478,240</td>
</tr>
<tr>
<td>20%</td>
<td>.5890</td>
<td>No</td>
<td>$479,200</td>
</tr>
</tbody>
</table>

l. **Money market hedge**

Amount of NZ$ to invest = $800,000

\[
= \frac{800,000}{1.021} = \text{NZ$783,545}
\]

Amount of $ to borrow = \text{NZ$783,545} \times .589

\[
= 461,508
\]

Amount of $ needed to repay loan = $461,508 \times (1.025) = $473,046

The U.S. dollars that would be needed when using the forward hedge is NZ$800,000 \times .5878 = $470,420. This amount is less than the amount that would be needed when using the money market hedge.
m. The forward hedge would be preferable to the call option hedge because it would be cheaper for any of the three FSR scenarios.

n. The forward hedge is preferable to not hedging because it does as well or better than not hedging in all three FSR scenarios.

**Small Business Dilemma**

**Hedging Decisions by the Sports Exports Company**

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.

   **ANSWER:**
   Scenario I: A 3% rate of depreciation reflects a future spot rate (in one month) of:
   \[
   \$1.65 \times (1 - .03) = \$1.6005
   \]
   Dollars received = 10,000 \times \$1.6005 = \$16,005
   
   Scenario II: A 2% rate of appreciation reflects a future spot rate (in one month) of:
   \[
   \$1.65 \times (1 + .02) = \$1.683
   \]
   Dollars received = 10,000 \times \$1.683 = \$16,830

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.

   **ANSWER:**
   Scenario I: The put option would be hedged, resulting in the conversion of 10,000 pounds at an exchange rate of \$1.645:
   
   \[10,000 \times \$1.645 = \$16,450\]
   
   The cost of the premium paid for the put options is:
   
   \[10,000 \times .025 = \$250\]
   
   Thus, the amount of dollars received after accounting for the premium is:
   
   \[\$16,450 - \$250 = \$16,200\]
Scenario II: The put option would not be exercised, so that the pounds could be converted at the future spot rate of $1.683:

\[10,000 \times 1.683 = 16,830\]

Thus, the amount of dollars received after accounting for the put option premium is:

\[16,830 - 250 = 16,580\]

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.

**ANSWER:** The forward rate is $1.645. Therefore, the amount of dollars to be received regardless of the exchange rate scenario is:

\[10,000 \times 1.645 = 16,450\]

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.

**ANSWER:**

<table>
<thead>
<tr>
<th></th>
<th>Results Based on Scenario I</th>
<th>Results Based on Scenario II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unhedged Strategy</td>
<td>$16,005</td>
<td>$16,830</td>
</tr>
<tr>
<td>Option Hedge</td>
<td>$16,200</td>
<td>$16,580</td>
</tr>
<tr>
<td>Forward Hedge</td>
<td>$16,450</td>
<td>$16,450</td>
</tr>
</tbody>
</table>

Given that there is a 70% chance of Scenario I, the forward hedge appears to be the optimal choice. If Scenario II occurs, the unhedged strategy yields the best results. Yet, there is only a 30% chance that this scenario will occur.