QUESTIONS

1. How would you define transaction exposure? How is it different from economic exposure?

Answer: Transaction exposure is the sensitivity of realized domestic currency values of the firm’s contractual cash flows denominated in foreign currencies to unexpected changes in exchange rates. Unlike economic exposure, transaction exposure is well-defined and short-term.

2. Discuss and compare hedging transaction exposure using the forward contract vs. money market instruments. When do the alternative hedging approaches produce the same result?

Answer: Hedging transaction exposure by a forward contract is achieved by selling or buying foreign currency receivables or payables forward. On the other hand, money market hedge is achieved by borrowing or lending the present value of foreign currency receivables or payables, thereby creating offsetting foreign currency positions. If the interest rate parity is holding, the two hedging methods are equivalent.

3. Discuss and compare the costs of hedging via the forward contract and the options contract.

Answer: There is no up-front cost of hedging by forward contracts. In the case of options hedging, however, hedgers should pay the premiums for the contracts up-front. The cost of forward hedging, however, may be realized ex post when the hedger regrets his/her hedging decision.

4. What are the advantages of a currency options contract as a hedging tool compared with the forward contract?

Answer: The main advantage of using options contracts for hedging is that the hedger can decide whether to exercise options upon observing the realized future exchange rate. Options thus provide a hedge against ex post regret that forward hedger might have to suffer. Hedgers can only eliminate the downside risk while retaining the upside potential.
5. Suppose your company has purchased a put option on the euro to manage exchange exposure associated with an account receivable denominated in that currency. In this case, your company can be said to have an 'insurance' policy on its receivable. Explain in what sense this is so.

Answer: Your company in this case knows in advance that it will receive a certain minimum dollar amount no matter what might happen to the $/€ exchange rate. Furthermore, if the euro appreciates, your company will benefit from the rising euro.

6. Recent surveys of corporate exchange risk management practices indicate that many U.S. firms simply do not hedge. How would you explain this result?

Answer: There can be many possible reasons for this. First, many firms may feel that they are not really exposed to exchange risk due to product diversification, diversified markets for their products, etc. Second, firms may be using self-insurance against exchange risk. Third, firms may feel that shareholders can diversify exchange risk themselves, rendering corporate risk management unnecessary.

7. Should a firm hedge? Why or why not?

Answer: In a perfect capital market, firms may not need to hedge exchange risk. But firms can add to their value by hedging if markets are imperfect. First, if management knows about the firm's exposure better than shareholders, the firm, not its shareholders, should hedge. Second, firms may be able to hedge at a lower cost. Third, if default costs are significant, corporate hedging can be justifiable because it reduces the probability of default. Fourth, if the firm faces progressive taxes, it can reduce tax obligations by hedging which stabilizes corporate earnings.

8. Using an example, discuss the possible effect of hedging on a firm's tax obligations.

Answer: One can use an example similar to the one presented in the chapter.

9. Explain contingent exposure and discuss the advantages of using currency options to manage this type of currency exposure.

Answer: Companies may encounter a situation where they may or may not face currency exposure. In this situation, companies need options, not obligations, to buy or sell a given amount
of foreign exchange they may or may not receive or have to pay. If companies either hedge using forward contracts or do not hedge at all, they may face definite currency exposure.

10. Explain cross-hedging and discuss the factors determining its effectiveness.

Answer: Cross-hedging involves hedging a position in one asset by taking a position in another asset. The effectiveness of cross-hedging would depend on the strength and stability of the relationship between the two assets.

PROBLEMS

1. Cray Research sold a super computer to the Max Planck Institute in Germany on credit and invoiced €10 million payable in six months. Currently, the six-month forward exchange rate is $1.10/€ and the foreign exchange advisor for Cray Research predicts that the spot rate is likely to be $1.05/€ in six months.
   (a) What is the expected gain/loss from the forward hedging?
   (b) If you were the financial manager of Cray Research, would you recommend hedging this euro receivable? Why or why not?
   (c) Suppose the foreign exchange advisor predicts that the future spot rate will be the same as the forward exchange rate quoted today. Would you recommend hedging in this case? Why or why not?
   (d) Suppose now that the future spot exchange rate is forecast to be $1.17/€. Would you recommend hedging? Why or why not?

Solution:
(a) Expected gain($) = 10,000,000(1.10 – 1.05)
= 10,000,000(.05)
= $500,000.
(b) I would recommend hedging because Cray Research can increase the expected dollar receipt by $500,000 and also eliminate the exchange risk.
(c) Since Cray Research can eliminate risk without sacrificing dollar receipt, I still would recommend hedging.
(d) Now, hedging via forward contract involves an expected loss: -$700,000 = 10,000,000 (1.10 - 1.17). Hedging thus becomes much less attractive. But if Cray Research is highly risk averse, it
may still decide to hedge. The decision to hedge then critically depends on the firm’s degree of risk aversion.

2. IBM purchased computer chips from NEC, a Japanese electronics concern, and was billed ¥250 million payable in three months. Currently, the spot exchange rate is ¥105/$ and the three-month forward rate is ¥100/$. The three-month money market interest rate is 8 percent per annum in the U.S. and 7 percent per annum in Japan. The management of IBM decided to use the money market hedge to deal with this yen account payable.

(a) Explain the process of a money market hedge and compute the dollar cost of meeting the yen obligation.

(b) Conduct the cash flow analysis of the money market hedge.

Solution:
(a). Let’s first compute the PV of ¥250 million, i.e.,

\[
\frac{250m}{1.0175} = ¥245,700,245.70
\]

So if the above yen amount is invested today at the Japanese interest rate for three months, the maturity value will be exactly equal to ¥25 million which is the amount of payable.

To buy the above yen amount today, it will cost:

\[
2,340,002.34 = \frac{¥245,700,245.70}{105}.
\]

The dollar cost of meeting this yen obligation is $2,340,002.34 as of today.
(b)

<table>
<thead>
<tr>
<th>Transaction</th>
<th>CF₀</th>
<th>CF₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Buy yens spot</td>
<td>-$2,340,002.34</td>
<td></td>
</tr>
<tr>
<td>with dollars</td>
<td>¥245,700,245.70</td>
<td></td>
</tr>
<tr>
<td>2. Invest in Japan</td>
<td>- ¥245,700,245.70</td>
<td>¥250,000,000</td>
</tr>
<tr>
<td>3. Pay yens</td>
<td>- ¥250,000,000</td>
<td></td>
</tr>
<tr>
<td>Net cash flow</td>
<td>-$2,340,002.34</td>
<td></td>
</tr>
</tbody>
</table>

3. You plan to visit Geneva, Switzerland in three months to attend an international business conference. You expect to incur the total cost of SF 5,000 for lodging, meals and transportation during your stay. As of today, the spot exchange rate is $0.60/SF and the three-month forward
rate is $0.63/SF. You can buy the three-month call option on SF with the exercise rate of $0.64/SF for the premium of $0.05 per SF. Assume that your expected future spot exchange rate is the same as the forward rate. The three-month interest rate is 6 percent per annum in the United States and 4 percent per annum in Switzerland.

(a) Calculate your expected dollar cost of buying SF5,000 if you choose to hedge via call option on SF.
(b) Calculate the future dollar cost of meeting this SF obligation if you decide to hedge using a forward contract.
(c) At what future spot exchange rate will you be indifferent between the forward and option market hedges?
(d) Illustrate the future dollar costs of meeting the SF payable against the future spot exchange rate under both the options and forward market hedges.

Solution:
(a) Total option premium = (.05)(5000) = $250. In three months, $250 is worth $253.75 = $250(1.015). At the expected future spot rate of $0.63/SF, which is less than the exercise price, you don’t expect to exercise options. Rather, you expect to buy Swiss franc at $0.63/SF. Since you are going to buy SF5,000, you expect to spend $3,150 (=.63x5,000). Thus, the total expected cost of buying SF5,000 will be the sum of $3,150 and $253.75, i.e., $3,403.75.

(b) $3,150 = (.63)(5,000).

(c) $3,150 = 5,000x + 253.75, where x represents the break-even future spot rate. Solving for x, we obtain x = $0.57925/SF. Note that at the break-even future spot rate, options will not be exercised.

(d) If the Swiss franc appreciates beyond $0.64/SF, which is the exercise price of call option, you will exercise the option and buy SF5,000 for $3,200. The total cost of buying SF5,000 will be $3,453.75 = $3,200 + $253.75. This is the maximum you will pay for SF5,000.
4. Boeing just signed a contract to sell a Boeing 737 aircraft to Air France. Air France will be billed €20 million which is payable in one year. The current spot exchange rate is $1.05/€ and the one-year forward rate is $1.10/€. The annual interest rate is 6.0% in the U.S. and 5.0% in France. Boeing is concerned with the volatile exchange rate between the dollar and the euro and would like to hedge exchange exposure.

(a) It is considering two hedging alternatives: sell the euro proceeds from the sale forward or borrow euros from Credit Lyonnaise against the euro receivable. Which alternative would you recommend? Why?

(b) Other things being equal, at what forward exchange rate would Boeing be indifferent between the two hedging methods?

Solution:

(a) In the case of forward hedge, the future dollar proceeds will be (20,000,000)(1.10) = $22,000,000. In the case of money market hedge (MMH), the firm has to first borrow the PV of its euro receivable, i.e., 20,000,000/1.05 = €19,047,619. Then the firm should exchange this euro amount into dollars at the current spot rate to receive: (€19,047,619)($1.05/€) = $20,000,000, which can be invested at the dollar interest rate for one year to yield: $20,000,000(1.06) = $21,200,000. Clearly, the firm can receive $800,000 more by using forward hedging.

(b) According to IRP, \( F = S(1+i_S)/(1+i_F) \). Thus the “indifferent” forward rate will be:

\[
F = 1.05(1.06)/1.05 = $1.06/€.
\]

5. Suppose that Baltimore Machinery sold a drilling machine to a Swiss firm and gave the Swiss client a choice of paying either $10,000 or SF 15,000 in three months.

(a) In the above example, Baltimore Machinery effectively gave the Swiss client a free option to buy up to $10,000 dollars using Swiss franc. What is the ‘implied’ exercise exchange rate?

(b) If the spot exchange rate turns out to be $0.62/SF, which currency do you think the Swiss
client will choose to use for payment? What is the value of this free option for the Swiss client?
(c) What is the best way for Baltimore Machinery to deal with the exchange exposure?

Solution:
(a) The implied exercise (price) rate is: 10,000/15,000 = $0.6667/SF.

(b) If the Swiss client chooses to pay $10,000, it will cost SF16,129 (=10,000/.62). Since the Swiss client has an option to pay SF15,000, it will choose to do so. The value of this option is obviously SF1,129 (=SF16,129-SF15,000).

(c) Baltimore Machinery faces a contingent exposure in the sense that it may or may not receive SF15,000 in the future. The firm thus can hedge this exposure by buying a put option on SF15,000.

6. Princess Cruise Company (PCC) purchased a ship from Mitsubishi Heavy Industry. PCC owes Mitsubishi Heavy Industry 500 million yen in one year. The current spot rate is 124 yen per dollar and the one-year forward rate is 110 yen per dollar. The annual interest rate is 5% in Japan and 8% in the U.S. PCC can also buy a one-year call option on yen at the strike price of $.0081 per yen for a premium of .014 cents per yen.

(a) Compute the future dollar costs of meeting this obligation using the money market hedge and the forward hedges.

(b) Assuming that the forward exchange rate is the best predictor of the future spot rate, compute the expected future dollar cost of meeting this obligation when the option hedge is used.

(c) At what future spot rate do you think PCC may be indifferent between the option and forward hedge?

Solution:
(a) In the case of forward hedge, the dollar cost will be 500,000,000/110 = $4,545,455. In the case of money market hedge, the future dollar cost will be: 500,000,000(1.08)/(1.05)(124) = $4,147,465.

(b) The option premium is: (.014/100)(500,000,000) = $70,000. Its future value will be $70,000(1.08) = $75,600.
At the expected future spot rate of $.0091(=1/110), which is higher than the exercise of $.0081,
PCC will exercise its call option and buy ¥500,000,000 for $4,050,000 (=500,000,000x.0081). The total expected cost will thus be $4,125,600, which is the sum of $75,600 and $4,050,000.

(c) When the option hedge is used, PCC will spend “at most” $4,125,000. On the other hand, when the forward hedging is used, PCC will have to spend $4,545,455 regardless of the future spot rate. This means that the options hedge dominates the forward hedge. At no future spot rate, PCC will be indifferent between forward and options hedges.

7. Consider a U.S.-based company that exports goods to Switzerland. The U.S. Company expects to receive payment on a shipment of goods in three months. Because the payment will be in Swiss francs, the U.S. Company wants to hedge against a decline in the value of the Swiss franc over the next three months. The U.S. risk-free rate is 2 percent, and the Swiss risk-free rate is 5 percent. Assume that interest rates are expected to remain fixed over the next six months. The current spot rate is $0.5974

a. Indicate whether the U.S. Company should use a long or short forward contract to hedge currency risk.

b. Calculate the no-arbitrage price at which the U.S. Company could enter into a forward contract that expires in three months.

c. It is now 30 days since the U.S. Company entered into the forward contract. The spot rate is $0.55. Interest rates are the same as before. Calculate the value of the U.S. Company’s forward position.

Solution:

a. The risk to the U.S. company is that the value of the Swiss franc will decline and it will receive fewer U.S. dollars on conversion. To hedge this risk, the company should enter into a contract to sell Swiss francs forward.

b. \( S_0 = $0.5974 \)

\[ T = \frac{90}{365} \]
\[ r = 0.02 \]
\[ r^f = 0.05 \]

\[ F(0,T) = \left[ \frac{0.5974}{(1.05)^{90/365}} \right] (1.02)^{90/365} = $0.5931 \]
c. \( S_t = 0.55 \)
\[ T = \frac{90}{365} \]
\[ t = \frac{30}{365} \]
\[ T - t = \frac{60}{365} \]
\[ r = 0.02 \]
\[ r' = 0.05 \]
\[
V_t(0,T) = \frac{0.55}{(1.05)^{60/365}} - \frac{0.5931}{(1.02)^{60/365}} = -0.0456
\]

This represents a gain to the short position of $0.0456 per Swiss franc. In this problem, the U.S. company holds the short forward position.

8. Suppose that you are a U.S.-based importer of goods from the United Kingdom. You expect the value of the pound to increase against the U.S. dollar over the next 30 days. You will be making payment on a shipment of imported goods in 30 days and want to hedge your currency exposure. The U.S. risk-free rate is 5.5 percent, and the U.K. risk-free rate is 4.5 percent. These rates are expected to remain unchanged over the next month. The current spot rate is $1.50.

a. Indicate whether you should use a long or short forward contract to hedge currency risk.

b. Calculate the no-arbitrage price at which you could enter into a forward contract that expires in three months.

c. Move forward 10 days. The spot rate is $1.53. Interest rates are unchanged. Calculate the value of your forward position.

d. Using the text software spreadsheet TRANSEX, replicate the analysis in Exhibit 8.8.

Solution:

a. The risk to you is that the value of the British pound will rise over the next 30 days and it will require more U.S. dollars to buy the necessary pounds to make payment. To hedge this risk, you should enter a forward contract to buy British pounds.

b. \( S_0 = 1.50 \)
\[ T = \frac{30}{365} \]
\[ r = 0.055 \]
\[ r' = 0.045 \]
\[ F(0,T) = \left[ \frac{\$1.50}{(1.045)^{30/365}} \right] (1.055)^{30/365} = \$1.5018 \]

c. \( S_t = \$1.53 \)
\[ T = \frac{30}{365} \]
\[ t = \frac{10}{365} \]
\[ T - t = \frac{20}{365} \]
\[ r = 0.055 \]
\[ r' = 0.045 \]
\[ V_t(0,T) = \frac{\$1.53}{(1.045)^{20/365}} - \frac{\$1.5012}{(1.055)^{20/365}} = \$0.0295 \]

Because you are long, this is a gain of \$0.0295 per British pound.

d. The answer is provided in Exhibit 8.8 of the textbook.