CHAPTER 9  MANAGEMENT OF ECONOMIC EXPOSURE
SUGGESTED ANSWERS AND SOLUTIONS TO END-OF-CHAPTER QUESTIONS AND PROBLEMS

QUESTIONS

1. How would you define economic exposure to exchange risk?

Answer: Economic exposure can be defined as the possibility that the firm’s cash flows and thus its market value may be affected by the unexpected exchange rate changes.

2. Explain the following statement: “Exposure is the regression coefficient.”

Answer: Exposure to currency risk can be appropriately measured by the sensitivity of the firm’s future cash flows and the market value to random changes in exchange rates. Statistically, this sensitivity can be estimated by the regression coefficient. Thus, exposure can be said to be the regression coefficient.

3. Suppose that your company has an equity position in a French firm. Discuss the condition under which the dollar/franc exchange rate uncertainty does not constitute exchange exposure for your company.

Answer: Mere changes in exchange rates do not necessarily constitute currency exposure. If the French franc value of the equity moves in the opposite direction as much as the dollar value of the franc changes, then the dollar value of the equity position will be insensitive to exchange rate movements. As a result, your company will not be exposed to currency risk.

4. Explain the competitive and conversion effects of exchange rate changes on the firm’s operating cash flow.
Answer: The competitive effect: exchange rate changes may affect operating cash flows by altering the firm’s competitive position.

The conversion effect: A given operating cash flows in terms of a foreign currency will be converted into higher or lower dollar (home currency) amounts as the exchange rate changes.

5. Discuss the determinants of operating exposure.

Answer: The main determinants of a firm’s operating exposure are (1) the structure of the markets in which the firm sources its inputs, such as labor and materials, and sells its products, and (2) the firm’s ability to mitigate the effect of exchange rate changes by adjusting its markets, product mix, and sourcing.

6. Discuss the implications of purchasing power parity for operating exposure.

Answer: If the exchange rate changes are matched by the inflation rate differential between countries, firms’ competitive positions will not be altered by exchange rate changes. Firms are not subject to operating exposure.

7. General Motors exports cars to Spain but the strong dollar against the peseta hurts sales of GM cars in Spain. In the Spanish market, GM faces competition from the Italian and French car makers, such as Fiat and Renault, whose currencies remain stable relative to the peseta. What kind of measures would you recommend so that GM can maintain its market share in Spain.

Answer: Possible measures that GM can take include: (1) diversify the market; try to market the cars not just in Spain and other European countries but also in, say, Asia; (2) locate production facilities in Spain and source inputs locally; (3) locate production facilities, say, in Mexico where production costs are low and export to Spain from Mexico.

8. What are the advantages and disadvantages of financial hedging of the firm’s operating exposure vis-à-vis operational hedges (such as relocating manufacturing site)?
Financial hedging can be implemented quickly with relatively low costs, but it is difficult to hedge against long-term, real exposure with financial contracts. On the other hand, operational hedges are costly, time-consuming, and not easily reversible.

9. Discuss the advantages and disadvantages of maintaining multiple manufacturing sites as a hedge against exchange rate exposure.

Answer: To establish multiple manufacturing sites can be effective in managing exchange risk exposure, but it can be costly because the firm may not be able to take advantage of the economy of scale.

10. Evaluate the following statement: “A firm can reduce its currency exposure by diversifying across different business lines.”

Answer: Conglomerate expansion may be too costly as a means of hedging exchange risk exposure. Investment in a different line of business must be made based on its own merit.

11. The exchange rate uncertainty may not necessarily mean that firms face exchange risk exposure. Explain why this may be the case.

Answer: A firm can have a natural hedging position due to, for example, diversified markets, flexible sourcing capabilities, etc. In addition, to the extent that the PPP holds, nominal exchange rate changes do not influence firms’ competitive positions. Under these circumstances, firms do not need to worry about exchange risk exposure.
1. Suppose that you hold a piece of land in the City of London that you may want to sell in one year. As a U.S. resident, you are concerned with the dollar value of the land. Assume that, if the British economy booms in the future, the land will be worth £2,000 and one British pound will be worth $1.40. If the British economy slows down, on the other hand, the land will be worth less, i.e., £1,500, but the pound will be stronger, i.e., $1.50/£. You feel that the British economy will experience a boom with a 60% probability and a slow-down with a 40% probability.

(a) Estimate your exposure $b$ to the exchange risk.

(b) Compute the variance of the dollar value of your property that is attributable to the exchange rate uncertainty.

(c) Discuss how you can hedge your exchange risk exposure and also examine the consequences of hedging.

Solution: (a) Let us compute the necessary parameter values:

\[ E(P) = (.6)(2800) + (.4)(2250) = 1680 + 900 = 2580 \]

\[ E(S) = (.6)(1.40) + (.4)(1.5) = 0.84 + 0.60 = 1.44 \]

\[ \text{Var}(S) = (.6)(1.40-1.44)^2 + (.4)(1.50-1.44)^2 \]

\[ = .00096 + .00144 = .0024. \]

\[ \text{Cov}(P,S) = (.6)(2800-2580)(1.4-1.44) + (.4)(2250-2580)(1.5-1.44) \]

\[ = -.528 - 7.92 = -13.20 \]

\[ b = \frac{\text{Cov}(P,S)}{\text{Var}(S)} = -13.20 / .0024 = -£5,500. \]

You have a negative exposure! As the pound gets stronger (weaker) against the dollar, the dollar value of your British holding goes down (up).

(b) $b^2 \text{Var}(S) = (-5500)^2(.0024) = 72,600(S)^2$

(c) Buy £5,500 forward. By doing so, you can eliminate the volatility of the dollar value of your British asset that is due to the exchange rate volatility.
2. A U.S. firm holds an asset in France and faces the following scenario:

<table>
<thead>
<tr>
<th></th>
<th>State 1</th>
<th>State 2</th>
<th>State 3</th>
<th>State 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Spot rate</td>
<td>$1.20/€</td>
<td>$1.10/€</td>
<td>$1.00/€</td>
<td>$0.90/€</td>
</tr>
<tr>
<td>( P^* )</td>
<td>€1500</td>
<td>€1400</td>
<td>€1300</td>
<td>€1200</td>
</tr>
<tr>
<td>( P )</td>
<td>$1,800</td>
<td>$1,540</td>
<td>$1,300</td>
<td>$1,080</td>
</tr>
</tbody>
</table>

In the above table, \( P^* \) is the euro price of the asset held by the U.S. firm and \( P \) is the dollar price of the asset.

(a) Compute the exchange exposure faced by the U.S. firm.

(b) What is the variance of the dollar price of this asset if the U.S. firm remains unhedged against this exposure?

(c) If the U.S. firm hedges against this exposure using the forward contract, what is the variance of the dollar value of the hedged position?

Solution: (a)

\[
E(S) = 0.25(1.20 + 1.10 + 1.00 + 0.90) = \$1.05/€
\]

\[
E(P) = 0.25(1,800 + 1,540 + 1,300 + 1,080) = \$1,430
\]

\[
\text{Var}(S) = 0.25[(1.20-1.05)^2 + (1.10-1.05)^2 + (1.00-1.05)^2 + (0.90-1.05)^2]
\]

\[
= 0.0125
\]

\[
\text{Cov}(P,S) = 0.25[(1,800-1,430)(1.20-1.05) + (1,540-1,430)(1.10-1.05)
\]

\[
+ (1,300-1,430)(1.00-1.05) + (1,080-1,430)(0.90-1.05)]
\]

\[
= 30
\]

\[
b = \text{Cov}(P,S)/\text{Var}(S) = 30/0.0125 = 2,400.
\]

(b) \[
\text{Var}(P) = 0.25[(1,800-1,430)^2 + (1,540-1,430)^2 + (1,300-1,430)^2 + (1,080-1,430)^2]
\]

\[
= 72,100(\$)^2.
\]

(c) \[
\text{Var}(P) - b^2\text{Var}(S) = 72,100 - (2,400)^2(0.0125) = 100(\$)^2.
\]
This means that most of the volatility of the dollar value of the French asset can be removed by hedging exchange risk. The hedging can be achieved by selling €2,400 forward.

3. Suppose you are a British venture capitalist holding a major stake in an e-commerce start-up in Silicon Valley. As a British resident, you are concerned with the pound value of your U.S. equity position. Assume that if the American economy booms in the future, your equity stake will be worth $1,000,000, and the exchange rate will be $1.40/£. If the American economy experiences a recession, on the other hand, your American equity stake will be worth $500,000, and the exchange rate will be $1.60/£. You assess that the American economy will experience a boom with a 70 percent probability and a recession with a 30 percent probability.

(a) Estimate your exposure to the exchange risk.
(b) Compute the variance of the pound value of your American equity position that is attributable to the exchange rate uncertainty.
(c) How would you hedge this exposure? If you hedge, what is the variance of the pound value of the hedged position?

Solution:

\[
\begin{align*}
\text{Prob} &= 0.70 \quad P^* = $1,000,000 \quad S = $1.40 \quad P = £714,300 \\
\text{Prob} &= 0.30 \quad P^* = $500,000 \quad S = $1.60 \quad P = £312,500 \\
E(S) &= (0.70)/(1.40) + (0.30)/(1.60) = £0.688/$ \\
E(P) &= (0.70)*(714,300) + (0.30)*(312,500) = £593,760/$ \\
\text{Var}(S) &= 0.00167 \\
\text{Cov}(P,S) &= 7,535
\end{align*}
\]

(a) \( b = \text{Cov}(P,S)/\text{Var}(S) = 7,535/0.00167 = 4,511,976 \) ($)

(b) \( b^2\text{Var}(S) = (4,511,976)^2*(0.00167) = 33,997,738,800 \)

(c) \( \text{Var}(e) = \text{Var}(P) - b^2\text{Var}(S) = 33,903,080,400 - 33,997,738,800 \approx 0 \)

You can hedge this exposure by selling $4,511,976 forward.
MINI CASE: ECONOMIC EXPOSURE OF ALBION COMPUTERS PLC

Consider Case 3 of Albion Computers PLC discussed in the chapter. Now, assume that the pound is expected to depreciate to $1.50 from the current level of $1.60 per pound. This implies that the pound cost of the imported part, i.e., Intel’s microprocessors, is £341 (=£512/$1.50). Other variables, such as the unit sales volume and the U.K. inflation rate, remain the same as in Case 3.

(a) Compute the projected annual cash flow in dollars.
(b) Compute the projected operating gains/losses over the four-year horizon as the discounted present value of change in cash flows, which is due to the pound depreciation, from the benchmark case presented in Exhibit 12.4.
(c) What actions, if any, can Albion take to mitigate the projected operating losses due to the pound depreciation?
Suggested Solution to Economic Exposure of Albion Computers PLC

a) The projected annual cash flow can be computed as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount (£)</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>43,200,000</td>
<td>64,833,333</td>
</tr>
<tr>
<td>Variable costs</td>
<td>27,880,000</td>
<td>41,111,111</td>
</tr>
<tr>
<td>Fixed overhead costs</td>
<td>4,000,000</td>
<td>6,000,000</td>
</tr>
<tr>
<td>Depreciation allowances</td>
<td>1,000,000</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Net profit before tax</td>
<td>15,315,000</td>
<td>23,805,797</td>
</tr>
<tr>
<td>Income tax (50%)</td>
<td>7,657,500</td>
<td>11,902,892</td>
</tr>
<tr>
<td>Profit after tax</td>
<td>7,657,500</td>
<td>11,902,892</td>
</tr>
<tr>
<td>Add back depreciation</td>
<td>1,000,000</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Operating cash flow in pounds</td>
<td>8,657,500</td>
<td>12,986,250</td>
</tr>
<tr>
<td>Operating cash flow in dollars</td>
<td>12,986,250</td>
<td>19,975,000</td>
</tr>
</tbody>
</table>

b)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Benchmark Case</th>
<th>Current Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange rate ($/£)</td>
<td>1.60</td>
<td>1.50</td>
</tr>
<tr>
<td>Unit variable cost (£)</td>
<td>650</td>
<td>697</td>
</tr>
<tr>
<td>Unit sales price (£)</td>
<td>1,000</td>
<td>1,080</td>
</tr>
<tr>
<td>Sales volume (units)</td>
<td>50,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Annual cash flow (£)</td>
<td>7,250,000</td>
<td>8,657,500</td>
</tr>
<tr>
<td>Annual cash flow ($)</td>
<td>11,600,000</td>
<td>12,986,250</td>
</tr>
<tr>
<td>Four-year present value ($)</td>
<td>33,118,000</td>
<td>37,076,946</td>
</tr>
<tr>
<td>Operating gains/losses ($)</td>
<td>3,958,946</td>
<td>6,572,325</td>
</tr>
</tbody>
</table>
c) In this case, Albion actually can expect to realize exchange gains, rather than losses. This is mainly due to the fact that while the selling price appreciates by 8% in the U.K. market, the variable cost of imported input increased by about 6.25%. Albion may choose not to do anything.