CHAPTER 8 MANAGEMENT OF TRANSACTION EXPOSURE
SUGGESTED ANSWERS AND SOLUTIONS TO END-OF-CHAPTER QUESTIONS AND PROBLEMS

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 German mark 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 German mark 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?

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 I eliminate risk without sacrificing dollar receipt, I still would recommend hedging.

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.,

\[
250m/1.0175 = ¥245,700,245.70
\]

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:

\[
$2,340,002.34 = ¥245,700,245.70/105.
\]

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

![Graph showing options hedge and forward hedge costs versus strike price]

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 the 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, \( F = \frac{S(1+i_d)}{(1+i_f)}. \) Thus the “indifferent” forward rate will be:
\[
F = \frac{1.05(1.06)}{1.05} = \frac{1.06}{\varepsilon}.
\]

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: \( \frac{10,000}{15,000} = \frac{0.6667}{SF} \).
(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 \( \frac{500,000,000}{110} = \$4,545,455 \). In the case of money market hedge, the future dollar cost will be: \( \frac{500,000,000(1.08)}{(1.05)(124)} = \$4,147,465 \).
(b) The option premium is: \((0.014/100)(500,000,000) = \$70,000\). Its future value will be \(\$70,000(1.08) = \$75,600\).

At the expected future spot rate of \(\$0.0091 (=1/110)\), which is higher than the exercise of \(\$0.0081\), PCC will exercise its call option and buy \(¥500,000,000\) for \(\$4,050,000 (=500,000,000 \times 0.0081)\).

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. \(S_0 = \$0.5974\)

\(T = 90/365\)

\(r = 0.02\)

\(r^f = 0.05\)

\[F(0,T) = \left[ \frac{0.5974}{(1.05)^{\frac{90}{365}}} \right] (1.02)^{\frac{90}{365}} = \$0.5931\]
c. $S_t = 0.55$
   $T = 90/365$
   $t = 30/365$
   $T - t = 60/365$
   $r = 0.02$
   $r_f = 0.05$
   
   $$V_t(0, T) = \frac{0.55}{(1.05)^{60/365}} - \frac{0.5931}{(1.02)^{60/365}} = -0.0456$$

   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.

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. $S_0 = 1.50$
      $T = 30/365$
      $r = 0.055$
      $r_f = 0.045$
      
      $$F(0, T) = \left[ \frac{1.50}{(1.045)^{30/365}} \right] \left(1.055\right)^{30/365} = 1.5018$$
c. \( S_t = 1.53 \)
\[ T = \frac{30}{365} \]
\[ t = \frac{10}{365} \]
\[ T - t = \frac{20}{365} \]
\[ r = 0.055 \]
\[ r_f = 0.045 \]

\[ V_t(0,T) = \frac{1.53}{(1.045)^{20/365}} - \frac{1.5012}{(1.055)^{20/365}} = 0.0295 \]

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

Minicase: Airbus’ Dollar Exposure

Airbus sold an aircraft, A400, to Delta Airlines, a U.S. company, and billed $30 million payable in six months. Airbus is concerned with the euro proceeds from international sales and would like to control exchange risk. The current spot exchange rate is $1.05/€ and six-month forward exchange rate is $1.10/€ at the moment. Airbus can buy a six-month put option on U.S. dollars with a strike price of €0.95/$ for a premium of €0.02 per U.S. dollar. Currently, six-month interest rate is 2.5% in the euro zone and 3.0% in the U.S.

a. Compute the guaranteed euro proceeds from the American sale if Airbus decides to hedge using a forward contract.

b. If Airbus decides to hedge using money market instruments, what action does Airbus need to take? What would be the guaranteed euro proceeds from the American sale in this case?

c. If Airbus decides to hedge using put options on U.S. dollars, what would be the ‘expected’ euro proceeds from the American sale? Assume that Airbus regards the current forward exchange rate as an unbiased predictor of the future spot exchange rate.

d. At what future spot exchange rate do you think Airbus will be indifferent between the option and money market hedge?

Solution:

a. Airbus will sell $30 million forward for €27,272,727 = ($30,000,000) / ($1.10/€).

b. Airbus will borrow the present value of the dollar receivable, i.e., $29,126,214 = $30,000,000 / 1.03, and then sell the dollar proceeds spot for euros: €27,739,251. This is the euro amount that Airbus is going to keep.
c. Since the expected future spot rate is less than the strike price of the put option, i.e., €0.9091 < €0.95, Airbus expects to exercise the option and receive €28,500,000 = ($30,000,000)(€0.95/$). This is gross proceeds. Airbus spent €600,000 (=0.02x30,000,000) upfront for the option and its future cost is equal to €615,000 = €600,000 x 1.025. Thus the net euro proceeds from the American sale is €27,885,000, which is the difference between the gross proceeds and the option costs.

d. At the indifferent future spot rate, the following will hold:
   \[ €28,432,732 = S_T (30,000,000) - 615,000. \]
   Solving for \( S_T \), we obtain the “indifference” future spot exchange rate, i.e., €0.9683/$, or $1.0327/€. Note that €28,432,732 is the future value of the proceeds under money market hedging:
   \[ €28,432,732 = (€27,739,251) (1.025). \]

Suggested solution for Mini Case: Chase Options, Inc.
[See Chapter 13 for the case text]

Chase Options, Inc.
Hedging Foreign Currency Exposure Through Currency Options
Harvey A. Poniachek

I. Case Summary

This case reviews the foreign exchange options market and hedging. It presents various international transactions that require currency options hedging strategies by the corporations involved. Seven transactions under a variety of circumstances are introduced that require hedging by currency options. The transactions involve hedging of dividend remittances, portfolio investment exposure, and strategic economic competitiveness. Market quotations are provided for options (and options hedging ratios), forwards, and interest rates for various maturities.

II. Case Objective.

The case introduces the student to the principles of currency options market and hedging strategies. The transactions are of various types that often confront companies that are involved in extensive international business or multinational corporations. The case induces students to acquire hands-on experience in
addressing specific exposure and hedging concerns, including how to apply various market quotations, which hedging strategy is most suitable, and how to address exposure in foreign currency through cross hedging policies.

III. Proposed Assignment Solution

1. The company expects DM100 million in repatriated profits, and does not want the DM/$ exchange rate at which they convert those profits to rise above 1.70. They can hedge this exposure using DM put options with a strike price of 1.70. If the spot rate rises above 1.70, they can exercise the option, while if that rate falls they can enjoy additional profits from favorable exchange rate movements.

To purchase the options would require an up-front premium of:
DM 100,000,000 x 0.0164 = DM 1,640,000.

With a strike price of 1.70 DM/$, this would assure the U.S. company of receiving at least:

DM 100,000,000 – DM 1,640,000 x (1 + 0.085106 x 272/360)
= DM 98,254,544/1.70 DM/$ = $57,796,791
by exercising the option if the DM depreciated. Note that the proceeds from the repatriated profits are reduced by the premium paid, which is further adjusted by the interest foregone on this amount.

However, if the DM were to appreciate relative to the dollar, the company would allow the option to expire, and enjoy greater dollar proceeds from this increase.

Should forward contracts be used to hedge this exposure, the proceeds received would be:

DM100,000,000/1.6725 DM/$ = $59,790,732,

regardless of the movement of the DM/$ exchange rate. While this amount is almost $2 million more than that realized using option hedges above, there is no flexibility regarding the exercise date; if this date differs from that at which the repatriate profits are available, the company may be exposed to additional further current exposure. Further, there is no opportunity to enjoy any appreciation in the DM.
If the company were to buy DM puts as above, and sell an equivalent amount in calls with strike price 1.647, the premium paid would be exactly offset by the premium received. This would assure that the exchange rate realized would fall between 1.647 and 1.700. If the rate rises above 1.700, the company will exercise its put option, and if it fell below 1.647, the other party would use its call; for any rate in between, both options would expire worthless. The proceeds realized would then fall between:

DM $100,000,000/1.647 DM/$ = $60,716,454
and
DM $100,000,000/1.700 DM/$ = $58,823,529.

This would allow the company some upside potential, while guaranteeing proceeds at least $1 million greater than the minimum for simply buying a put as above.

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<tr>
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<td>1,742,846</td>
<td>0</td>
<td>58,823,529</td>
</tr>
</tbody>
</table>
Since the firm believes that there is a good chance that the pound sterling will weaken, locking them into a forward contract would not be appropriate, because they would lose the opportunity to profit from this weakening. Their hedge strategy should follow for an upside potential to match their viewpoint. Therefore, they should purchase sterling call options, paying a premium of:

\[ 5,000,000 \text{ STG} \times 0.0176 = 88,000 \text{ STG} . \]

If the dollar strengthens against the pound, the firm allows the option to expire, and buys sterling in the spot market at a cheaper price than they would have paid for a forward contract; otherwise, the sterling calls protect against unfavorable depreciation of the dollar.

Because the fund manager is uncertain when he will sell the bonds, he requires a hedge which will allow flexibility as to the exercise date. Thus, options are the best instrument for him to use. He can buy A$ puts to lock in a floor of 0.72 A$/$. Since he is willing to forego any further currency appreciation, he can sell A$ calls with a strike price of 0.8025 A$/ to defray the cost of his hedge (in fact he earns a net premium of A$ 100,000,000 x (0.007234 – 0.007211) = A$ 2,300), while knowing that he can’t receive less than 0.72 A$/ when redeeming his investment, and can benefit from a small appreciation of the A$.

Example #3:
Problem: Hedge principal denominated in A$ into US$. Forgo upside potential to buy floor protection.
I. Hedge by writing calls and buying puts
   1) Write calls for $/A$ @ 0.8025
      Buy puts for $/A$ @ 0.72
      \# contracts needed = Principal in A$/Contract size
      \[
      \frac{100,000,000 \text{ A$}}{100,000 \text{ A$}} = 100
      \]
   2) Revenue from sale of calls = (\# contracts)(size of contract)(premium)
      \[
      \$75,573 = (100)(100,000 \text{ A$})(0.007234 \text{ $/A$})(1 + 0.0825 \frac{195}{360})
      \]
   3) Total cost of puts = (\# contracts)(size of contract)(premium)
      \[
      \$75,332 = (100)(100,000 \text{ A$})(0.007211 \text{ $/A$})(1 + 0.0825 \frac{195}{360})
      \]
   4) Put payoff
      If spot falls below 0.72, fund manager will exercise put
      If spot rises above 0.72, fund manager will let put expire
5) Call payoff
   If spot rises above .8025, call will be exercised
   If spot falls below .8025, call will expire

6) Net payoff
   See following Table for net payoff

### Australian Dollar Bond Hedge

<table>
<thead>
<tr>
<th>Strike Price</th>
<th>“Put” Principal</th>
<th>Call Payoff</th>
<th>“Call” Principal</th>
<th>Net Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.60</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.61</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.62</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.63</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.64</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.65</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.66</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.67</td>
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<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.68</td>
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<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
</tr>
<tr>
<td>0.69</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
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<td>72,000,241</td>
</tr>
<tr>
<td>0.70</td>
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<td>75,573</td>
<td>0</td>
<td>72,000,241</td>
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<tr>
<td>0.71</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
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<tr>
<td>0.72</td>
<td>(75,332) 72,000,000</td>
<td>75,573</td>
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<td>72,000,241</td>
</tr>
<tr>
<td>0.73</td>
<td>(75,332) 73,000,000</td>
<td>75,573</td>
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<td>73,000,241</td>
</tr>
<tr>
<td>0.74</td>
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<td>74,000,241</td>
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<tr>
<td>0.75</td>
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<td>75,573</td>
<td>0</td>
<td>75,000,241</td>
</tr>
<tr>
<td>0.76</td>
<td>(75,332) 76,000,000</td>
<td>75,573</td>
<td>0</td>
<td>76,000,241</td>
</tr>
<tr>
<td>0.77</td>
<td>(75,332) 77,000,000</td>
<td>75,573</td>
<td>0</td>
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</tr>
<tr>
<td>0.78</td>
<td>(75,332) 78,000,000</td>
<td>75,573</td>
<td>0</td>
<td>78,000,241</td>
</tr>
<tr>
<td>0.79</td>
<td>(75,332) 79,000,000</td>
<td>75,573</td>
<td>0</td>
<td>79,000,241</td>
</tr>
<tr>
<td>0.80</td>
<td>(75,332) 80,000,000</td>
<td>75,573</td>
<td>0</td>
<td>80,000,241</td>
</tr>
<tr>
<td>0.81</td>
<td>(75,332) 0</td>
<td>75,573</td>
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<td>80,250,241</td>
</tr>
<tr>
<td>0.82</td>
<td>(75,332) 0</td>
<td>75,573</td>
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<td>80,250,241</td>
</tr>
<tr>
<td>0.83</td>
<td>(75,332) 0</td>
<td>75,573</td>
<td>80,250,000</td>
<td>80,250,241</td>
</tr>
<tr>
<td>0.84</td>
<td>(75,332) 0</td>
<td>75,573</td>
<td>80,250,000</td>
<td>80,250,241</td>
</tr>
<tr>
<td>0.85</td>
<td>(75,332) 0</td>
<td>75,573</td>
<td>80,250,000</td>
<td>80,250,241</td>
</tr>
</tbody>
</table>
4. The German company is bidding on a contract which they cannot be certain of winning. Thus, the need to execute a currency transaction is similarly uncertain, and using a forward or futures as a hedge is inappropriate, because it would force them to perform even if they do not win the contract.

Using a sterling put option as a hedge for this transaction makes the most sense. For a premium of:

12 million STG x 0.0161 = 193,200 STG,

they can assure themselves that adverse movements in the pound sterling exchange rate will not diminish the profitability of the project (and hence the feasibility of their bid), while at the same time allowing the potential for gains from sterling appreciation.

5. Since AMC is concerned about the adverse effects that a strengthening of the dollar would have on its business, we need to create a situation in which it will profit from such an appreciation. Purchasing a yen put or a dollar call will achieve this objective. The data in Exhibit 1, row 7 represent a 10 percent appreciation of the dollar (128.15 strike vs. 116.5 forward rate) and can be used to hedge against a similar appreciation of the dollar.

For every million yen of hedging, the cost would be:
Yen 100,000,000 x 0.000127 = 127 Yen.

To determine the breakeven point, we need to compute the value of this option if the dollar appreciated 10 percent (spot rose to 128.15), and subtract from it the premium we paid. This profit would be compared with the profit earned on five to 10 percent of AMC’s sales (which would be lost as a result of the dollar appreciation). The number of options to be purchased which would equalize these two quantities would represent the breakeven point.
Example #5:
Hedge the economic cost of the depreciating Yen to AMC.

If we assume that AMC sales fall in direct proportion to depreciation in the yen (i.e., a 10 percent decline in yen and 10 percent decline in sales), then we can hedge the full value of AMC’s sales. I have assumed $100 million in sales.

1) Buy yen puts
   
   \[
   \text{# contracts needed} = \frac{\text{Expected Sales} \times \text{Current ¥/$ Rate}}{\text{Contract size}}
   \]
   
   \[9600 = \left(\frac{100,000,000}{120¥/$}\right) / ¥1,250,000\]

2) Total Cost = (\# contracts)(contract size)(premium)
   
   \[1,524,000 = (9600)( ¥1,250,000)(¥0.0001275/¥)\]

3) Floor rate = Exercise – Premium
   
   \[128.1499¥/$ = 128.15¥/$ - 1,524,000/12,000,000,000¥\]

4) The payoff changes depending on the level of the ¥/$ rate. The following table summarizes the payoffs. An equilibrium is reached when the spot rate equals the floor rate.
AMC Profitability

<table>
<thead>
<tr>
<th>Spot</th>
<th>Put Payoff</th>
<th>Sales</th>
<th>Net Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>(1,524,990)</td>
<td>100,000,000</td>
<td>98,475,010</td>
</tr>
<tr>
<td>121</td>
<td>(1,524,990)</td>
<td>99,173,664</td>
<td>97,648,564</td>
</tr>
<tr>
<td>122</td>
<td>(1,524,990)</td>
<td>98,360,656</td>
<td>96,835,666</td>
</tr>
<tr>
<td>123</td>
<td>(1,524,990)</td>
<td>97,560,976</td>
<td>86,035,986</td>
</tr>
<tr>
<td>124</td>
<td>(1,524,990)</td>
<td>96,774,194</td>
<td>95,249,204</td>
</tr>
<tr>
<td>125</td>
<td>(1,524,990)</td>
<td>96,000,000</td>
<td>94,475,010</td>
</tr>
<tr>
<td>126</td>
<td>(1,524,990)</td>
<td>95,238,095</td>
<td>93,713,105</td>
</tr>
<tr>
<td>127</td>
<td>(847,829)</td>
<td>94,488,189</td>
<td>93,640,360</td>
</tr>
<tr>
<td>128</td>
<td>(109,640)</td>
<td>93,750,000</td>
<td>93,640,360</td>
</tr>
<tr>
<td>129</td>
<td>617,104</td>
<td>93,023,256</td>
<td>93,640,360</td>
</tr>
<tr>
<td>130</td>
<td>1,332,668</td>
<td>92,307,692</td>
<td>93,640,360</td>
</tr>
<tr>
<td>131</td>
<td>2,037,307</td>
<td>91,603,053</td>
<td>93,640,360</td>
</tr>
<tr>
<td>132</td>
<td>2,731,269</td>
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<td>133</td>
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<td>134</td>
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<tr>
<td>135</td>
<td>4,751,431</td>
<td>88,888,889</td>
<td>93,640,360</td>
</tr>
<tr>
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<tr>
<td>137</td>
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<tr>
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<tr>
<td>142</td>
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<tr>
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<tr>
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</tr>
<tr>
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<td>10,881,740</td>
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<td>93,640,360</td>
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<tr>
<td>146</td>
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<td>82,191,781</td>
<td>93,640,360</td>
</tr>
<tr>
<td>147</td>
<td>12,007,707</td>
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<td>93,640,360</td>
</tr>
<tr>
<td>148</td>
<td>12,569,279</td>
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<td>93,640,360</td>
</tr>
<tr>
<td>149</td>
<td>13,103,448</td>
<td>80,536,913</td>
<td>93,640,360</td>
</tr>
<tr>
<td>150</td>
<td>13,640,360</td>
<td>80,000,000</td>
<td>93,640,360</td>
</tr>
</tbody>
</table>
The parent has a DM payable, and Lira receivable. It has several ways to cover its exposure; forwards, options, or swaps.

The forward would be acceptable for the DM loan, because it has a known quantity and maturity, but the Lira exposure would retain some of its uncertainty because these factors are not assured.

The parent could buy DM calls and Lira puts. This would allow them to take advantage of favorable currency fluctuations, but would require paying for two premiums.

Finally, they could swap their Lira receivable into DM. This would leave a net DM exposure which would probably be smaller than the amount of the loan, which they could hedge using forwards or options, depending upon their risk outlook.

The company has Lira receivables, and is concerned about possible depreciation versus the dollar. Because of the high costs of Lira options, they instead buy DM puts, making the assumption that movement in the DM and Lira exchange rates versus the dollar correlate well.

A hedge of lira using DM options will depend on the relationship between lira FX rates and DM options. This relationship could be determined using a regression of historical data.

The hedged risk as a percent of the open risk can be estimated as:
Square Root (var(error)/(b²var(lira FX rate) ) * 100

The “cost” of the risk of the DM hedge would have to be compared with the cost of the expensive lira options.

Whichever hedge is “cheaper” (i.e., lower cost for same risk or lower risk for same cost) should be selected. This hedge must be closely monitored, however, to make sure that this relationship holds true. If it does not, this “basis risk” can cause the ratio of DM versus Lira to change, so that the appropriate amount of cross-hedge is different. If that amount is not then adjusted, a net currency exposure could result, leaving the company open to additional currency losses.