Chapter 9

Forecasting Exchange Rates

Lecture Outline

Why Firms Forecast Exchange Rates

Forecasting Techniques
  Technical Forecasting
  Fundamental Forecasting
  Market-Based Forecasting
  Mixed Forecasting

Forecasting Services
  Reliance on Forecasting Services

Forecast Error
  Potential Impact of Forecast Error
  Measurement of Forecast Error
  Forecast Accuracy Among Currencies
  Forecast Bias
  Graphic Evaluation of Forecast Performance
  Comparison of Forecasting Methods
  Forecasting Under Market Efficiency

Using Interval Forecasts
  Methods of Forecasting Exchange Rate Volatility
Chapter Theme

This chapter stresses the value of reliable forecasts, but suggests that reliable forecasts can’t always be obtained. Because no single forecast technique has been singled out as superior, various techniques are mentioned. Whatever techniques the MNC chooses, it should monitor performance over time. This chapter illustrates how this evaluation can be accomplished.

Topics to Stimulate Class Discussion

1. Which forecast technique would you use if you were hired by an MNC to forecast exchange rates?

2. Do you think there will ever be a published technical forecasting model that you could use in the future to most accurately forecast exchange rates? Why or why not?

3. Recall the theories of purchasing power parity (PPP) and international Fisher effect (IFE) in Chapter 8. If these theories were used to forecast exchange rates, which techniques would they be classified as? Why?

4. Assume there is a regression model that was able to identify the factors which affected exchange rate movements in a recent four-year period. Also, suppose that the sensitivity of the exchange rate’s movements to each factor was precisely quantified. Is there any reason not to expect superior forecasting results from this method in the future? Elaborate.

5. What is the use of detecting a forecast bias?

POINT/COUNTER-POINT:
Which Exchange Rate Forecast Technique Should MNCs Use?

POINT: Use the spot rate to forecast. When a U.S.-based MNC firm conducts financial budgeting, it must estimate the values of its foreign currency cash flows that will be received by the parent. Since it is well documented that firms can not accurately forecast future values, MNCs should use the spot rate for budgeting. Changes in economic conditions are difficult to predict, and the spot rate reflects the best guess of the future spot rate if there are no changes in economic conditions.

COUNTER-POINT: Use the forward rate to forecast. The spot rates of some currencies do not represent accurate or even unbiased estimates of the future spot rates. Many currencies of developing countries have generally declined over time. These currencies tend to be in countries that have high inflation rates. If the spot rate had been used for budgeting, the dollar cash flows resulting from cash inflows in these currencies would have been highly overestimated. The expected inflation in a country can be accounted for by using the nominal interest rate. A high nominal interest rate implies a high level of expected inflation. Based on interest rate parity, these currencies will have pronounced discounts. Thus, the forward rate captures the expected inflation differential between countries because it is influenced by the nominal interest rate differential. Since it captures the inflation differential, it should provide a more accurate forecast of currencies, especially those currencies in high-inflation countries.
WHO IS CORRECT? Use the Internet to learn more about this issue. Which argument do you support? Offer your own opinion on this issue.

ANSWER: To the extent that high expected inflation leads to weakness of a currency, the forward rate should provide a more appropriate forecast. However, for some very short horizons, the inflation expectations may not have much influence.

Answers to End of Chapter Questions

1. **Motives for Forecasting.** Explain corporate motives for forecasting exchange rates.

   ANSWER: Several decisions of MNCs require an assessment of the future. Future exchange rates will affect all critical characteristics of the firm such as costs and revenues. To be more specific, various operations of MNCs use exchange rate projections, including hedging, short-term financing and investing, capital budgeting decisions, long-term financing, and earnings assessment. Such operations will be more effective if exchange rates are forecasted accurately.

2. **Technical Forecasting.** Explain the technical technique for forecasting exchange rates. What are some limitations of using technical forecasting to predict exchange rates?

   ANSWER: Technical forecasting involves the review of historical exchange rates to search for a repetitive pattern that may occur in the future. This pattern would be the basis for future exchange rate movements.

   Even if a technical forecasting model turns out to be valuable, it will no longer be valuable once other market participants use it. This is because their actions in the market due to the model’s forecast will cause the currency values to move as suggested by the model immediately instead of in the future. Also, MNCs often prefer long-term forecasts. Technical forecasting is typically conducted for short time horizons.

3. **Fundamental Forecasting.** Explain the fundamental technique for forecasting exchange rates. What are some limitations of using a fundamental technique to forecast exchange rates?

   ANSWER: Fundamental forecasting is based on underlying relationships that are believed to exist between one or more variables and a currency’s value. Given these relationships, a change in one or more of these variables (or a forecasted change in them) will lead to a forecast of the currency’s value.

   Even if a fundamental relationship exists, it is difficult to accurately quantify that relationship in a form applicable to forecasting. Even if the relationship could be quantified, there is no guarantee that the historical relationship will persist in the future. It is difficult to determine the lagged impact of some variables. It is also difficult to incorporate some qualitative factors into the model.

4. **Market-Based Forecasting.** Explain the market-based technique for forecasting exchange rates. What is the rationale for using market-based forecasts? If the euro appreciates substantially against the dollar during a specific period, would market-based forecasts have overestimated or underestimated the realized values over this period? Explain.
ANSWER: Market-based forecasts should reflect an expectation of the market on future rates. If the market’s expectation differed from existing rates, then the market participants should react by taking positions in various currencies until the current rates do reflect an expectation of the future.

The market determines the spot exchange rate and forward exchange rate. These market-based rates can be used to forecast since if they were not good indicators of the future rates, speculators would take positions. This speculative movement would force the rates to gravitate toward the expectation of the future spot rate.

Market-based forecasts would have underestimated the realized values of the euro over this period because the actual values were above the spot rates and forward rates quoted earlier.

5. **Mixed Forecasting.** Explain the mixed technique for forecasting exchange rates.

ANSWER: Mixed forecasting involves a combination of two or more techniques. The specific combination can differ in terms of techniques included and the weight of importance assigned to each technique.

6. **Detecting a Forecast Bias.** Explain how to assess performance in forecasting exchange rates. Explain how to detect a bias in forecasting exchange rates.

ANSWER: Performance can be evaluated by computing the absolute forecast error as a percentage of the realized value for all periods where a forecast was necessary. Then an average of this type of error can be computed. This average can be compared among all currencies or among all forecasting models.

A forecast bias exists from consistently underestimating or overestimating exchange rates. If the majority of points are above the 45 degree perfect forecast line, then the forecasts generally underestimate the realized values. If the majority of points are below the 45 degree perfect forecast line, then the forecasts generally overestimate the realized values.

7. **Measuring Forecast Accuracy.** You are hired as a consultant to assess a firm’s ability to forecast. The firm has developed a point forecast for two different currencies presented in the following table. The firm asks you to determine which currency was forecasted with greater accuracy.

ANSWER:

<table>
<thead>
<tr>
<th>Period</th>
<th>Yen Forecast</th>
<th>Actual Yen Value</th>
<th>Pound Forecast</th>
<th>Actual Pound Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$.0050</td>
<td>$.0051</td>
<td>$1.50</td>
<td>$1.51</td>
</tr>
<tr>
<td>2</td>
<td>.0048</td>
<td>.0052</td>
<td>1.53</td>
<td>1.50</td>
</tr>
<tr>
<td>3</td>
<td>.0053</td>
<td>.0052</td>
<td>1.55</td>
<td>1.58</td>
</tr>
<tr>
<td>4</td>
<td>.0055</td>
<td>.0056</td>
<td>1.49</td>
<td>1.52</td>
</tr>
</tbody>
</table>
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**Absolute Forecast Error as a Percentage of the Realized Value**

<table>
<thead>
<tr>
<th>Period</th>
<th>Yen Forecast</th>
<th>Pound Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.96%</td>
<td>.66%</td>
</tr>
<tr>
<td>2</td>
<td>7.69</td>
<td>2.00</td>
</tr>
<tr>
<td>3</td>
<td>1.92</td>
<td>1.89</td>
</tr>
<tr>
<td>4</td>
<td>1.78</td>
<td>1.97</td>
</tr>
</tbody>
</table>

Mean 3.34% 1.63%

Because the mean absolute forecast error of the pound is lower than that of the yen, the pound was forecasted with greater accuracy.

8. **Limitations of a Fundamental Forecast.** Syracuse Corp. believes that future real interest rate movements will affect exchange rates, and it has applied regression analysis to historical data to assess the relationship. It will use regression coefficients derived from this analysis, along with forecasted real interest rate movements, to predict exchange rates in the future. Explain at least three limitations of this method.

**ANSWER:**

First, the timing of the impact of real interest rates on exchange rates may differ from what is specified by the model.

Second, the forecasted real interest rates may be inaccurate, causing inaccurate forecasts of the exchange rate.

Third, the sensitivity of exchange rates to real interest rate movements may change in the future (differ from what was determined when using historical data).

Fourth, the model has ignored other factors that also influence exchange rates.

9. **Consistent Forecasts.** Lexington Co. is a U.S.-based MNC with subsidiaries in most major countries. Each subsidiary is responsible for forecasting the future exchange rate of its local currency relative to the U.S. dollar. Comment on this policy. How might Lexington Co. ensure consistent forecasts among the different subsidiaries?

**ANSWER:**

If each subsidiary uses its own data and techniques to forecast its local currency’s exchange rate, its forecast may be inconsistent with forecasts of other currencies by other subsidiaries. Subsidiary forecasts could be consistent if forecasts for all currencies were based on complete information from all subsidiaries.

10. **Forecasting with a Forward Rate.** Assume that the four-year annualized interest rate in the United States is 9 percent and the four-year annualized interest rate in Singapore is 6 percent. Assume interest rate parity holds for a four-year horizon. Assume that the spot rate of the Singapore dollar is $.60. If the forward rate is used to forecast exchange rates, what will be the forecast for the Singapore dollar’s spot rate in four years? What percentage appreciation or depreciation does this forecast imply over the four-year period?
<table>
<thead>
<tr>
<th>Country</th>
<th>Four-Year Compounded Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>$(1.09)^4 - 1 = 41%$</td>
</tr>
<tr>
<td>Singapore</td>
<td>$(1.06)^4 - 1 = 26%$</td>
</tr>
</tbody>
</table>

Premium $= \frac{1.41}{1.26} - 1$

$= 11.9\%$

ANSWER: Thus, the four-year forward rate should contain an 11.9% premium above today’s spot rate of $0.60, which means the forward rate is $0.60 \times (1 + 0.119) = 0.6714$. The forecast for the Singapore dollar’s spot rate in four years is $0.6714$, which represents an appreciation of 11.9% over the four-year period.

11. **Foreign Exchange Market Efficiency.** Assume that foreign exchange markets were found to be weak-form efficient. What does this suggest about utilizing technical analysis to speculate in euros? If MNCs believe that foreign exchange markets are strong-form efficient, why would they develop their own forecasts of future exchange rates? That is, why wouldn’t they simply use today’s quoted rates as indicators about future rates? After all, today’s quoted rates should reflect all relevant information.

ANSWER: Technical analysis should not be able to achieve excess profits if foreign exchange markets are weak-form efficient.

Today’s rates do not provide information about the range of possible outcomes. MNCs may desire to assess the range of possible outcomes.

12. **Forecast Error.** The director of currency forecasting at Champaign-Urbana Corp. says, “The most critical task of forecasting exchange rates is not to derive a point estimate of a future exchange rate but to assess how wrong our estimate might be.” What does this statement mean?

ANSWER: Point estimate forecasts of exchange rates are not likely to be perfectly accurate. MNCs that develop point estimate forecasts recognize this, but would like to determine how far off the forecast may be. They will have more confidence in the forecasts of currencies that have been forecasted with only minor errors. For other currencies in which forecast errors have been large, they would be very careful when basing policy decisions on forecasts of these currencies.

13. **Forecasting Exchange Rates of Currencies That Previously Were Fixed.** When some countries in Eastern Europe initially allowed their currencies to fluctuate against the dollar, would the fundamental technique based on historical relationships have been useful for forecasting future exchange rates of these currencies? Explain.

ANSWER: Fundamental forecasting typically relies on historical relationships between economic factors and exchange rate movements. However, if exchange rates were not allowed to move in the past, historical relationships would not help predict future exchange rates of these currencies.

14. **Forecast Error.** Royce Co. is a U.S. firm with future receivables one year from now in Canadian dollars and British pounds. Its pound receivables are known with certainty, and its estimated Canadian dollar receivables are subject to a 2 percent error in either direction. The dollar values of both types of receivables are similar. There is no chance of default by the customers involved. Royce’s treasurer says that the estimate of dollar cash flows to be generated from the British...
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pound receivables is subject to greater uncertainty than that of the Canadian dollar receivables. Explain the rationale for the treasurer’s statement.

ANSWER: The British pound’s future spot rate is more difficult to predict because of the pound’s volatility. Therefore, the dollar revenues from the pound receivables are more uncertain.

15. Forecasting the Euro. Cooper, Inc., a U.S.-based MNC, periodically obtains euros to purchase German products. It assesses U.S. and German trade patterns and inflation rates to develop a fundamental forecast for the euro. How could Cooper possibly improve its method of fundamental forecasting as applied to the euro?

ANSWER: It should use data for all countries participating in the euro (not just the German data), as the euro’s exchange rate is affected by all transactions between euros and dollars, not just the German transactions.

16. Forward Rate Forecast. Assume that you obtain a quote for a one-year forward rate on the Mexican peso. Assume that Mexico’s one-year interest rate is 40 percent, while the U.S. one-year interest rate is 7 percent. Over the next year, the peso depreciates by 12 percent. Do you think the forward rate overestimated the spot rate one year ahead in this case? Explain.

ANSWER: A quoted forward rate for the Mexican peso would contain a large discount because of the high interest rate in Mexico relative to the U.S. Assuming that the discount exceeds 12 percent, the forward rate would have actually underestimated the future spot rate in this example. (This answer may surprise many students; it deserves a little attention in class.)

17. Forecasting Based on PPP versus the Forward Rate. You believe that the Singapore dollar’s exchange rate movements are mostly attributed to purchasing power parity. Today, the nominal annual interest rate in Singapore is 18%. The nominal annual interest rate in the U.S. is 3%. You expect that annual inflation will be about 4% in Singapore and 1% in the U.S. Assume that interest rate parity holds. Today the spot rate of the Singapore dollar is $.63. Do you think the one-year forward rate would underestimate, overestimate, or be an unbiased estimate of the future spot rate in one year? Explain.

ANSWER: The forward rate will likely underestimate the future spot rate. The inflation differential suggests that the Singapore dollar should decline slightly. Yet, the forward rate would have a large discount due to the interest differential. Thus, the forward rate would predict a very weak Singapore dollar, which means that it would underestimate the future spot rate.

18. Interpreting an Unbiased Forward Rate. Assume that the forward rate is an unbiased but not necessarily accurate forecast of the future exchange rate of the yen over the next several years. Based on this information, do you think Raven Co. should hedge its remittance of expected Japanese yen profits to the U.S. parent by selling yen forward contracts? Why would this strategy be advantageous? Under what conditions would this strategy backfire?

ANSWER: If the forward rate is an unbiased forecast, the amount of dollars received from remittances when hedging should be the same (on average, over time) as the amount of dollars received from remittances when not hedging. Under these conditions, Raven may be able to more accurately predict the dollar cash flows that will result from remitted foreign cash flows, without reducing the expected amount of dollar cash flows received. This strategy could backfire in those
periods that the spot rate of yen at the time of remittances exceeds the previously agreed upon forward rate at which the yen would be converted to dollars.

Advanced Questions

19. Probability Distribution of Forecasts. Assume that the following regression model was applied to historical quarterly data:

\[ e_t = a_0 + a_1 \text{INT}_t + a_2 \text{INF}_{t-1} + \mu_t \]

where \( e_t \) = percentage change in the exchange rate of the Japanese yen in period \( t \)

\( \text{INT}_t \) = average real interest rate differential (U.S. interest rate minus Japanese interest rate) over period \( t \)

\( \text{INF}_{t-1} \) = inflation differential (U.S. inflation rate minus Japanese inflation rate) in the previous period

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

\( \mu_t \) = error term

Assume that the regression coefficients were estimated as follows:

\begin{align*}
    a_0 &= 0.0 \\
    a_1 &= 0.9 \\
    a_2 &= 0.8
\end{align*}

Also assume that the inflation differential in the most recent period was 3 percent. The real interest rate differential in the upcoming period is forecasted as follows:

<table>
<thead>
<tr>
<th>Interest Rate Differential</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>30%</td>
</tr>
<tr>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>

If Stillwater, Inc., uses this information to forecast the Japanese yen’s exchange rate, what will be the probability distribution of the yen’s percentage change over the upcoming period?
ANSWER:

<table>
<thead>
<tr>
<th>Forecast of Interest Rate Differential</th>
<th>Forecast of the Percentage Change in the Japanese Yen</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>.9(0%) + .8(3%) = 2.4%</td>
<td>30%</td>
</tr>
<tr>
<td>1%</td>
<td>.9(1%) + .8(3%) = 3.3%</td>
<td>60%</td>
</tr>
<tr>
<td>2%</td>
<td>.9(2%) + .8(3%) = 4.2%</td>
<td>10%</td>
</tr>
</tbody>
</table>

20. Testing for a Forecast Bias. You must determine whether there is a forecast bias in the forward rate. You apply regression analysis to test the relationship between the actual spot rate and the forward rate forecast (F):

\[ S = a_0 + a_1 (F) \]

The regression results are as follows:

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a_0 = .006)</td>
<td>.011</td>
</tr>
<tr>
<td>(a_1 = .800)</td>
<td>.05</td>
</tr>
</tbody>
</table>

Based on these results, is there a bias in the forecast? Verify your conclusion. If there is a bias, explain whether it is an overestimate or an underestimate.

ANSWER: This question is appropriate for students with a background in regression analysis. If there is no bias, \(a_0\) is hypothesized to equal zero and \(a_1\) is hypothesized to equal one. The t-statistics are estimated below:

\[ t = \frac{a_0 - 0}{\text{s.e. of } a_0} \]

\[ = \frac{.006}{.011} \]

\[ = .55 \]
t-statistic for \( a_1 \):

\[
t = \frac{a_1 - 1}{\text{s.e. of } a_1}
\]

\[
= \frac{.80 - 1}{.05}
\]

\[
= \frac{- .20}{.05}
\]

\[
= -4.0
\]

The results suggest that while \( a_0 \) is not significantly different from its hypothesized value of zero, \( a_1 \) is significantly below its hypothesized value of 1. This implies that the realized spot rate is significantly below the forecasted rate. Thus, the forecast contains an upward bias, because it is overestimating the future spot rate.

21. **Effect of September 11 on Forward Rate Forecasts.** The September 11, 2001 terrorist attack on the U.S. was quickly followed by lower interest rates in the U.S. How would this affect a fundamental forecast of foreign currencies? How would this affect the forward rate forecast of foreign currencies?

ANSWER: Lower interest rates in the U.S. reduce the capital flows into the U.S., which places upward pressure on foreign currencies against the dollar.

The forward rates of foreign currencies would have more pronounced discounts, or higher premiums, which implies that the forecasts were revised to either reflect a smaller degree of depreciation of the foreign currency than the forecast before September 11, or a higher degree of appreciation of the foreign currency than the forecast before September 11.

22. **Interpreting Forecast Bias Information.** The treasurer of Glencoe, Inc., detected a forecast bias when using the 30-day forward rate of the euro to forecast future spot rates of the euro over various periods. He believes he can use this information to determine whether imports ordered every week should be hedged (payment is made 30 days after each order). Glencoe’s president says that in the long run the forward rate is unbiased and that the treasurer should not waste time trying to “beat the forward rate” but should just hedge all orders. Who is correct?

ANSWER: Even if the forward rate is unbiased over the long run, Glencoe could save money if it could effectively detect a forward bias (assuming that the bias would continue after being detected). Glencoe may decide to hedge only when the forward rate is expected to be less than the future spot rate. The Treasurer is correct if the bias continues beyond the point at which it is detected.

23. **Forecasting Latin American Currencies.** The value of each Latin American currency relative to the dollar is dictated by supply and demand conditions between that currency and the dollar. The values of Latin American currencies have generally declined substantially against the dollar over time. Most of these countries have high inflation rates and high interest rates. The data on inflation
rates, economic growth, and other economic indicators are subject to error, as limited resources are used to compile the data.

a. If the forward rate is used as a market-based forecast, will this rate result in a forecast of appreciation, depreciation, or no change in any particular Latin American currency? Explain.

ANSWER: The forward rate of each Latin American currency would have a large discount, because the Latin American interest rate would be much higher than the U.S. interest rate. The discount serves as the forecast of the percentage change in the value of the Latin American currency over the length of time represented by the forward contract period.

b. If technical forecasting is used, will this result in a forecast of appreciation, depreciation, or no change in the value of a specific Latin American currency? Explain.

ANSWER: Technical forecasting would result in a forecast of depreciation, because the Latin American currencies have declined consistently in the past, and most technical methods would apply the past trends to the future.

c. Do you think that U.S. firms can accurately forecast the future values of Latin American currencies? Explain.

ANSWER: U.S. firms cannot forecast Latin American currency values accurately, because they are so volatile. U.S. firms even have trouble forecasting the values of currencies of industrialized countries. The values change in response to economic conditions, which are volatile and difficult to anticipate. The values are also affected by political conditions, which are also difficult to predict.

24. Selecting between Forecast Methods. Bolivia currently has a nominal one-year risk-free interest rate of 40 percent, which is primarily due to the high level of expected inflation. The U.S. nominal one-year risk-free interest rate is 8 percent. The spot rate of Bolivia’s currency (called the boliviana) is $.14. The one-year forward rate of the boliviana is $.108. What is the forecasted percentage change in the boliviana if the spot rate is used as a one-year forecast? What is the forecasted percentage change in the boliviana if the one-year forward rate is used as a one-year forecast? Which forecast do you think will be more accurate? Why?

ANSWER: The forecasted percentage change in the boliviana is zero percent based on the spot rate, while the forecasted percentage change in the boliviana is –22.86 percent based on the forward rate. The forward rate should be a better forecast in this example because it captures the effect of expected inflation on the exchange rate. The spot rate ignores this information.

25. Comparing Market-based Forecasts. For all parts of this question, assume that interest rate parity exists, the prevailing one-year U.S. nominal interest rate is low, and that you expect the U.S. inflation to be low this year.

a. Assume that the country Dinland engages in much trade with the U.S. and the trade involves many different products. Dinland has had a zero trade balance with the U.S. (the value of exports and imports is about the same) in the past. Assume that you expect a high level of inflation (perhaps about 40%) in Dinland over the next year because of a large increase in the prices of many products that Dinland produces. Dinland presently has a one-year risk-free interest rate of more than 40%. Do you think that the prevailing spot rate or the one-year
forward rate would result in a more accurate forecast of Dinland’s currency (the din) one year from now? Explain.

ANSWER: The high inflation should create a shift in international trade, which will place severe downward pressure on the value of the din. Since the forward rate of the din would have a large discount, it should provide a better forecast than the spot rate.

b. Assume that the country Freeland engages in much trade with the U.S. and the trade involves many different products. Freeland has had a zero trade balance with the U.S. (the value of exports and imports is about the same) in the past. You expect high inflation (perhaps about 40%) in Freeland over the next year because of a large increase in the cost of land (and therefore housing) in Freeland. You believe that the prices of products that Freeland produces will not be affected. Freeland presently has a one-year risk-free interest rate of more than 40%. Do you think that the prevailing one-year forward rate of Freeland’s currency (the fre) would overestimate, underestimate, or be a reasonably accurate forecast of the spot rate one year from now? [Presume a direct quotation of the exchange rate, so that if the forward rate underestimates, it means that its value is less than the realized spot rate in one year. If the forward rate overestimates, it means that its value is more than the realized spot rate in one year.]

ANSWER: The inflation in Freeland does not affect the trade balance between the U.S. and Freeland. Therefore, the value of Freeland’s currency should not be substantially affected by trade flows. Since the forward rate of the fre would contain a large discount, it would likely underestimate the spot of the fre in one year.

26. IRP and Forecasting. New York Co. has agreed to pay 10 million Australian dollars (A$) in two years for equipment that it is importing from Australia. The spot rate of the Australian dollar is $.60. The annualized U.S. interest rate is 4%, regardless of the debt maturity. The annualized Australian dollar interest rate is 12% regardless of the debt maturity. New York plans to hedge its exposure with a forward contract that it will arrange today. Assume that interest rate parity exists. Determine the amount of U.S. dollars that New York Co. will need in 2 years to make its payment.

ANSWER: The 2-year forward premium is computed as:
\[ p = \frac{(1.04)^2}{(1.12)^2} - 1 \]
\[ = \frac{1.0816}{1.2544} - 1 \]
\[ = -.1377 \text{ or } -13.77\% \]

\[ 2\text{-year FR} = S [1 + (p)] \]
\[ = .60 [1 + (-.1377)] \]
\[ = .5173 \]

Amount of $ needed = $.5173 \times 10,000,000 \text{ units} = $5,173,000

27. Forecasting Based on the International Fisher Effect. Purdue Co. (based in the U.S.) exports cable wire to Australian manufacturers. It invoices its product in U.S. dollars, and will not change its price over the next year. There is intense competition between Purdue and the local cable wire producers that are based there. Purdue’s competitors invoice their products in Australian dollars and will not be changing their prices over the next year. The annualized risk-free interest rate is presently 8% in the U.S., versus 3% in Australia. Today the spot rate of the Australian dollar is $.55. Purdue Co. uses this spot rate as a forecast of future exchange rate of the Australian dollar.
Purdue expects that revenue from its cable wire exports to Australia will be about $2 million over the next year.

If Purdue decides to use the international Fisher effect rather than the spot rate to forecast the exchange rate of the Australian dollar over the next year, will its expected revenue from its exports be higher, lower, or unaffected? Explain.

**ANSWER:** If IFE exists, the forecasted change in the exchange rate is:

\[ ef = \frac{(1 + ih)}{(1 + if)} - 1 \]

\[ ef = \frac{1.08}{1.03} - 1 = 0.0485 \text{ or } 4.85\% \]

According to the IFE, the Australian dollar is expected to appreciate. Since Purdue’s exports are denominated in U.S. dollars, it will be cheaper for Australian importers to purchase Purdue’s product. Purdue will have comparative (price) advantage over its competitors in Australia. Its market share is likely to increase, which will increase Purdue’s expected revenue from its exports.

28. IRP, Expectations, and Forecast Error. Assume that interest rate parity exists and it will continue to exist in the future. Assume that interest rates of the U.S. and the U.K. vary substantially in many periods. You expect that interest rates at the beginning of each month have a major effect on the British pound’s exchange rate at the end of each month, because you believe that capital flows between the U.S. and the U.K. influence the pound’s exchange rate. You expect that money will flow to whichever country has the higher nominal interest rate. At the beginning of each month, you will either use the spot rate or the one-month forward rate to forecast the future spot rate of the pound that will exist at the end of the month. Will the use of the spot rate as a forecast result in smaller, larger or the same mean absolute forecast error as the forward rate when forecasting the future spot rate of the pound on a monthly basis? Explain.

**ANSWER:** The forward rate forecast will be poor because it will forecast depreciation when interest rates are high, but the currency will appreciate. The spot rate forecast reflects no change, which is a more accurate forecast.

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

1. Considering both Blades’ current practices and future plans, how can it benefit from forecasting the baht-dollar exchange rate?

**ANSWER:** Blades can benefit from forecasting the baht-dollar exchange rate in various ways. First, Blades currently generates net cash inflows denominated in Thai baht. The dollar value of these cash flows is sensitive to the future baht-dollar exchange rate, and Blades may decide to hedge these cash flows based on the exchange rate forecast. Second, Blades may establish a subsidiary in Thailand in the near future. Earnings generated by this subsidiary may be remitted back to the parent, and a forecast of future exchange rates may again help Blades in making hedging decisions. Alternatively, earnings may be invested in Thailand, which would be more attractive if the baht is expected to appreciate. Conversely, if Blades plans to borrow short- or long-term funds in Thailand, it would benefit from a depreciation of the baht. Forecasting the baht-dollar exchange rate will aid Blades in making both short-term and long-term decisions regarding its Thai operations.
2. Which forecasting technique (i.e., technical, fundamental, or market-based) would be easiest to use in forecasting the future value of the baht? Why?

**ANSWER:** A market-based forecast is the easiest to use. A fundamental forecast is more sophisticated, but is not necessarily more accurate.

3. Blades is considering using either current spot rates or available forward rates to forecast the future value of the baht. Available forward rates currently exhibit a large discount. Do you think the spot or the forward rate will yield a better market-based forecast? Why?

**ANSWER:** The forward rates will likely yield more accurate results. The forward rate of the baht exhibits a discount, which reflects the higher nominal interest rate in Thailand (according to interest rate parity) and the higher expected inflation associated with the higher nominal interest rate. Thus, there could be future downward pressure on the baht. Conversely, using the current spot rate to forecast future spot rates of the baht would imply that the baht’s value will remain unchanged.

4. The current 90-day forward rate for the baht is $.021. By what percentage is the baht expected to change over the next quarter according to a market-based forecast using the forward rate? What will be the value of the baht in 90 days according to this forecast?

**ANSWER:** According to the market-based forecast, the baht is expected to change by:

\[ \frac{(.021 - .023)}{.023} = -8.70\% \]

Thus, the baht is expected to depreciate using this forecast.

The forecasted value of the baht in 90 days using this forecast is $.021, the forward rate.

5. Assume that the technical forecast has been more accurate than the market-based forecast in recent weeks. What does this indicate about market efficiency for the baht-dollar exchange rate? Do you think this means that technical analysis will always be superior to other forecasting techniques in the future? Why or why not?

**ANSWER:** A more accurate forecast using historical information than when using the spot rate as a forecast would indicate that the foreign exchange rate market for the Thai baht is inefficient in the weak form; today’s exchange rate does not reflect all historical information.

6. What is the expected percentage change in the value of the baht during the next quarter based on the fundamental forecast? What is the forecasted value of the baht using this forecast? If the value of the baht 90 days from now turns out to be $.022, which forecasting technique is the most accurate? (Use the absolute forecast error as a percentage of the realized value to answer the last part of this question.)
ANSWER: The expected change in the value of the baht according to the fundamental forecast is:

\[
(0.3)(-2\%) + (0.15)(-5\%) + (0.55)(-10\%) = -6.85\%
\]

Thus, the baht is expected to depreciate by 6.85 percent over the next quarter.

The forecasted value of the baht in 90 days using a fundamental forecast is:

\[
0.023 \times (1 - 0.0685) = 0.0214
\]

The absolute forecast errors as a percentage of the realized value will therefore be \((0.02162 - 0.022)/0.022 = 1.73\%\) for the technical forecast, \((0.0214 - 0.022)/0.022 = 2.73\%\) for the fundamental forecast, and \((0.021 - 0.022)/0.022 = 4.54\%\) for the market-based forecast if the realized value of the baht turns out to be $0.022 in 90 days. Thus, the technical forecast is the most accurate.

7. Do you think the technique you have identified in question 6 will always be the most accurate? Why or why not?

ANSWER: No, the technical forecast will probably not always be the most accurate. First, the foreign exchange market for the Thai baht may become more efficient over time, rendering the use of historical information for forecasting purposes less accurate. Second, due to unfavorable economic conditions and the recent conversion of the baht to a freely floating exchange rate system, there is much uncertainty surrounding the baht-dollar exchange rate. The high volatility of the baht-dollar exchange rate may yield very different forecasting accuracy levels for the different forecasting techniques in subsequent periods.

**Solution to Supplemental Case: Whaler Publishing Co.**

1. The first step is to measure the standard deviation of the percentage change in each exchange rate, which can most easily be done with a spreadsheet. This information can then be used along with today’s spot exchange rate to derive the confidence intervals for each exchange rate.

<table>
<thead>
<tr>
<th>Currency</th>
<th>Approximate Standard Deviation</th>
<th>68 Percent Confidence Interval</th>
<th>95 Percent Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian $</td>
<td>9.59%</td>
<td>$.6935 to $.8407</td>
<td>$.6200 to $.9142</td>
</tr>
<tr>
<td>Canadian $</td>
<td>5.10</td>
<td>$.8185 to $.9065</td>
<td>$.7745 to $.9505</td>
</tr>
<tr>
<td>New Zealand $</td>
<td>12.03</td>
<td>$.5265 to $.6705</td>
<td>$.4545 to $.7425</td>
</tr>
<tr>
<td>British pound</td>
<td>16.40</td>
<td>$1.6203 to $2.2560</td>
<td>$1.3024 to $2.5739</td>
</tr>
</tbody>
</table>

Using the intervals described above and the number of foreign currency units to be received from each country, the range of forecasted U.S. dollar revenues (in thousands) from each country is disclosed below:
The numbers here may differ slightly from those the students compute due to rounding. The standard deviations estimated above suggest that the Canadian dollar is the most stable currency so the U.S. dollar revenues coming from Canada are more predictable. Conversely, the standard deviation of the British pound has been most volatile, so that the U.S. dollar revenues coming from the United Kingdom are less predictable. The above comparison of predictability of U.S. dollar revenues from various countries assumes that the foreign currency revenues in each country are known. In other words, the reason for the uncertainty in dollar revenues is the exchange rate, not the demand for textbooks by each given country.

Notice that the estimates were not pooled in any way to derive a confidence interval about the overall dollar revenues. This would require an assumption that each exchange rate moves independently of the others. If some of these currencies were positively correlated, such an assumption would cause one to underestimate the dispersion in the confidence interval when combining estimates from individual countries. If time permits, you may wish to challenge the students by asking them whether combining the individual country results would be appropriate. The supplemental case in the following chapter focuses on this issue and is an extension of this case.

**Small Business Dilemma**

**Exchange Rate Forecasting by the Sports Exports Company**

1. Explain how Jim can use technical forecasting to forecast the future value of the pound. Based on the information provided, do you think that a technical forecast will predict future appreciation or depreciation in the pound?

   **ANSWER:** Jim could develop a technical forecast by reviewing historical values of the British pound, and estimating the future values as a continuation of a recent trend that has been detected.

   A technical forecast would likely reflect appreciation of the pound, because the historical trend shows a consistent upward trend in the pound’s value.

2. Explain how Jim can use fundamental forecasting to forecast the future value of the pound. Based on the information provided, do you think that a fundamental forecast will predict appreciation or depreciation in the pound?

   **ANSWER:** Jim could develop a fundamental forecast by first developing a model that determines how the pound’s value has been affected by economic variables. Then, Jim could use that information along with forecasts of the economic variables to forecast the future value of the pound.

   The fundamental forecast would reflect depreciation of the pound. The pound depreciated when British inflation was high in the past. Jim expects British inflation to be high in the future. Based
on the forecast of this economic variable and the relationship between inflation and the value of the pound, the pound would be expected to weaken.

3. Explain how Jim can use a market-based forecast to forecast the future value of the pound. Do you think the market-based forecast will predict appreciation, depreciation, or no change in the value of the pound?

ANSWER: Jim could use either the spot rate or the forward rate as a market-based forecast.

If Jim uses the spot rate as a forecast, this results in a forecast of no change in the value of the pound. Jim could also use the forward rate as a market-based forecast. The forward rate of the pound should exhibit a discount because it was mentioned that the British interest rate is higher than the U.S. interest rate. Therefore, the forward rate would suggest depreciation in the pound’s value if it is used as a forecast.

4. Does it appear that all of the forecasting techniques will lead to the same forecast of the pound’s future value? Which technique would you prefer to use in this situation?

ANSWER: The forecast techniques do not lead to the same conclusion about the direction of the pound’s future value.

The optimal forecast technique in this situation is not clear. Some students may prefer to focus on the recent trend (technical), while others may prefer to focus on the potential impact of economic conditions (fundamental). Other students may simply prefer to use a market-based approach, if they do not expect that a trend will continue, and also believe that it is dangerous to use expected British inflation when forecasting the pound’s future value, because there is much uncertainty about the future British inflation.