

CHAPTER 8

Exchange Rate Forecasting

Opening Case 8: Mundell Wins Nobel Prize in Economics

One major finding by Robert A. Mundell, who won the Nobel Prize in economics in 1999, has become conventional wisdom: when money can move freely across borders, policy-makers must choose between exchange rate stability and an independent monetary policy. They cannot have both. Professor Mundell remains a fan of the gold standard and fixed exchange rates at a time when they are out of favor with most economists. "You have fixed rates between New York and California, and it works perfectly," he has said. This statement implies that if the US dollar works well for 50 US states, a common currency such as the euro should also work well for its member states, the eurozone countries.

The Nobel committee praised Mundell's research into common-currency zones for laying the intellectual foundation for the 11-country euro. In 1961, when European countries were still faithful to national currencies, he described circumstances in which nations could share a common currency. Mundell's Nobel Prize in economics has renewed the focus on the fixed exchange rate system. First, economists and policy-makers failed to forecast recent currency crises in Asia, Europe, Latin America, and Russia. Second, advocates of flexible exchange rates had argued that under the floating-rate system, exchange rates would be stable, trade imbalances would fall, and countries would not need reserves, but none of these predictions proved to be true.

"The benefits of the euro will derive from the transparency of pricing, stability of expectations, lower transaction costs, and a common monetary policy run by the best minds that Europe can muster," Mundell wrote in 1998. The stability of expectations under a single currency would reduce exchange rate uncertainty, prevent speculative attacks, and eliminate competitive devaluations. The benefits of switching to a single

currency come with costs, however. Probably the biggest cost is that each country relinquishes its right to set monetary policy to respond to domestic economic problems. In addition, exchange rates between countries can no longer adjust in response to regional problems. Still, economists and policy-makers believe that the benefits of the euro far exceed its costs.

Mundell believes that the euro will eventually challenge the dollar for global dominance. He said in 1998: "The creation of the euro will set new precedents. For the first time in history, an important group of independent countries have voluntarily agreed to relinquish their national currencies, pool their monetary sovereignties, and create a supercurrency of continental dimensions. The euro will create an alternative to the dollar in its role as unit of account, reserve currency, and intervention currency." As a result, he regards the introduction of the euro as the most important event in the history of the international monetary system since the dollar took over from the pound the role of dominant currency during World War I.

Sources: G. Eudey, "Why is Europe Forming a Monetary Union?" *Business Review*, Federal Reserve Bank of Philadelphia, Dec. 1998, p. 21; R. Mundell, "The Case for the Euro," *The Wall Street Journal*, Mar. 25, 1998; and M. M. Phillips, "Mundell Wins Nobel Prize in Economics," *The Wall Street Journal*, Oct. 14, 1999, pp. A2, A8.

Because future exchange rates are uncertain, participants in international markets never know with certainty what the spot rate will be in 2 months or in 1 year. Thus, currency forecasts are a necessity. In other words, the quality of a company's decisions depends on the accuracy of exchange rate projections. If investors forecast future spot rates more accurately than the rest of the market, they have an opportunity to realize large monetary gains.

This chapter covers four related topics: (1) measuring a change in exchange rates; (2) forecasting the needs of a multinational company (MNC); (3) forecasting floating exchange rates; and (4) forecasting fixed exchange rates. Floating exchange rates are rates of foreign exchange determined by the market forces of supply and demand, without government intervention on how much rates can fluctuate. Fixed exchange rates are exchange rates which do not change, or they fluctuate within a predetermined band.

● 8.1 Measuring Exchange Rate Changes

An exchange rate is the price of one currency expressed in terms of another currency. As economic conditions change, exchange rates may become substantially volatile. A decrease in a currency's value relative to another currency is known as **depreciation**, or devaluation. Likewise, an increase in a currency's value is known as **appreciation**, or revaluation. MNCs frequently measure a percentage change in the exchange rate between two specific points in time; that is, the current exchange rate and the forecasted exchange rate 1 year ahead.

When the exchange rates from two specific points in time are compared, the beginning exchange rate is denoted as e_0 and the ending exchange rate is denoted as e_1 . The percentage

change in the value of a foreign currency relative to the home currency is computed as follows:

$$\text{percentage change} = \frac{(e_1 - e_0)}{e_0} \quad (8.1)$$

Alternatively, the percentage change in the value of a domestic currency is computed as follows:

$$\text{percentage change} = \frac{(e_0 - e_1)}{e_1} \quad (8.2)$$

A positive percentage change represents a currency appreciation, while a negative percentage change represents a currency depreciation.

Example 8.1

Assume that the exchange rate for the Swiss franc changed from \$0.64 on January 1 to \$0.68 on December 31. In this case, the percentage change in the exchange rate for the franc against the dollar can be expressed in two different ways, but they have the same meaning. From a franc perspective, we can say that the franc's value against the dollar appreciated from \$0.64 to \$0.68. From a dollar perspective, we can say that the dollar's value against the franc depreciated from \$0.64 to \$0.68.

The percentage change in the spot rate for the franc (a foreign currency) can be computed by using equation 8.1:

$$\text{percentage change} = \frac{\$0.68 - \$0.64}{\$0.64} = -0.0625$$

Alternatively, the percentage change in the spot rate for the dollar (a domestic currency) against the foreign currency can be computed by using equation 8.2:

$$\text{percentage change} = \frac{\$0.64 - \$0.68}{\$0.68} = -0.0588$$

Thus, a change in the exchange rate from \$0.64 to \$0.68 is equivalent to a franc appreciation of 6.25 percent or a dollar depreciation of 5.88 percent. It is important to note that the two exchange rate changes are not equal to each other. The amount of franc appreciation is not equal to the amount of dollar depreciation, because the value of one currency is the inverse of the value of the other currency. In other words, the percentage change in the exchange rate differs because the base rate from which it is measured differs.

8.2 The Forecasting Needs of the Multinational Company

Virtually all aspects of multinational operations may be influenced by changes in exchange rates. Thus, an MNC needs foreign-exchange forecasts for many of its corporate functions, although future foreign-exchange rates are not easy to forecast (see Global Finance in Action 8.1).

Global Finance in Action 8.1

Tracking the US Dollar

The dollar goes up, the dollar goes down. Recently, it has been down. From January 2, 2002, to March 7, 2003, the dollar fell 20 percent against the euro, 10 percent against the British pound, and 13 percent against the Japanese yen. Historically, such fluctuations are not unusual, though they are seldom easy to explain.

Ask an economist to describe the reasons for the greenback's recent decline, and the reply will include a furrowed brow. Few subjects are as complicated or confounding to us as the foreign-currency exchange rate market – the deepest, most liquid, and one of the least regulated markets in the world.

Each day, more than \$1 trillion in currency trades in the foreign-exchange market. Many participants and factors affect the value of one currency versus another. The market consists of a worldwide cast of businesses, investors, speculators, governments, and central banks, acting and reacting on the basis of a mix of forces such as trade patterns, interest rate differentials, capital flows, and international relations.

As the dollar has recently undergone its worst slide against European currencies since 1987, the overarching reason can be attributed to a reduced demand to place investment funds in the USA, a situation quite different from that of the late 1990s. Between 1995 and 2000, the attractiveness of US capital markets resulted in the dollar rising 20 percent against other major currencies. Recently, with the decline in the US stock market as well as lower interest rates on US government securities, outside investors have turned skittish. Other confidence crushers include the corporate accounting scandal of 2002 and rising tensions with Iraq and North Korea.

A weakened dollar, despite the negative connotation, does carry certain benefits. Although American travelers and businesses are not able to stretch their money as far on foreign soil, the opposite is also true: foreign consumers are able to purchase more US goods with their beefed-up currency. Such behavior, in theory, could help reduce the US trade deficit, which swelled to a record \$44.2 billion in December 2002.

If the dollar's recent decline can be attributed to the slowdown in the US economy, along with corporate governance and geopolitical uncertainties, then recent weakness in the dollar is not a matter for serious concern. As the economy rebounds, we would expect foreign investment to make a comeback, and the dollar with it. So, remember: the dollar goes up, the dollar goes down. These are normal fluctuations in a well-functioning and vigorously competitive market.

Source. William Poole, "Tracking the US Dollar," *A Quarterly Review of Business and Economic Conditions*, Apr. 2003, p. 3.

8.2.1 *The hedging decision*

MNCs have a variety of foreign currency denominated payables and receivables: credit purchases and credit sales whose prices are stated in foreign currencies, borrowed and loaned funds denominated in foreign currencies, and uncovered forward contracts. These payables and receivables are exposed to foreign-exchange risks due to unexpected changes in the future exchange rate. A company's decision to hedge against these potential losses may be determined by its forecasts of foreign-currency values.

8.2.2 *Working capital management*

Working capital management consists of short-term financing and short-term investment decisions. The value of the currency borrowed or invested will change with respect to the borrower's or the investor's local currency over time. The actual cost of a foreign bank credit to the borrower depends on the interest rate charged by the bank and the movement in the borrowed currency's value over the life of the loan. Likewise, the actual rate of return on a short-term foreign investment consists of the rate of return on the investment in a local currency and the amount of the change in the local currency value.

When MNCs borrow money, they have access to a number of different currencies. As a result, they would wish to borrow money in a currency whose rate of interest is low and whose value will depreciate over the life of the loan. MNCs sometimes have a substantial amount of excess funds available for a short-term investment. Large short-term investments may be made in a number of different currencies. The ideal currency for such an investment should have a high interest rate and should appreciate in value over the investment period.

8.2.3 *Long-term investment analysis*

The evaluation of foreign direct and portfolio investments requires exchange rate forecasts well into the future. An important feature of foreign investment analysis is the fact that project cash inflows available to the investor depend partially on future exchange rates. There are several ways in which exchange rates can influence the estimated cash inflows. The key point here, however, is that accurate forecasts of future exchange rates will improve the estimates of the cash inflows and thus improve a company's decision-making process.

Some institutions, such as pension funds and insurance companies, invest a substantial portion of their money in foreign stocks and bonds. As with short-term investors, portfolio investors wish to invest in a currency that would have a high rate of return and would appreciate in value over the investment period.

8.2.4 *The long-term financing decision*

When MNCs issue bonds to obtain long-term funds, they can denominate their bonds in foreign currencies. Like short-term financing, companies would prefer to denominate the bonds in a cur-

rency that would depreciate in value over the life of the bond. To estimate the cost of issuing bonds, companies will have to forecast exchange rates.

8.2.5 *Other uses*

There are additional situations that require companies to use exchange rate forecasts. First, companies need exchange rate forecasts to assess foreign subsidiary earnings. Most MNCs are required to consolidate the earnings of subsidiaries into those of the parent if the parent owns more than a certain percentage of the subsidiary's voting shares. In other words, when an MNC reports its earnings, it has to consolidate and translate subsidiary earnings into the parent currency. Forecasts of exchange rates, therefore, play an important role in the overall estimate of a company's consolidated earnings.

Second, if a company wishes to buy or sell a product in a foreign currency, it has to forecast the effective exchange rate at the time of transaction. Third, if a company wants to remit its foreign profits to the parent country at some point in the future, it has to forecast the effective exchange rate at the time of remittance.

● 8.3 Forecasting Floating Exchange Rates

This section opens by first questioning the validity of generating exchange rate forecasts. This question is based on the assumption that market exchange rates reflect all currently available information, thereby making it futile to attempt forecasting exchange rates.

8.3.1 *Currency forecasting and market efficiency*

Banks and independent consultants offer many currency-forecasting services. Some MNCs have in-house forecasting capabilities. Yet, no one should pay for currency-forecasting services if foreign-exchange markets are perfectly efficient. The **efficient market hypothesis** holds that: (1) spot rates reflect all current information and adjust quickly to new information; (2) it is impossible for any market analyst to consistently "beat the market"; and (3) all currencies are fairly priced.

Foreign-exchange markets are efficient if the following conditions hold: First, there are many well-informed investors with ample funds for arbitrage opportunities when opportunities present themselves. Second, there are no barriers to the movement of funds from one country to another. Third, transaction costs are negligible. Under these three conditions, exchange rates reflect all available information. Thus, exchange rate changes at a given time must be due to new information alone. Because information that is useful for currency forecasting tends to arrive randomly, exchange rate changes follow a random walk. In other words, no one can consistently beat the market if foreign-exchange markets are efficient. Because all currencies are fairly priced in efficient exchange markets, there are no undervalued currencies and therefore no investors can earn unusually large profits in foreign-exchange markets.

Financial theorists define three forms of market efficiency: (1) weak-form efficiency, (2) semi-strong-form efficiency, and (3) strong-form efficiency. **Weak-form efficiency** implies that all

information contained in past exchange rate movements is fully reflected in current exchange rates. Hence, information about recent trends in a currency's price would not be useful for forecasting exchange rate movements. **Semistrong-form efficiency** suggests that current exchange rates reflect all publicly available information, thereby making such information useless for forecasting exchange rate movements. **Strong-form efficiency** indicates that current exchange rates reflect all pertinent information, whether publicly available or privately held. If this form is valid, then even insiders would find it impossible to earn abnormal returns in the exchange market.

Efficiency studies of foreign-exchange markets using statistical tests, various currencies, and different time periods have not provided clear-cut support of the efficient market hypothesis. Nevertheless, all careful studies have concluded that the weak form of the efficient market hypothesis is essentially correct. Empirical tests have also shown that the evidence of the semistrong-form efficiency is mixed. Finally, almost no one believes that strong-form efficiency is valid.

Dufey and Giddy (1978) suggested that currency forecasting can only be consistently useful or profitable if the forecaster meets one of the following four criteria:

- 1 The forecaster has exclusive use of a superior forecasting model.
- 2 The forecaster has consistent access to information before other investors.
- 3 The forecaster exploits small but temporary deviations from equilibrium.
- 4 The forecaster predicts the nature of government intervention in the foreign-exchange market.

Three methods – fundamental analysis, technical analysis, and market-based forecasts – are widely used to forecast exchange rates. Fundamental analysis relies heavily on economic models. Technical analysis bases predictions solely on historical price information. Market-based forecasts depend on a number of relationships that are presumed to exist between exchange rates and interest rates.

8.3.2 *Fundamental analysis*

Fundamental analysis is a currency forecasting technique that uses fundamental relationships between economic variables and exchange rates. The economic variables used in fundamental analysis include inflation rates, national income growth, changes in money supply, and other macroeconomic variables. Because fundamental analysis has become more sophisticated in recent years, it now depends on computer-based econometric models to forecast exchange rates. Model builders believe that changes in certain economic indicators may trigger changes in exchange rates in a similar way to changes that occurred in the past.

THE THEORY OF PURCHASING POWER PARITY The simplest form of fundamental analysis uses the theory of purchasing power parity (PPP). In chapter 5, we learned that the PPP doctrine relates equilibrium changes in the exchange rate to changes in the ratio of domestic and foreign prices:

$$e_t = e_0 \times \frac{(1 + I_d)^t}{(1 + I_f)^t} \quad (8.3)$$

where e_t is the dollar price of one unit of foreign currency in period t , e_0 is the dollar price of one unit of foreign currency in period 0, I_d is the domestic inflation rate, and I_f is the foreign inflation rate.

Example 8.2

The spot rate is \$0.73 per Australian dollar. The USA will have an inflation rate of 3 percent per year for the next 2 years, while Australia will have an inflation rate of 5 percent per year over the same period. What will the US dollar price of the Australian dollar be in 2 years?

Using equation 8.3, the US dollar price of the Australian dollar in 2 years can be computed as follows:

$$e_2 = \$0.73 \times \frac{(1+0.03)^2}{(1+0.05)^2} = \$0.7025$$

Thus, the expected spot rate for the Australian dollar in 2 years is \$0.7025.

MULTIPLE REGRESSION ANALYSIS A more sophisticated approach for forecasting exchange rates calls for the use of multiple regression analysis. A **multiple regression forecasting model** is a systematic effort at uncovering functional relationships between a set of independent (macro-economic) variables and a dependent variable – namely, the exchange rate.

US MNCs frequently forecast the percentage change in a foreign currency with respect to the US dollar during the coming months or years. Consider that a US company's forecast for the percentage change in the British pound (PP) depends on only three variables: inflation rate differentials, US inflation minus British inflation (I); differentials in the rate of growth in money supply, the growth rate in US money supply minus the growth rate in British money supply (M); and differentials in national income growth rates, US income growth rates minus British income growth rates (N):

$$PP = b_0 + b_1I + b_2M + b_3N + \mu \quad (8.4)$$

where b_0 , b_1 , b_2 , and b_3 are regression coefficients, and μ is an error term.

Example 8.3

Assume the following values: $b_0 = 0.001$, $b_1 = 0.5$, $b_2 = 0.8$, $b_3 = 1$, $I = 2$ percent (the inflation rate differential during the most recent quarter), $M = 3$ percent (the differential in the rate of growth in money supply during the most recent quarter), and $N = 4$ percent (the differential in national income growth rates during the most recent quarter).

The percentage change in the British pound during the next quarter is

$$\begin{aligned} PP &= 0.001 + 0.5(2\%) + 0.8(3\%) + 1(4\%) \\ &= 0.1\% + 1\% + 2.4\% + 4\% \\ &= 7.5\%. \end{aligned}$$

Given the current figures for inflation rates, money supply, and income growth rates, the pound should appreciate by 7.5 percent during the next quarter. The regression coefficients of $b_0 = 0.001$, $b_1 = 0.5$, $b_2 = 0.8$, and $b_3 = 1$ can be interpreted as follows. The constant value, 0.001, indicates that the pound will appreciate by 0.1 percent when the United States and the United Kingdom have the same inflation rate, the same growth rate in money supply, and the same growth rate in national income. If there are no differentials in these three variables, I , M , and N are equal to zero. The value of 0.5 means that each 1 percent change in the inflation differential would cause the pound to change by 0.5 percent in the same direction, other variables (N and M) being held constant. The value of 0.8 implies that the pound changes by 0.8 percent for each 1 percent change in the money supply differential, other variables (I and N) being held constant. The value of 1 indicates that the pound is expected to change by 1 percent for every 1 percent change in the income differential, other variables (I and M) being held constant.

8.3.3 *Technical analysis*

Technical analysis is a currency forecasting technique that uses historical prices or trends. This method has been applied to commodity and stock markets for many years, but its application to the foreign-exchange market is a recent phenomenon. Yet technical analysis of foreign-exchange rates has attracted a growing audience. This method focuses exclusively on past prices and volume movements, rather than on economic and political factors. Success depends on whether technical analysts can discover forecastable price trends. However, price trends will be forecastable only if price patterns repeat themselves.

Charting and mechanical rules are the two primary methods of technical analysis. These two types of technical analysis examine all sorts of charts and graphs to identify recurring price patterns. Foreign-exchange traders will buy or sell certain currencies if their prices deviate from past patterns. Trend analysts seek to find price trends through mathematical models, so that they can decide whether particular price trends will continue or shift direction.

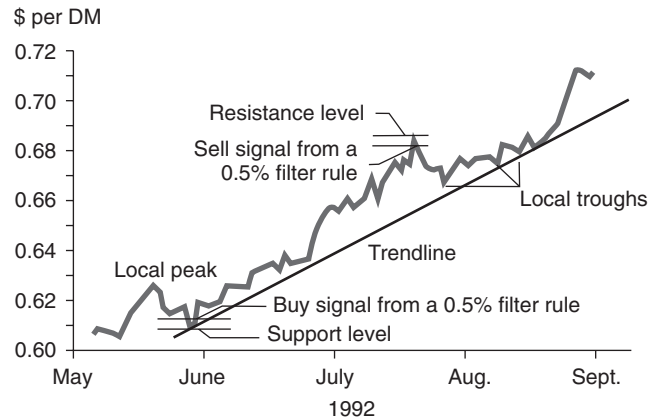


Figure 8.1 Technical analysis: charting and the filter rule; peaks, troughs, trends, resistance, and support levels illustrated for the \$/DM

Source: C. J. Neely, "Technical Analysis in the Foreign Exchange Market: A Layman's Rule," *Review*, Federal Reserve Bank of St. Louis, Sept./Oct. 1997, p. 24.

CHARTING To identify trends through the use of charts, practitioners must first find "peaks" and "troughs" in the price series. A peak is the highest value of the exchange rate within a specified period of time, while a trough is the lowest price of the exchange rate within the same period. As shown in figure 8.1, a trendline is drawn by connecting two local troughs based on data of the dollar–mark rate (Neely 1997). Although figure 8.1 does not show it, another trendline may be drawn by connecting two local peaks. After these two trendlines have been established, foreign-exchange traders buy a currency if an uptrend is signaled and sell the currency if a downtrend seems likely.

MECHANICAL RULES Chartists admit that their subjective system requires them to use judgment and skill in finding and interpreting patterns. A class of mechanical rules avoids this subjectivity. These rules impose consistency and discipline on technical analysts by requiring them to use rules based on mathematical functions of present and past exchange rates.

Filter rules and moving averages are the most commonly used mechanical rules. Figure 8.1 illustrates some of the buy-and-sell signals generated by a filter rule with a filter size of 0.5 percent. Local peaks are called resistance levels, and local troughs are called support levels. This **filter rule** suggests that investors buy a currency when it rises more than a given percentage above its recent lowest value (the support level) and sell the currency when it falls more than a given percentage below its highest recent value (the resistance level).

Figure 8.2 illustrates the behavior of a 5-day and a 20-day moving average of the dollar–mark rate from February 1992 to June 1992. A typical moving average rule suggests that investors buy a currency when a short-moving average crosses a long-moving average from below; that is, when the exchange rate is rising relatively fast. This same rule suggests that investors sell the currency when a short-moving average crosses a long-moving average from above; that is, when the exchange rate is falling relatively fast.

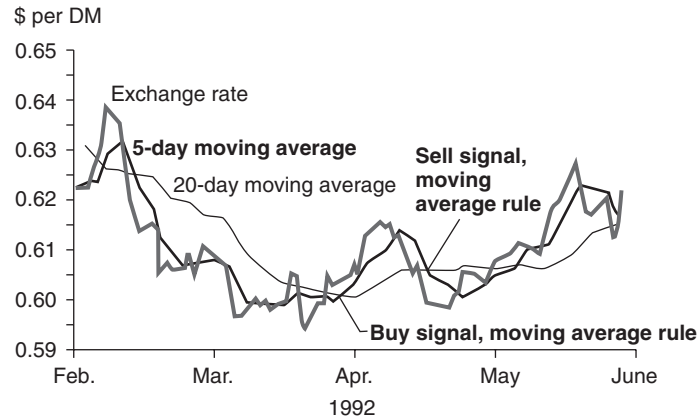


Figure 8.2 Technical analysis: moving-average rule (5- and 20-day moving averages)

Source: C. J. Neely, "Technical Analysis in the Foreign Exchange Market: A Layman's Rule," *Review*, Federal Reserve Bank of St. Louis, Sept./Oct. 1997, p. 24.

8.3.4 Market-based forecasts

A **market-based forecast** is a forecast based on market indicators such as forward rates. The empirical evidence on the relationship between exchange rates and market indicators implies that the financial markets of industrialized countries efficiently incorporate expected currency changes in the spot rate, the forward rate, and in the cost of money. This means that we can obtain currency forecasts by extracting predictions already embodied in spot, forward, and interest rates. Therefore, companies can develop exchange forecasts on the basis of these three market indicators.

SPOT RATES Some companies track changes in the spot rate and then use these changes to estimate the future spot rate. To clarify this point, assume that the Mexican peso is expected to depreciate against the dollar in the near future. Such an expectation will cause speculators to sell pesos today in anticipation of their depreciation. This speculative action will bid down the peso spot rate immediately. By the same token, assume that the peso is expected to appreciate against the dollar in the near future. Such an expectation will encourage speculators to buy pesos today, hoping to sell them at a higher price after they increase in value. This speculative action will bid up the peso spot rate immediately. The present value of the peso, therefore, reflects the expectation of the peso's value in the very near future. Companies can use the current spot rate to forecast the future spot rate because it represents the market's expectation of the spot rate in the near future.

FORWARD RATES The expectation theory assumes that the current forward rate is a consensus forecast of the spot rate in the future. For example, today's 30-day yen forward rate is a market forecast of the spot rate that will exist in 30 days.

Example 8.4

The spot rate is \$0.8000 per Canadian dollar. The 90-day forward discount for Canadian dollars is 5 percent. What is the expected spot rate in 90 days?

To solve this problem, use equation 5.4:

$$\text{premium (discount)} = \frac{n\text{-day forward rate} - \text{spot rate}}{\text{spot rate}} \times \frac{360}{n}$$

Applying equation 5.4 to the 90-day forward discount for Canadian dollars given above, we obtain:

$$\begin{aligned} -0.05 &= \frac{90\text{-day forward rate} - \$0.8000}{\$0.8000} \times \frac{360}{90} \\ \text{or } 90\text{-day forward rate} &= \$0.7900 \end{aligned}$$

INTEREST RATES Although forward rates provide simple currency forecasts, their forecasting horizon is limited to about 1 year, because long-term forward contracts are generally nonexistent. Interest rate differentials can be used to predict exchange rates beyond 1 year. The market's forecast of the future spot rate can be found by assuming that investors demand equal returns on domestic and foreign securities:

$$e_t = e_0 \frac{(1+i_d)^t}{(1+i_f)^t}$$

where e_t is the dollar price of one unit of foreign currency in period t , e_0 is the dollar price of one unit of foreign currency in period 0, i_d is the domestic interest rate, and i_f is the foreign interest rate.

Example 8.5

The spot rate is \$2 per pound. The annual interest rates are 10 percent for the USA and 20 percent for the UK. If these interest rates remain constant, then what is the market forecast of the spot rate for the pound in 3 years?

The market's forecast of e_3 – the spot rate in 3 years – can be found as follows:

$$e_3 = \$2 \times \frac{(1+0.10)^3}{(1+0.20)^3} = \$1.5405$$

8.3.5 The evaluation of exchange forecast performance

Because exchange forecasts are not free, MNCs must monitor their forecast performance to determine whether the forecasting procedure is satisfactory. Forecast performance can be evaluated by measuring the forecast error as follows:

$$RSE = \sqrt{\frac{(FV - RV)^2}{RV}}$$

where RSE is the root square error as a percentage of the realized value, FV is the forecasted value, and RV is the realized value. Average forecasting accuracy is usually measured by the root mean square error. The error is squared because a positive error is no better than a negative error. The RSE averages the squared errors over all forecasts. A forecasting model is more accurate than the forward rate if it has a smaller RSE than the forward rate.

In order to avoid a possible offsetting effect when we determine the mean forecast error, an absolute value (a squared error) is used to compute the forecast error. To clarify why the forecast error must have an absolute value, assume that the forecast error is 20 percent in the first quarter and -20 percent in the second quarter. If the absolute value is not used, the mean error over the two quarters is zero. The mean error of zero in this case, however, is misleading, because the forecast was not perfect in either quarter. If the absolute value is used here, the mean error over the quarters is 20 percent. Thus, the absolute value avoids such a distortion.

Example 8.6

The forecasted value for the Canadian dollar is \$0.7300 and its realized value is \$0.7500. The forecasted value for the Mexican peso is \$0.1100 and its realized value is \$0.1000. What is the dollar difference between the forecasted value and the realized value for both the Canadian dollar and the Mexican peso? What is the forecast error for each of these two currencies?

The dollar difference between the forecasted value and the realized value is \$0.0200 for the Canadian dollar and \$0.0100 for the peso. This does not necessarily mean that the forecast of the peso is more accurate. When we consider the relative size of the difference, we can see that the Canadian dollar has been forecasted more accurately on a percentage basis. The forecast error of the Canadian dollar is computed as follows:

$$RSE = \sqrt{\frac{(\$0.7300 - \$0.7500)^2}{\$0.7500}} = 0.023$$

The forecasted error of the peso is computed as follows:

$$RSE = \sqrt{\frac{(\$0.1100 - \$0.1000)^2}{\$0.1000}} = 0.032$$

These computations, thus, confirm the fact that the Canadian dollar has been predicted more accurately than the peso.

EMPIRICAL EVIDENCE Several studies have analyzed the forecasting effectiveness of market-based forecasts, technical analysis, fundamental analysis, and exchange forecasting firms. In addition to their mixed results, these studies are not comparable because they include different currencies and cover different time periods. Nevertheless, we discuss the results of two most representative studies: one that focuses on the accuracy of several forecasting models and the other that analyzes the accuracy of several forecasting firms.

Meese and Rogoff (1983) evaluated the forecasting effectiveness of seven models – two market-based forecasts (spot rate and forward rate), two technical models, and three fundamental models – for the time period between November 1976 and June 1981. For each currency, they analyzed forecasting horizons of 1, 6, and 12 months. Using the *RSE* between the forecasted value and the realized value for three currencies – the German mark, the Japanese yen and the British pound – they concluded that the market-based forecasts were more accurate than both the technical and fundamental models; and of the two market-based forecasts, the spot rate performed slightly better than the forward rate.

Goodman (1979) evaluated the record of six fundamentally oriented forecasting firms on the basis of their predictive accuracy for six currencies – the Canadian dollar, the French franc, the German mark, the Japanese yen, the Swiss franc, and the British pound – from January 1976 to June 1979. His study evaluated the performance of these forecasting firms using two measures: accuracy in predicting trend and the accuracy of their point estimates. He used the forward rate as a benchmark to judge the effectiveness of the forecasting firms. His study found that no individual firm was significantly more accurate than the forward rate in predicting trend. On average, these firms did not perform better than the forward rate.

Goodman's study also computed the accuracy of the point estimate by measuring the percentage of times that the predicted rates were closer to the actual spot rate than forward rate. Some of the firms performed better than others, but their overall forecast performance was worse than that of the forward rate. A 1982 study by Levich also found that professional forecasting firms clearly failed to outperform the forward exchange rate. In a more recent study, Eun and Sabherwal (2002) evaluated the forecasting performance of 10 major commercial banks from around the world. Their study concluded that, in general, these 10 banks could not beat the random walk model in forecasting the British pound, the German mark, the Swiss franc, and the Japanese yen. More surprising, no bank, including the Japanese bank, could beat the random walk model in forecasting the Japanese yen. In other words, these studies failed to beat the market. Thus, the performance of these companies does not refute the efficient market hypothesis of the foreign-exchange market.

SKEPTICS OF THE EFFICIENT MARKET HYPOTHESIS Many financial economists believe that the exchange rate can be well approximated by a random walk. Using the efficient market hypoth-

esis, they argue that the forward rate is the best available predictor of future spot rates. However, some recent studies by Taylor and Allen (1992), LeBaron (1996), and Szakmary and Mathur (1997) cast doubts on the efficient market hypothesis.

In 1997, for example, Neely tested six filter rules and four moving-average rules on data of daily US dollar bid–ask quotes for the German mark, the Japanese yen, the British pound, and the Swiss franc. All exchange rates data begin on March 1, 1974, and end on April 10, 1997. These four series are the dollar–mark rate, the dollar–yen rate, the dollar–pound rate, and the dollar–franc rate. These 10 rules that were tested had positive excess returns of 4.4 percent over the whole sample period. These test results cast doubts on the efficient market hypothesis, which holds that no trading strategy should be able to earn positive excess returns.

● 8.4 Forecasting Fixed Exchange Rates

Since the breakdown of the fixed exchange rate system in 1971, exchange rates are believed to be determined by a floating exchange rate system. However, many International Monetary Fund (IMF) member countries have used some form of fixed exchange rates since 1971. The annual report published by the IMF describes the exchange arrangements and exchange restrictions of its member countries. The 2003 report (see chapter 4), which covered 186 countries, listed 97 cases of fixed exchange rates as of January 31, 2003. Exchange rate forecasting under a fixed exchange rate system can be very useful for MNCs with operations in countries that employ fixed exchange rates.

Jacque (1978) suggests the following four-step sequence as a general forecasting procedure under a fixed-rate system. First, through a review of key economic indicators, the forecaster should identify those countries whose balance of payments is in fundamental disequilibrium. Second, for the currencies of such countries, the forecaster should evaluate the pressure that market forces exert on prevailing exchange rates. Third, the forecaster should assess the level of central banks' international reserves to ascertain whether the central bank is in a position to defend the prevailing exchange rate. Finally, the forecaster should try to predict the type of corrective policies that political decision-makers are likely to implement.

A rule of thumb suggests that in a fixed-rate system, the forecaster ought to focus on the government decision-making structure, because the decision to devalue a currency at a given time is clearly a political one. The basic forecasting approach in this case is to first ascertain the pressure to devalue a currency and then determine how long the nation's leaders can persist with this particular level of disequilibrium. We discuss each of the four steps below.

8.4.1 *Step one: assessing the balance-of-payments outlook*

Step one is an early warning system that will assist the forecaster in identifying those countries whose currencies are likely to be adjusted. Currencies are rarely devalued without prior indication of weakness. Many researchers in this area have attempted to forecast currency devaluation on the basis of key economic indicators that are critical in assessing a country's balance-of-payments outlook. Some of these indicators are the international monetary reserves, international trade, inflation, monetary supply, and exchange spread between official versus market rates. These economic indicators are also used to forecast foreign-exchange controls.

INTERNATIONAL RESERVES International reserves reflect the solvency of a country – its ability to meet international obligations. Debt repayment obligations, profit and royalty obligations, and payments of purchases on credit represent international obligations. Continued balance-of-payments deficits decrease the international reserves of a country that maintains fixed exchange rates, unless these deficits are offset by increased short-term loans or investment. This situation increases the likelihood of devaluation or depreciation.

THE BALANCE OF FOREIGN TRADE Trends and forecasts for the balance of foreign trade indicate the direction in which the value of a currency is to be adjusted. If a country spends more money than it obtains from abroad over a sustained period, the possibility of devaluation increases. If the country receives more money from abroad than it spends abroad, the probability of revaluation increases.

INFLATION Economic forces link the prices of real assets (inflation rates) with the prices of currencies (exchange rates). The relationship between inflation rates and exchange rates is provided by the purchasing power parity doctrine. According to this doctrine, currencies of countries with higher inflation rates than that of the USA tend to depreciate in value against the dollar. By the same token, currencies of countries with lower inflation rates than that of the USA tend to appreciate in value against the dollar.

MONEY SUPPLY Money supply consists of currency in circulation and demand deposits. Simply stated, inflation is the consequence of a country's spending beyond its capacity to produce. As an economy approaches full employment, any additional increase in money supply can serve only to make prices spiral upward. Some foreign-exchange forecasters rely on the money supply as a timely indicator of price changes and exchange rate changes for maintaining purchasing power parity.

OFFICIAL VERSUS MARKET RATES Many foreign-exchange forecasters use the exchange spread between official and market rates as a valid indicator of currency health. In their comparison, forecasters observe the value that outsiders place on a particular currency. Under a freely flexible exchange system, no spread exists between these two exchange rates. However, some spread is practically inevitable where currencies are pegged and exchange controls are imposed on the convertibility of local currency into hard currencies. In this situation, one measures the falling confidence in a local currency by checking the widening spread between official and free market rates.

A rise in the spread between official and market rates serves as an indication of increasing apprehension in the near future. Thus, the increasing divergence from a free market rate over an official rate may be used as a valuable piece of information to forecast devaluation.

8.4.2 *Step two: measuring the magnitude of the required adjustment*

Once currency forecasters single out a currency for adjustment, they will carry out the second step of the forecasting procedure – that is, determining the size of the change in the exchange rate required to restore the balance-of-payments equilibrium. Essentially, there are three ways of doing this: (1) generalized application of the purchasing power parity (PPP) hypothesis; (2) using

forward exchange rates as predictors of future spot exchange rates; and (3) using free market or black market rates as indicators of future spot exchange rates.

GENERALIZED APPLICATION OF THE PPP THEORY Under the generalized application of the PPP hypothesis, the percentage change in the exchange rate between any two currencies can be estimated by inflation rate differentials between the two countries. The PPP hypothesis, however, is inapplicable if either country or both countries impose controls on prices. Many countries with a fixed exchange system tend to have price controls.

FORWARD PREMIUM OR DISCOUNT An unbiased estimate of the future percentage revaluation or devaluation of a currency may be provided by forward premium or discount. Speculators who think that a forward rate is higher than their prediction of a future spot rate will sell the foreign currency forward. This transaction tends to reduce the forward rate until it equals the expected future spot rate. By the same token, speculators who believe a forward rate is lower than an expected future spot rate will buy a foreign currency forward. This transaction tends to increase the forward rate until it reaches the expected future spot rate.

THE FREE MARKET RATE In the absence of a forward exchange market, the exchange rate quoted by the free market can be used as an indicator of the future spot rate. In the absence of a free market, the black market rate provides a good proxy estimate of the equilibrium exchange rate. These black markets for foreign currencies are likely to appear whenever exchange controls create a divergence between the equilibrium exchange rate and the controlled exchange rate. However, both the free market rate and the black market rate normally overestimate the extent of the devaluation required to bring the balance of payments into fundamental equilibrium.

8.4.3 *Step three: the timing of the adjustment*

Once forecasters have estimated the pressure on a country's currency based on the discrepancy between the forecasted rate and the actual rate, they will evaluate the resistance capacity of the country under pressure to adjust. The country's ability to resist or to postpone the implementation of corrective policies depends upon two factors: the ability to borrow hard currencies and the overall amount of international reserves.

Countries with good credit ratings can easily borrow money from a number of capital markets, such as Euromarkets, local capital markets, foreign capital markets, and international financial institutions. International reserves and borrowed funds can be used to finance the balance-of-payments deficit caused by the fundamental disequilibrium. Consequently, those countries with a large amount of international reserves and with good credit ratings can resist or delay the implementation of their corrective policies. However, if disequilibrium persists, even these countries will run out of reserves and borrowing capacity.

8.4.4 *Step four: the nature of the adjustment*

Whether a country will devalue its currency or let it float downward is ultimately a political decision. No matter how necessary a devaluation may be from an economic point of view, political

factors have the final word before choosing between the implementation of corrective policies and a change in the par value of the currency.

CORRECTIVE POLICIES In the case of a structural balance-of-payments deficit, policy-makers will first attempt to implement a number of corrective policies: deflate the economy and institute strict exchange controls, among others.

A government may adopt tight monetary and fiscal policies. To stem inflation, it should control budget deficits, reduce the growth in the money supply, and institute wage and price controls. These deflationary policies should reduce aggregate domestic demand for both domestic and foreign goods, so that the demand for imports falls and the supply of exports rises. In addition, external controls on capital account transactions should further reinforce improvement in the balance of payments.

Under foreign-exchange controls, a country would force its exporters and other recipients to sell their foreign exchange proceeds to the central bank. Then, the government would allocate this foreign exchange only to the various users of foreign exchange. In this way, the government restricts the country's imports to an amount of foreign exchange earned by the country's exports. Thus, imports under exchange controls are less than they would be under free market conditions.

Although deflationary policies appear to be a good way to fix balance-of-payments deficits, they are not without costs. Deflationary policies may slow the economy. Exchange controls may hurt foreign investment and tourism. In other words, the cost of such corrective policies for the balance-of-payments deficit is high unemployment, which is unlikely to arouse popular enthusiasm.

8.4.5 *Devaluation*

A country will devalue its currency when various corrective policies prove economically ineffective or politically unacceptable. To determine how much longer a devaluation can be delayed for purely political reasons, the currency analyst will have to review political factors in a qualitative manner. At this point, the key question is whether the decision-makers in power can afford the expected political cost of higher unemployment. The answer to this question depends on the economic philosophies of the party in power, government attitudes toward devaluation, the type of government currently in power, patterns of political behavior, and norms for stability. Background information on the political environment of the government goes far beyond understanding an Administration's attitudes and policies toward devaluation. Currency forecasters should understand the path along which all policies toward devaluation have been made in the past.

8.4.6 *Why and how central banks intervene in currency markets*

In a system of fixed exchange rates, central banks frequently intervene in the foreign-exchange market to maintain the par value system. Even within the flexible exchange rate system, central banks intervene in the foreign-exchange market to maintain orderly trading conditions. Monetary authorities normally intervene in the foreign-exchange market (1) to smooth exchange rate movements, (2) to establish implicit exchange rate boundaries, and (3) to respond to temporary disturbances. Depending on market conditions, a central bank may:

- 1 Coordinate its action with other central banks or go it alone.
- 2 Enter the market aggressively to change attitudes about its views and policies.
- 3 Call for reassuring action to calm markets.
- 4 Intervene to reverse, resist, or support a market trend.
- 5 Operate openly or indirectly through brokers (Cross 2002).

In 1999, the Bank for International Settlements (BIS) sent a questionnaire on the practice of exchange market intervention to 44 central banks, including the European Central Bank. Of 44 institutions, 22 responded to some or all of the questions asked. The Reserve Bank of New Zealand was the only authority to report that it had not intervened in the past 10 years. Table 8.1 shows summary statistics of the intervention survey responses. The survey of central banks' intervention practices reveals that a number of monetary authorities do intervene with some frequency in foreign-exchange (mostly spot) markets. The desire to check short-run trends or correct longer-term misalignments often motivates intervention, whereas the size of the intervention often depends on market reaction to initial trades. Although intervention typically takes place during business hours, most monetary authorities will also intervene outside of these hours if necessary. While there is unanimous agreement that intervention does influence exchange rates, there is much disagreement about the horizon over which the full effect of this influence is felt, with estimates ranging from a few minutes to more than a few days.

Table 8.1 A summary of intervention survey responses

	<i>No. of responses</i>	<i>Minimum</i>	<i>Median</i>	<i>Maximum</i>
1 In the last decade, on approximately what percentage of business days has your monetary authority conducted intervention?	14	0.5	4.5	40.0
	<i>No. of responses</i>	<i>Never</i>	<i>Sometimes</i>	<i>Always</i>
2 Foreign-exchange intervention changes the domestic monetary base.	20	40.0	30.0	30.0
3 Intervention transactions are conducted with the following counterparties:				
Major domestic banks	21	0.0	28.6	71.4
Major foreign banks	18	16.7	72.2	11.1
Other central banks	17	76.5	23.5	0.0
Investment banks	16	68.8	25.0	6.3
4 Intervention transactions are conducted in the following markets:				
Spot	21	0.0	4.8	95.2
Forward	17	47.1	52.9	0.0
Future	16	93.8	6.3	0.0
Other (please specify in margin)	15	93.3	6.7	0.0

Table 8.1 *continued*

	<i>No. of responses</i>	<i>Never</i>	<i>Sometimes</i>	<i>Always</i>
5 Intervention transactions are conducted by:				
Direct dealing with counterparties via telephone	20	0.0	30.0	70.0
Direct dealing with counterparties via electronic communication	16	56.3	31.3	12.5
Live FX brokers	19	36.8	52.6	10.5
Electronic brokers (e.g., EBS, Reuters 2002)	16	87.5	0.0	12.5
6 The following strategies determine the amount of intervention:				
A prespecified amount is traded	17	17.6	70.6	11.8
Intervention size depends on market reaction to initial trades	20	5.0	55.0	40.0
7 Intervention is conducted at the following times of day:				
Prior to normal business hours	16	56.3	43.8	0.0
Morning of the business day	21	0.0	85.7	14.3
Afternoon of the business day	20	0.0	90.0	10.0
After normal business hours	17	35.3	64.7	0.0
8 Is intervention sometimes conducted through indirect methods, such as changing the regulations regarding foreign exchange exposure of banks?	21	76.2	23.8	0.0
9 The following are factors in intervention decisions:				
To resist short-term trends in exchange rates	19	10.5	42.1	47.4
To correct long-run misalignments of exchange rates from fundamental values	18	33.3	44.4	22.2
To profit from speculative trades	17	100.0	0.0	0.0
Other	16	62.5	25.0	12.5
10 Intervention transactions are conducted secretly for the following reasons:				
To maximize market impact	17	23.5	35.3	41.2
To minimize market impact	14	42.9	57.1	0.0
For portfolio adjustment	11	100.0	0.0	0.0
Other	12	75.0	16.7	8.3
11 In your opinion, how long does it take to observe the full effect of intervention on exchange rates?				
A few minutes	18	38.9		
A few hours	18	22.2		
One day	18	0.0		
A few days	18	27.8		
More than a few days	18	11.1		
Intervention has no effect on exchange rates	18	0.0		

Note: Question 1 shows the minimum, median, and maximum responses (from 0 to 100) on the percentage of days intervention was conducted in the last decade. Questions 2 through 10 show the percentage of responses of "Never," "Sometimes," and "Always" to those questions. Question 11 shows the percentage of responses indicating that the full effects of intervention were felt at each horizon.

Source: C. J. Neely, "The Practice of Central Bank Intervention," *Review*, Federal Reserve Bank of St. Louis, May/June 2001, p. 5.

SUMMARY

This chapter has discussed four closely related topics: measuring exchange rate changes, forecasting needs, forecasting floating exchange rates, and forecasting fixed exchange rates. MNCs need exchange rate forecasts to make decisions on hedging foreign-currency payables and receivables, working capital management, long-term investment analysis, and long-term financing.

The quality of a company's decision depends on the accuracy of exchange rate predictions. Many forecasters believe that for the major floating currencies, foreign-exchange markets are efficient and forward exchange rates are unbiased predictors of future spot rates. No one should solicit the services of forecasting firms if foreign-exchange markets are perfectly efficient.

Fundamental analysis, technical analysis, and market-based forecasts are the most common forecasting techniques. Currently, two dozen forecasting firms exist, and their annual service costs several thousands of dollars. Many traders and MNCs have in-house forecasting services. Investors may earn extra profits by using forecasting techniques and forecasting firms if foreign-exchange markets are inefficient. While many financial economists believe that the foreign-exchange market is highly efficient, some recent studies cast doubts on the efficient market hypothesis. In fact, survey data from a variety of sources indicates a large and growing influence of technical forecasting techniques, especially for very short horizons.

Under a fixed exchange rate system, central banks are committed to maintain exchange rates within a narrow band around the par value. This par value may be changed whenever the following successive events occur. First, the balance of payments of a country moves into fundamental disequilibrium. Second, various corrective policies prove economically ineffective or politically unacceptable. Under such conditions, a change in the exchange rate is a discrete, one-way adjustment of a relatively considerable magnitude, with the new rate to be expected to prevail for some time.

Questions

- 1 Describe corporate motives for currency forecasting.
- 2 If foreign-exchange markets are perfectly efficient, why should no one pay for the services of currency forecasting firms?
- 3 Most empirical studies have found that foreign-exchange markets are at least weak-form efficient. Does this mean that investors can earn extra profits by using technical analysis?
- 4 Explain fundamental analysis as a technique for forecasting exchange rates.
- 5 Explain technical analysis as a technique for forecasting exchange rates.
- 6 Explain the market-based forecast as a technique for forecasting exchange rates.
- 7 How can we assess performance in forecasting exchange rates?

- 8 In the early 1990s, some former Eastern-bloc countries allowed the exchange rates of their currencies to fluctuate against the dollar. Would the use of fundamental analysis be useful for forecasting the future exchange rates of these currencies?
- 9 Explain the events that would force the par value to change.
- 10 A general rule suggests that in a fixed-rate system, the forecaster ought to focus on the government decision-making structure. Explain.
- 11 Why do the central banks of countries with flexible exchange rate systems intervene in the foreign-exchange market?

Problems

- 1 The beginning spot rate is \$0.1854 per South African rand and the ending spot rate is \$0.20394 per rand.
 - (a) Calculate the percentage change in the exchange rate for the rand against the dollar.
 - (b) Calculate the percentage change in the exchange rate for the dollar against the rand.
- 2 The beginning spot rate is \$0.1040 per Chinese yuan and the ending spot rate is \$0.0936 per yuan.
 - (a) What is the percentage change in the exchange rate for the yuan?
 - (b) What is the percentage change in the exchange rate for the dollar?
- 3 The spot rate is \$0.60 per Swiss franc. The 4-year annualized inflation rate is 9 percent in the USA and 6 percent in Switzerland.
 - (a) What is the expected percentage appreciation or depreciation of the franc over the 4-year period?
 - (b) What is the forecast for the franc's spot rate in 4 years?
- 4 A US company's forecast for the percentage change in the British pound (BP) depends on only three variables: inflation rate differentials, US inflation minus British inflation (I); differentials in the rate of growth in money supply, the growth rate in US money supply minus the growth rate in British money supply (M); and differentials in national income growth, US income growth minus British income growth (N). The coefficients are $b_0 = 0.002$, $b_1 = 0.8$, $b_2 = 1.0$, and $b_3 = 0.5$. Finally, differentials in inflation rate, money supply, and income growth are $I = 4$ percent, $M = 2$ percent, and $N = 0$ percent during the most recent quarter. What is the percentage change in the British pound during the next quarter?
- 5 The spot rate is \$0.5800 per Singapore dollar. The 90-day forward premium for Singapore dollars is 13.79 percent. What is the expected spot rate in 90 days?
- 6 The spot rate is \$0.08 per Spanish peseta. The annual interest rates are 4 percent for the USA and 9 percent for Spain. What is the market's forecast of the spot rate in 2 years?
- 7 The forecasted value for the Mexican peso is \$0.1200 and its realized value is \$0.1000. What is the forecast error (root square error) for the peso?

REFERENCES

- Cross, S. Y., *All About the Foreign Exchange Market in the United States*, Federal Reserve Bank of New York, 2002, pp. 92–3.
- Dufey, G. and I. H. Giddy, *The International Money Market*, Englewood Cliffs, NJ: Prentice Hall, 1978.
- Eun, C. and S. Sabherwal, “Forecasting Exchange Rates? Do Banks Know Better?” *Global Finance Journal*, 2002, pp. 195–215.
- Goodman, S. H., “Foreign Exchange Rate Forecasting Techniques: Implications for Business and Policy,” *Journal of Finance*, May 1979, pp. 415–27.
- Hopper, G. P., “Is the Foreign Exchange Market Inefficient?” *Business Review*, Federal Reserve Bank of Philadelphia, May/June 1994, pp. 17–27.
- Jacque, L. L., *Management of Foreign Exchange Risk*, Lexington, MA: Lexington Books, 1978.
- LeBaron, B., “Technical Trading Rule Profitability and Foreign Exchange Intervention,” NBER, Working Paper 5505, Mar. 1996.
- Levich, R. M., “Evaluating the Performance of the Forecasters,” in R. Ensor, ed., *The Management of Foreign Exchange Risk*, Euromoney Publication, 1982, pp. 121–34.
- Meese, R. and K. Rogoff, “Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample?” *Journal of International Economics*, Feb. 1983, pp. 3–24.
- Neely, C. J., “Technical Analysis in the Foreign Exchange Market: A Layman’s Rule,” *Review*, Federal Reserve Bank of St. Louis, Sept./Oct. 1997, pp. 23–38.
- Neely, C. J., “Technical Analysis and the Profitability of US Foreign Exchange Intervention,” *Review*, Federal Reserve Bank of St. Louis, July/Aug. 1998, pp. 3–17.
- Neely, C. J., “The Practice of Central Bank Intervention: Looking Under the Hood,” *Review*, Federal Reserve Bank of St. Louis, May/June 2001, pp. 1–10.
- Neely, C. J. and L. Sarno, “How Well Do Monetary Fundamentals Forecast Exchange Rates,” *Review*, Federal Reserve Bank of St. Louis, Sept./Oct. 2002, pp. 51–74.
- Szakmary, A. C. and I. Mathur, “Central Bank Intervention and Trading Rules Profits in Foreign Exchange Markets,” *Journal of International Money and Finance*, Aug. 1997, pp. 513–36.
- Taylor, M. P. and H. Allen, “The Use of Technical Analysis in the Foreign Exchange Market,” *Journal of International Money and Finance*, June 1992, pp. 304–14.

Case Problem 8: General Motors Operations in Mexico, and the Peso Crisis

Although Mexico had allowed its peso to fluctuate within a narrow band, the government had virtually pegged the peso to the US dollar since 1990. However, on December 20, 1994, Mexico unexpectedly announced its decision to float the peso and a 40 percent devaluation followed in the next 2 days. The peso devaluation and the peso float, at first glance, seemed to have caused serious problems for General Motors (GM), whose manufacturing facilities in Mexico depend heavily on materials and components from the USA. An emergency meeting of the GM Executive Committee was called on December 24 in Detroit, to deal with the consequences of the devaluation and the float. Gary Henson, President and Managing Director

Table 8.2 Selected economic indicators for the USA and Mexico

	1990	1991	1992	3rd Q 1993	4th Q 1993	1994
Exchange rate (pesos per \$)	2.9454	3.0710	3.1154	3.1059	3.4040	5.3250
Mexican CPI	100.0	122.7	141.7	155.5	167.4	170.5
US CPI	100.0	103.1	105.0	106.9	109.2	110.1
US money supply	100.0	108.6	124.0	136.7	135.9	139.1
Mexican money supply	100.0	223.9	257.6	303.3	276.2	306.6

Source: The International Monetary Fund, *International Financial Statistics*, Washington, DC, June 1995.

Table 8.3 Mexico's balance of payments (millions of US dollars)

Accounts	1990	1991	1992	1993	3rd Q 1994	4th Q 1994
Goods and services	-3,110	-9,369	-18,619	-16,010	-15,466	-21,054
Current account	-7,451	-14,888	-24,442	-23,400	-21,525	-28,784
International receivers	9,863	17,726	18,942	25,110	16,374	6,278

Source: The International Monetary Fund, *International Financial Statistics*, Washington, DC, June 1995.

of GM de Mexico since December 1992, knew that all of the company's top executives would be attending the meeting and felt certain that he would be asked why the devaluation and the float had caught him off guard. He decided to analyze economic statistics for both Mexico and the USA (see tables 8.2 and 8.3) along with the news clippings in his file on the Mexican peso.

Concern over the possibility of devaluation had existed for years, from 1990 to December 20, 1994, because real exchange rates for the peso had skyrocketed. However, many observers felt that President Salinas's economic reforms had improved Mexico's economy to such an extent that devaluation would not be necessary.

Henson was, therefore, not the only person caught off guard by the size of the devaluation and by the timing of the float. When the Mexican Central Bank opened on December 22, it began quoting pesos at 5.5 per US dollar, then as low as 6.33; the peso dropped to 5.8 by the end of the day. By December 23, foreign-exchange experts had become sharply divided on how far the peso might fall. Some said that the foreign-exchange market had already overreacted, but others saw no end in sight to the peso's depreciation. Analysts also disagreed on whether the valuation and the float would be sufficient to correct the country's balance-of-payments difficulties and other economic problems. All these conflicting and perplexing points of view made it more difficult for Henson to assess the effects of the float and the devaluation on GM's operations in Mexico.

Although there are some historical exceptions, exchange rate stabilization programs commonly result in a specific dynamic of consumption and investment patterns, current-account deficits, and exchange rate pressures. The typical pattern of exchange rate stabilization programs includes the following (Gruben 1996). First, despite reductions in inflation, the real

exchange rate rises because some inflation remains and is not offset by nominal exchange rate movements. Second, the trade and current-account balances deteriorate. Third, in the early stages of the program, capital inflows finance the excess of consumption and investment over domestic production, allowing a boom to ensue, but the inflows ultimately reverse. Fourth, with this reversal, the growing current-account deficit can no longer be financed, the consumption boom ends, and the exchange rate stabilization program collapses.

Case Questions

- 1 Do you think that the peso had fallen far enough as of December 22 or that it would continue to lose value? (Hint: answer this question using equation 8.3.) Is the predicted exchange rate usually accurate?
- 2 Could the peso float have been forecasted? (Hint: answer this question using economic indicators such as the balance of payments, international reserves, inflation, and money supply.)
- 3 What alternatives were available to the Mexican government for dealing with its balance-of-payments problems?
- 4 Assume that Mexico imposed prolonged foreign-exchange controls and thus GM de Mexico, the Mexican subsidiary of General Motors, could not import crucial materials and components from the USA. Briefly outline courses of action that GM de Mexico should take to cope with the foreign-exchange controls.
- 5 Is there any evidence that the typical pattern of exchange rate stabilization programs suggested by researchers such as William Gruben took place in Mexico?
- 6 The website of the Chicago Mercantile Exchange, www.cme.com, provides information on currency futures prices, including recent quotes and trends. Because a futures contract is similar to a forward contract, it can be used to forecast the value of a currency. Use this website to review the recent trend of futures prices for the Mexican peso and to answer the following question: Why do you think that the futures prices of the peso have changed over the past few months? Discuss how this information could be of assistance to Mr Gary Henson, President and Managing Director of GM de Mexico. The website of Olsen and Associates, www.olsen.ch, provides information on technical forecasts. Visit this website to obtain technical information for several currencies.

Sources: The International Monetary Fund, *International Financial Statistics*, Washington, DC: IMF, various issues; W. C. Gruben, "Policy Priorities and the Mexican Exchange Rate Crisis," *Economic Review*, Federal Reserve Bank of Dallas, First Quarter 1996, pp. 19–29; C. Ramirez, "GM Pulls into Leader Spot in Mexico Sale," *Automotive News*, July 17, 1995, p. 33; and D. Wessel, P. B. Carroll, and T. T. Vogel, "How Mexico's Crisis Ambushed Top Minds in Officialdom, Finance," *The Wall Street Journal*, July 6, 1995, pp. A1, A3.