

Chapter Objectives

- Explain why firms forecast exchange rates.
- Describe the common techniques used for forecasting.
- Explain how forecasting performance can be evaluated.
- Explain how to account for the uncertainty surrounding forecasts.

Why Firms Forecast Exchange Rates (1 of 2)

Hedging decisions

- Whether a firm hedges may be determined by its forecasts of foreign currency values.

Short-term investment decisions

- Corporations sometimes have a substantial amount of excess cash available for a short time period. Large deposits can be established in several currencies.

Capital budgeting decisions

- When an MNC's parent assesses whether to invest funds in a foreign project, the firm takes into account that the project may periodically require the exchange of currencies.

Why Firms Forecast Exchange Rates (2 of 2)

Earnings assessment

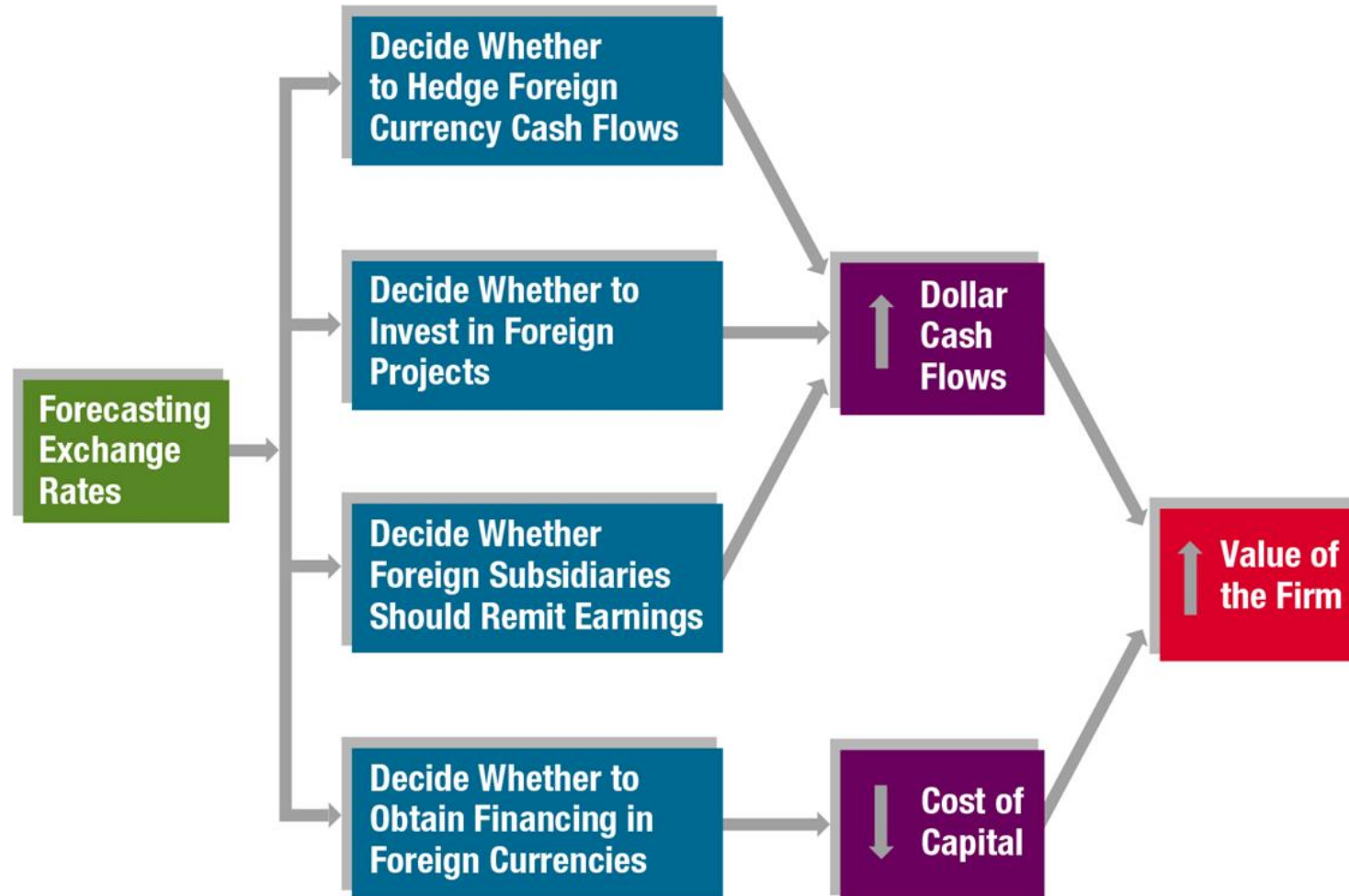
- The parent's decision about whether a foreign subsidiary should reinvest earnings in a foreign country or remit earnings back to the parent may be influenced by exchange rate forecasts.

Long-term financing decisions

- MNCs that issue bonds to secure long-term funds may consider denominating the bonds in foreign currencies.

Summarized in Exhibit 9.1

Exhibit 9.1 Corporate Motives for Forecasting Exchange Rates



Forecasting Techniques (1 of 8)

1. Technical Forecasting
2. Fundamental Forecasting
3. Market-Based Forecasting
4. Mixed Forecasting

Forecasting Techniques (2 of 8)

Technical Forecasting

- Involves the use of historical exchange rate data to predict future values.
- **Limitations of technical forecasting:**
 - Useful for very short-term periods.
 - It may work well in one particular period but may not work well in another period.
 - If the foreign exchange market is weak-form efficient then technical analysis would not be able to improve upon today's exchange rates when forecasting those rates in the near future.

Forecasting Techniques (3 of 8)

Fundamental Forecasting

- Based on fundamental relationships between economic variables and exchange rates
- **Use of PPP for fundamental forecasting**
 - While the inflation differential by itself is not sufficient to accurately forecast exchange rate movements, it should be included in any fundamental forecasting model.
- **Fundamental Forecasting with a Lagged Impact**
 - Fundamental forecasting sometimes has to account for a lagged (delayed) impact, in which changes in variables in an earlier period spill over to affect exchange rate movements in a later period.
- **Instantaneous Influences in Fundamental Forecasting**
 - The values of independent variables may not be known at the time when the MNC wants to forecast the exchange rate, forecasts for these independent variables must be used.

Forecasting Techniques (4 of 8)

Fundamental Forecasting (Continued)

- **Forecasting with a Comprehensive Model**

- Comprehensive model might include many more factors than are described here, the application would still be similar. A large time-series database would be necessary to warrant any confidence in the relationships detected by such a model.
- Change in a currency's spot rate is influenced by the following factors:

$$e_f = f(\Delta INF, \Delta INT, \Delta INC, \Delta GC, \Delta EXP)$$

where

e_f = percentage change in the spot rate

ΔINF = change in the differential between U. S. inflation and the foreign country's inflation

ΔINT = change in the differential between the U.S. interest rate and the foreign country's interest rate

ΔINC = change in the differential between the U.S. income level and the foreign country's income level

ΔGC = change in government controls

ΔEXP = change in expectations of future exchange rates

Forecasting Techniques (5 of 8)

Fundamental Forecasting (Continued)

- **Limitations of fundamental forecasting include:**
 - Unknown timing of the impact of some factors.
 - Forecasts of some factors may be difficult to obtain.
 - Some factors are not easily quantified.
 - Regression coefficients may not remain constant.

Forecasting Techniques (6 of 8)

Market-Based Forecasting

- **Using the spot rate:** Today's spot rate may be used as a forecast of the spot rate that will exist on a future date.
- **Using the forward rate** to forecast the future spot rate:

$$E(e) = p$$

$$E(e) = \left(\frac{F}{S}\right) - 1$$

where

$E(e)$ = expected percentage change in the exchange rate

p = percentage by which the forward rate (F) exceeds the spot rate (S)

Rationale for using the forward rate should serve as a reasonable forecast for the future spot rate because otherwise speculators would trade forward contracts (or futures contracts) to capitalize on the difference between the forward rate and the expected future spot rate.

Forecasting Techniques (7 of 8)

Market-Based Forecasting (Continued)

- **Long-Term Forecasting with Forward Rates**
 - Long-term exchange rate forecasts can be derived from long-term forward rates. Like any method of forecasting exchange rates, the forward rate is typically more accurate when forecasting exchange rates for short-term horizons than for long-term horizons.
- **Implications of the IFE for Forecasts**
 - Since the forward rate captures the interest rate differential (and therefore the expected inflation rate differential) between two countries, it should provide more accurate forecasts for currencies in high-inflation countries than the spot rate.

Forecasting Techniques (8 of 8)

Mixed Forecasting

- Use a combination of forecasting techniques. (Exhibit 9.2)
- Mixed forecast is then a weighted average of the various forecasts developed.

Consider other sources of forecasts

Forecasting exchange rates is subject to considerable error, MNCs may complement their own forecasts with forecasts from outside sources, such as a bank or a securities firm that provides forecasting services.

Exhibit 9.2 Forecasts of the Mexican Peso Drawn from Each Forecasting Technique

FORECAST TECHNIQUE	FACTORS CONSIDERED	SITUATION	FORECAST
Technical	Recent movement in peso	The peso's value declined below a specific threshold level in the last few weeks.	The peso's value will continue to fall now that it is beyond the threshold level.
Fundamental	Economic growth, inflation, interest rates	Mexico's interest rates are high, and inflation should remain low.	The peso's value will rise as U.S. investors capitalize on the high interest rates by investing in Mexican securities.
Market-based	Spot rate, forward rate	The peso's forward rate exhibits a significant discount, which is attributed to Mexico's relatively high interest rates.	Based on the forward rate, which provides a forecast of the future spot rate, the peso's value will decline.

Assessment of Forecast Performance (1 of 3)

Measurement of forecast error

$$\text{Absolute forecast error as a percentage of the realized value} \left. \vphantom{\text{Absolute forecast error as a percentage of the realized value}} \right\} = \frac{|\text{Forecasted value} - \text{Realized value}|}{\text{Realized value}}$$

Forecast errors among time horizons

The potential forecast error for a particular currency depends on the forecast horizon.

Forecast errors among currencies (Exhibit 9.3)

The ability to forecast currency values may vary with the currency of concern.

Comparing Forecast Errors among Forecast Techniques (Exhibit 9.4)

An MNC may compare the forecast error produced by two or more techniques used to derive forecasted exchange rates for a particular currency so that it can decide which technique to use in the future.

Exhibit 9.3 How the Forecast Error Is Affected by Volatility

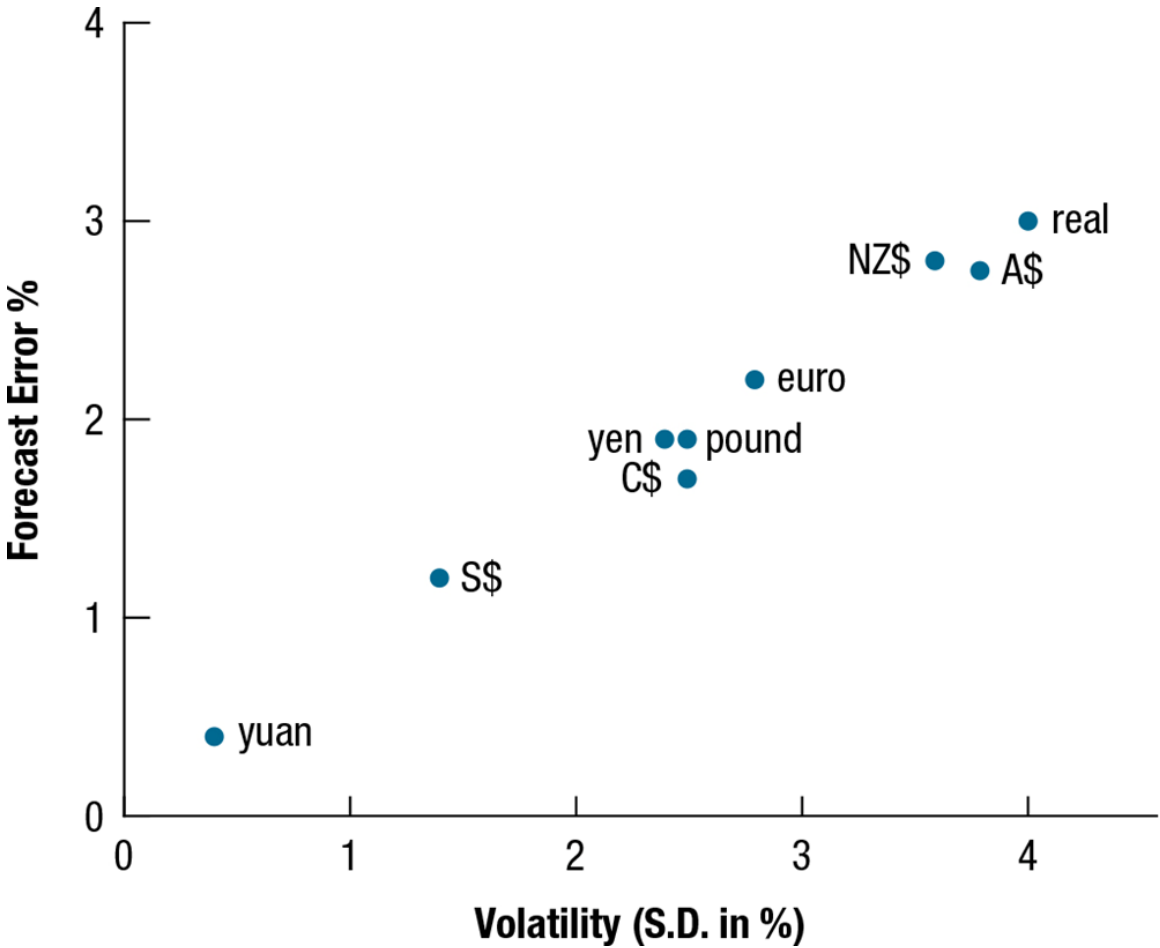


Exhibit 9.4 Comparison of Forecast Techniques

(1)	(2)	(3)	(4)	(5)	(6)	(7) = (5) - (6)
PERIOD	PREDICTED VALUE OF ZLOTY BY MODEL 1	PREDICTED VALUE OF ZLOTY BY MODEL 2	REALIZED VALUE OF ZLOTY	ABSOLUTE FORECAST ERROR USING MODEL 1	ABSOLUTE FORECAST ERROR USING MODEL 2	DIFFERENCE IN ABSOLUTE FORECAST ERRORS (MODEL 1 - MODEL 2)
1	\$.20	\$.24	\$.16	\$.04	\$.08	\$-.04
2	.18	.20	.14	.04	.06	-.02
3	.24	.20	.16	.08	.04	.04
4	.26	.20	.22	.04	.02	.02
5	.30	.18	.28	.02	.10	-.08
6	.22	.32	.26	.04	.06	-.02
7	.16	.20	.14	.02	.06	-.04
8	.14	.24	.10	.04	.14	-.10
				Sum = .32 Mean = .04	Sum = .56 Mean = .07	Sum = -.24 Mean = -.03

Assessment of Forecast Performance (2 of 3)

- **Graphic Evaluation of Forecast Bias**

- Forecast bias can be examined with the use of a graph that compares forecasted values with the realized values for various time periods. (Exhibits 9.4, 9.5 & 9.6)

- **Statistical test of forecast bias**

- A conventional method of testing for a forecast bias is to apply the following regression model to historical data.

$$S_t = a_0 + a_1 F_{t-1} + \mu_t$$

where

S_t = spot rate at time t

F_{t-1} = forward rate at time $t - 1$

μ_t = error term

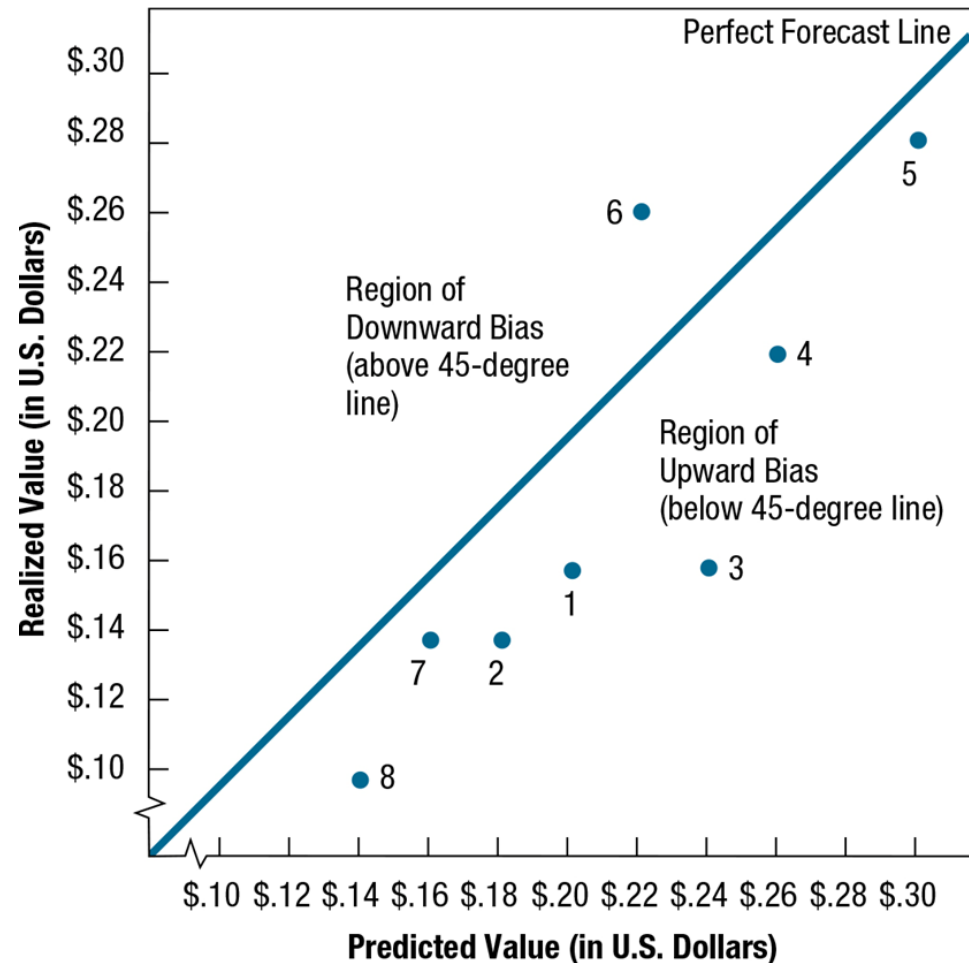
a_0 = intercept

a_1 = regression coefficient

Exhibit 9.5 Evaluation of Forecast Performance

PERIOD	PREDICTED VALUE OF CURRENCY FOR END OF PERIOD	REALIZED VALUE OF CURRENCY AT END OF PERIOD
1	\$.20	\$.16
2	.18	.14
3	.24	.16
4	.26	.22
5	.30	.28
6	.22	.26
7	.16	.14
8	.14	.10

Exhibit 9.6 Graphic Evaluation of Forecast Performance



Assessment of Forecast Performance (3 of 3)

- **Shifts in Forecast Bias over Time**
 - Because the forecast bias can change over time, refining a forecast to adjust for a forecast bias detected in the past is not a perfect solution.

Accounting for Uncertainty Surrounding Forecasts (1 of 2)

- **Sensitivity Analysis Applied to Fundamental Forecasting**
 - Accounts for the possible error in the forecasted value of the factor and improve its forecasts.
 - Valuable because it allows the MNC to derive a variety of forecasts based on alternative scenarios (Exhibit 9.7).

Exhibit 9.7 Illustration of Sensitivity Analysis Applied to Forecasting

POSSIBLE VALUE OF INFLATION DIFFERENTIAL (INF_t)	PROBABILITY OF THIS SCENARIO OCCURRING	EXPECTED EXCHANGE RATE MOVEMENT (e_f) IF THIS SCENARIO OCCURS
1.0%	25%	$.7 \times 1\% = 0.70\%$
2.0%	50%	$.7 \times 2.0\% = 1.40\%$
4.0%	25%	$.7 \times 4.0\% = 2.80\%$

Accounting for Uncertainty Surrounding Forecasts (2 of 2)

Interval Forecasts

MNCs can also account for uncertain exchange rate forecasts by creating an interval around the point estimate forecast.

- **Using recent levels of volatility**
 - The volatility of historical exchange rate movements over a recent period can be used to forecast the future.
- **Using historical patterns of volatilities**
 - If there is a pattern to the changes in exchange rate volatility over time, a series of time periods may be used to forecast volatility in the next period.
- **Using implied standard deviation**
 - Derive the exchange rate's implied standard deviation (ISD) from the currency option pricing model.

Summary (1 of 3)

- Multinational corporations need exchange rate forecasts to make decisions on hedging payables and receivables, short-term financing and investment, capital budgeting, and long-term financing.
- The most common forecasting techniques can be classified as (1) technical, (2) fundamental, (3) market based, or (4) mixed. Each technique has limitations, and the quality of the forecasts produced varies. Yet, exchange rates are very difficult to forecast accurately, because their movements can be volatile over time.

Summary (2 of 3)

- Forecasting methods can be evaluated by comparing the actual values of currencies to the values predicted by the forecasting method. To be meaningful, this comparison should be conducted over several periods. Two criteria used to evaluate performance of a forecast method are bias and accuracy. When comparing the accuracy of forecasts for two currencies, the absolute forecast error should be divided by the realized value of the currency in order to control for differences in the currencies' relative values.

Summary (3 of 3)

- MNCs specify an interval around their point estimate forecast to account for uncertainty. Such an interval can be derived from the recent exchange rate volatility, the historical time series of volatilities, and the implied standard deviation from currency option prices.