



10: Measuring Exposure to Exchange Rate Fluctuations

Exchange rate risk can be broadly defined as the risk that a company's performance will be affected by exchange rate movements. Multinational corporations (MNCs) closely monitor their operations to determine how they are exposed to various forms of exchange rate risk. Financial managers must understand how to measure the exposure of their MNCs to exchange rate fluctuations so that they can determine whether and how to protect their companies from that exposure.

The specific objectives of this chapter are to:

- discuss the relevance of an MNC's exposure to exchange rate risk,
- explain how transaction exposure can be measured,
- explain how economic exposure can be measured, and
- explain how translation exposure can be measured.

Is Exchange Rate Risk Relevant?

Some have argued that exchange rate risk is irrelevant. These contentions, in turn, have resulted in counterarguments, as summarized here.

Purchasing Power Parity Argument

One argument for exchange rate irrelevance is that, according to purchasing power parity (PPP) theory, exchange rate movements are just a response to differentials in price changes between countries. Therefore, the exchange rate effect is offset by the change in prices.

EXAMPLE

Franklin Co. is a U.S. exporter that denominates its exports in euros. If the euro weakens by 3 percent due to purchasing power parity, that implies that European inflation is about 3 percent higher than U.S. inflation. If European competitors raise their prices in line with European inflation, Franklin can increase its prices without losing any customers. Thus, the increase in its price offsets the reduction in the value of the euro. ■

PPP does not necessarily hold, however, so the exchange rate will not necessarily change in accordance with the inflation differential between the two countries. Since a perfect offsetting effect is unlikely, the firm's competitive capabilities may indeed be influenced by exchange rate movements. Even if PPP did hold over a very long period of time, this would not comfort managers of MNCs that are focusing on the next quarter or year.

The Investor Hedge Argument

A second argument for exchange rate irrelevance is that investors in MNCs can hedge exchange rate risk on their own. The investor hedge argument assumes that investors have complete information on corporate exposure to exchange rate fluctuations

as well as the capabilities to correctly insulate their individual exposure. To the extent that investors prefer that corporations perform the hedging for them, exchange rate exposure is relevant to corporations. An MNC may be able to hedge at a lower cost than individual investors. In addition, it has more information about its exposure and can more effectively hedge its exposure.

Currency Diversification Argument

Another argument is that if a U.S.-based MNC is well diversified across numerous countries, its value will not be affected by exchange rate movements because of offsetting effects. It is naive, however, to presume that exchange rate effects will offset each other just because an MNC has transactions in many different currencies.

Stakeholder Diversification Argument

Some critics also argue that if stakeholders (such as creditors or stockholders) are well diversified, they will be somewhat insulated against losses experienced by an MNC due to exchange rate risk. Many MNCs are similarly affected by exchange rate movements, however, so it is difficult to compose a diversified portfolio of stocks that will be insulated from exchange rate movements.

Response from MNCs

Creditors that provide loans to MNCs can experience large losses if the MNCs experience financial problems. Thus, creditors may prefer that the MNCs maintain low exposure to exchange rate risk. Consequently, MNCs that hedge their exposure to risk may be able to borrow funds at a lower cost.

To the extent that MNCs can stabilize their earnings over time by hedging their exchange rate risk, they may also reduce their general operating expenses over time (by avoiding costs of downsizing and restructuring). Many MNCs, including Colgate-Palmolive, Eastman Kodak, and Merck, have attempted to stabilize their earnings with hedging strategies because they believe exchange rate risk is relevant. Further evidence that MNCs consider exchange rate risk to be relevant can be found in annual reports. The following comments from annual reports of MNCs are typical:

The primary purpose of the Company's foreign currency hedging program is to manage the volatility associated with foreign currency purchases of materials and other assets and liabilities created in the normal course of business. Corporate policy prescribes a range of allowable hedging activity.

Procter & Gamble Co.

The Company enters into foreign exchange contracts and options to hedge various currency exposures. . . . the primary business objective of the activity is to optimize the U.S. dollar value of the Company's assets, liabilities, and future cash flows with respect to exchange rate fluctuations.

Dow Chemical Co.

Types of Exposure

As mentioned in the previous chapter, exchange rates cannot be forecasted with perfect accuracy, but the firm can at least measure its exposure to exchange rate fluctuations. If the firm is highly exposed to exchange rate fluctuations, it can consider techniques to reduce its exposure. Such techniques are identified in the following chapter. Before choosing among them, the firm should first measure its degree of exposure.

Exposure to exchange rate fluctuations comes in three forms:

- Transaction exposure
- Economic exposure
- Translation exposure

Each type of exposure will be discussed in turn.

Transaction Exposure

The value of a firm's future contractual transactions in foreign currencies is affected by exchange rate movements. The sensitivity of the firm's contractual transactions in foreign currencies to exchange rate movements is referred to as **transaction exposure**.

Transaction exposure can have a substantial impact on a firm's value. It is not unusual for a currency to change by as much as 10 percent in a given year. If an exporter denominates its exports in a foreign currency, a 10 percent decline in that currency will reduce the dollar value of its receivables by 10 percent. This effect could possibly eliminate any profits from exporting.

To assess transaction exposure, an MNC needs to (1) estimate its net cash flows in each currency and (2) measure the potential impact of the currency exposure.

Estimating “Net” Cash Flows in Each Currency

MNCs tend to focus on transaction exposure over an upcoming short-term period (such as the next month or the next quarter) for which they can anticipate foreign currency cash flows with reasonable accuracy. Since MNCs commonly have foreign subsidiaries spread around the world, they need an information system that can track their currency positions. The Internet enables all subsidiaries to tap into the same network and provide information on their existing and expected future currency positions.

To measure its transaction exposure, an MNC needs to project the consolidated net amount in currency inflows or outflows for all its subsidiaries, categorized by currency. One foreign subsidiary may have inflows of a foreign currency while another has outflows of that same currency. In that case, the MNC's net cash flows of that currency overall may be negligible. If most of the MNC's subsidiaries have future inflows in another currency, however, the net cash flows in that currency could be substantial. Estimating the consolidated net cash flows per currency is a useful first step when assessing an MNC's exposure because it helps to determine the MNC's overall position in each currency.

EXAMPLE

Miami Co. conducts its international business in four currencies. Its objective is to first measure its exposure in each currency in the next quarter and then estimate its consolidated cash flows for one quarter ahead, as shown in Exhibit 10.1. For example, Miami expects Canadian dollar inflows of C\$12 million and outflows of C\$2 million over the next quarter. Thus, Miami expects net inflows of C\$10 million. Given an expected exchange rate of \$.80 at the end of the quarter, it can convert the expected net inflow of Canadian dollars into an expected net inflow of \$8 million (estimated as C\$10 million \times \$.80).

The same process is used to determine the net cash flows of each of the other three currencies. Notice from the last column of Exhibit 10.1 that the expected net cash flows in three of the currencies are positive, while the net cash flows in Swedish kronor are negative (reflecting cash outflows). Thus, Miami will be favorably affected by appreciation of the pound, Canadian dollar, and Mexican peso. Conversely, it will be adversely affected by appreciation of the krona.

The information in Exhibit 10.1 needs to be converted into dollars so that Miami Co. can assess the exposure of each currency by using a standardized measure. For each currency, the net cash flows are converted into dollars to determine the dollar amount of exposure. Notice that Miami has a smaller dollar amount of exposure in Mexican pesos and Canadian dollars than in the other currencies. However, this does not necessarily mean that Miami will be less affected by these exposures, as will be explained shortly.

Recognize that the net inflows or outflows in each foreign currency and the exchange rates at the end of the period are uncertain. Thus, Miami might develop a range of possible exchange rates for each currency, as shown in Exhibit 10.2, instead of a point estimate. In this case, there is a range of net cash flows in dollars rather than a point estimate. Notice that the range of dollar cash flows resulting from Miami's peso transactions is wide, reflecting the high degree of uncertainty surrounding the peso's value over the next quarter. In contrast, the range of dollar cash flows resulting from the Canadian dollar transactions is narrow because the Canadian dollar is expected to be relatively stable over the next quarter. ■

Miami Co. assessed its net cash flow situation for only one quarter. It could also derive its expected net cash flows for other periods, such as a week or a month. Some MNCs assess their transaction exposure during several periods by applying the methods just described to each period. The further into the future an MNC attempts to measure its transaction exposure, the less accurate will be the measurement due to the greater uncertainty about inflows or outflows in each foreign currency, as well as future exchange rates, over periods further into the future. An MNC's overall exposure can be assessed only after considering each currency's variability and the correlations among currencies. The overall exposure of Miami Co. will be assessed after the following discussion of currency variability and correlations.

Exhibit 10.1 Consolidated Net Cash Flow Assessment of Miami Co.

Currency	Total Inflow	Total Outflow	Net Inflow or Outflow	Expected Exchange Rate at End of Quarter	Net Inflow or Outflow as Measured in U.S. Dollars
British pound	£17,000,000	£7,000,000	+£10,000,000	\$1.50	+\$15,000,000
Canadian dollar	C\$12,000,000	C\$2,000,000	+C\$10,000,000	\$.80	+\$ 8,000,000
Swedish krona	SK20,000,000	SK120,000,000	−SK100,000,000	\$.15	−\$15,000,000
Mexican peso	MXP90,000,000	MXP10,000,000	+MXP80,000,000	\$.10	+\$ 8,000,000

Exhibit 10.2 Estimating the Range of Net Inflows or Outflows for Miami Co.

Currency	Net Inflow or Outflow	Range of Possible Exchange Rates at End of Quarter	Range of Possible Net Inflows or Outflows in U.S. Dollars (Based on Range of Possible Exchange Rates)
British pound	+£10,000,000	\$1.40 to \$1.60	+\$14,000,000 to +\$16,000,000
Canadian dollar	+C\$10,000,000	\$.79 to \$.81	+\$ 7,900,000 to +\$ 8,100,000
Swedish krona	−SK100,000,000	\$.14 to \$.16	−\$14,000,000 to −\$16,000,000
Mexican peso	+MXP80,000,000	\$.08 to \$.11	+\$ 6,400,000 to +\$ 8,800,000

Measuring the Potential Impact of the Currency Exposure

The dollar net cash flows of an MNC are generated from a portfolio of currencies. The exposure of the portfolio of currencies can be measured by the standard deviation of the portfolio, which indicates how the portfolio's value may deviate from what is expected. Consider an MNC that will receive payments in two foreign currencies. The risk (as measured by the standard deviation of monthly percentage changes) of a two-currency portfolio (σ_p) can be estimated as follows:

$$\sigma_p = \sqrt{W_X^2 \sigma_X^2 + W_Y^2 \sigma_Y^2 + 2 W_X W_Y \sigma_X \sigma_Y \text{CORR}_{XY}}$$

where

W_X = proportion of total portfolio value that is in currency X

W_Y = proportion of total portfolio value that is in currency Y

σ_X = standard deviation of monthly percentage changes in currency X

σ_Y = standard deviation of monthly percentage changes in currency Y

CORR_{XY} = correlation coefficient of monthly percentage changes between currencies X and Y

The equation shows that an MNC's exposure to multiple currencies is influenced by the variability of each currency and the correlation of movements between the currencies. The volatility of a currency portfolio is positively related to a currency's volatility and positively related to the correlation between currencies. Each component in the equation that affects a currency portfolio's risk can be measured using a series of monthly percentage changes in each currency. These components are described in more detail next.

HTTP://

<http://www.fednewyork.org/markets/IMPLIEDVOLATILITY.html>
Measure of exchange rate volatility.

Measurement of Currency Variability. The standard deviation statistic measures the degree of movement for each currency. In any given period, some currencies clearly fluctuate much more than others. For example, the standard deviations of the monthly movements in the Japanese yen and the Swiss franc are typically more than twice that of the Canadian dollar. Based on this information, the potential for substantial deviations from the projected future values is greater for the yen and the Swiss franc than for the Canadian dollar (from a U.S. firm's perspective). Some currencies in emerging markets are very volatile.

Currency Variability over Time. The variability of a currency will not necessarily remain consistent from one time period to another. Nevertheless, an MNC can at least identify currencies whose values are *most likely* to be stable or highly variable in the future. For example, the Canadian dollar consistently exhibits lower variability than other currencies, regardless of the period that is assessed.

Measurement of Currency Correlations. The correlations among currency movements can be measured by their *correlation coefficients*, which indicate the degree to which two currencies move in relation to each other. The extreme case is perfect positive correlation, which is represented by a correlation coefficient equal to 1.00. Correlations can also be negative, reflecting an inverse relationship between individual movements, the extreme case being -1.00 .

Exhibit 10.3 shows the correlation coefficients (based on quarterly data) for several currency pairs. It is clear that some currency pairs exhibit a much higher correlation than others. The European currencies are highly correlated, whereas the Canadian dollar has a relatively low correlation with other currencies. Currency correlations

Exhibit 10.3 Correlations among Exchange Rate Movements

	British Pound	Canadian Dollar	Euro	Japanese Yen	Swedish Krona
British pound	1.00				
Canadian dollar	.35	1.00			
Euro	.91	.48	1.00		
Japanese yen	.71	.12	.67	1.00	
Swedish krona	.83	.57	.92	.64	1.00

are generally positive; this implies that currencies tend to move in the same direction against the U.S. dollar (though by different degrees). The positive correlation may not always occur on a day-to-day basis, but it appears to hold over longer periods of time for most currencies.

Applying Currency Correlations to Net Cash Flows. The implications of currency correlations for a particular MNC depend on the cash flow characteristics of that MNC.

The equation for a portfolio's standard deviation suggests that positive cash flows in highly correlated currencies result in higher exchange rate risk for the MNC. However, many MNCs have negative net cash flow positions in some currencies; in these situations, the correlations can have different effects on the MNC's exchange rate risk. Exhibit 10.4 illustrates some common situations for an MNC that has exposure to only two currencies.

EXAMPLE

The concept of currency correlations can be applied to the earlier example of Miami Co.'s net cash flows, as displayed in Exhibit 10.2. Recall that Miami Co. anticipates cash inflows in British pounds equivalent to \$15 million and cash outflows in Swedish kronor equivalent to \$15 million. Thus, if a weak-dollar cycle occurs, Miami will be adversely affected by its exposure to the krona, but favorably affected by its pound exposure. During a strong-dollar cycle, it will be adversely affected by the pound exposure but favorably affected by its krona exposure. If Miami expects that these two currencies will move in the same direction and by about the same degree over the next period, its exposures to these two currencies are partially offset.

Miami may not be too concerned about its exposure to the Canadian dollar's movements because the Canadian dollar is somewhat stable with respect to the U.S. dollar over time; risk of substantial depreciation of the Canadian dollar is low. However, the company should be concerned about its exposure to the Mexican peso's movements because the peso is quite volatile and could depreciate substantially within a short period of time. Miami has no exposure to another currency that will offset the exposure to the peso. Therefore, Miami should seriously consider whether to hedge its expected net cash flow position in pesos. ■

Currency Correlations over Time. Exhibit 10.5 shows the trends of exchange rate movements of various currencies against the dollar. Notice how correlations and volatility levels of currencies vary among currencies and over time.

An MNC cannot use previous correlations to predict future correlations with perfect accuracy. Nevertheless, some general relationships tend to hold over time. For example, movements in the values of the pound, the euro, and other European currencies against the U.S. dollar tend to be highly correlated in most periods. In addition, the Canadian dollar tends to move independently of other currency movements.

Exhibit 10.4 Impact of Cash Flow and Correlation Conditions on an MNC's Exposure

If the MNC's Expected Cash Flow Situation Is:	And the Currencies Are:	The MNC's Exposure Is Relatively:
Equal amounts of net inflows in two currencies	Highly correlated	High
Equal amounts of net inflows in two currencies	Slightly positively correlated	Moderate
Equal amounts of net inflows in two currencies	Negatively correlated	Low
A net inflow in one currency and a net outflow of about the same amount in another currency	Highly correlated	Low
A net inflow in one currency and a net outflow of about the same amount in another currency	Slightly positively correlated	Moderate
A net inflow in one currency and a net outflow of about the same amount in another currency	Negatively correlated	High

Assessing Transaction Exposure Based on Value at Risk

A related method for assessing exposure is the value-at-risk (VAR) method, which measures the potential maximum one-day loss on the value of positions of an MNC that is exposed to exchange rate movements.

EXAMPLE

Celia Co. will receive 10 million Mexican pesos (MXP) tomorrow as a result of providing consulting services to a Mexican firm. It wants to determine the maximum one-day loss due to a potential decline in the value of the peso, based on a 95 percent confidence level. It estimates the standard deviation of daily percentage changes of the Mexican peso to be 1.2 percent over the last 100 days. If these daily percentage changes are normally distributed, the maximum one-day loss is determined by the lower boundary (the left tail) of the probability distribution, which is about 1.65 standard deviations away from the expected percentage change in the peso. Assuming an expected percentage change of 0 percent (implying no expected change in the peso) during the next day, the maximum one-day loss is

$$\begin{aligned}
 \text{Maximum one-day loss} &= E(e_t) - (1.65 \times \sigma_{MXP}) \\
 &= 0\% - (1.65 \times 1.2\%) \\
 &= -.0198, \text{ or } -1.98\%
 \end{aligned}$$

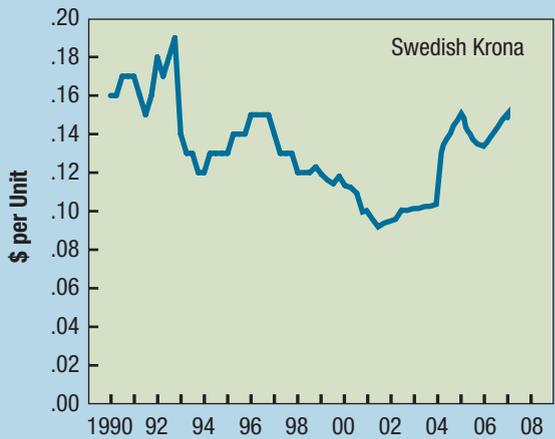
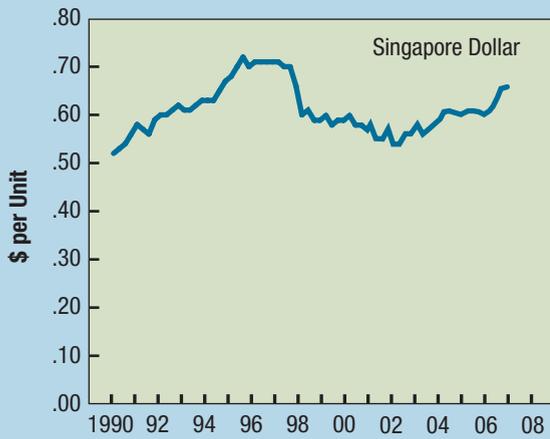
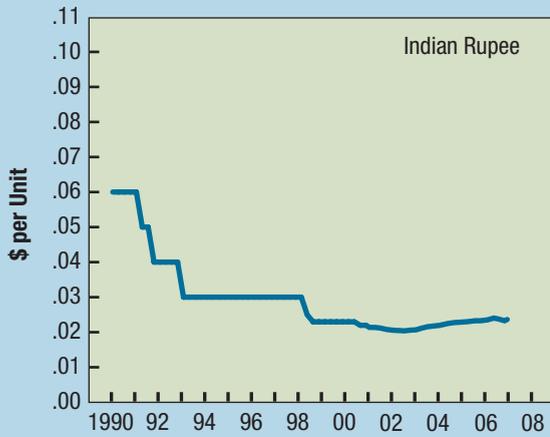
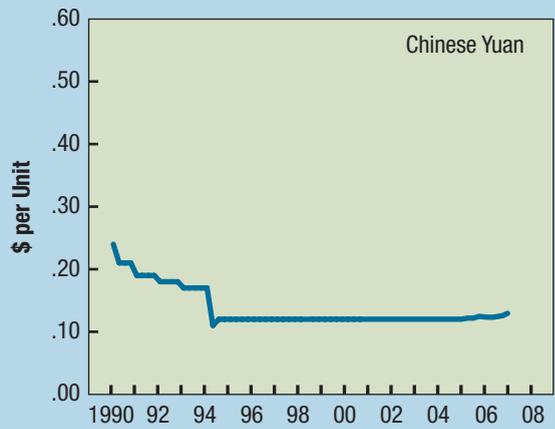
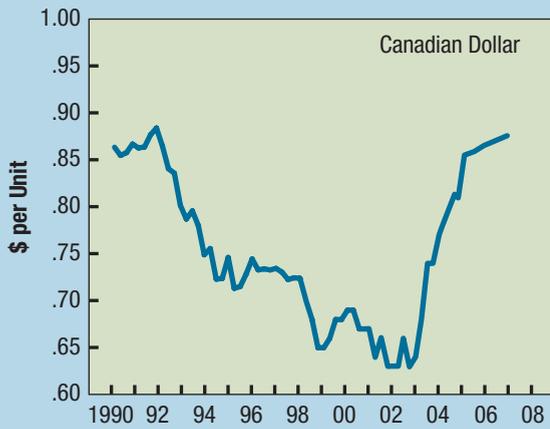
Assume the spot rate of the peso is \$.09. The maximum one-day loss of -1.98 percent implies a peso value of

$$\begin{aligned}
 \text{Peso value based on maximum one-day loss} &= S \times [1 + E(e_t)] \\
 &= \$.09 \times [1 + (-.0198)] \\
 &= \$.088218
 \end{aligned}$$

Thus, if the maximum one-day loss occurs, the peso's value will have declined to \$.088218. The dollar value of this maximum one-day loss is dependent on Celia's position in Mexican pesos. For example, if Celia has MXP10 million, this represents a value of \$900,000 (at \$.09 per peso), so a decline in the peso's value of -1.98 percent would result in a loss of $\$900,000 \times -1.98\% = -\$17,820$. ■

Factors That Affect the Maximum One-Day Loss. The maximum one-day loss of a currency is dependent on three factors. First, it is dependent on the expected percentage change in the currency for the next day. If the expected

Exhibit 10.5 Movements of Selected Currencies against the Dollar



outcome in the previous example is -0.2 percent instead of 0 percent, the maximum loss over the one-day period is

$$\begin{aligned}\text{Maximum one-day loss} &= E(e_t) - (1.65 \times \sigma_{MXP}) \\ &= -0.2\% - (1.65 \times 1.2\%) \\ &= -0.0218, \text{ or } -2.18\%\end{aligned}$$

Second, the maximum one-day loss is dependent on the confidence level used. A higher confidence level will cause a more pronounced maximum one-day loss, holding other factors constant. If the confidence level in the example is 97.5 percent instead of 95 percent, the lower boundary is 1.96 standard deviations from the expected percentage change in the peso. Thus, the maximum one-day loss is

$$\begin{aligned}\text{Maximum one-day loss} &= E(e_t) - (1.96 \times \sigma_{MXP}) \\ &= 0\% - (1.96 \times 1.2\%) \\ &= -0.02352, \text{ or } -2.352\%\end{aligned}$$

Third, the maximum one-day loss is dependent on the standard deviation of the daily percentage changes in the currency over a previous period. If the peso's standard deviation in the example is 1 percent instead of 1.2 percent, the maximum one-day loss (based on the 95 percent confidence interval) is

$$\begin{aligned}\text{Maximum one-day loss} &= E(e_t) - (1.65 \times \sigma_{MXP}) \\ &= 0\% - (1.65 \times 1\%) \\ &= -0.0165, \text{ or } -1.65\%\end{aligned}$$

Applying VAR to Longer Time Horizons. The VAR method can also be used to assess exposure over longer time horizons. The standard deviation should be estimated over the time horizon in which the maximum loss is to be measured.

EXAMPLE

Lada, Inc., expects to receive Mexican pesos in one month for products that it exported. It wants to determine the maximum one-month loss due to a potential decline in the value of the peso, based on a 95 percent confidence level. It estimates the standard deviation of monthly percentage changes of the Mexican peso to be 6 percent over the last 40 months. If these monthly percentage changes are normally distributed, the maximum one-month loss is determined by the lower boundary (the left tail) of the probability distribution, which is about 1.65 standard deviations away from the expected percentage change in the peso. Assuming an expected percentage change of -1 percent during the next month, the maximum one-month loss is

$$\begin{aligned}\text{Maximum one-month loss} &= E(e_t) - (1.65 \times \sigma_{MXP}) \\ &= -1\% - (1.65 \times 6\%) \\ &= -0.109, \text{ or } -10.9\%\end{aligned}$$

If Lada, Inc., is uncomfortable with the magnitude of the potential loss, it can hedge its position as explained in the next chapter. ■

Applying VAR to Transaction Exposure of a Portfolio.

Since MNCs are commonly exposed to more than one currency, they may apply the VAR method to a currency portfolio. When considering multiple currencies, software packages can be used to perform the computations. An example of applying VAR to a two-currency portfolio is provided here.

E X A M P L E

Benou, Inc., a U.S. exporting firm, expects to receive substantial payments denominated in Indonesian rupiah and Thai baht in one month. Based on today's spot rates, the dollar value of the funds to be received is estimated at \$600,000 for the rupiah and \$400,000 for the baht. Thus, Benou is exposed to a currency portfolio weighted 60 percent in rupiah and 40 percent in baht. Benou wants to determine the maximum expected one-month loss due to a potential decline in the value of these currencies, based on a 95 percent confidence level. Based on data for the last 20 months, it estimates the standard deviation of monthly percentage changes to be 7 percent for the rupiah and 8 percent for the baht, and a correlation coefficient of .50 between the rupiah and baht. The portfolio's standard deviation is

$$\begin{aligned}\sigma_p &= \sqrt{(.36)(.0049) + (.16)(.0064) + 2(.60)(.40)(.07)(.08)(.50)} \\ &= \text{about } .0643, \text{ or about } 6.43\%\end{aligned}$$

If the monthly percentage changes of each currency are normally distributed, the monthly percentage changes of the portfolio should be normally distributed. The maximum one-month loss of the currency portfolio is determined by the lower boundary (the left tail) of the probability distribution, which is about 1.65 standard deviations away from the expected percentage change in the currency portfolio. Assuming an expected percentage change of 0 percent for each currency during the next month (and therefore an expected change of zero for the portfolio), the maximum one-month loss is

$$\begin{aligned}\text{Maximum one-month loss of currency portfolio} &= E(e_t) - (1.65 \times \sigma_p) \\ &= 0\% - (1.65 \times 6.43\%) \\ &= \text{about } -.1061, \\ &\quad \text{or about } -10.61\%\end{aligned}$$

Compare this maximum one-month loss to that of the rupiah or the baht:

$$\begin{aligned}\text{Maximum one-month loss of rupiah} &= 0\% - (1.65 \times 7\%) \\ &= -.1155, \text{ or } -11.55\% \\ \text{Maximum one-month loss of baht} &= 0\% - (1.65 \times 8\%) \\ &= -.132, \text{ or } -13.2\%\end{aligned}$$

Notice that the maximum one-month loss for the portfolio is lower than the maximum loss for either individual currency, which is attributed to the diversification effects. Even if one currency experiences its maximum loss in a given month, the other currency is not likely to experience its maximum loss in that same month. The lower the correlation between the movements in the two currencies, the greater are the diversification benefits.

Given the maximum losses calculated here, Benou, Inc., may decide to hedge its rupiah position, its baht position, neither position, or both positions. The decision of whether to hedge is discussed in the next chapter. ■

Limitations of VAR. The VAR method presumes that the distribution of exchange rate movements is normal. If the distribution of exchange rate movements is not normal, the estimate of the maximum expected loss is subject to error. In addition, the VAR method assumes that the volatility (standard deviation) of exchange rate movements is stable over time. If exchange rate movements are less volatile in the past than in the future, the estimated maximum expected loss derived from the VAR method will be underestimated.

Economic Exposure

The value of a firm's cash flows can be affected by exchange rate movements if it executes transactions in foreign currencies, receives revenue from foreign customers, or is subject to foreign competition. The sensitivity of the firm's cash flows to exchange

rate movements is referred to as **economic exposure** (also sometimes referred to as operating exposure). Transaction exposure is a subset of economic exposure. But economic exposure also includes other ways in which a firm's cash flows can be affected by exchange rate movements.

EXAMPLE

Intel invoices about 65 percent of its chip exports in U.S. dollars. Although Intel is not subject to transaction exposure for its dollar-denominated exports, it is subject to economic exposure. If the euro weakens against the dollar, the European importers of those chips from Intel will need more euros to pay for them. These importers are subject to transaction exposure and economic exposure. As their costs of importing the chips increase in response to the weak euro, they may decide to purchase chips from European manufacturers instead. Consequently, Intel's cash flows from its exports will be reduced, even though these exports are invoiced in dollars. ■

Exhibit 10.6 provides examples of how a firm is subject to economic exposure. Consider each example by itself as if the firm had no other international business. Since the first two examples involve contractual transactions in foreign currencies, they reflect transaction exposure. The remaining examples do not involve contractual transactions in foreign currencies and therefore do not reflect transaction exposure. Yet, they do reflect economic exposure because they affect the firm's cash flows. If a firm experienced the exposure described in the third and fourth examples but did not have any contractual transactions in foreign currencies, it would be subject to economic exposure without being subject to transaction exposure.

Some of the more common international business transactions that typically subject an MNC's cash flows to economic exposure are listed in the first column of Exhibit 10.7. Transactions listed in the exhibit that require conversion of currencies, and thus reflect transaction exposure, include exports denominated in foreign currency, interest received from foreign investments, imports denominated in foreign currency, and interest owed on foreign loans. The other transactions, which do not require conversion of currencies and therefore do not reflect transaction exposure, are also a form of economic exposure because the cash flows resulting from these transactions can be influenced by exchange rate movements. Exchange rate movements can have as large an effect on cash flows from these transactions as on cash flows from transactions that require currency conversion.

The second and third columns of Exhibit 10.7 indicate how each transaction can be affected by the appreciation and depreciation, respectively, of the firm's home (local) currency. The next sections discuss these effects in turn.

Exhibit 10.6 Examples That Subject a Firm to Economic Exposure

A U.S. Firm:	U.S. Firm's Dollar Cash Flows Are Adversely Affected If the:
1. has a contract to export products in which it agreed to accept euros.	euro depreciates.
2. has a contract to import materials that are priced in Mexican pesos.	peso appreciates.
3. exports products to the United Kingdom that are priced in dollars, and competitors are located in the United Kingdom.	pound depreciates (causing some customers to switch to the competitors).
4. sells products to local customers, and its main competitor is based in Belgium.	euro depreciates (causing some customers to switch to the competitors).

Exhibit 10.7 Economic Exposure to Exchange Rate Fluctuations

Transactions That Influence the Firm's Local Currency Inflows	Impact of Local Currency Appreciation on Transactions	Impact of Local Currency Depreciation on Transactions
Local sales (relative to foreign competition in local markets)	Decrease	Increase
Firm's exports denominated in local currency	Decrease	Increase
Firm's exports denominated in foreign currency	Decrease	Increase
Interest received from foreign investments	Decrease	Increase
Transactions That Influence the Firm's Local Currency Outflows		
Firm's imported supplies denominated in local currency	No change	No change
Firm's imported supplies denominated in foreign currency	Decrease	Increase
Interest owed on foreign funds borrowed	Decrease	Increase

Economic Exposure to Local Currency Appreciation

The following discussion is related to the second column of Exhibit 10.7. Local sales (in the firm's home country) are expected to decrease if the local (home) currency appreciates because the firm will face increased foreign competition. Local customers will be able to obtain foreign substitute products cheaply with their strengthened currency. Cash inflows from exports denominated in the local currency will also likely be reduced as a result of appreciation in that currency because foreign importers will need more of their own currency to pay for these products. Any interest or dividends received from foreign investments will also convert to a reduced amount if the local currency has strengthened.

With regard to the firm's cash outflows, the cost of imported supplies denominated in the local currency will not be directly affected by changes in exchange rates. If the local currency appreciates, however, the cost of imported supplies denominated in the foreign currency will be reduced. In addition, any interest to be paid on financing in foreign currencies will be reduced (in terms of the local currency) if the local currency appreciates because the strengthened local currency will be exchanged for the foreign currency to make the interest payments.

Thus, appreciation in the firm's local currency causes a reduction in both cash inflows and outflows. The impact on a firm's net cash flows will depend on whether the inflow transactions are affected more or less than the outflow transactions. If, for example, the firm is in the exporting business but obtains its supplies and borrows funds locally, its inflow transactions will be reduced by a greater degree than its outflow transactions. In this case, net cash flows will be reduced. Conversely, cash inflows of a firm concentrating its sales locally with little foreign competition will not be severely reduced by appreciation of the local currency. If such a firm obtains supplies and borrows funds overseas, its outflows will be reduced. Overall, this firm's net cash flows will be enhanced by the appreciation of its local currency.

Economic Exposure to Local Currency Depreciation

If the firm's local currency depreciates (see the third column of Exhibit 10.7), its transactions will be affected in a manner opposite to the way they are influenced by appreciation. Local sales should increase due to reduced foreign competition because

prices denominated in strong foreign currencies will seem high to the local customers. The firm's exports denominated in the local currency will appear cheap to importers, thereby increasing foreign demand for those products. Even exports denominated in the foreign currency can increase cash flows because a given amount in foreign currency inflows to the firm will convert to a larger amount of the local currency. In addition, interest or dividends from foreign investments will now convert to more of the local currency.

With regard to cash outflows, imported supplies denominated in the local currency will not be directly affected by any change in exchange rates. The cost of imported supplies denominated in the foreign currency will rise, however, because more of the weakened local currency will be required to obtain the foreign currency needed. Any interest payments paid on financing in foreign currencies will increase.

In general, depreciation of the firm's local currency causes an increase in both cash inflows and outflows. A firm that concentrates on exporting and obtains supplies and borrows funds locally will likely benefit from a depreciated local currency. This is the case for Caterpillar, Ford, and General Motors in periods when the dollar weakens substantially against most major currencies. Conversely, a firm that concentrates on local sales, has very little foreign competition, and obtains foreign supplies (denominated in foreign currencies) will likely be hurt by a depreciated local currency.

Economic Exposure of Domestic Firms

Although our focus is on the financial management of MNCs, even purely domestic firms are affected by economic exposure.

EXAMPLE

Burlington, Inc., is a U.S. manufacturer of steel that purchases all of its supplies locally and sells all of its steel locally. Because its transactions are solely in the local currency, Burlington is not subject to transaction exposure. It is subject to economic exposure, however, because it faces foreign competition in its local markets. If the exchange rate of the foreign competitor's invoice currency depreciates against the dollar, customers interested in steel products will shift their purchases toward the foreign steel producer. Consequently, demand for Burlington's steel will likely decrease, and so will its net cash inflows. Thus, Burlington is subject to economic exposure even though it is not subject to transaction exposure. ■

Measuring Economic Exposure

Since MNCs are affected by economic exposure, they should assess the potential degree of exposure that exists and then determine whether to insulate themselves against it.

Using Sensitivity Analysis to Measure Economic Exposure. One method of measuring an MNC's economic exposure is to separately consider how sales and expense categories are affected by various exchange rate scenarios.

EXAMPLE

Madison Co. is a U.S.-based MNC that purchases most of its materials from Canada and generates a small portion of its sales from exporting to Canada. Its U.S. sales are denominated in U.S. dollars, while its Canadian sales are denominated in Canadian dollars (C\$). The estimates of its cash flows are shown in Exhibit 10.8, separated by country.

Assume that Madison Co. expects three possible exchange rates for the Canadian dollar over the period of concern: (1) \$.75, (2) \$.80, or (3) \$.85. These scenarios are separately analyzed in the second, third, and fourth columns of Exhibit 10.9. Row 1 is constant across scenarios since the U.S. business sales are not affected by exchange rate movements. In row 2, the estimated U.S. dollar sales due to the Canadian business are determined by converting the estimated Canadian dollar sales into U.S. dollars. Row 3 is the sum of the U.S. dollar sales in rows 1 and 2.

Row 4 is constant across scenarios since the cost of materials in the United States is not affected by exchange rate movements. In row 5, the estimated U.S. dollar cost of materials due to the Canadian business is determined by converting the estimated Canadian cost of materials into U.S. dollars. Row 6 is the sum of the U.S. dollar cost of materials in rows 4 and 5.

Row 7 is constant across scenarios since the U.S. operating expenses are not affected by exchange rate movements. Row 8 is constant across scenarios since the interest expense on U.S. debt is not affected by exchange rate movements. In row 9, the estimated U.S. dollar interest expense from Canadian debt is determined by converting the estimated Canadian interest expenses into U.S. dollars. Row 10 is the sum of the U.S. dollar interest expenses in rows 8 and 9.

The effect of exchange rates on Madison's revenues and costs can now be reviewed. Exhibit 10.9 illustrates how the dollar value of Canadian sales and Canadian cost of materials would increase as a result of a stronger Canadian dollar. Because Madison's Canadian

Exhibit 10.8 Estimated Sales and Expenses for Madison's U.S. and Canadian Business Segments (in Millions)

	U.S. Business	Canadian Business
Sales	\$320	C\$4
Cost of materials	\$50	C\$200
Operating expenses	\$60	—
Interest expenses	\$3	C\$10
Cash flows	\$207	−C\$206

Exhibit 10.9 Impact of Possible Exchange Rates on Cash Flows of Madison Co. (in Millions)

	Exchange Rate Scenario		
	C\$1 = \$.75	C\$1 = \$.80	C\$1 = \$.85
Sales			
(1) U.S. sales	\$320.00	\$320.00	\$320.00
(2) Canadian sales	C\$4 = <u>\$ 3.00</u>	C\$4 = <u>\$ 3.20</u>	C\$4 = <u>\$ 3.40</u>
(3) Total sales in U.S. \$	\$323.00	\$323.20	\$323.40
Cost of Materials and Operating Expenses			
(4) U.S. cost of materials	\$ 50.00	\$ 50.00	\$ 50.00
(5) Canadian cost of materials	C\$200 = <u>\$150.00</u>	C\$200 = <u>\$160.00</u>	C\$200 = <u>\$170.00</u>
(6) Total cost of materials in U.S. \$	\$200.00	\$210.00	\$220.00
(7) Operating expenses	\$ 60.00	\$ 60.00	\$ 60.00
Interest Expenses			
(8) U.S. interest expenses	\$ 3	\$ 3	\$ 3
(9) Canadian interest expenses	C\$10 = <u>\$ 7.5</u>	C\$10 = <u>\$ 8</u>	C\$10 = <u>\$ 8.50</u>
(10) Total interest expenses in U.S. \$	\$10.50	\$11.00	\$11.50
Cash Flows in U.S. Dollars before Taxes	\$52.50	\$42.20	\$31.90

cost of materials exposure (C\$200 million) is much greater than its Canadian sales exposure (C\$4 million), a strong Canadian dollar has a negative overall impact on its cash flow. The total amount in U.S. dollars needed to make interest payments is also higher when the Canadian dollar is stronger. In general, Madison Co., would be adversely affected by a stronger Canadian dollar. It would be favorably affected by a weaker Canadian dollar because the reduced value of total sales would be more than offset by the reduced cost of materials and interest expenses. ■

A general conclusion from this example is that firms with more (less) in foreign costs than in foreign revenue will be unfavorably (favorably) affected by a stronger foreign currency. The precise anticipated impact, however, can be determined only by utilizing the procedure described here or some alternative procedure. The example is based on a one-period time horizon. If firms have developed forecasts of sales, expenses, and exchange rates for several periods ahead, they can assess their economic exposure over time. Their economic exposure will be affected by any change in operating characteristics over time.

Using Regression Analysis to Measure Economic Exposure. A firm's economic exposure to currency movements can also be assessed by applying regression analysis to historical cash flow and exchange rate data as follows:

$$PCF_t = a_0 + a_1 e_t + \mu_t$$

where

PCF_t = percentage change in inflation-adjusted cash flows measured in the firm's home currency over period t

e_t = percentage change in the direct exchange rate of the currency over period t

μ_t = random error term

a_0 = intercept

a_1 = slope coefficient

The regression coefficient a_1 , estimated by regression analysis, indicates the sensitivity of PCF_t to e_t . If the coefficient is positive and significant, this implies that a positive change in the currency's value has a favorable effect on the firm's cash flows. If the coefficient is negative and significant, this implies an inverse relationship between the change in the currency's value and the firm's cash flows. If the firm anticipates no major adjustments in its operating structure, it will expect the sensitivity detected from regression analysis to be somewhat similar in the future.

This regression model can be revised to handle more complex situations. For example, if additional currencies are to be assessed, they can be included in the model as additional independent variables. Each currency's impact is measured by estimating its respective regression coefficient. If an MNC is influenced by numerous currencies, it can measure the sensitivity of PCF_t to an index (or composite) of currencies.

The analysis just described for a single currency can also be extended over separate subperiods, as the sensitivity of a firm's cash flows to a currency's movements may change over time. This would be indicated by a shift in the regression coefficient, which may occur if the firm's exposure to exchange rate movements changes.

Some MNCs may prefer to use their stock price as a proxy for the firm's value and then assess how their stock price changes in response to currency movements. Regression analysis could also be applied to this situation by replacing PCF_t with the percentage change in stock price in the model specified here.

Some researchers, including Adler and Dumas,¹ suggest the use of regression analysis for this purpose. By assigning stock returns as the dependent variable, regression analysis can indicate how the firm's value is sensitive to exchange rate fluctuations.

Some companies may assess the impact of exchange rates on particular corporate characteristics, such as earnings, exports, or sales.

EXAMPLE

Toyota Motor Corp. measures the sensitivity of its exports to the yen exchange rate (relative to the U.S. dollar). Consequently, it can determine how the level of exports may change in response to potential changes in the value of the yen. This information is useful when Toyota determines its production level and manages its inventory. ■

Translation Exposure

An MNC creates its financial statements by consolidating all of its individual subsidiaries' financial statements. A subsidiary's financial statement is normally measured in its local currency. To be consolidated, each subsidiary's financial statement must be translated into the currency of the MNC's parent. Since exchange rates change over time, the translation of the subsidiary's financial statement into a different currency is affected by exchange rate movements. The exposure of the MNC's consolidated financial statements to exchange rate fluctuations is known as **translation exposure**. In particular, subsidiary earnings translated into the reporting currency on the consolidated income statement are subject to changing exchange rates.

To translate earnings, MNCs use a process established by the Financial Accounting Standards Board (FASB). The prevailing guidelines are set by FASB 52 for translation and by FASB 133 for valuing existing currency derivative contracts.

Does Translation Exposure Matter?

The relevance of translation exposure can be argued based on a cash flow perspective or a stock price perspective.

Cash Flow Perspective. Translation of financial statements for consolidated reporting purposes does not by itself affect an MNC's cash flows. The subsidiary earnings do not actually have to be converted into the parent's currency. If a subsidiary's local currency is currently weak, the earnings could be retained rather than converted and sent to the parent. The earnings could be reinvested in the subsidiary's country if feasible opportunities exist.

An MNC's parent, however, may rely on funding from periodic remittances of earnings by the subsidiary. Even if the subsidiary does not need to remit any earnings today, it will remit earnings at some point in the future. To the extent that today's spot rate serves as a forecast of the spot rate that will exist when earnings are remitted, a weak foreign currency today results in a forecast of a weak exchange rate at the time that the earnings are remitted. In this case, the expected future cash flows are affected, so translation exposure is relevant.

Stock Price Perspective. Many investors tend to use earnings when valuing firms, either by deriving estimates of expected cash flows from previous earnings or by applying an industry price-earnings (P/E) ratio to expected annual earnings to derive a value per share of stock. Since an MNC's translation exposure affects its consolidated earnings, it can affect the MNC's valuation.

¹Michael Adler and Bernard Dumas, "Exposure to Currency Risk: Definition and Measurement," *Financial Management*, 13, no. 2 (Summer 1984): 41–50.

Determinants of Translation Exposure

Some MNCs are subject to a greater degree of translation exposure than others. An MNC's degree of translation exposure is dependent on the following:

- The proportion of its business conducted by foreign subsidiaries
- The locations of its foreign subsidiaries
- The accounting methods that it uses

Proportion of Its Business Conducted by Foreign Subsidiaries. The greater the percentage of an MNC's business conducted by its foreign subsidiaries, the larger the percentage of a given financial statement item that is susceptible to translation exposure.

EXAMPLE

Locus Co. and Zeuss Co. each generate about 30 percent of their sales from foreign countries. However, Locus Co. generates all of its international business by exporting, whereas Zeuss Co. has a large Mexican subsidiary that generates all of its international business. Locus Co. is not subject to translation exposure (although it is subject to economic exposure), while Zeuss has substantial translation exposure. ■

Locations of Foreign Subsidiaries. The locations of the subsidiaries can also influence the degree of translation exposure because the financial statement items of each subsidiary are typically measured by the home currency of the subsidiary's country.

EXAMPLE

Zeuss Co. and Canton Co. each have one large foreign subsidiary that generates about 30 percent of their respective sales. However, Zeuss Co. is subject to a much higher degree of translation exposure because its subsidiary is based in Mexico, and the peso's value is subject to a large decline. In contrast, Canton's subsidiary is based in Canada, and the Canadian dollar is very stable against the U.S. dollar. ■

Accounting Methods. An MNC's degree of translation exposure can be greatly affected by the accounting procedures it uses to translate when consolidating financial statement data. Many of the important consolidated accounting rules for U.S.-based MNCs are based on FASB 52:

1. The functional currency of an entity is the currency of the economic environment in which the entity operates.
2. The current exchange rate as of the reporting date is used to translate the assets and liabilities of a foreign entity from its functional currency into the reporting currency.
3. The weighted average exchange rate over the relevant period is used to translate revenue, expenses, and gains and losses of a foreign entity from its functional currency into the reporting currency.
4. Translated income gains or losses due to changes in foreign currency values are not recognized in current net income but are reported as a second component of stockholder's equity; an exception to this rule is a foreign entity located in a country with high inflation.
5. Realized income gains or losses due to foreign currency transactions are recorded in current net income, although there are some exceptions.

Under FASB 52, consolidated earnings are sensitive to the functional currency's weighted average exchange rate.

E X A M P L E

A British subsidiary of Providence, Inc., earned £10 million in year 1 and £10 million in year 2. When these earnings are consolidated along with other subsidiary earnings, they are translated into U.S. dollars at the weighted average exchange rate in that year. Assume the weighted average exchange rate is \$1.70 in year 1 and \$1.50 in year 2. The translated earnings for each reporting period in U.S. dollars are determined as follows:

Reporting Period	Local Earnings of British Subsidiary	Weighted Average Exchange Rate of Pound over the Reporting Period	Translated U.S. Dollar Earnings of British Subsidiary
Year 1	£10,000,000	\$1.70	\$17,000,000
Year 2	£10,000,000	\$1.50	\$15,000,000

Notice that even though the subsidiary's earnings in pounds were the same each year, the translated consolidated dollar earnings were reduced by \$2 million in year 2. The discrepancy here is due to the change in the weighted average of the British pound exchange rate. The drop in earnings is not the fault of the subsidiary but rather of the weakened British pound that makes its year 2 earnings look small (when measured in U.S. dollars). ■

Examples of Translation Exposure

Consolidated earnings of Black & Decker, The Coca-Cola Co., and other MNCs are very sensitive to exchange rates because more than a third of their assets and sales are overseas. Their earnings in foreign countries are reduced when translated if foreign currencies depreciate against the U.S. dollar.

In the 2000–2001 period, the weakness of the euro caused several U.S.-based MNCs to report lower earnings than they had expected. In September 2000, when DuPont announced that its consolidated earnings would be affected by its translation exposure to the euro, investors responded quickly by dumping DuPont's shares. The stock price of DuPont declined 10 percent on that day. Other MNCs including Colgate-Palmolive, Gillette, Goodyear, and McDonald's followed with similar announcements.

In the 2002–2007 period, the euro strengthened, which had a favorable translation effect on the consolidated earnings of U.S.-based MNCs that have foreign subsidiaries in the euro zone. In some quarters over this period, more than half of the increase in reported earnings by MNCs was due to the translation effect.

SUMMARY

■ MNCs with less risk can obtain funds at lower financing costs. Since they may experience more volatile cash flows because of exchange rate movements, exchange rate risk can affect their financing costs. Thus, MNCs may benefit from hedging exchange rate risk.

■ Transaction exposure is the exposure of an MNC's future cash transactions to exchange rate movements. MNCs can measure their transaction expo-

sure by determining their future payables and receivables positions in various currencies, along with the variability levels and correlations of these currencies. From this information, they can assess how their revenue and costs may change in response to various exchange rate scenarios.

■ Economic exposure is any exposure of an MNC's cash flows (direct or indirect) to exchange rate movements. MNCs can attempt to measure their economic

exposure by determining the extent to which their cash flows will be affected by their exposure to each foreign currency.

■ Translation exposure is the exposure of an MNC's consolidated financial statements to exchange rate

movements. To measure translation exposure, MNCs can forecast their earnings in each foreign currency and then determine how their earnings could be affected by the potential exchange rate movements of each currency.

POINT COUNTER-POINT

Should Investors Care about an MNC's Translation Exposure?

Point No. The present value of an MNC's cash flows is based on the cash flows that the parent receives. Any impact of the exchange rates on the financial statements is not important unless cash flows are affected. MNCs should focus their energy on assessing the exposure of their cash flows to exchange rate movements and should not be concerned with the exposure of their financial statements to exchange rate movements. Value is about cash flows, and investors focus on value.

Counter-Point Investors do not have sufficient financial data to derive cash flows. They commonly use earnings as a base, and if earnings are distorted, their estimates of cash flows will be also. If they underesti-

mate cash flows because of how exchange rates affected the reported earnings, they may underestimate the value of the MNC. Even if the value is corrected in the future once the market realizes how the earnings were distorted, some investors may have sold their stock by the time the correction occurs. Investors should be concerned about an MNC's translation exposure. They should recognize that the earnings of MNCs with large translation exposure may be more distorted than the earnings of MNCs with low translation exposure.

Who Is Correct? Use the Internet to learn more about this issue. Which argument do you support?

SELF TEST

Answers are provided in Appendix A at the back of the text.

- Given that shareholders can diversify away an individual firm's exchange rate risk by investing in a variety of firms, why are firms concerned about exchange rate risk?
- Bradley, Inc., considers importing its supplies from either Canada (denominated in C\$) or Mexico (denominated in pesos) on a monthly basis. The quality is the same for both sources. Once the firm completes the agreement with a supplier, it will be obligated to continue using that supplier for at least 3 years. Based on existing exchange rates, the dollar amount to be paid (including transportation costs) will be the same. The firm has no other exposure to exchange rate movements. Given that the firm prefers to have less exchange rate risk, which alternative is preferable? Explain.
- Assume your U.S. firm currently exports to Mexico on a monthly basis. The goods are priced in pesos. Once material is received from a source, it is quickly used to produce the product in the United States, and then the product is exported. Currently, you have no other exposure to exchange rate risk. You have a choice of purchasing the material from Canada (denominated in C\$), from Mexico (denominated in pesos), or from within the United States (denominated in U.S. dollars). The quality and your expected cost are similar across the three sources. Which source is preferable, given that you prefer minimal exchange rate risk?
- Using the information in the previous question, consider a proposal to price the exports to Mexico in dollars and to use the U.S. source for material. Would this proposal eliminate the exchange rate risk?
- Assume that the dollar is expected to strengthen against the euro over the next several years. Explain how this will affect the consolidated earnings of U.S.-based MNCs with subsidiaries in Europe.

QUESTIONS AND APPLICATIONS

- Transaction versus Economic Exposure.** Compare and contrast transaction exposure and economic exposure. Why would an MNC consider examining only its “net” cash flows in each currency when assessing its transaction exposure?
- Assessing Transaction Exposure.** Your employer, a large MNC, has asked you to assess its transaction exposure. Its projected cash flows are as follows for the next year. Danish krone inflows equal DK50,000,000 while outflows equal DK40,000,000. British pound inflows equal £2,000,000 while outflows equal £1,000,000. The spot rate of the krone is \$.15, while the spot rate of the pound is \$1.50. Assume that the movements in the Danish krone and the British pound are highly correlated. Provide your assessment as to your firm’s degree of transaction exposure (as to whether the exposure is high or low). Substantiate your answer.
- Factors That Affect a Firm’s Transaction Exposure.** What factors affect a firm’s degree of transaction exposure in a particular currency? For each factor, explain the desirable characteristics that would reduce transaction exposure.
- Currency Correlations.** Kopetsky Co. has net receivables in several currencies that are highly correlated with each other. What does this imply about the firm’s overall degree of transaction exposure? Are currency correlations perfectly stable over time? What does your answer imply about Kopetsky Co. or any other firm using past data on correlations as an indicator for the future?
- Currency Effects on Cash Flows.** How should appreciation of a firm’s home currency generally affect its cash inflows? How should depreciation of a firm’s home currency generally affect its cash outflows?
- Transaction Exposure.** Fischer, Inc., exports products from Florida to Europe. It obtains supplies and borrows funds locally. How would appreciation of the euro likely affect its net cash flows? Why?
- Exposure of Domestic Firms.** Why are the cash flows of a purely domestic firm exposed to exchange rate fluctuations?
- Measuring Economic Exposure.** Memphis Co. hires you as a consultant to assess its degree of economic exposure to exchange rate fluctuations. How would you handle this task? Be specific.
- Factors That Affect a Firm’s Translation Exposure.** What factors affect a firm’s degree of translation exposure? Explain how each factor influences translation exposure.
- Translation Exposure.** Consider a period in which the U.S. dollar weakens against the euro. How will this affect the reported earnings of a U.S.-based MNC with European subsidiaries? Consider a period in which the U.S. dollar strengthens against most foreign currencies. How will this affect the reported earnings of a U.S.-based MNC with subsidiaries all over the world?
- Transaction Exposure.** Aggie Co. produces chemicals. It is a major exporter to Europe, where its main competition is from other U.S. exporters. All of these companies invoice the products in U.S. dollars. Is Aggie’s transaction exposure likely to be significantly affected if the euro strengthens or weakens? Explain. If the euro weakens for several years, can you think of any change that might occur in the global chemicals market?
- Economic Exposure.** Longhorn Co. produces hospital equipment. Most of its revenues are in the United States. About half of its expenses require outflows in Philippine pesos (to pay for Philippine materials). Most of Longhorn’s competition is from U.S. firms that have no international business at all. How will Longhorn Co. be affected if the peso strengthens?
- Economic Exposure.** Lubbock, Inc., produces furniture and has no international business. Its major competitors import most of their furniture from Brazil and then sell it out of retail stores in the United States. How will Lubbock, Inc., be affected if Brazil’s currency (the real) strengthens over time?
- Economic Exposure.** Sooner Co. is a U.S. wholesale company that imports expensive high-quality luggage and sells it to retail stores around the United States. Its main competitors also import high-quality luggage and sell it to retail stores. None of these competitors hedge their exposure to exchange rate movements. Why might Sooner’s market share be more volatile over time if it hedges its exposure?
- PPP and Economic Exposure.** Boulder, Inc., exports chairs to Europe (invoiced in U.S. dollars) and competes against local European companies. If purchasing power parity exists, why would Boulder not benefit from a stronger euro?

16. Measuring Changes in Economic Exposure.

Toyota Motor Corp. measures the sensitivity of its exports to the yen exchange rate (relative to the U.S. dollar). Explain how regression analysis could be used for such a task. Identify the expected sign of the regression coefficient if Toyota primarily exports to the United States. If Toyota established plants in the United States, how might the regression coefficient on the exchange rate variable change?

- 17. Impact of Exchange Rates on Earnings.** Cieplak, Inc., is a U.S.-based MNC that has expanded into Asia. Its U.S. parent exports to some Asian countries, with its exports denominated in the Asian currencies. It also has a large subsidiary in Malaysia that serves that market. Offer at least two reasons related to exposure to exchange rates that explain why Cieplak's earnings were reduced during the Asian crisis.

Advanced Questions

- 18. Speculating Based on Exposure.** During the Asian crisis in 1998, there were rumors that China would weaken its currency (the yuan) against the U.S. dollar and many European currencies. This caused investors to sell stocks in Asian countries such as Japan, Taiwan, and Singapore. Offer an intuitive explanation for such an effect. What types of Asian firms would have been affected the most?

- 19. Comparing Transaction and Economic Exposure.** Erie Co. has most of its business in the United States, except that it exports to Belgium. Its exports were invoiced in euros (Belgium's currency) last year. It has no other economic exposure to exchange rate risk. Its main competition when selling to Belgium's customers is a company in Belgium that sells similar products, denominated in euros. Starting today, Erie Co. plans to adjust its pricing strategy to invoice its exports in U.S. dollars instead of euros. Based on the new strategy, will Erie Co. be subject to economic exposure to exchange rate risk in the future? Briefly explain.

- 20. Using Regression Analysis to Measure Exposure.**
- How can a U.S. company use regression analysis to assess its economic exposure to fluctuations in the British pound?
 - In using regression analysis to assess the sensitivity of cash flows to exchange rate movements, what is the purpose of breaking the database into subperiods?
 - Assume the regression coefficient based on assessing economic exposure was much higher in the

second subperiod than in the first subperiod. What does this tell you about the firm's degree of economic exposure over time? Why might such results occur?

- 21. Transaction Exposure.** Vegas Corp. is a U.S. firm that exports most of its products to Canada. It historically invoiced its products in Canadian dollars to accommodate the importers. However, it was adversely affected when the Canadian dollar weakened against the U.S. dollar. Since Vegas did not hedge, its Canadian dollar receivables were converted into a relatively small amount of U.S. dollars. After a few more years of continual concern about possible exchange rate movements, Vegas called its customers and requested that they pay for future orders with U.S. dollars instead of Canadian dollars. At this time, the Canadian dollar was valued at \$.81. The customers decided to oblige since the number of Canadian dollars to be converted into U.S. dollars when importing the goods from Vegas was still slightly smaller than the number of Canadian dollars that would be needed to buy the product from a Canadian manufacturer. Based on this situation, has transaction exposure changed for Vegas Corp.? Has economic exposure changed? Explain.
- 22. Measuring Economic Exposure.** Using the following cost and revenue information shown for DeKalb, Inc., determine how the costs, revenue, and cash flow items would be affected by three possible exchange rate scenarios for the New Zealand dollar (NZ\$): (1) NZ\$ = \$.50, (2) NZ\$ = \$.55, and (3) NZ\$ = \$.60. (Assume U.S. sales will be unaffected by the exchange rate.) Assume that NZ\$ earnings will be remitted to the U.S. parent at the end of the period. Ignore possible tax effects.

Revenue and Cost Estimates: DeKalb, Inc.
(in Millions of U.S. Dollars and
New Zealand Dollars)

	U.S. Business	New Zealand Business
Sales	\$800	NZ\$800
Cost of materials	500	100
Operating expenses	300	0
Interest expense	100	0
Cash flow	-\$100	NZ\$700

- 23. Changes in Economic Exposure.** Walt Disney World built an amusement park in France that

opened in 1992. How do you think this project has affected Disney's economic exposure to exchange rate movements? Think carefully before you give your final answer. There is more than one way in which Disney's cash flows may be affected. Explain.

24. Lagged Effects of Exchange Rate Movements.

Cornhusker Co. is an exporter of products to Singapore. It wants to know how its stock price is affected by changes in the Singapore dollar's exchange rate. It believes that the impact may occur with a lag of one to three quarters. How could regression analysis be used to assess the impact?

25. Potential Effects if the United Kingdom Adopted the Euro. The United Kingdom still has its own currency, the pound. The pound's interest rate has historically been higher than the euro's interest rate. The United Kingdom has considered adopting the euro as its currency. There have been many arguments about whether it should do so.

Use your knowledge and intuition to discuss the likely effects if the United Kingdom adopts the euro. For each of the 10 statements below, insert either *increase* or *decrease* in the first blank and complete the statement by adding a clear, short explanation (perhaps one to three sentences) of why the United Kingdom's adoption of the euro would have that effect.

To help you narrow your focus, follow these guidelines. Assume that the pound is more volatile than the euro. Do not base your answer on whether the pound would have been stronger than the euro in the future. Also, do not base your answer on an unusual change in economic growth in the United Kingdom or in the euro zone if the euro is adopted.

- a. The economic exposure of British firms that are heavy exporters to the euro zone would _____ because _____.
- b. The translation exposure of firms based in the euro zone that have British subsidiaries would _____ because _____.
- c. The economic exposure of U.S. firms that conduct substantial business in the United Kingdom and have no other international business would _____ because _____.
- d. The translation exposure of U.S. firms with British subsidiaries would _____ because _____.
- e. The economic exposure of U.S. firms that export to the United Kingdom and whose only other international business is importing from firms based in the euro zone would _____ because _____.

f. The discount on the forward rate paid by U.S. firms that periodically use the forward market to hedge payables of British imports would _____ because _____.

g. The earnings of a foreign exchange department of a British bank that executes foreign exchange transactions desired by its European clients would _____ because _____.

h. Assume that the Swiss franc is more highly correlated with the British pound than with the euro. A U.S. firm has substantial monthly exports to the United Kingdom denominated in the British currency and also has substantial monthly imports of Swiss supplies (denominated in Swiss francs). The economic exposure of this firm would _____ because _____.

i. Assume that the Swiss franc is more highly correlated with the British pound than with the euro. A U.S. firm has substantial monthly exports to the United Kingdom denominated in the British currency and also has substantial monthly exports to Switzerland (denominated in Swiss francs). The economic exposure of this firm would _____ because _____.

j. The British government's reliance on monetary policy (as opposed to fiscal policy) as a means of fine-tuning the economy would _____ because _____.

26. Invoicing Policy to Reduce Exposure. Celtic Co. is a U.S. firm that exports its products to England. It faces competition from many firms in England. Its price to customers in England has generally been lower than those of the competitors, primarily because the British pound has been strong. It has priced its exports in pounds and then converts the pound receivables into dollars. All of its expenses are in the United States and are paid with dollars. It is concerned about its economic exposure. It considers a change in its pricing policy, in which it will price its products in dollars instead of pounds. Offer your opinion on why this will or will not significantly reduce its economic exposure.

27. Exposure of an MNC's Subsidiary. Decko Co. is a U.S. firm with a Chinese subsidiary that produces cell phones in China and sells them in Japan. This subsidiary pays its wages and its rent in Chinese yuan. The cell phones sold to Japan are denominated in Japanese yen. Assume that Decko Co. expects that the Chinese yuan will continue to remain stable against the U.S. dollar. The subsidiary's main goal is to generate profits for itself and it reinvests the profits. It does not plan to remit any funds to the U.S. parent.

- a. Assume that the Japanese yen strengthens against the U.S. dollar over time. How would this be expected to affect the profits earned by the Chinese subsidiary?
- b. If Decko Co. had established its subsidiary in Tokyo, Japan, instead of China, would its subsidiary's profits be more exposed or less exposed to exchange rate risk?
- c. Why do you think that Decko Co. established the subsidiary in China instead of Japan? Assume no major country risk barriers.
- d. If the Chinese subsidiary needs to borrow money to finance its expansion and wants to reduce its exchange rate risk, should it borrow U.S. dollars, Chinese yuan, or Japanese yen?
28. Washington Co. and Vermont Co. have no domestic business. They have a similar dollar equivalent amount of international exporting business. Washington Co. exports all of its products to Canada. Vermont Co. exports its products to Poland and Mexico, with about half of its business in each of these two countries. Each firm receives the currency of the country where it sends its exports. You obtain the end-of-month spot exchange rates of the currencies mentioned above during the end of each of the last 6 months.

End of Month	Canadian Dollar	Mexican Peso	Polish Zloty
1	\$.8142	\$.09334	\$.29914
2	.8176	.09437	.29829
3	.8395	.09241	.30187
4	.8542	.09263	.3088
5	.8501	.09251	.30274
6	.8556	.09448	.30312

You want to assess the data in a logical manner to determine which firm has a higher degree of exchange rate risk. Show your work and write your conclusion.

29. **Exposure to Pegged Currency System.** Assume that the Mexican peso and the Brazilian currency (the real) have depreciated against the U.S. dollar recently due to the high inflation rates in those countries. Assume that inflation in these two countries is expected to continue and that it will have a major effect on these currencies if they are still allowed to float. Assume that the government of Brazil decides to peg its currency to the dollar and will definitely

maintain the peg for the next year. Milez Co. is based in Mexico. Its main business is to export supplies from Mexico to Brazil. It invoices its supplies in Mexican pesos. Its main competition is from firms in Brazil that produce similar supplies and sell them locally. How will the sales volume of Milez Co. be affected (if at all) by the Brazilian government's actions? Explain.

30. **Assessing Currency Volatility.** Zemart is a U.S. firm that plans to establish international business in which it will export to Mexico (these exports will be denominated in pesos) and to Canada (these exports will be denominated in Canadian dollars) once a month and will therefore receive payments once a month. It is concerned about exchange rate risk. It wants to compare the standard deviation of exchange rate movements of these two currencies against the U.S. dollar on a monthly basis. For this reason, it asks you to:
- a. Estimate the standard deviation of the monthly movements in the Canadian dollar against the U.S. dollar over the last 12 months.
- b. Estimate the standard deviation of the monthly movements in the Mexican peso against the U.S. dollar over the last 12 months.
- c. Determine which currency is less volatile.

You can use the oanda.com website (or any legitimate website that has currency data) to obtain the end-of-month direct exchange rate of the peso and the Canadian dollar in order to do your analysis. Show your work. You can use a calculator or a spreadsheet (like Excel) to do the actual computations.

31. **Exposure of Net Cash Flows.** Each of the following U.S. firms is expected to generate \$40 million in net cash flows (after including the estimated cash flows from international sales if there are any) over the next year. Ignore any tax effects. Each firm has the same level of expected earnings. None of the firms has taken any position in exchange rate derivatives to hedge exchange rate risk. All payments for the international trade by each firm will occur one year from today.

Sunrise Co. has ordered imports from Austria, and its imports are invoiced in euros. The dollar value of the payables (based on today's exchange rate) from its imports during this year is \$10 million. It has no international sales.

Copans Co. has ordered imports from Mexico, and its imports are invoiced in U.S. dollars. The dollar value of the payables from its imports during this year is \$15 million. It has no international sales.

Yamato Co. ordered imports from Italy, and its imports are invoiced in euros. The dollar value of the payables (based on today's exchange rate) from its imports during this year is \$12 million. In addition, Yamato exports to Portugal, and its exports are denominated in euros. The dollar value of the receivables (based on today's exchange rate) from its exports during this year is \$8 million.

Glades Co. ordered imports from Belgium, and these imports are invoiced in euros. The dollar value of the payables (based on today's exchange rate) from its imports during this year is \$7 million. Glades also ordered imports from Luxembourg, and these imports are denominated in dollars. The dollar value of these payables is \$30 million. Glades has no international sales.

Based on this information, which firm is exposed to the most exchange rate risk? Explain.

32. Cash Flow Sensitivity to Exchange Rate

Movements. The Central Bank of Poland is about to engage in indirect intervention later today in which it will lower Poland's interest rates substantially. This will have an impact on the value of the Polish currency (zloty) against most currencies because it will immediately affect capital flows. Missouri Co. has a subsidiary in Poland that sells appliances. The demand for its appliances is not affected much by the local economy. Most of its appliances produced in Poland are typically invoiced in zloty and are purchased by consumers from Germany. The subsidiary's main competition is from appliance producers in Portugal, Spain, and Italy, which also export appliances to Germany.

- a. Explain how the impact on the zloty's value will affect the sales of appliances by the Polish subsidiary.
- b. The subsidiary owes a British company 1 million British pounds for some technology that the British company provided. Explain how the impact on the zloty's value will affect the cost of this technology to the subsidiary.
- c. The subsidiary plans to take 2 million zloty from its recent earnings and will remit it to the U.S. parent in the near future. Explain how the impact on the zloty's value will affect the amount of dollar cash flows received by the U.S. parent due to this remittance of earnings by the subsidiary.

33. Applying the Value-at-Risk Method. You use today's spot rate of the Brazilian real to forecast the spot rate of the real for one month ahead. Today's spot rate is \$.4558. Use the value-at-risk method to determine the maximum percentage loss of the

Brazilian real over the next month based on a 95 percent confidence level. Use the spot exchange rates at the end of each of the last 6 months to conduct your analysis. Forecast the exchange rate that would exist under these conditions.

34. Assessing Translation Exposure. Kanab Co. and Zion Co. are U.S. companies that engage in much business within the United States and are about the same size. They both conduct some international business as well.

Kanab Co. has a subsidiary in Canada that will generate earnings of about C\$20 million in each of the next 5 years. Kanab Co. also has a U.S. business that will receive about C\$1 million (after costs) in each of the next 5 years as a result of exporting products to Canada that are denominated in Canadian dollars.

Zion Co. has a subsidiary in Mexico that will generate earnings of about 1 million pesos in each of the next 5 years. Zion Co. also has a business in the United States that will receive about 300 million pesos (after costs) in each of the next 5 years as a result of exporting products to Mexico that are denominated in Mexican pesos.

The salvage value of Kanab's Canadian subsidiary and Zion's Mexican subsidiary will be zero in 5 years. The spot rate of the Canadian dollar is \$.60 while the spot rate of the Mexican peso is \$.10. Assume the Canadian dollar could appreciate or depreciate against the U.S. dollar by about 8 percent in any given year, while the Mexican peso could appreciate or depreciate against the U.S. dollar by about 12 percent in any given year. Which company is subject to a higher degree of translation exposure? Explain.

35. Cross-Currency Relationships. The Hong Kong dollar (HK\$) is presently pegged to the U.S. dollar and is expected to remain pegged. Some Hong Kong firms export products to Australia that are denominated in Australian dollars and have no other business in Australia. The exports are not hedged. The Australian dollar is presently worth .50 U.S. dollars, but you expect that it will be worth .45 U.S. dollars by the end of the year. Based on your expectations, will the Hong Kong exporters be affected favorably or unfavorably? Briefly explain.

36. Interpreting Economic Exposure. Spratt Co. (a U.S. firm) attempts to determine its economic exposure to movements in the British pound by applying regression analysis to data over the last 36 quarters:

$$SP = b_0 + b_1e + \mu$$

where SP represents the percentage change in Spratt's stock price per quarter, e represents the percentage change in the pound value per quarter, and μ is an error term. Based on the analysis, the b_0 coefficient is zero and the b_1 coefficient is $-.4$ and is statistically significant. Assume that interest rate parity exists. Today, the spot rate of the pound is \$1.80, the 90-day British interest rate is 3 percent, and the 90-day U.S. interest rate is 2 percent. Assume that the 90-day forward rate is expected to be an accurate forecast of the future spot rate. Would you expect that Spratt's value will be favorably

affected, unfavorably affected, or not affected by its economic exposure over the next quarter? Explain.

Discussion in the Boardroom

This exercise can be found in Appendix E at the back of this textbook.

Running Your Own MNC

This exercise can be found on the Xtra! website at <http://maduraxtra.swlearning.com>.

BLADES, INC. CASE

Assessment of Exchange Rate Exposure

Blades, Inc., is currently exporting roller blades to Thailand and importing certain components needed to manufacture roller blades from that country. Under a fixed contractual agreement, Blades' primary customer in Thailand has committed itself to purchase 180,000 pairs of roller blades annually at a fixed price of 4,594 Thai baht (THB) per pair. Blades is importing rubber and plastic components from various suppliers in Thailand at a cost of approximately THB2,871 per pair, although the exact price (in baht) depends on current market prices. Blades imports materials sufficient to manufacture 72,000 pairs of roller blades from Thailand each year. The decision to import materials from Thailand was reached because rubber and plastic components needed to manufacture Blades' products are inexpensive, yet of high quality, in Thailand.

Blades has also conducted business with a Japanese supplier in the past. Although Blades' analysis indicates that the Japanese components are of a lower quality than the Thai components, Blades has occasionally imported components from Japan when the prices were low enough. Currently, Ben Holt, Blades' chief financial officer (CFO), is considering importing components from Japan more frequently. Specifically, he would like to reduce Blades' baht exposure by taking advantage of the recently high correlation between the baht and the yen. Since Blades has net inflows denominated in baht and would have outflows denominated in yen, its net transaction exposure would be reduced if these two currencies were highly correlated. If Blades decides to import components from Japan, it would probably import materials sufficient to manufacture 1,700 pairs of roller blades annually at a price of ¥7,440 per pair.

Holt is also contemplating further expansion into foreign countries. Although he would eventually like to establish a subsidiary or acquire an existing business overseas, his immediate focus is on increasing Blades' foreign sales. Holt's primary reason for this plan is that the profit margin from Blades' imports and exports exceeds 25 percent, while the profit margin from Blades' domestic production is below 15 percent. Consequently, he believes that further foreign expansion will be beneficial to the company's future.

Though Blades' current exporting and importing practices have been profitable, Ben Holt is contemplating extending Blades' trade relationships to countries in different regions of the world. One reason for this decision is that various Thai roller blade manufacturers have recently established subsidiaries in the United States. Furthermore, various Thai roller blade manufacturers have recently targeted the U.S. market by advertising their products over the Internet. As a result of this increased competition from Thailand, Blades is uncertain whether its primary customer in Thailand will renew the current commitment to purchase a fixed number of roller blades annually. The current agreement will terminate in 2 years. Another reason for engaging in transactions with other, non-Asian, countries is that the Thai baht has depreciated substantially recently, which has somewhat reduced Blades' profit margins. The sale of roller blades to other countries with more stable currencies may increase Blades' profit margins.

While Blades will continue exporting to Thailand under the current agreement for the next 2 years, it may also export roller blades to Jogs, Ltd., a British retailer. Preliminary negotiations indicate that Jogs

would be willing to commit itself to purchase 200,000 pairs of “Speedos,” Blades’ primary product, for a fixed price of £80 per pair.

Holt is aware that further expansion would increase Blades’ exposure to exchange rate fluctuations, but he believes that Blades can supplement its profit margins by expanding. He is vaguely familiar with the different types of exchange rate exposure but has asked you, a financial analyst at Blades, Inc., to help him assess how the contemplated changes would affect Blades’ financial position. Among other concerns, Holt is aware that recent economic problems in Thailand have had an effect on Thailand and other Asian countries. Whereas the correlation between Asian currencies such as the Japanese yen and the Thai baht is generally not very high and very unstable, these recent problems have increased the correlation among most Asian currencies. Conversely, the correlation between the British pound and the Asian currencies is quite low.

To aid you in your analysis, Holt has provided you with the following data:

Currency	Expected Exchange Rate	Range of Possible Exchange Rates
British pound	\$1.50	\$1.47 to \$1.53
Japanese yen	\$.0083	\$.0079 to \$.0087
Thai baht	\$.024	\$.020 to \$.028

Holt has asked you to answer the following questions:

1. What type(s) of exposure (i.e., transaction, economic, or translation exposure) is Blades subject to? Why?
2. Using a spreadsheet, conduct a consolidated net cash flow assessment of Blades, Inc., and estimate the range of net inflows and outflows for Blades for the coming year. Assume that Blades enters into the agreement with Jogs, Ltd.
3. If Blades does not enter into the agreement with the British firm and continues to export to Thailand and import from Thailand and Japan, do you think the increased correlations between the Japanese yen and the Thai baht will increase or reduce Blades’ transaction exposure?
4. Do you think Blades should import components from Japan to reduce its net transaction exposure in the long run? Why or why not?
5. Assuming Blades enters into the agreement with Jogs, Ltd., how will its overall transaction exposure be affected?
6. Given that Thai roller blade manufacturers located in Thailand have begun targeting the U.S. roller blade market, how do you think Blades’ U.S. sales were affected by the depreciation of the Thai baht? How do you think its exports to Thailand and its imports from Thailand and Japan were affected by the depreciation?

SMALL BUSINESS DILEMMA

Assessment of Exchange Rate Exposure by the Sports Exports Company

At the current time, the Sports Exports Company is willing to receive payments in British pounds for the monthly exports it sends to the United Kingdom. While all of its receivables are denominated in pounds, it has no payables in pounds or in any other foreign currency. Jim Logan, owner of the Sports Exports Company, wants to assess his firm’s exposure to exchange rate risk.

1. Would you describe the exposure of the Sports Exports Company to exchange rate risk as transaction exposure? Economic exposure? Translation exposure?
2. Jim Logan is considering a change in the pricing policy in which the importer must pay in dollars,

so that Jim will not have to worry about converting pounds to dollars every month. If implemented, would this policy eliminate the transaction exposure of the Sports Exports Company? Would it eliminate Sports Exports’ economic exposure? Explain.

3. If Jim decides to implement the policy described in the previous question, how would the Sports Exports Company be affected (if at all) by appreciation of the pound? By depreciation of the pound? Would these effects on Sports Exports differ if Jim retained his original policy of pricing the exports in British pounds?

INTERNET/EXCEL EXERCISES

1. Go to <http://www.oanda.com/convert/fxhistory> and obtain the direct exchange rate of the Canadian dollar and euro at the beginning of each of the last 7 years.
 - a. Assume you received C\$2 million in earnings from your Canadian subsidiary at the beginning of each year over the last 7 years. Multiply this amount times the direct exchange rate of the Canadian dollar at the beginning of each year to determine how many U.S. dollars you received. Determine the percentage change in the dollar cash flows received from one year to the next. Determine the standard deviation of these percentage changes. This measures the volatility of movements in the dollar earnings resulting from your Canadian business over time.
 - b. Now assume that you also received 1 million euros at the beginning of each year from your German subsidiary. Repeat the same process for the euro to measure the volatility of movements in the dollar cash flows resulting from your German business over time. Are the movements in dollar cash flows more volatile for the Canadian business or the German business?
 - c. Now consider the dollar cash flows you received from the Canadian subsidiary and the German subsidiary combined. That is, add the dollar cash flows received from both businesses for each year. Repeat the process to measure the volatility of movements in the dollar cash flows resulting from both businesses over time. Compare the volatility in the dollar cash flows of the portfolio to the volatility in cash flows resulting from the German business. Does it appear that diversification of businesses across two countries results in more stable cash flows than the business in Germany? Explain.
 - d. Compare the volatility in the dollar cash flows of the portfolio to the volatility in cash flows resulting from the Canadian business. Does it appear that diversification of businesses across two countries results in more stable cash flow movements than the business in Canada? Explain.
2. The following website contains annual reports of many MNCs: <http://www.reportgallery.com>. Review the annual report of your choice. Look for any comments in the report that describe the MNC's transaction exposure, economic exposure, or translation exposure. Summarize the MNC's exposure based on the comments in the annual report.