CHAPTER 10
Measuring and Managing Translation and Transaction Exposure

The stream of time sweeps away errors, and leaves the truth for the inheritance of humanity.

GEORGE BRANDES

LEARNING OBJECTIVES

- To define translation and transaction exposure and distinguish between the two
- To describe the four principal currency translation methods available and to calculate translation exposure using these different methods
- To describe and apply the current (FASB-52) currency translation method prescribed by the Financial Accounting Standards Board
- To identify the basic hedging strategy and techniques used by firms to manage their currency transaction and translation risks
- To explain how a forward market hedge works
- To explain how a money market hedge works
- To describe how foreign currency contract prices should be set to factor in exchange rate change expectations
- To describe how currency risk-sharing arrangements work
- To explain when foreign currency options are the preferred hedging technique
- To describe the costs associated with using the different hedging techniques
- To describe and assess the economic soundness of the various corporate hedging objectives
- To explain the advantages and disadvantages of centralizing foreign exchange risk management

Foreign currency fluctuations are one of the key sources of risk in multinational operations. Consider the case of Dell Inc., which operates assembly plants for its computers within the United States as well as in Ireland, Malaysia, China, and Brazil; runs offices and call centers in several other countries; and markets its products in more than 100 countries. Dell’s currency problems are evident in the fact that it may manufacture a product in Ireland for sale in, say, Denmark and obtain payments in Danish krone. Dell would like to ensure that its foreign profits are not eroded by currency fluctuations. Also, at the end of the year, when Dell consolidates its financial statements for the year in U.S. dollars, it wants to ensure that exchange rate changes do not adversely impact its financial performance.

The pressure to monitor and manage foreign currency risks has led many companies to develop sophisticated computer-based systems to keep track of their foreign exchange exposure and aid in managing that exposure. The general concept of exposure refers to the degree to which a company is affected by exchange rate changes. This impact can be measured in
several ways. As so often happens, economists tend to favor one approach to measuring foreign exchange exposure, whereas accountants favor an alternative approach. This chapter deals with the measurement and management of accounting exposure, including both translation and transaction exposure. Management of accounting exposure centers on the concept of **hedging**. **Hedging** a particular currency exposure means establishing an offsetting currency position so that whatever is lost or gained on the original currency exposure is exactly offset by a corresponding foreign exchange gain or loss on the currency hedge. Regardless of what happens to the future exchange rate, therefore, hedging locks in a dollar (home currency) value for the currency exposure. In this way, hedging can protect a firm from **foreign exchange risk**, which is the risk of valuation changes resulting from unforeseen currency movements.

### 10.1 Alternative Measures of Foreign Exchange Exposure

The three basic types of exposure are **translation exposure**, **transaction exposure**, and **operating exposure**. Transaction exposure and operating exposure combine to form economic exposure. Exhibit 10.1 illustrates and contrasts translation, transaction, and operating exposure. As can be seen, these exposures cannot always be neatly separated but instead overlap to some extent.

#### Translation Exposure

Translation exposure, also known as **accounting exposure** or **balance-sheet exposure**, arises from the need, for purposes of reporting and consolidation, to convert the financial statements of foreign operations from the local currencies (LC) involved to the home currency (HC). If

<table>
<thead>
<tr>
<th>Exhibit 10.1</th>
<th>Comparison of Translation, Transaction, and Operating Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Translation Exposure</strong></td>
<td><strong>Operating Exposure</strong></td>
</tr>
<tr>
<td>Changes in income statement items and the book value of balance sheet assets and liabilities that are caused by an exchange rate change. The resulting exchange gains and losses are determined by accounting rules and are paper only. The measurement of accounting exposure is retrospective in nature, as it is based on activities that occurred in the past.</td>
<td>Changes in the amount of future operating cash flow caused by an exchange rate change. The resulting exchange gains or losses are determined by changes in the firm’s future competitive position and are real. The measurement of operating exposure is prospective in nature as it is based on future activities.</td>
</tr>
<tr>
<td><strong>Impacts:</strong> Balance sheet assets and liabilities and income statement items that already exist.</td>
<td><strong>Impacts:</strong> Revenues and costs associated with future sales.</td>
</tr>
<tr>
<td>Exchange rate change occurs</td>
<td></td>
</tr>
<tr>
<td>Impacts: Contracts already entered into, but · · · to be settled at a later date.</td>
<td></td>
</tr>
</tbody>
</table>

#### Transaction Exposure

Changes in the value of outstanding foreign-currency-denominated contracts (i.e., contracts that give rise to future foreign currency cash flows) that are brought about by an exchange rate change. The resulting exchange gains and losses are determined by the nature of the contracts already entered into and are real. The measurement of transaction exposure mixes the retrospective and prospective because it is based on activities that occurred in the past but will be settled in the future. Contracts already on the balance sheet are part of accounting exposure, whereas contracts not yet on the balance sheet are part of operating exposure.
Exchange rates have changed since the previous reporting period, this translation, or restatement, of those assets, liabilities, revenues, expenses, gains, and losses that are denominated in foreign currencies will result in foreign exchange gains or losses. The possible extent of these gains or losses is measured by the translation exposure figures. The rules that govern translation are devised by an accounting association such as the Financial Accounting Standards Board (FASB) in the United States, the parent firm’s government, or the firm itself. Appendix 10A discusses Statement of Financial Accounting Standards No. 52 (FASB 52)—the present currency translation method prescribed by FASB.

**Transaction Exposure**

Transaction exposure results from transactions that give rise to known, contractually binding future foreign-currency-denominated cash inflows or outflows. As exchange rates change between now and when these transactions settle, so does the value of their associated foreign currency cash flows, leading to currency gains and losses. Examples of transaction exposure for a U.S. company would be the account receivable associated with a sale denominated in euros or the obligation to repay a Japanese yen debt. Although transaction exposure is rightly part of economic exposure, it is usually lumped under accounting exposure. In reality, transaction exposure overlaps with both accounting and operating exposure. Some elements of transaction exposure, such as foreign-currency-denominated accounts receivable and debts, are included in a firm’s accounting exposure because they already appear on the firm’s balance sheet. Other elements of transaction exposure, such as foreign currency sales contracts that have been entered into but where the goods have not yet been delivered (and so receivables have not yet been created), do not appear on the firm’s current financial statements and instead are part of the firm’s operating exposure.

**Operating Exposure**

Operating exposure measures the extent to which currency fluctuations can alter a company’s future operating cash flows—that is, its future revenues and costs. Any company whose revenues or costs are affected by currency changes has operating exposure, even if it is a purely domestic corporation and has all its cash flows denominated in home currency.

The two cash-flow exposures—operating exposure and transaction exposure—combine to equal a company’s economic exposure. In technical terms, economic exposure is the extent to which the value of the firm, as measured by the present value of its expected cash flows, will change when exchange rates change.

### 10.2 Alternative Currency Translation Methods

Companies with international operations will have foreign-currency-denominated assets and liabilities, revenues, and expenses. However, because home country investors and the entire financial community are interested in home currency (HC) values, the foreign currency balance sheet accounts and income statement must be assigned HC values. In particular, the financial statements of an MNC’s overseas subsidiaries must be translated from local currency to home currency before consolidation with the parent’s financial statements.

If currency values change, foreign exchange translation gains or losses may result. Assets and liabilities that are translated at the current (postchange) exchange rate are considered to be exposed; those translated at a historical (prechange) exchange rate will maintain their historical HC values and, hence, are regarded as not exposed. Translation exposure is simply the difference between exposed assets and exposed liabilities. The controversies among accountants
center on which assets and liabilities are exposed and on when accounting-derived foreign exchange gains and losses should be recognized (reported on the income statement). A crucial point to realize in putting these controversies in perspective is that such gains or losses are of an accounting nature—that is, no cash flows are necessarily involved.

Four principal translation methods are available: the current/noncurrent method, the monetary/nonmonetary method, the temporal method, and the current rate method. In practice, there are also variations of each method.

**Current/Noncurrent Method**

At one time, the current/noncurrent method, whose underlying theoretical basis is maturity, was used by almost all U.S. multinationals. With this method, all the foreign subsidiary’s current assets and liabilities are translated into home currency at the current exchange rate. Each noncurrent asset or liability is translated at its historical exchange rate—that is, at the rate in effect at the time the asset was acquired or the liability was incurred. Hence, a foreign subsidiary with positive local currency working capital will give rise to a translation loss (gain) from a devaluation (revaluation) with the current/noncurrent method, and vice versa if working capital is negative.

The income statement is translated at the average exchange rate of the period, except for those revenues and expense items associated with noncurrent assets or liabilities. The latter items, such as depreciation expense, are translated at the same rates as the corresponding balance sheet items. Thus, it is possible to see different revenue and expense items with similar maturities being translated at different rates.

**Monetary/Nonmonetary Method**

The monetary/nonmonetary method differentiates between monetary assets and liabilities—that is, those items that represent a claim to receive, or an obligation to pay, a fixed amount of foreign currency units—and nonmonetary, or physical, assets and liabilities. Monetary items (for example, cash, accounts payable and receivable, and long-term debt) are translated at the current rate; nonmonetary items (e.g., inventory, fixed assets, and long-term investments) are translated at historical rates.

Income statement items are translated at the average exchange rate during the period, except for revenue and expense items related to nonmonetary assets and liabilities. The latter items, primarily depreciation expense and cost of goods sold, are translated at the same rate as the corresponding balance sheet items. As a result, the cost of goods sold may be translated at a rate different from that used to translate sales.

**Temporal Method**

The temporal method appears to be a modified version of the monetary/nonmonetary method. The only difference is that under the monetary/nonmonetary method, inventory is always translated at the historical rate. Under the temporal method, inventory is normally translated at the historical rate, but it can be translated at the current rate if it is shown on the balance sheet at market values. Despite the similarities, the theoretical bases of the two methods are different. The choice of exchange rate for translation is based on the type of asset or liability in the monetary/nonmonetary method; in the temporal method, it is based on the underlying approach to evaluating cost (historical versus market). Under a historical cost-accounting system, as the United States now has, most accounting theoreticians probably would argue that the temporal method is the appropriate method for translation.

Income statement items normally are translated at an average rate for the reporting period. However, cost of goods sold and depreciation and amortization charges related to balance sheet items carried at past prices are translated at historical rates.
Current Rate Method

The current rate method is the simplest: All balance sheet and income items are translated at the current rate. This method is widely employed by British companies. With some variation, it is the method mandated by the current U.S. translation standard—FASB 52. Under the current rate method, if a firm’s foreign-currency-denominated assets exceed its foreign-currency-denominated liabilities, a devaluation must result in a loss and a revaluation must result in a gain.

Exhibit 10.2 applies the four methods to a hypothetical balance sheet that is affected by both a 20% devaluation and a 60% revaluation. Depending on the method chosen, the translation results for the LC devaluation can range from a loss of $205,000 to a gain of $215,000; LC revaluation results can vary from a gain of $615,000 to a loss of $645,000. The assets and liabilities that are considered exposed under each method are the ones that change in dollar value. Note that the translation gains or losses for each method show up as the change in the equity account. For example, the LC devaluation combined with the current rate method

<table>
<thead>
<tr>
<th>Assets</th>
<th>U.S. Dollars After Devaluation of Local Currency (LC 5 = $1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local Currency</td>
</tr>
<tr>
<td></td>
<td>Exchange Rate Change (LC 4 = $1)</td>
</tr>
<tr>
<td>Current assets</td>
<td></td>
</tr>
<tr>
<td>Cash, marketable securities, and receivables</td>
<td>LC 2,600</td>
</tr>
<tr>
<td>Inventory (at market)</td>
<td>3,600</td>
</tr>
<tr>
<td>Prepaid expenses</td>
<td>200</td>
</tr>
<tr>
<td>Total current assets</td>
<td>6,400</td>
</tr>
<tr>
<td>Fixed assets less accumulated depreciation</td>
<td>3,600</td>
</tr>
<tr>
<td>Goodwill</td>
<td>1,000</td>
</tr>
<tr>
<td>Total assets</td>
<td>LC 11,000</td>
</tr>
<tr>
<td>Liabilities</td>
<td></td>
</tr>
<tr>
<td>Current liabilities</td>
<td>3,400</td>
</tr>
<tr>
<td>Long-term debt</td>
<td>3,000</td>
</tr>
<tr>
<td>Deferred income taxes</td>
<td>500</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>6,900</td>
</tr>
<tr>
<td>Capital stock</td>
<td>1,500</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>2,600</td>
</tr>
<tr>
<td>Total equity</td>
<td>4,100</td>
</tr>
<tr>
<td>Total liabilities plus equity</td>
<td>LC 11,000</td>
</tr>
<tr>
<td>Translation gain (loss)</td>
<td>—</td>
</tr>
</tbody>
</table>
10.3 • Transaction Exposure

results in a $205,000 reduction in the equity account ($1,025,000 − $820,000), which equals the translation loss for this method. Another way to calculate this loss is to take the net LC translation exposure, which equals exposed assets minus exposed liabilities (for the current rate method this figure is LC 4,100,000, which, not coincidentally, equals its equity value) and multiply it by the $0.05 ($0.25 − $0.20) change in the exchange rate. This calculation yields a translation loss of $205,000 ($0.05 × 4,100,000), the same as calculated in Exhibit 10.2. Another way to calculate this loss is to multiply the net dollar translation exposure by the fractional change in the exchange rate, or $1,025,000 × 0.05/0.25 = $205,000. Either approach gives the correct answer.

10.3 Transaction Exposure

Companies often include transaction exposure as part of their accounting exposure, although as a cash-flow exposure, it is rightly part of a company’s economic exposure. As we have seen, transaction exposure stems from the possibility of incurring future exchange gains or losses on

<table>
<thead>
<tr>
<th>After Revaluation of Local Currency (LC 2.5 = $1)</th>
<th>Current Rates for All Assets and Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetary/ Non-monetary</td>
<td>Temporal</td>
</tr>
<tr>
<td>$ 1,040</td>
<td>$ 1,040</td>
</tr>
<tr>
<td>900</td>
<td>1,440</td>
</tr>
<tr>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>1,990</td>
<td>2,530</td>
</tr>
<tr>
<td>900</td>
<td>900</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>3,140</td>
<td>3,680</td>
</tr>
<tr>
<td>1,360</td>
<td>1,360</td>
</tr>
<tr>
<td>61,200</td>
<td>1,200</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
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<tr>
<td>2,760</td>
<td>2,760</td>
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<td>375</td>
<td>375</td>
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<td>5</td>
<td>545</td>
</tr>
<tr>
<td>380</td>
<td>920</td>
</tr>
<tr>
<td>3,140</td>
<td>3,680</td>
</tr>
<tr>
<td>$ 645</td>
<td>$ 105</td>
</tr>
</tbody>
</table>
transactions already entered into and denominated in a foreign currency. For example, when IBM sells a mainframe computer to Royal Dutch Shell in England, it typically will not be paid until a later date. If that sale is priced in pounds, IBM has a pound transaction exposure.

A company’s transaction exposure is measured currency by currency and equals the difference between contractually fixed future cash inflows and outflows in each currency. Some of these unsettled transactions, including foreign-currency-denominated debt and accounts receivable, are already listed on the firm’s balance sheet. However, other obligations, such as contracts for future sales or purchases, are not.

### Application
**Computing Transaction Exposure for Boeing**

Suppose Boeing Airlines sells five 747s to Garuda, the Indonesian airline, in rupiahs. The rupiah price is Rp 140 billion. To help reduce the impact on Indonesia’s balance of payments, Boeing agrees to buy parts from various Indonesian companies worth Rp 55 billion.

a. If the spot rate is $0.004/Rp, what is Boeing’s net rupiah transaction exposure?

   Solution. Boeing’s net rupiah exposure equals its projected rupiah inflows minus its projected rupiah outflows, or Rp 140 billion — Rp 55 billion = Rp 85 billion. Converted into dollars at the spot rate of $0.004/Rp, Boeing’s transaction exposure equals $340 million.

b. If the rupiah depreciates to $0.0035/Rp, what is Boeing’s transaction loss?

   Solution. Boeing will lose an amount equal to its rupiah exposure multiplied by the change in the exchange rate, or 85 billion × (0.004 — 0.0035) = $42.5 million. This loss can also be determined by multiplying Boeing’s exposure in dollar terms by the fractional change in the exchange rate, or 340 million × (0.0005/0.004) = $42.5 million.

Although translation and transaction exposures overlap, they are not synonymous. Some items included in translation exposure, such as inventories and fixed assets, are excluded from transaction exposure, whereas other items included in transaction exposure, such as contracts for future sales or purchases, are not included in translation exposure. Thus, it is possible for transaction exposure in a currency to be positive and translation exposure in that same currency to be negative and vice versa.

### 10.4 Designing a Hedging Strategy

We now come to the problem of managing exposure by means of hedging. As mentioned earlier, hedging a particular currency exposure means establishing an offsetting currency position so as to lock in a dollar (home currency) value for the currency exposure and thereby eliminate the risk posed by currency fluctuations. A variety of hedging techniques are available for managing exposure, but before a firm uses them, it must decide on which exposures to manage and how to manage them. Addressing these issues successfully requires an operational set of goals for those involved in exchange risk management. Failure to set out objectives can lead to possibly conflicting and costly actions on the part of employees. Although many firms do have objectives, their goals are often so vague and simplistic (e.g., “eliminate all exposure” or “minimize reported foreign exchange losses”) that they provide little realistic guidance to managers. For example,
Designing a Hedging Strategy

should an employee told to eliminate all exposure do so by using forward contracts and
currency options or by borrowing in the local currency? And if hedging is not possible in a
particular currency, should sales in that currency be forgone even if it means losing potential
profits? The latter policy is likely to present a manager with the dilemma of choosing between
the goals of increased profits and reduced exchange losses. Moreover, reducing translation
exposure could increase transaction exposure and vice versa. What trade-offs, if any, should a
manager be willing to make between these two types of exposure?

These and similar questions demonstrate the need for a coherent and effective strategy.
The following elements are suggested for an effective exposure management strategy:

1. Determine the types of exposure to be monitored.
2. Formulate corporate objectives and give guidance in resolving potential conflicts in
   objectives.
3. Ensure that these corporate objectives are consistent with maximizing shareholder
   value and can be implemented.
4. Clearly specify who is responsible for which exposures and detail the criteria by which
   each manager is to be judged.
5. Make explicit any constraints on the use of exposure-management techniques, such as
   limitations on entering into forward contracts.
6. Identify the channels by which exchange rate considerations are incorporated into
   operating decisions that will affect the firm’s exchange risk posture.
7. Develop a system for monitoring and evaluating exchange risk management activities.

Objectives

The usefulness of a particular hedging strategy depends on both acceptability and quality.
Acceptability refers to approval by those in the organization who will implement the strategy,
and quality refers to the ability to provide better decisions. To be acceptable, a hedging strategy
must be consistent with top management’s values and overall corporate objectives. In turn,
these values and objectives are strongly motivated by management’s beliefs about financial
markets and how its performance will be evaluated. The quality, or value to the shareholders, of
a particular hedging strategy is, therefore, related to the congruence between those perceptions
and the realities of the business environment.

The most frequently occurring objectives, explicit and implicit, in management behavior
include the following:

1. Minimize translation exposure. This common goal necessitates a complete focus on
   protecting foreign-currency-denominated assets and liabilities from changes in value resulting
   from exchange rate fluctuations. Given that translation and transaction exposures are not
   synonymous, reducing the former could cause an increase in the latter (and vice versa).
2. Minimize quarter-to-quarter (or year-to-year) earnings fluctuations owing to exchange rate
   changes. This goal requires a firm to consider both its translation exposure and its transaction
   exposure.

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1 Dow Chemical stated in its 2010 Form 10-K (p. 76) that “The primary objective of the Company’s foreign exchange risk
management is to optimize the U.S. dollar value of net assets and cash flows, keeping the adverse impact of currency
movements to a minimum.” Although a laudable objective, it is difficult to determine what specific actions a manager should
take to accomplish it.

2 Most of these elements are suggested in Thomas G. Evans and William R. Folks, Jr., “Defining Objectives for Exposure

3 See, for example, David B. Zenoff, “Applying Management Principles to Foreign Exchange Exposure,” Euromoney (September
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3. Minimize transaction exposure. This objective involves managing a subset of the firm’s true cash-flow exposure.

4. Minimize economic exposure. To achieve this goal, a firm must ignore accounting earnings and concentrate on reducing cash-flow fluctuations stemming from currency fluctuations.

5. Minimize foreign exchange risk management costs. This goal requires a firm to balance off the benefits of hedging with its costs. It also assumes risk neutrality.

6. Avoid surprises. This objective involves preventing large foreign exchange losses.

The most appropriate way to rank these objectives is on their consistency with the overarching goal of maximizing shareholder value. To establish what hedging can do to further this goal, we return to our discussion of total risk in Chapter 1. In that discussion, we saw that total risk tends to adversely affect a firm’s value by leading to lower sales and higher costs. Consequently, actions taken by a firm that decrease its total risk will improve its sales and cost outlooks, thereby increasing its expected cash flows.

Reducing total risk can also ensure that a firm will not run out of cash to fund its planned investment program. Otherwise, potentially profitable investment opportunities may be passed up because of corporate reluctance to tap the financial markets when internally generated cash is insufficient.4

This and other explanations for hedging all relate to the idea that there is likely to be an inverse relation between total risk and shareholder value.5 Given these considerations, the view taken here is that the basic purpose of hedging is to reduce exchange risk, where exchange risk is defined as that element of cash-flow variability attributable to currency fluctuations. This is Objective 4.

To the extent that earnings fluctuations or large losses can adversely affect the company’s perceptions in the minds of potential investors, customers, employees, and so on, there may be reason to also pay attention to Objectives 2 and 6.6 However, despite these potential benefits, there are likely to be few, if any, advantages to devoting substantial resources to managing earnings fluctuations or accounting exposure more generally (Objectives 1 and 3). To begin, trying to manage accounting exposure is inconsistent with a large body of empirical evidence that investors have the uncanny ability to peer beyond the ephemeral and concentrate on the firm’s true cash-flow-generating ability. In addition, whereas balance sheet gains and losses can be dampened by hedging, operating earnings will also fluctuate in line with the combined and offsetting effects of currency changes and inflation. Moreover, hedging costs themselves will vary unpredictably from one period to the next, leading to unpredictable earnings changes. Thus, it is impossible for firms to protect themselves from earnings fluctuations resulting from exchange rate changes except in the very short run.

Given the questionable benefits of managing accounting exposure, the emphasis in this text is on managing economic exposure. However, this chapter describes the techniques used to manage transaction and translation exposure because many of these techniques are equally applicable to hedging cash flows.

4This explanation appears in Kenneth Froot, David Scharfstein, and Jeremy Stein, “A Framework for Risk Management,” Harvard Business Review (November 1994): 91–102. The reluctance to raise additional external capital may stem from the problem of information asymmetry—this problem arises when one party to a transaction knows something relevant to the transaction that the other party does not know—which could lead investors to impose higher costs on the company seeking capital.

5For a good summary of these other rationales for corporate hedging, see Matthew Bishop, “A Survey of Corporate Risk Management,” The Economist (February 10, 1996): special section.

6Fluctuating earnings could also boost a company’s taxes by causing it to alternate between high and low tax brackets (see Rene Stulz, “Rethinking Risk Management,” working paper, Ohio State University).
In operational terms, hedging to reduce the variance of cash flows translates into the following exposure management goal: to arrange a firm’s financial affairs in such a way that however the exchange rate may move in the future, the effects on dollar returns are minimized. This objective is not universally subscribed to, however. Instead, many firms follow a selective hedging policy designed to protect against anticipated currency movements. A selective hedging policy is especially prevalent among those firms that organize their treasury departments as profit centers. In such firms, the desire to reduce the expected costs of hedging (Objective 5), and thereby increase profits, often leads to taking higher risks by hedging only when a currency change is expected and going unhedged otherwise.

If financial markets are efficient, however, firms cannot hedge against expected exchange rate changes. Interest rates, forward rates, and sales-contract prices should already reflect currency changes that are anticipated, thereby offsetting the loss-reducing benefits of hedging with higher costs. In the case of Mexico, for instance, the one-year forward discount in the futures market was close to 100% just before the peso was floated in 1982. The unavoidable conclusion is that a firm can protect itself only against unexpected currency changes.

Moreover, there is always the possibility of bad timing. For example, big Japanese exporters such as Toyota and Honda have incurred billions of dollars in foreign exchange losses. One reason for these losses is that Japanese companies often try to predict where the dollar is going and hedge (or not hedge) accordingly. At the beginning of 1994, many thought that the dollar would continue to strengthen, and thus they failed to hedge their exposure. When the dollar plummeted instead, they lost billions. Similarly, Nintendo lost ¥62.1 billion ($766 million) in 2010 on its $7.4 billion pile of foreign currencies. The foreign exchange was generated from overseas sales of Nintendo’s popular Wii game console. Rather than convert this cash into yen or hedge it, Nintendo held most of its reserves in foreign currencies because it anticipated yen depreciation; it took a big hit when the yen strengthened instead. The lesson is that firms that try simultaneously to use hedging both to reduce risk and to beat the market may end up with more risk, not less.

**Application: Malaysia Gets Mauled by the Currency Markets**

In January 1994, Bank Negara, Malaysia’s central bank, declared war on “currency speculators” who were trying to profit from an anticipated rise in the Malaysian dollar. The timing of this declaration struck a nerve among currency traders because Bank Negara had itself long been a major speculator in the currency markets—a speculator whose boldness was matched only by its incompetence. During the two-year period from 1992 to 1993, Bank Negara had foreign exchange losses of M$14.7 billion (US$5.42 billion). It seems that even central banks are not immune to the consequences of market efficiency—and stupidity.

A related lesson is that companies should stick to their knitting. In deciding whether to engage in selective hedging or even outright currency speculation, executives must ask themselves how their firms are most likely to generate profits—by betting against apparently efficient markets or by designing, developing, producing, and marketing their goods and services. Most executives, if they are honest with themselves, will agree it’s the latter.

**Application: Mexican Meltdown/Brazilian Backfire**

In October 2008, despite solid operating fundamentals, Mexico’s third largest retailer, Controladora Comercial Mexicana SAB de CV, filed for bankruptcy. The culprit: risky foreign-exchange bets that lost it an estimated $1.4 billion. At the same time, Brazil’s paper-pulp giant Aracruz Celulose SA lost $920 million on bad foreign-currency gambles. Such losses were all too common, as companies throughout Latin
America lost millions, sometimes billions, of dollars owing to foreign-exchange speculation that had little to nothing to do with their core businesses. These losses were especially prevalent in Brazil and Mexico. Brazilian corporate foreign-exchange losses alone were estimated to exceed $30 billion and to have affected 200 companies. The common thread to these losses was a bet that the steady appreciation of both the Mexican peso and Brazilian real against the U.S. dollar in the years leading up to 2008, thanks to high commodity prices and record foreign investment, would continue. For example, Comercial Mexicana, whose stores sell many imported products, had protected itself against currency fluctuations by purchasing dollar futures. However, with the peso’s continuing rise, that strategy proved costly. Rather than just stop buying dollar futures, Comercial Mexicana went one better and began to sell dollar derivatives, not only leaving itself subject to transaction exposure on its purchases of foreign goods but magnifying that risk by also exposing it to losses on its currency derivatives if the dollar strengthened. That unexpected scenario occurred in 2008 when investors, panicked over the global financial crisis, began pulling money out of Mexico, Brazil, and other emerging markets, sending their currencies down sharply and leading to the huge foreign-exchange losses. Comercial Mexicana, Aracruz, and many of its Mexican and Brazilian compatriots, such as Cemex and Grupo Votorantim, learned to their regret that profitable currency speculation required either superior information or skills very different from those needed to run their businesses.

Costs and Benefits of Standard Hedging Techniques

Standard techniques for responding to anticipated currency changes are summarized in Exhibit 10.3. Such techniques, however, are vastly overrated in terms of their ability to minimize hedging costs.

**Costs of Hedging.** If a devaluation is unlikely, hedging may be a costly and inefficient way of doing business. If a devaluation is expected, the cost of using the techniques (like the cost of local borrowing) rises to reflect the anticipated devaluation. Just before the August 1982 peso devaluation, for example, every company in Mexico was trying to delay peso payments. Of course, this technique cannot produce a net gain because one company’s payable is another

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**Exhibit 10.3 Basic Hedging Techniques**

<table>
<thead>
<tr>
<th>Depreciation</th>
<th>Appreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sell local currency forward</td>
<td>• Buy local currency forward</td>
</tr>
<tr>
<td>• Buy a local currency put option</td>
<td>• Buy a local currency call option</td>
</tr>
<tr>
<td>• Reduce levels of local currency cash and marketable securities</td>
<td>• Increase levels of local currency cash and marketable securities</td>
</tr>
<tr>
<td>• Tighten credit (reduce local currency receivables)</td>
<td>• Relax local currency credit terms</td>
</tr>
<tr>
<td>• Delay collection of hard currency receivables</td>
<td>• Speed up collection of soft currency receivables</td>
</tr>
<tr>
<td>• Increase imports of hard currency goods</td>
<td>• Reduce imports of soft currency goods</td>
</tr>
<tr>
<td>• Borrow locally</td>
<td>• Reduce local borrowing</td>
</tr>
<tr>
<td>• Delay payment of accounts payable</td>
<td>• Speed up payment of accounts payable</td>
</tr>
<tr>
<td>• Speed up dividend and fee remittances to parent and other subsidiaries</td>
<td>• Delay dividend and fee remittances to parent and other subsidiaries</td>
</tr>
<tr>
<td>• Speed up payment of intersubsidiary accounts payable</td>
<td>• Delay payment of intersubsidiary accounts payable</td>
</tr>
<tr>
<td>• Delay collection of intersubsidiary accounts receivable</td>
<td>• Speed up collection of intersubsidiary accounts receivable</td>
</tr>
<tr>
<td>• Invoice exports in foreign currency and imports in local currency</td>
<td>• Invoice exports in local currency and imports in foreign currency</td>
</tr>
</tbody>
</table>
Designing a Hedging Strategy

company’s receivable. As another example, if one company wants peso trade credit, another must offer it. Assuming that both the borrower and the lender are rational, a deal will not be struck until the interest cost rises to reflect the expected decline in the peso.

Even shifting funds from one country to another is not a costless means of hedging. The net effect of speeding up remittances while delaying receipt of intercompany receivables is to force a subsidiary in a devaluation-prone country to increase its local currency borrowings to finance the additional working capital requirements. The net cost of shifting funds, therefore, is the cost of the LC loan minus the profit generated from use of the funds—for example, prepaying a hard currency loan—with both adjusted for expected exchange rate changes. As mentioned previously, loans in local currencies subject to devaluation fears carry higher interest rates that are likely to offset any gains from LC devaluation.

Reducing the level of cash holdings to lower exposure can adversely affect a subsidiary’s operations, whereas selling LC-denominated marketable securities can entail an opportunity cost (the lower interest rate on hard currency securities). A firm with excess cash or marketable securities should reduce its holdings regardless of whether a devaluation is anticipated. After cash balances are at the minimum level, however, any further reductions will involve real costs that must be weighed against the expected benefits.

Invoicing exports in the foreign currency and imports in the local currency may cause the loss of valuable sales or may reduce a firm’s ability to extract concessions on import prices. Similarly, tightening credit may reduce profits more than costs.

In summary, hedging exchange risk costs money and should be scrutinized like any other purchase of insurance. The costs of these hedging techniques are summarized in Exhibit 10.4.

Benefits of Hedging. A company can benefit from the preceding techniques only to the extent that it can forecast future exchange rates more accurately than the general market. For example, if the company has a foreign currency cash inflow, it would hedge only if the forward rate exceeds its estimate of the future spot rate. Conversely, with a foreign currency cash outflow, it would hedge only if the forward rate was below its estimated future spot rate. In this way, it would apparently be following the profit-guaranteeing dictum of buy low-sell

### Exhibit 10.4

**Cost of the Basic Hedging Techniques**

<table>
<thead>
<tr>
<th>Depreciation</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sell local currency forward</td>
<td>Transaction costs; difference between forward and future spot rates</td>
</tr>
<tr>
<td>Buy a local currency put option</td>
<td>Put option premium</td>
</tr>
<tr>
<td>Reduce levels of local currency cash and marketable securities</td>
<td>Operational problems; opportunity cost (loss of higher interest rates on LC securities)</td>
</tr>
<tr>
<td>Tighten credit (reduce local currency receivables)</td>
<td>Lost sales and profits</td>
</tr>
<tr>
<td>Delay collection of hard currency receivables</td>
<td>Cost of financing additional receivables</td>
</tr>
<tr>
<td>Increase imports of hard currency goods</td>
<td>Financing and holding costs</td>
</tr>
<tr>
<td>Borrow locally</td>
<td>Higher interest rate</td>
</tr>
<tr>
<td>Delay payment of accounts payable</td>
<td>Harm to credit reputation</td>
</tr>
<tr>
<td>Speed up dividend and fee remittances to parent and other subsidiaries</td>
<td>Borrowing cost if funds not available or loss of higher interest rates if LC securities must be sold</td>
</tr>
<tr>
<td>Speed up payment of intersubsidiary accounts payable</td>
<td>Opportunity cost of funds not available or loss of higher interest rates if LC securities must be sold</td>
</tr>
<tr>
<td>Delay collection of intersubsidiary accounts receivable</td>
<td>Opportunity cost of money</td>
</tr>
<tr>
<td>Invoice exports in foreign currency and imports in local currency</td>
<td>Opportunity cost of money</td>
</tr>
<tr>
<td>Speed up payment of intersubsidiary accounts payable</td>
<td>Lost export sales or lower price; premium price for imports</td>
</tr>
</tbody>
</table>
high. The key word, however, is *apparently* because attempting to profit from foreign exchange forecasting is speculating rather than hedging. The hedger is well advised to assume that the market knows as much as she does. Those who feel that they have superior information may choose to speculate, but this activity should not be confused with hedging.

**APPLICATION  Selective Hedging**

In March, Multinational Industries, Inc. (MII) assessed the September spot rate for sterling at the following rates:

- $1.80/£ with probability 0.15
- $1.85/£ with probability 0.20
- $1.90/£ with probability 0.25
- $1.95/£ with probability 0.20
- $2.00/£ with probability 0.20

a. What is the expected spot rate for September?

   **Solution.** The expected future spot rate is $1.80(0.15) + 1.85(0.2) + 1.90(0.25) + 1.95(0.20) + 2.00(0.20) = $1.905.

b. If the six-month forward rate is $1.90, should the firm sell forward its £500,000 pound receivables due in September?

   **Solution.** If MII sells its pound proceeds forward, it will lock in a value of $950,000 (1.90 × 500,000). Alternatively, if it decides to wait until September and sell its pound proceeds in the spot market, it expects to receive $952,500 (1.905 × 500,000). Based on these figures, if MII wants to maximize expected profits, it should retain its pound receivables and sell the proceeds in the spot market upon receipt.

c. What factors are likely to affect Multinational Industries' hedging decision?

   **Solution.** Risk aversion could lead MII to sell its receivables forward to hedge their dollar value. However, if MII has pound liabilities, they could provide a natural hedge and reduce (or eliminate) the amount necessary to hedge. The existence of a cheaper hedging alternative, such as borrowing pounds and converting them to dollars for the duration of the receivables, would also make undesirable the use of a forward contract. This latter situation assumes that interest rate parity is violated. The tax treatment of foreign exchange gains and losses on forward contracts could also affect the hedging decision.

   Under some circumstances, a company may benefit at the expense of the local government without speculating. Such a circumstance would involve the judicious use of market imperfections or existing tax asymmetries or both. In the case of an overvalued currency, such as the Mexican peso in 1982, if exchange controls are not imposed to prevent capital outflows and if hard currency can be acquired at the official exchange rate, then money can be moved out of the country via intercompany payments. For instance, a subsidiary can speed payments of intercompany accounts payable, make immediate purchases from other subsidiaries, or speed remittances to the parent. Unfortunately, governments are not unaware of these tactics. During a currency crisis, when hard currency is scarce, the local government can be expected to block such transfers or at least make them more expensive.

   Another often-cited reason for market imperfection is that individual investors may not have equal access to capital markets. For example, because forward exchange markets exist
10.4 • Designing a Hedging Strategy

only for the major currencies, hedging often requires local borrowing in heavily regulated capital markets. As a legal citizen of many nations, the MNC normally has greater access to these markets.

Similarly, if forward contract losses are treated as a cost of doing business, whereas gains are taxed at a lower capital gains rate, the firm can engage in tax arbitrage. In the absence of financial market imperfections or tax asymmetries, however, the net expected value of hedging over time should be zero. Despite the questionable value to shareholders of hedging balance sheet exposure or even transaction exposure, however, managers often try to reduce these exposures because they are evaluated, at least in part, on translation or transaction gains or losses.

In one area, at least, companies can reduce their exchange risk at no cost. This costless hedging technique is known as exposure netting.

**Exposure Netting.** Exposure netting involves offsetting exposures in one currency with exposures in the same or another currency, where exchange rates are expected to move in a way such that losses (gains) on the first exposed position will be offset by gains (losses) on the second currency exposure. This portfolio approach to hedging recognizes that the total variability or risk of a currency exposure portfolio will be less than the sum of the individual variabilities of each currency exposure considered in isolation. The assumption underlying exposure netting is that the net gain or loss on the entire currency exposure portfolio is what matters, rather than the gain or loss on any individual monetary unit.

**Centralization versus Decentralization**

In the area of foreign exchange risk management, there are good arguments both for and against centralization. Favoring centralization is the reasonable assumption that local treasurers want to optimize their own financial and exposure positions, regardless of the overall corporate situation. An example is a multibillion-dollar U.S. consumer-goods firm that gives its affiliates a free hand in deciding on their hedging policies. The firm’s local treasurers ignore the possibilities available to the corporation to trade off positive and negative currency exposure positions by consolidating exposure worldwide. If subsidiary A sells to subsidiary B in sterling, then from the corporate perspective, these sterling exposures net out on a consolidated translation basis (but only before tax). If A or B or both hedge their sterling positions, however, unnecessary hedging takes place, or a zero sterling exposure turns into a positive or negative position. Furthermore, in their dealings with external customers, some affiliates may wind up with a positive exposure and others with a negative exposure in the same currency. Through lack of knowledge or incentive, individual subsidiaries may undertake hedging actions that increase rather than decrease overall corporate exposure in a given currency.

A further benefit of centralized exposure management is the ability to take advantage, through exposure netting, of the portfolio effect discussed previously. Thus, centralization of exchange risk management should reduce the amount of hedging required to achieve a given level of safety.

After the company has decided on the maximum currency exposure it is willing to tolerate, it can then select the cheapest option(s) worldwide to hedge its remaining exposure. Tax effects can be crucial at this stage, in computing both the amounts to hedge and the costs involved, but only headquarters will have the required global perspective. Centralized management also is needed to take advantage of the before-tax hedging cost variations that are likely to exist among subsidiaries because of market imperfections.

All these arguments for centralization of currency risk management are powerful. Against the benefits must be weighed the loss of local knowledge and the lack of incentive for local managers to take advantage of particular situations that only they may be familiar with.
Companies that decentralize the hedging decision may allow local units to manage their own exposures by engaging in forward contracts with a central unit at negotiated rates. The central unit, in turn, may or may not lay off these contracts in the marketplace.

Managing Risk Management

A number of highly publicized cases of derivatives-related losses have highlighted the potential dangers in the use of derivatives such as futures and options. Although not all of these losses involved the use of currency derivatives, several lessons for risk management can be drawn from these cases, which include the bankruptcies of Orange County and Barings PLC and the huge losses taken at AIG, Merrill Lynch, Kidder Peabody, Sumitomo, Allied Irish Banks, Union Bank of Switzerland, Société Générale, and Citic Pacific. The most important lesson to be learned is that risk-management failures have their origins in inadequate systems and controls rather than from any risk inherent in the use of derivatives themselves. In every case of large losses, senior management did not fully understand the activities of those taking positions in derivatives and failed to monitor and supervise their activities adequately. Some specific lessons learned include the following.

First, segregate the duties of those trading derivatives from those supposed to monitor them. For example, Nicholas Leeson, the rogue trader who sank Barings, was in charge of trading and also kept his own books. When he took losses, he covered them up and doubled his bets. Similarly, the manager responsible for the profits generated by trading derivatives at UBS also oversaw the risks of his position. No one else at the bank was allowed to examine the risks his department was taking. And a rogue trader at Sumitomo, who lost $1.8 billion, oversaw the accounts that kept track of his dealings. These conflicts of interest are a recipe for disaster.

Second, derivatives positions should be limited to prevent the possibility of catastrophic losses, and they should be marked to market every day to avoid the possibility of losses going unrecognized and being allowed to accumulate. As in the cases of Barings and Sumitomo, traders who can roll over their positions at nonmarket prices tend to make bigger and riskier bets to recoup their losses.

Third, compensation arrangements should be designed to shift more of the risk onto the shoulders of those taking the risks. For example, deferring part of traders’ salaries until their derivatives positions actually pay off would make them more cognizant of the risks they are taking. Fourth, one should pay attention to warning signs. For example, Barings was slow to respond to an audit showing significant discrepancies in Leeson’s accounts. Similarly, Kidder Peabody’s executives ignored a trader who was generating record profits while supposedly engaging in risk-free arbitrage. A related lesson is that there’s no free lunch. Traders and others delivering high profits deserve special scrutiny by independent auditors. The auditors must pay particular attention to the valuation of exotic derivatives—specialized contracts not actively traded. Given the lack of ready market prices for exotics, it is easy for traders to overvalue their positions in exotics without independent oversight.

Fifth, companies must ensure that the risk management controls they put in place are actually followed. For example, Citic Pacific lost almost $2 billion when bets the company’s finance director placed on the direction of the Australian dollar went bad. Its chairman said the trades were unauthorized. If so, controls should have been in place that would have prevented

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7 According to Anthony M. Santomero, president of the Federal Reserve Bank of Philadelphia, some bank managers have little knowledge of controls on their trading activities. For example, when he visited a major financial institution in New York, the CEO assured him that the bank had a highly sophisticated risk-management system already in place, the CFO said they had just implemented it, the head of trading said they were about to implement it, and the traders had never heard of it. See Anthony M. Santomero, “Processes and Progress in Risk Management,” Business Review, Federal Reserve Bank of Philadelphia (Q1 2003): 3.
10.4 • Designing a Hedging Strategy

anyone from placing such bets without obtaining approval. Finally, those who value reward above risk will likely wind up with risk at the expense of reward.

**APPLICATION**  The Luck of the Irish Eludes Allied Irish Banks

In February 2002, Allied Irish Banks announced that a rogue trader at its U.S. unit lost $750 million through unauthorized foreign exchange trades. Allied said John Rusnak, a foreign exchange dealer at its U.S. unit Allfirst tried to disguise huge losses through fictitious foreign exchange trades over the past year. Traders in the foreign exchange market believe that Rusnak bet on the wrong direction of the Japanese yen, which was the only currency that moved enough during that period to have enabled a trader to pile up such colossal losses. The foreign exchange trades at issue were believed by the bank to have been hedged with currency options to reduce their risk. As it turned out, however, the options that Rusnak claimed to have bought were fictitious, leaving the bank with enormous “naked” (unhedged) foreign exchange positions. As his losses piled up, he placed even larger foreign currency bets, which turned sour as well. Bank analysts said the episode raised serious issues about the risk management controls in place at Allied and throughout the entire banking industry that are supposed to prevent the kinds of events that apparently hit Allied.

**Accounting for Hedging and FASB 133**

Companies have a greater incentive for systematizing their hedging practices since FASB issued its *Statement of Financial Accounting Standards No. 133 (FASB 133)* to establish accounting and reporting standards for derivative instruments and for hedging activities. Under FASB 133, a foreign currency derivative that qualifies as a foreign currency hedge gets special hedge accounting treatment that essentially matches gains or losses resulting from the changes in the value of the derivative with losses or gains in the value of the underlying transaction or asset, thereby removing these hedging gains and losses from current income. However, any change in the value of the derivative not offset by a change in the value of the hedged item is recorded to earnings in the current period. Foreign currency hedges include hedges of net investments in foreign operations, of forecasted foreign currency transactions, and of foreign-currency-denominated assets or liabilities.

Under FASB, an entity that elects to apply hedge accounting is required to formally document each hedging transaction from the outset, explain its risk management objective and strategy for undertaking the hedge, and the nature of the risk being hedged, and establish the method it will use for assessing the effectiveness of the hedging derivative and its measurement approach for determining the ineffective aspect of the hedge.

Three points are worth noting.

*Hedge designations are critical.* Each hedging relationship should fit into the company’s risk management objectives and strategy, which must be documented.

*Hedging must be effective.* To qualify for hedge accounting, an entity must demonstrate a hedging relationship to be highly effective in achieving offsetting changes in fair value or cash flows for the risk being hedged. “Highly effective” has been interpreted to mean a correlation ratio between 80% to 125% (this is the change in value of the derivative divided by the change in value of the hedged item).

*Hedge ineffectiveness can lead to earnings volatility.* A foreign currency derivative that cannot be shown to be effective in hedging a specific foreign currency risk must be marked to market and any gain or loss on it included in current earnings, making reported earnings more volatile.
Empirical Evidence on Hedging

The most important issue in hedging is whether it works. Here the evidence is mixed. According to a recent, large-scale study on hedging practices and their consequences, employing a sample of 6,888 firms headquartered in 47 different countries, the use of financial derivatives reduces the risk of companies that hedge compared to nonhedging companies. This evidence suggests that despite the horror stories of companies using derivatives to gamble, most firms use them to reduce risk. However, there is only weak evidence that hedging increases company value. One possible explanation for this result is that financial markets are correctly pricing risks and hence derivatives, leaving little if any value to be added through their purchase and use.

10.5 Managing Translation Exposure

Firms have three available methods for managing their translation exposure: (1) adjusting fund flows, (2) entering into forward contracts, and (3) exposure netting. The basic hedging strategy for reducing translation exposure shown in Exhibit 10.5 uses these methods. Essentially, the strategy involves increasing hard currency (likely to appreciate) assets and decreasing soft currency (likely to depreciate) assets, while simultaneously decreasing hard currency liabilities and increasing soft currency liabilities. For example, if a devaluation appears likely, the basic hedging strategy will be executed as follows: Reduce the level of cash, tighten credit terms to decrease accounts receivable, increase LC borrowing, delay accounts payable, and sell the weak currency forward. An expected currency appreciation would trigger the opposite tactics.

Despite their prevalence among firms, these hedging activities are not automatically valuable. As discussed in the previous section, if the market already recognizes the likelihood of currency appreciation or depreciation, this recognition will be reflected in the costs of the various hedging techniques. Only if the firm’s anticipations differ from the market’s and are also superior to the market’s can hedging lead to reduced costs. Otherwise, the principal value of hedging would be to protect a firm from unforeseen currency fluctuations.

Funds Adjustment

Most techniques for hedging an impending LC devaluation reduce LC assets or increase LC liabilities, thereby generating LC cash. If accounting exposure is to be reduced, these funds must be converted into hard currency assets. For example, a company will reduce its translation loss if, before an LC devaluation, it converts some of its LC cash holdings to the home currency. This conversion can be accomplished, either directly or indirectly, by means of funds adjustment techniques.

Funds adjustment involves altering either the amounts or the currencies (or both) of the planned cash flows of the parent or its subsidiaries to reduce the firm’s local currency exposure.

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### Exhibit 10.5 Basic Strategy for Hedging Translation Exposure

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard currencies (Likely to appreciate)</td>
<td>Increase</td>
</tr>
<tr>
<td>Soft currencies (Likely to appreciate)</td>
<td>Decrease</td>
</tr>
</tbody>
</table>

---

accounting exposure. If an LC devaluation is anticipated, direct funds adjustment methods include pricing exports in hard currencies and imports in the local currency, investing in hard currency securities, and replacing hard currency borrowings with local currency loans. The indirect methods, which are elaborated upon in Chapter 20, include adjusting transfer prices on the sale of goods between affiliates; speeding up the payment of dividends, fees, and royalties; and adjusting the leads and lags of intersubsidiary accounts. The last method, which is the one most frequently used by multinationals, involves speeding up the payment of intersubsidiary accounts payable and delaying the collection of intersubsidiary accounts receivable. These hedging procedures for devaluations would be reversed for revaluations (see Exhibit 10.3).

Some of these techniques or tools may require considerable lead time, and—as is the case with a transfer price—once they are introduced, they cannot easily be changed. In addition, techniques such as transfer price, fee and royalty, and dividend flow adjustments fall into the realm of corporate policy and are not usually under the treasurer’s control, although this situation may be changing. It is, therefore, incumbent on the treasurer to educate other decision makers about the impact of these tools on the costs and management of corporate exposure.

Although entering forward contracts is the most popular coverage technique, the leading and lagging of payables and receivables is almost as important. For those countries in which a formal market in LC forward contracts does not exist, leading and lagging and LC borrowing are the most important techniques. The bulk of international business, however, is conducted in those few currencies for which forward markets do exist.

Forward contracts can reduce a firm’s translation exposure by creating an offsetting asset or liability in the foreign currency. For example, suppose that IBM U.K. has translation exposure of £40 million (i.e., sterling assets exceed sterling liabilities by that amount). IBM U.K. can eliminate its entire translation exposure by selling £40 million forward. Any loss (gain) on its translation exposure will then be offset by a corresponding gain (loss) on its forward contract. Note, however, that the gain (or loss) on the forward contract is of a cash-flow nature and is netted against an unrealized translation loss (or gain).

Selecting convenient (less risky) currencies for invoicing exports and imports and adjusting transfer prices are two techniques that are less frequently used, perhaps because of constraints on their use. It is often difficult, for instance, to make a customer or supplier accept billing in a particular currency.

Exposure netting is an additional exchange-management technique that is available to multinational firms with positions in more than one foreign currency or with offsetting positions in the same currency. As defined earlier, this technique involves offsetting exposures in one currency with exposures in the same or another currency such that gains and losses on the two currency positions will offset each other.

Evaluating Alternative Hedging Mechanisms

Ordinarily, the selection of a funds adjustment strategy cannot proceed by evaluating each possible technique separately without risking suboptimization; for example, whether a firm chooses to borrow locally is not independent of its decision to use or not use those funds to import additional hard currency inventory. However, when the level of forward contracts that the financial manager can enter into is unrestricted, the following two-stage methodology allows the optimal level of forward transactions to be determined apart from the selection of what funds adjustment techniques to use. Moreover, this methodology is valid regardless of the manager’s (or firm’s) attitude toward risk.

Chapter 10 • Measuring and Managing Translation and Transaction Exposure

Stage 1: Compute the profit associated with each funds adjustment technique on a covered after-tax basis. Transactions that are profitable on a covered basis ought to be undertaken regardless of whether they increase or decrease the firm’s accounting exposure. However, such activities should not be termed *hedging*; rather, they involve the use of *arbitrage* to exploit market distortions.

Stage 2: Any unwanted exposure resulting from the first stage can be corrected in the forward market. Stage 2 is the selection of an optimal level of forward transactions based on the firm’s initial exposure, adjusted for the impact on exposure of decisions made in Stage 1. When the forward market is nonexistent, or when access to it is limited, the firm must determine both the techniques to use and their appropriate levels. In the latter case, a comparison of the net cost of a funds adjustment technique with the anticipated currency depreciation will indicate whether the hedging transaction is profitable on an expected-value basis.

10.6 Managing Transaction Exposure

As we saw in Section 10.1, transaction exposure arises whenever a company is committed to a foreign-currency-denominated transaction. Since the transaction will result in a future foreign currency cash inflow or outflow, any change in the exchange rate between the time the transaction is entered into and the time it is settled in cash will lead to a change in the dollar (HC) amount of the cash inflow or outflow. Protective measures to guard against transaction exposure involve entering into foreign currency transactions whose cash flows exactly offset the cash flows of the transaction exposure.

These protective measures include using forward contracts, price adjustment clauses, currency options, and borrowing or lending in the foreign currency. For example, General Electric explained its hedging activities in its 2007 Annual Report (p. 52) as follows:

Financial results of our global activities reported in U.S. dollars are affected by currency exchange. We use a number of techniques to manage the effects of currency exchange, including selective borrowings in local currencies and selective hedging of significant cross-currency transactions. Such principal currencies are the pound sterling, the euro, the Japanese yen and the Canadian dollar.

Alternatively, the company could try to invoice all transactions in dollars and to avoid transaction exposure entirely. However, eliminating transaction exposure does not eliminate all foreign exchange risk. The firm still is subject to exchange risk on its future revenues and costs—its operating cash flows. In its 2007 Annual Report (p. 49), IBM explained that its hedging program may not completely eliminate all the risks:

The company earned approximately 47 percent of its pre-tax income from continuing operations in currencies other than the U.S. dollar. The company also maintains hedging programs to limit the volatility of currency impacts on the company’s financial results. These hedging programs limit the impact of currency changes on the company’s financial results but do not eliminate them. In addition to the translation of earnings and the company’s hedging programs, the impact of currency changes also will affect the company’s pricing and sourcing actions. For example, the company may procure components and supplies in multiple functional currencies and sell products and services in other currencies. Therefore, it is impractical to quantify the impact of currency on these transactions and on consolidated net income.
We will now look at the various techniques for managing transaction exposure by examining the case of General Electric’s euro exposure. Suppose that on January 1, GE is awarded a contract to supply turbine blades to Lufthansa, the German airline. On December 31, GE will receive payment of €10 million for these blades. The most direct way for GE to hedge this receivable is to sell a €10 million forward contract for delivery in one year. Alternatively, it can use a money market hedge, which would involve borrowing €10 million for one year, converting it into dollars, and investing the proceeds in a security that matures on December 31. As we will see, if interest rate parity holds, the two methods will yield the same results. GE can also manage its transaction exposure through risk shifting, risk sharing, exposure netting, and currency options.

### Forward Market Hedge

In a **forward market hedge**, a company that is long a foreign currency will sell the foreign currency forward, whereas a company that is short a foreign currency will buy the currency forward. In this way, the company can fix the dollar value of future foreign currency cash flow. For example, by selling forward the proceeds from its sale of turbine blades, GE can effectively transform the currency denomination of its €10 million receivable from euros to dollars, thereby eliminating all currency risk on the sale. For example, suppose the current spot price for the euro is $1.50/€, and the one-year forward rate is $1.479/€. Then, a forward sale of €10 million for delivery in one year will yield GE $14.79 million on December 31. Exhibit 10.6 shows the cash-flow consequences of combining the forward sale with the euro receivable, given three possible exchange rate scenarios.

Regardless of what happens to the future spot rate, Exhibit 10.6 demonstrates that GE still gets to collect $14.79 million on its turbine sale. Any exchange gain or loss on the forward contract will be offset by a corresponding exchange loss or gain on the receivable. The effects of this transaction also can be seen with the following simple T-account describing GE’s position as of December 31:

<table>
<thead>
<tr>
<th>December 31: GE T-Account (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Account Receivable: €10.000</td>
</tr>
<tr>
<td>Forward contract payment: €10.000</td>
</tr>
<tr>
<td>Forward contract receipt: $14.79</td>
</tr>
</tbody>
</table>

Without hedging, GE will have an €10 million asset whose value will fluctuate with the exchange rate. The forward contract creates an equal euro liability, offset by an asset worth $14.79 million dollars. The euro asset and liability cancel each other out, and GE is left with a $14.79 million asset.

This example illustrates another point as well: *Hedging with forward contracts eliminates the downside risk at the expense of forgoing the upside potential.*

<table>
<thead>
<tr>
<th>Exhibit 10.6</th>
<th>Possible outcomes of Forward Market Hedge As of December 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot Exchange Rate</td>
<td>Value of Original Receivable (1)</td>
</tr>
<tr>
<td>€1 = $1.50</td>
<td>$15,000,000</td>
</tr>
<tr>
<td>€1 = $1.479</td>
<td>14,790,000</td>
</tr>
<tr>
<td>€1 = $1.40</td>
<td>14,000,000</td>
</tr>
</tbody>
</table>
The True Cost of Hedging. Exhibit 10.6 also shows that the true cost of hedging cannot be calculated in advance because it depends on the future spot rate, which is unknown at the time the forward contract is entered into. In the GE example, the actual cost of hedging can vary from $+210,000 to $−790,000; a plus (+) represents a cost, and a minus (−) represents a negative cost or a gain. In percentage terms, the cost varies from −4.4% to +2.8%.

This example points out the distinction between the traditional method of calculating the cost of a forward contract and the correct method, which measures its opportunity cost. Specifically, the cost of a forward contract is usually measured as its forward discount or premium:

\[
\frac{f_1 - e_0}{e_0}
\]

where \( e_0 \) is the current spot rate (dollar price) of the foreign currency and \( f_1 \) is the forward rate. In GE’s case, this cost would equal 1.4%.

However, this approach is wrong because the relevant comparison must be between the dollars per unit of foreign currency received with hedging, \( f_1 \), and the dollars received in the absence of hedging, \( e_1 \), where \( e_1 \) is the future (unknown) spot rate on the date of settlement. That is, the real cost of hedging is an opportunity cost. In particular, if the forward contract had not been entered into, the future value of each unit of foreign currency would have been \( e_1 \) dollars. Thus, the true dollar cost of the forward contract per dollar’s worth of foreign currency sold forward equals

\[
\frac{f_1 - e_1}{e_0}
\]

The expected cost (value) of a forward contract depends on whether a risk premium or other source of bias exists. Absent such bias, the expected cost of hedging via a forward contract will be zero. Otherwise, there would be an arbitrage opportunity. Suppose, for example, that management at General Electric believes that despite a one-year forward rate of $1.479, the euro will actually be worth about $1.491 on December 31. Then GE could profit by buying (rather than selling) euros forward for one year at $1.479 and, on December 31, completing the contract by selling euros in the spot market at $1.491. If GE is correct, it will earn $0.012 ($1.491 − 1.479) per euro sold forward. On a €10 million forward contract, this profit would amount to $120,000—a substantial reward for a few minutes of work.

The prospect of such rewards would not go unrecognized for long, which explains why, on average, the forward rate appears to be unbiased. Therefore, unless GE or any other company has some special information about the future spot rate that it has good reason to believe is not adequately reflected in the forward rate, it should accept the forward rate’s predictive validity as a working hypothesis and avoid speculative activities. After the fact, of course, the actual cost of a forward contract will turn out to be positive or negative (unless the future spot rate equals the forward rate), but the sign cannot be predicted in advance.

On the other hand, the evidence presented in Chapter 4 points to the possibility of bias in the forward rate at any point in time. The nature of this apparent bias suggests that the selective use of forward contracts in hedging may reduce expected hedging costs, but beware of the peso problem—the possibility that historical returns may be unrepresentative of future returns. The specific cost-minimizing selective hedging policy to take advantage of this bias would depend on whether you are trying to hedge a long or a short position in a currency. The policy is as follows:

- If you are long a currency, hedge (by selling forward) if the currency is at a forward premium; if the currency is at a forward discount, do not hedge.
- If you are short a currency, hedge (by buying forward) if the currency is selling at a forward discount; if the currency is at a forward premium, do not hedge.
As discussed in Section 10.4, however, this selective hedging policy does not come free; it may reduce expected costs but at the expense of higher risk. Absent other considerations, therefore, the impact on shareholder wealth of selective hedging via forward contracts should be minimal, with any expected gains likely to be offset by higher risk.

**Money Market Hedge**

An alternative to a forward market hedge is to use a money market hedge. A money market hedge involves simultaneous borrowing and lending activities in two different currencies to lock in the dollar value of a future foreign currency cash flow. For example, suppose euro and U.S. dollar interest rates are 7% and 5.5%, respectively. Using a money market hedge, General Electric will borrow €(10/1.07) million = €9.35 million for one year, convert it into $14.02 million in the spot market, and invest the $14.02 million for one year at 5.5%. On December 31, GE will receive 1.055 * $14.02 million = $14.79 million from its dollar investment. GE will then use the proceeds of its euro receivable, collectible on that date, to repay 1.07 * €9.35 million = €10 million it owes in principal and interest. As Exhibit 10.7 shows, the exchange gain or loss on the borrowing and lending transactions exactly offsets the dollar loss or gain on GE's euro receivable.

The gain or loss on the money market hedge can be calculated simply by subtracting the cost of repaying the euro debt from the dollar value of the investment. For example, in the case of an end-of-year spot rate of $1.50, the €10 million in principal and interest will cost $15 million to repay. The return on the dollar investment is only $14.79 million, leaving a loss on the money market hedge of $210,000.

We can also view the effects of this transaction with the simple T-account used earlier:

<table>
<thead>
<tr>
<th>December 31: GE T-Account (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Account receivable</td>
</tr>
<tr>
<td>Investment return (including interest)</td>
</tr>
<tr>
<td>Loan repayment (including interest)</td>
</tr>
</tbody>
</table>

As with the forward contract, the euro asset and liability (the loan repayment) cancel each other out, and GE is left with a $14.79 million asset (its investment).

The equality of the net cash flows from the forward market and money market hedges is not coincidental. The interest rates and forward and spot rates were selected so that interest rate parity would hold. In effect, the simultaneous borrowing and lending transactions associated with a money market hedge enable GE to create a “homemade” forward contract. The effective rate on this forward contract will equal the actual forward rate if interest rate parity holds. Otherwise, a covered interest arbitrage opportunity would exist.

In reality, there are transaction costs associated with hedging: the bid-ask spread on the forward contract and the difference between borrowing and lending rates. These transaction costs

---

**Exhibit 10.7** Possible Outcomes of Money Market Hedge as of December 31

<table>
<thead>
<tr>
<th>Spot exchange Rate</th>
<th>Value of Original Receivable (1)</th>
<th>Gain (Loss) on Money Market (2)</th>
<th>Total Cash Flow (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>€1 = $1.50</td>
<td>$15,000,000</td>
<td>($210,000)</td>
<td>$14,790,000</td>
</tr>
<tr>
<td>€1 = $1.479</td>
<td>14,790,000</td>
<td>0</td>
<td>14,790,000</td>
</tr>
<tr>
<td>€1 = $1.40</td>
<td>14,000,000</td>
<td>790,000</td>
<td>14,790,000</td>
</tr>
</tbody>
</table>
costs must be factored in when comparing a forward contract hedge with a money market hedge. The key to making these comparisons, as shown in Chapter 7, is to ensure that the correct bid and ask and borrowing and lending rates are used.

**Application**

**Comparing Hedging Alternatives When There Are Transaction Costs**

PepsiCo would like to hedge its C$40 million payable to Alcan, a Canadian aluminum producer, which is due in 90 days. Suppose it faces the following exchange and interest rates.

<table>
<thead>
<tr>
<th>Description</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot rate</td>
<td>$0.9422-31/Can$</td>
</tr>
<tr>
<td>Forward rate (90 days)</td>
<td>$0.9440-61/Can$</td>
</tr>
<tr>
<td>Canadian dollar 90-day interest rate (annualized)</td>
<td>4.71%—4.64%</td>
</tr>
<tr>
<td>U.S. dollar 90-day interest rate (annualized)</td>
<td>5.50%—5.35%</td>
</tr>
</tbody>
</table>

Which hedging alternative would you recommend? Note that the first interest rate is the borrowing rate and the second one is the lending rate.

**Solution.** The hedged cost of the payable using the forward market is US$37,844,000 (0.9461 × 40,000,000), remembering that PepsiCo must buy forward Canadian dollars at the ask rate. Alternatively, PepsiCo could use a money market hedge. This hedge would entail the following steps:

1. Borrow U.S. dollars at 5.50% annualized for 90 days (the borrowing rate). The actual interest rate for 90 days will be 1.375% (5.50% × 90/360).
2. Convert the U.S. dollars into Canadian dollars at $0.9431 (the ask rate).
3. Invest the Canadian dollars for 90 days at 4.64% annualized for 90 days (the lending rate) and use the loan proceeds to pay Alcan. The actual interest rate for 90 days will be 1.16% (4.64% × 90/360).

Since PepsiCo needs C$40 million in 90 days and will earn interest equal to 1.16%, it must invest the present value of this sum or C$39,541,321 (40,000,000/1.0116). This sum is equivalent to US$37,291,420 converted at the spot ask rate (39,541,321 × 0.9431). At a 90-day borrowing rate of 1.375%, PepsiCo must pay back principal plus interest in 90 days of US$37,804,177 (37,291,420 × 1.01375). Thus, the hedged cost of the payable using the money market hedge is $37,804,177.

Comparing the two hedged costs, we see that by using the money market hedge instead of the forward market hedge, PepsiCo will save $39,823 (37,844,000 — 37,804,177). Other things being equal, therefore, this is the recommended hedge for PepsiCo.

**Application**

**Plantronics Hedges Its Exposure**

Plantronics owes SKr 50 million, due in one year, for electrical equipment it recently bought from ABB Asea Brown Boveri. At the current spot rate of $0.1480/SKr, this payable is $7.4 million. It wishes to hedge this payable but is undecided how to do it. The one-year forward rate is currently $0.1436. Plantronics’ treasurer notes that the company has $10 million in a marketable U.S. dollar CD yielding 7% per annum. At the same time, SE Banken in Stockholm is offering a one-year time deposit rate of 10.5%.

a. What is the low-cost hedging alternative for Plantronics? What is the cost?

**Solution.** Plantronics can use the forward market to lock in a cost for its payable of $7.18 million (50,000,000 × 0.1436). Alternatively, Plantronics can use a money market hedge to lock in a lower dollar cost of $7,165,611 for its payable. Thus, the money market hedge is the low-cost hedge. To compute this cost, note that Plantronics must invest SKr 45,248,869 today at 10.5% to have SKr 50 million in one year (45,248,869 × 1.105 = 50 million). This amount is equivalent to $6,696,833 at the current spot of SKr $0.1480/SKr. The opportunity cost to Plantronics of taking this amount
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from its CD today and converting it into SKr is $7,165,611, which is the future value of $6,696,833 invested at 7%.

b. Suppose interest rate parity held. What would the one-year forward rate be?

Solution. Interest rate parity holds when the dollar return on investing dollars equals the dollar return on investing SKr, or $1.07 = (1/0.1480) \times 1.105 \times f_1$, where $f_1$ is the equilibrium one-year forward rate. The solution to this equation is $f_1 = 0.1433/\text{SKr}$. Because the actual one-year forward rate exceeds this number, interest rate parity does not hold and a forward hedge is more expensive than a money market hedge.

Risk Shifting

To return to our previous example, General Electric can avoid its transaction exposure altogether if Lufthansa allows it to price the sale of turbine blades in dollars. Dollar invoicing, however, does not eliminate currency risk; it simply shifts that risk from GE to Lufthansa, which now has dollar exposure. Lufthansa may or may not be better able, or more willing, to bear it. Despite the fact that this form of risk shifting is a zero-sum game, it is common in international business. Firms typically attempt to invoice exports in strong currencies and imports in weak currencies.

Is it possible to gain from risk shifting? Not if one is dealing with informed customers or suppliers. To see why, consider the GE-Lufthansa deal. If Lufthansa is willing to be invoiced in dollars for the turbine blades, that must be because Lufthansa calculates that its euro equivalent cost will be no higher than the €10 million price it was originally prepared to pay. Since Lufthansa does not have to pay for the turbine blades until December 31, its cost will be based on the spot price of the dollars as of that date. By buying dollars forward at the one-year forward rate of $1.479/€, Lufthansa can convert a dollar price of $P$ into a euro cost of $P/1.479$. Thus, the maximum dollar price $P_M$ that Lufthansa should be willing to pay for the turbine blades is the solution to

\[
\frac{P_M}{1.479} = 10 \text{ million}
\]

or

\[
P_M = 14.79 \text{ million}
\]

Considering that GE can guarantee itself $14.79 million by pricing in euros and selling the resulting €10 million forward, it will not accept a lower dollar price. The bottom line is that both Lufthansa and General Electric will be indifferent between a U.S. dollar price and a euro price only if the two prices are equal at the forward exchange rate. Therefore, because the euro price arrived at through arm’s-length negotiations is €10 million, the dollar price that is equally acceptable to Lufthansa and GE can only be $14.79 million. Otherwise, one or both of the parties involved in the negotiations has ignored the possibility of currency changes. Such naiveté is unlikely to exist for long in the highly competitive world of international business.

Pricing Decisions

Notwithstanding the view just expressed, top management sometimes has failed to take anticipated exchange rate changes into account when making operating decisions, leaving financial management with the essentially impossible task, through purely financial operations, of recovering a loss already incurred at the time of the initial transaction. To illustrate this type of error, suppose that GE has priced Lufthansa’s order of turbine blades at $15 million and then, because Lufthansa demands to be quoted a price in euro, converts the dollar price to a euro quote of €10 million, using the spot rate of $1.50/€.
In reality, the quote is worth only $14.79 million—even though it is booked at $15 million—because that is the risk-free price that GE can guarantee for itself by using the forward market. If GE management wanted to sell the blades for $15 million, it should have set a euro price equal to €15,000,000/1.479 = €10.14 million. Thus, GE lost $210,000 the moment it signed the contract (assuming that Lufthansa would have agreed to the higher price rather than turn to another supplier). This loss is not an exchange loss; it is a loss due to management inattentiveness.

The general rule on credit sales overseas is to convert between the foreign currency price and the dollar price by using the forward rate, not the spot rate. If the dollar price is high enough, the exporter should follow through with the sale. Similarly, if the dollar price on a foreign-currency-denominated import is low enough, the importer should follow through on the purchase. All this rule does is recognize that a euro (or any other foreign currency) tomorrow is not the same as a euro today. This rule is the international analogue to the insight that a dollar tomorrow is not the same as a dollar today. In the case of a sequence of payments to be received at several points in time, the foreign currency price should be a weighted average of the forward rates for delivery on those dates.

**APPLICATION Weyerhaeuser Quotes a Euro Price for Its Lumber**

Weyerhaeuser is asked to quote a price in euros for lumber sales to a French company. The lumber will be shipped and paid for in four equal quarterly installments. Weyerhaeuser requires a minimum price of $1 million to accept this contract. If \( P_F \) is the euro price contracted for, then Weyerhaeuser will receive \( 0.25P_F \) every three months, beginning 90 days from now. Suppose the spot and forward rates for the euro are as follows:

<table>
<thead>
<tr>
<th>Spot</th>
<th>90-Day</th>
<th>180-Day</th>
<th>270-Day</th>
<th>360-Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.4772</td>
<td>$1.4767</td>
<td>$1.4761</td>
<td>$1.4758</td>
<td>$1.4751</td>
</tr>
</tbody>
</table>

On the basis of these forward rates, the certainty-equivalent dollar value of this euro revenue is \( 0.25P_F(1.4767 + 1.4761 + 1.4758 + 1.4751) \), or \( 0.25P_F(5.9037) = 1.4759P_F \). In order for Weyerhaeuser to realize $1 million from this sale, the minimum euro price must be the solution to

\[
1.4759P_F = 1,000,000
\]

or

\[
P_F = €677,553
\]

At any lower euro price, Weyerhaeuser cannot be assured of receiving the $1 million it demands for this sale. Note that the spot rate did not enter into any of these calculations.

**Exposure Netting**

As defined in Section 10.4, exposure netting involves offsetting exposures in one currency with exposures in the same or another currency, when exchange rates are expected to move in such a way that losses (gains) on the first exposed position should be offset by gains (losses) on the second currency exposure. Although simple conceptually, implementation of exposure netting can be more involved. It is easy to see, for example, that a €1 million receivable and €1 million payable cancel each other out, with no net (before-tax) exposure. Dow Chemical explained this basic form of exposure netting in its 2007 Form 10-K (p. 81) when it stated that “Assets and liabilities denominated in the same foreign currency are netted, and only the net exposure is
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hedged.” It may be less obvious that such exposure netting can also be accomplished by using positions in different currencies. However, multinationals commonly engage in multicurrency exposure netting.

In practice, exposure netting involves one of three possibilities:

1. A firm can offset a long position in a currency with a short position in that same currency.
2. If the exchange rate movements of two currencies are positively correlated (e.g., the Swiss franc and euro), then the firm can offset a long position in one currency with a short position in the other.
3. If the currency movements are negatively correlated, then short (or long) positions can be used to offset each other.

**Application Using Exposure Netting to Manage Transaction Exposure**

Suppose that Apex Computers has the following transaction exposures:

<table>
<thead>
<tr>
<th>Apex T-Account (Millions)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketable securities</td>
<td>€2.4</td>
</tr>
<tr>
<td>Accounts payable</td>
<td></td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>SFr 6.2</td>
</tr>
<tr>
<td>Bank loan</td>
<td>SFr 14.8</td>
</tr>
<tr>
<td>Tax liability</td>
<td>€1.1</td>
</tr>
<tr>
<td>Bank loan</td>
<td>SFr 14.8</td>
</tr>
<tr>
<td>Tax liability</td>
<td>€1.1</td>
</tr>
</tbody>
</table>

On a net basis, before taking currency correlations into account, Apex’s transaction exposures—now converted into dollar terms—are

<table>
<thead>
<tr>
<th>Apex T-Account ( Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro (1.3)</td>
</tr>
<tr>
<td>Swiss franc (8.6)</td>
</tr>
<tr>
<td>Mexican peso (15.4)</td>
</tr>
</tbody>
</table>

Given the historical positive correlation between the euro and Swiss franc, Apex decides to net out its euro long position from its franc short position, leaving it with a net short position in the Swiss franc of $6.6 million ($1.9 million — $8.5 million). Finally, Apex takes into account the historical negative correlation between the Mexican peso and the Swiss franc and offsets these two short positions. The result is a net short position in Swiss francs of $4.4 million ($6.6 million — $2.2 million). By hedging only this residual transaction exposure, Apex can dramatically reduce the volume of its hedging transactions. The latter exposure netting—offsetting euro, Swiss franc, and Mexican peso exposures with one another—depends on the strength of the correlations among these currencies. Specifically, Apex’s offsetting its exposures on a dollar-for-dollar basis will be fully effective and appropriate only if the correlations are +1 for the €/SFr currency pair and −1 for the SFr/Mex$ currency pair.

**Currency Risk-sharing**

In addition to, or instead of, a traditional hedge, General Electric and Lufthansa can agree to share the currency risks associated with their turbine blade contract. Currency risk sharing can be implemented by developing a customized hedge contract embedded in the underlying trade transaction. This hedge contract typically takes the form of a price adjustment clause, whereby a base price is adjusted to reflect certain exchange rate changes. For example, the base price could be set at €10 million, but the parties would share the currency risk beyond a neutral zone. The neutral zone represents the currency range in which risk is not shared.
Suppose the neutral zone is specified as a band of exchange rates: $1.48–1.52/€, with a base rate of $1.50/€. This means that the exchange rate can fall as far as $1.48/€ or rise as high as $1.52/€ without reopening the contract. Within the neutral zone, Lufthansa must pay GE the dollar equivalent of €10 million at the base rate of $1.50, or $15 million. Thus, Lufthansa’s cost within the neutral zone can vary from €9.87 million to €10.14 million (15 million/1.52 to 15 million/1.48). However, if the euro depreciates from $1.50 to, say, $1.40, the actual rate will have moved $0.08 beyond the lower boundary of the neutral zone ($1.48/€). This amount is shared equally. Thus, the exchange rate actually used in settling the transaction is $1.46/€ ($1.50 – 0.08/2). The new price of the turbine blades becomes €10 million × 1.46, or $14.6 million. Lufthansa’s cost rises to €10.43 million (14,600,000/1.40). In the absence of a risk-sharing agreement, the contract value to GE would have been $14.0 million. Of course, if the euro appreciates beyond the upper bound to, say, $1.60, GE does not get the full benefit of the euro’s rise in value. Instead, the new contract exchange rate becomes $1.54 (1.50 + 0.08/2). GE collects €10 million × 1.54, or $15.4 million, and Lufthansa pays a price of €9.63 million (15,400,000/1.60).

Exhibit 10.8 compares the currency risk protection features of the currency risk-sharing arrangement with that of a traditional forward contract (at a forward rate of $1.479) and a no-hedge alternative. Within the neutral zone, the dollar value of GE’s contract under the risk-sharing agreement stays at $15 million. This situation is equivalent to Lufthansa selling GE a forward contract at the current spot rate of $1.50. Beyond the neutral zone, the contract’s dollar value rises or falls only half as much under the risk-sharing agreement as under the no-hedge alternative. The value of the hedged contract remains the same, regardless of the exchange rate.

**Mini-Case  Chrysler Shares Its Currency Risk with Mitsubishi**

In 1983, Chrysler entered into a contract with Mitsubishi Motors Corporation for V6 engines. This contract, which became the major element of Chrysler’s foreign currency exposure, stipulated that for exchange rates from ¥240 to ¥220 to the dollar, Mitsubishi would absorb the entire cost of an exchange rate change. Within the range ¥220/$ to ¥190/$, Chrysler and Mitsubishi split the cost of exchange rate shifts evenly. In the range ¥190/$ to ¥130/$, Chrysler bore 75% of the costs of exchange rate shifts; below ¥130/$, Chrysler had to absorb the entire cost. Assume that the exchange rate at the time of the contract was ¥240/$ and that the price of a V6 engine was contractually set at ¥270,000.

**Questions**

1. Show how the dollar cost to Chrysler of an engine changed over the range ¥240/$ to ¥100/$.
2. Show how Mitsubishi’s yen revenue per engine changed over the range ¥240/$ to ¥100/$.
3. Suppose at the time of a new engine shipment, the exchange rate was ¥150/$. What was the dollar cost to Chrysler per engine? What was Mitsubishi’s yen revenue per engine?

**Currency Collars**

Suppose that GE is prepared to take some but not all of the risk associated with its euro receivable. In this case, it could buy a **currency collar**, which is a contract that provides protection against currency moves outside an agreed-upon range. For example, suppose that GE is willing to accept variations in the value of its euro receivable associated with fluctuations in the euro in the range of $1.35 to $1.45. Beyond that point, however, it wants protection.
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**Exhibit 10.8** CURRENCY RISK SHARING: GE AND LUFTHANSA

<table>
<thead>
<tr>
<th>Value of receivable with</th>
<th>GE’s revenue from sale to Lufthansa ($ millions)</th>
</tr>
</thead>
</table>

With a currency collar, also known as a **range forward**, GE will convert its euro receivable at the following range forward rate, \( RF \), which depends on the actual future spot rate, \( e_1 \).

- If \( e_1 < 1.45 \), then \( RF = 1.45 \)
- If \( 1.45 \leq e_1 \leq 1.55 \), then \( RF = e_1 \)
- If \( e_1 > 1.55 \), then \( RF = 1.55 \)

In effect, GE is agreeing to convert its euro proceeds at the future spot rate if that rate falls within the range $1.45 to $1.55 and at the boundary rates beyond that range. Specifically, if the future spot rate exceeds $1.55, then it will convert the euro proceeds at $1.55, giving the bank a profit on the range forward. Alternatively, if the future spot rate falls below $1.45, then GE will convert the proceeds at $1.45 and the bank suffers a loss.

Exhibit 10.9 shows that with the range forward, GE has effectively collared its exchange risk (hence the term, currency collar). Exhibit 10.9A shows the payoff profile of the euro receivable; Box 10.9B shows the payoff profile for the currency collar; and Box 10.9C shows...
Exhibit 10.9  Currency Range Forward: GE And Lufthansa

(a) Payoff profile of GE’s unhedged receivable from Lufthansa

(b) Payoff profile of range forward

(c) Payoff profile of GE’s receivable hedged with a range forward
the payoff profile for GE’s receivable hedged with the collar. With the collar, GE is guaranteed a minimum cash flow of $10 million × $1.45, or $14.5 million. Its maximum cash flow with the collar is $15.5 million, which it receives for any exchange rate beyond $1.55. For exchange rates within the range, it receives $10 million × (actual spot rate).

Why would GE accept a contract that limits its upside potential? In order to lower its cost of hedging its downside risk. The cost saving can be seen by recognizing that a currency collar can be created by simultaneously buying an out-of-the-money put option and selling an out-of-the-money call option of the same size. In effect, the purchase of the put option is financed by the sale of the call option. By selling off the upside potential with the call option, GE can reduce the cost of hedging its downside risk with the put option. The payoff profile of the combined put purchase and call sale, also known as a cylinder, is shown in Exhibit 10.10. By adjusting the strike prices such that the put premium just equals the call premium, you can always create a cylinder with a zero net cost, in which case you have a range forward. In this exhibit, it is assumed that the put premium at a strike price of $1.45 just equals the call premium at a strike price of $1.55.

**Exhibit 10.10**

**Use of a Currency Cylinder to Hedge GE’s Receivable**
Cross-Hedging

Hedging with futures is very similar to hedging with forward contracts. However, a firm that wants to manage its exchange risk with futures may find that the exact futures contract it requires is unavailable. In this case, it may be able to cross-hedge its exposure by using futures contracts on another currency that is correlated with the one of interest.

The idea behind cross-hedging is as follows: If we cannot find a futures/forward contract on the currency in which we have an exposure, we will hedge our exposure via a futures/forward contract on a related currency. Lacking a model or theory to tell us the exact relationship between the exchange rates of the two related currencies, we estimate the relationship by examining the historical association between these rates. The resulting regression coefficient tells us the sign and approximate size of the futures/forward position we should take in the related currency. However, the cross-hedge is only as good as the stability and economic significance of the correlation between the two currencies. A key output of the regression equation, such as the one between the Danish krone and euro, is the $R^2$, which measures the fraction of variation in the exposed currency that is explained by variation in the hedging currency. In general, the greater the $R^2$ of the regression of one exchange rate on the other, the better the cross-hedge will be.

**Application**  
Hedging a Danish Krone Exposure Using Euro Futures

An exporter with a receivable denominated in Danish krone will not find krone futures available. Although an exact matching futures contract is unavailable, the firm may be able to find something that comes close. The exporter can cross-hedge his Danish krone position with euro futures, as the dollar values of those currencies tend to move in unison.

Suppose it is October 15 and our exporter expects to collect a DK5 million receivable on December 15. The exporter can always sell the Danish kroner on the spot market at that time but is concerned about a possible fall in the krone’s value between now and then. The exporter’s treasurer has copied the spot prices of the Danish krone and euro from the *Wall Street Journal* every day for the past three months and has estimated the following regression relationship using this information:

$$\Delta \text{DK}/\$ = 0.8(\Delta \text{€}/\$$)

where $\Delta = e_t - e_{t-1}$ and $e_t$ is the spot rate for day $t$ (that is, $\Delta$ is the change in the exchange rate).

In addition, the $R^2$ of the regression is 0.91, meaning that 91% of the variation in the Danish krone is explained by movements in the euro. With an $R^2$ this high, the exporter can confidently use euro futures contracts to cross-hedge the Danish krone.

According to this relationship, a 1¢ change in the value of the euro leads to a 0.8¢ change in the value of the DK. To cross-hedge the forthcoming receipt of DK, 0.8 units of euro futures must be sold for every unit of DK to be sold on December 15. With a Danish krone exposure of DK 5 million, the exporter must sell euro futures contracts in the amount of €4 million ($0.8 \times 5$ million). With a euro futures contract size of €125,000, this euro amount translates into 32 contracts ($4 \text{ million}/125,000$). The example illustrates the idea that the euro futures can be used to effectively offset the risk posed by the DK receivable.

Foreign Currency Options

Thus far, we have examined how firms can hedge known foreign currency transaction exposures. Yet, in many circumstances, the firm is uncertain whether the hedged foreign currency cash inflow or outflow will materialize. For example, the previous assumption was that GE learned
on January 1 that it had won a contract to supply turbine blades to Lufthansa. But suppose that although GE's bid on the contract was submitted on January 1, the announcement of the winning bid would not be until April 1. During the three-month period from January 1 to April 1, GE does not know if it will receive a payment of €10 million on December 31. This uncertainty has important consequences for the appropriate hedging strategy.

GE would like to guarantee that the exchange rate does not move against it between the time it bids and the time it gets paid, should it win the contract. The danger of not hedging is that its bid will be selected and the euro will decline in value, possibly wiping out GE's anticipated profit margin. For example, if the forward rate on April 1 for delivery December 31 falls to €1 = $1.43, the value of the contract will drop from $14.79 million to $14.3 million, for a loss in value of $490,000.

The apparent solution is for GE to sell the anticipated €10 million receivable forward on January 1. However, if GE does that and loses the bid on the contract, it still has to sell the currency—which it will have to get by buying on the open market, perhaps at a big loss. For example, suppose the forward rate on April 1 for December 31 delivery has risen to $1.512. To eliminate all currency risk on its original forward contract, GE would have to buy €10 million forward at a price of $1.512. The result would be a loss of $330,000 [(1.479 − 1.512) × 10 million] on the forward contract entered into on January 1 at a rate of $1.479.

Using Options to Hedge Bids. Until recently, GE, or any company that bid on a contract denominated in a foreign currency and was not assured of success, would be unable to resolve its foreign exchange risk dilemma. The advent of currency options has changed all that. Specifically, the solution to managing its currency risk in this case is for GE, at the time of its bid, to purchase an option to sell €10 million on December 31. For example, suppose that on January 1, GE can buy for $100,000 the right to sell Citigroup €10 million on December 31 at a price of $1.479/€. If it enters into this put option contract with Citigroup, GE will guarantee itself a minimum price ($14.79 million) should its bid be selected, while simultaneously ensuring that if it lost the bid, its loss would be limited to the price paid for the option contract (the premium of $100,000). Should the spot price of the euro on December 31 exceed $1.479, GE would let its option contract expire unexercised and convert the €10 million at the prevailing spot rate.

Instead of a straight put option, GE could use a futures put option. This would entail GE buying a put option on a December futures contract with the option expiring in April. If the put were in-the-money on April 1, GE would exercise it and receive a short position in a euro futures contract plus a cash amount equal to the strike price minus the December futures price as of April 1. Assuming it had won the bid, GE would hold on to the December futures contract. If it had lost the bid, GE would pocket the cash and immediately close out its short futures position at no cost.

As we saw in Chapter 8, two types of options are available to manage exchange risk. A currency put option, such as the one appropriate to GE's situation, gives the buyer the right, but not the obligation, to sell a specified number of foreign currency units to the option seller at a fixed dollar price, up to the option's expiration date. Alternatively, a currency call option is the right, but not the obligation, to buy the foreign currency at a specified dollar price, up to the expiration date.

A call option is valuable, for example, when a firm has offered to buy a foreign asset, such as another firm, at a fixed foreign currency price but is uncertain whether its bid will be accepted. By buying a call option on the foreign currency, the firm can lock in a maximum dollar price for its tender offer, while limiting its downside risk to the call premium in the event its bid is rejected.
Application Air Products Loses Twice

In May 2000, Air Products & Chemicals Inc. announced a $300-million after-tax charge. The bulk of this charge came about from currency losses associated with the acquisition of British pounds to be used in a failed attempt to buy BOC Group PLC. After Air Products bought the pounds, the currency fell in value. According to the Wall Street Journal (May 11, 2000, p. A4), “While it would have had losses from the hedge even if it were to have acquired BOC, it would have effectively paid less as well, because of the currency’s decline.” Purchase of a call option on pounds sterling instead of its outright currency purchase would have protected Air Products from the currency losses on its failed acquisition.

Using Options to Hedge Other Currency Risks. Currency options are a valuable risk management tool in other situations as well. Conventional transaction-exposure management says you wait until your sales are booked or your orders are placed before hedging them. If a company does that, however, it faces potential losses from exchange rate movements because the foreign currency price does not necessarily adjust right away to changes in the value of the dollar. As a matter of policy, to avoid confusing customers and salespeople, most companies do not change their price list every time the exchange rate changes. Unless and until the foreign currency price changes, the unhedged company may suffer a decrease in its profit margin. Because of the uncertainty of anticipated sales or purchases, however, forward contracts are an imperfect tool to hedge the exposure.

For example, a company that commits to a foreign currency price list for, say, three months has a foreign currency exposure that depends on the unknown volume of sales at those prices during this period. Thus, the company does not know what volume of forward contracts to enter into to protect its profit margin on these sales. For the price of the premium, currency put options allow the company to insure its profit margin against adverse movements in the foreign currency while guaranteeing fixed prices to foreign customers. Without options, the firm might be forced to raise its foreign currency prices sooner than the competitive situation warranted.

Application Hewlett-Packard Uses Currency Options to Protect Its Profit Margins

Hewlett-Packard (H-P), the California-based computer firm, uses currency options to protect its dollar profit margins on products built in the United States but sold in Europe. The firm needs to be able to lower LC prices if the dollar weakens and hold LC prices steady for about three months (the price adjustment period) if the dollar strengthens.

Suppose H-P sells anticipated euro sales forward at €1/$ to lock in a dollar value for those sales. If one month later the dollar weakens to €0.80/$, H-P faces tremendous competitive pressure to lower its euro prices. H-P would be locked into a loss on the forward contracts that would not be offset by a gain on its sales because it had to cut euro prices. With euro put options, H-P would just let them expire, and it would lose only the put premium. Conversely, options help H-P delay LC price increases when the dollar strengthens until it can raise them without suffering a competitive disadvantage. The reduced profit margin on local sales is offset by the gain on the put option.

Currency options also can be used to hedge exposure to shifts in a competitor’s currency. Companies competing with firms from other nations may find their products at a price disadvantage if a major competitor’s currency weakens, allowing the competitor to reduce its
10.6 Managing Transaction Exposure

prices. Thus, the company will be exposed to fluctuations in the competitor's currency even if it has no sales in that currency. For example, a Swiss engine manufacturer selling in Germany will be placed at a competitive disadvantage if dollar depreciation allows its principal competitor, located in the United States, to sell at a lower price in Germany. Purchasing out-of-the-money put options on the dollar and selling them for a profit if they move into the money (which will happen if the dollar depreciates enough) will allow the Swiss firm to partly compensate for its lost competitiveness. The exposure is not contractually set, so forward contracts are again not as useful as options in this situation.

Options versus Forward Contracts. The ideal use of forward contracts is when the exposure has a straight risk-reward profile: Forward contract gains or losses are exactly offset by losses or gains on the underlying transaction. If the transaction exposure is uncertain, however, because the volume or the foreign currency prices of the items being bought or sold are unknown, a forward contract will not match it. By contrast, currency options are a good hedging tool in situations in which the quantity of foreign exchange to be received or paid out is uncertain.

Application How Cadbury Schweppes Uses Currency Options

Cadbury Schweppes, the British candy manufacturer, uses currency options to hedge uncertain payables. The price of its key product input, cocoa, is quoted in sterling but is really a dollar-based product. That is, as the value of the dollar changes, the sterling price of cocoa changes as well. The objective of the company's foreign exchange strategy is to eliminate the currency element in the decision to purchase the commodity, thus leaving the company's buyers able to concentrate on fundamentals. However, this task is complicated by the fact that the company's projections of its future purchases are highly uncertain.

As a result, Cadbury Schweppes has turned to currency options. After netting its total exposure, the company covers with forward contracts a base number of exposed, known payables. It covers the remaining—uncertain—portion with options. The options act as an insurance policy.

A company could use currency options to hedge its exposure in lieu of forward contracts. However, each type of hedging instrument is more advantageous in some situations, and it makes sense to match the instrument to the specific situation. The three general rules to follow when choosing between currency options and forward contracts for hedging purposes are summarized as follows:

1. When the quantity of a foreign currency cash outflow is known, buy the currency forward; when the quantity is unknown, buy a call option on the currency.
2. When the quantity of a foreign currency cash inflow is known, sell the currency forward; when the quantity is unknown, buy a put option on the currency.
3. When the quantity of a foreign currency cash flow is partially known and partially uncertain, use a forward contract to hedge the known portion and an option to hedge the maximum value of the uncertain remainder.10

These rules presume that the financial manager's objective is to reduce risk and not to speculate on the direction or volatility of future currency movements. They also presume that both forward and options contracts are fairly priced. In an efficient market, the expected value or cost of either of these contracts should be zero. Any other result would introduce the

10For elaboration, see Ian H. Giddy, "The Foreign Exchange Option as a Hedging Tool," Midland Corporate Finance Journal (Fall 1983): 32–42.
possibility of arbitrage profits. The presence of such profits would attract arbitrageurs as surely as bees are attracted to honey. Their subsequent attempts to profit from inappropriate prices would return these prices to their equilibrium values.

**Mini-Case  Help DKNY Cover Up Its Mexican Peso Transaction Exposure**

DKNY, the apparel design firm, owes Mex$7 million in 30 days for a recent shipment of textiles from Mexico. DKNY’s treasurer is considering hedging the company’s peso exposure on this shipment and is looking for some help in figuring out what her different hedging options might cost and which option is preferable. You call up your favorite foreign exchange trader and receive the following interest rate and exchange rate quotes:

- **Spot rate:** Mex$13.0/\$1
- **Forward rate (30 days):** Mex$13.1/\$1
- **30-day put option on dollars at Mex$12.9/\$:** 1% premium
- **30-day call option on dollars at Mex$13.1/\$:** 3% premium
- **U.S. dollar 30-day interest rate (annualized):** 7.5%
- **Peso 30-day interest rate (annualized):** 15%

Based on these quotes, the treasurer presents you with a series of questions that she would like you to address.

**Questions**

1. What hedging options are available to DKNY?
2. What is the hedged cost of DKNY’s payable using a forward market hedge?
3. What is the hedged cost of DKNY’s payable using a money market hedge?
4. What is the hedged cost of DKNY’s payable using a put option?
5. At what exchange rate is the cost of the put option just equal to the cost of the forward market hedge? To the cost of the money market hedge?
6. How can DKNY construct a currency collar? What is the net premium paid for the currency collar? Using this currency collar, what is the net dollar cost of the payable if the spot rate in 30 days is Mex$12.8/\$? Mex$13.1/\$? Mex$13.4/\$?
7. What is the preferred alternative?
8. Suppose that DKNY expects the 30-day spot rate to be Mex$13.4/\$. Should it hedge this payable? What other factors should go into DKNY’s hedging decision?

### 10.7 Summary and Conclusions

In this chapter, we examined the concept of exposure to exchange rate changes from the perspective of the accountant. The accountant’s concern is the appropriate way to translate foreign-currency-denominated items on financial statements to their home currency values. If currency values change, translation gains or losses may result. We surveyed the four principal translation methods available: the current/noncurrent method, the monetary/nonmonetary method, the temporal method, and the current rate method. In addition, we analyzed the present translation method mandated by the Financial Accounting Standards Board, FASB 52.

Regardless of the translation method selected, measuring accounting exposure is conceptually the same. It involves determining which foreign-currency-denominated assets and liabilities will be translated at the current (postchange) exchange rate and which will be...
translated at the historical (prechange) exchange rate. The former items are considered to be exposed, whereas the latter items are regarded as not exposed. Translation exposure is simply the difference between exposed assets and exposed liabilities.

Hedging this exposure is a complicated and difficult task. As a first step, the firm must specify an operational set of goals for those involved in exchange risk management. Failure to do so can lead to possibly conflicting and costly actions on the part of employees. We saw that the hedging objective that is most consistent with the overarching objective of maximizing shareholder value is to reduce exchange risk, when exchange risk is defined as that element of cash-flow variability attributable to currency fluctuations. This objective translates into the following exposure management goal: to arrange a firm's financial affairs in such a way that however the exchange rate may move in the future, the effects on dollar returns are minimized.

We saw that firms normally cope with anticipated currency changes by engaging in forward contracts, borrowing locally, and adjusting their pricing and credit policies. However, there is reason to question the value of much of this activity. In fact, in normal circumstances, hedging cannot provide protection against expected exchange rate changes.

A number of empirical studies indicate that on average the forward rate appears to be an unbiased estimate of the future spot rate. On the other hand, the evidence also points to the possibility of bias in the forward rate at any point in time. However, trying to take advantage of this apparent bias via selective hedging is likely to expose the company to increased risk. Furthermore, according to the international Fisher effect, in the absence of government controls, interest rate differentials among countries should equal anticipated currency devaluations or revaluations. Empirical research substantiates the notion that over time, gains or losses on debt in hard currencies tend to be offset by low interest rates; in soft currencies, they will be offset by higher interest rates unless, of course, there are barriers that preclude equalization of real interest rates. Again, to the extent that bias exists in the interest rate differential—because of a risk premium or other factor—the risk associated with selective hedging is likely to offset any expected gains.

The other hedging methods, which involve factoring anticipated exchange rate changes into pricing and credit decisions, can be profitable only at the expense of others. Thus, to consistently gain by these trade-term adjustments, it is necessary to deal continuously with less-knowledgeable people. Certainly, however, a policy predicated on the continued existence of naive firms is unlikely to be viable for very long in the highly competitive and well-informed world of international business. The real value to a firm of factoring currency change expectations into its pricing and credit decisions is to prevent others from profiting at its expense.

The basic value of hedging, therefore, is to protect a company against unexpected exchange rate changes; however, by definition, these changes are unpredictable and, consequently, impossible to profit from. To the extent that a government does not permit interest or forward rates to fully adjust to market expectations, a firm with access to these financial instruments can expect, on average, to gain from currency changes. Nevertheless, the very nature of these imperfections severely restricts a company's ability to engage in such profitable financial operations.

Questions

1. What is translation exposure? Transaction exposure?
2. What are the basic translation methods? How do they differ?
3. What factors affect a company's translation exposure? What can the company do to affect its degree of translation exposure?
4. What alternative hedging transactions are available to a company seeking to hedge the translation exposure of its German subsidiary? How would the appropriate hedge change if the German affiliate's functional currency were the U.S. dollar?
5. In order to eliminate all risk on its exports to Japan, a company decides to hedge both its actual and anticipated sales there. To what risk is the company exposing itself? How could this risk be managed?

6. Instead of its previous policy of always hedging its foreign currency receivables, Sun Microsystems has decided to hedge only when it believes the dollar will strengthen. Otherwise, it will go uncovered. Comment on this new policy.

7. Your bank is working with an American client who wishes to hedge its long exposure in the Malaysian ringgit. Suppose it is possible to invest in ringgit but not borrow in that currency. However, you can both borrow and lend in U.S. dollars.
   a. Assuming there is no forward market in ringgit, can you create a homemade forward contract that would allow your client to hedge its ringgit exposure?
   b. Several of your Malaysian clients are interested in selling their U.S. dollar export earnings forward for ringgit. Can you accommodate them by creating a forward contract?

8. Eastman Kodak gives its traders bonuses if their selective hedging strategies are less expensive than the cost of hedging all their transaction exposure on a continuous basis. What problems can you foresee from this bonus plan?

9. Many managers prefer to use options to hedge their exposure because it allows them the possibility of capitalizing on favorable movements in the exchange rate. In contrast, a company using forward contracts avoids the downside but also loses the upside potential as well. Comment on this strategy.

10. In January 1988, Arco bought a 24.3% stake in the British oil firm Britoil PLC. It intended to buy a further $1 billion worth of Britoil stock if Britoil were agreeable. However, Arco was uncertain whether Britoil, which had expressed a strong desire to remain independent, would accept its bid. To guard against the possibility of a pound appreciation in the interim, Arco decided to convert $1 billion into pounds and place them on deposit in London, pending the outcome of its discussions with Britoil’s management. What exchange risk did Arco face, and did it choose the best way to protect itself from that risk?

11. Sumitomo Chemical of Japan has one week in which to negotiate a contract to supply products to a U.S. company at a dollar price that will remain fixed for one year. What advice would you give Sumitomo?

12. U.S. Farm-Raised Fish Trading Co., a catfish concern in Jackson, Mississippi, tells its Japanese customers that it wants to be paid in dollars. According to its director of export marketing, this simple strategy eliminates all its currency risk. Is he right? Why?

13. The Montreal Expos are a major-league baseball team located in Montreal, Canada. What currency risk is faced by the Expos, and how can this exchange risk be managed?

14. General Electric recently had to put together a $50-million bid, denominated in Swiss francs, to upgrade a Swiss power plant. If it won, GE expected to pay subcontractors and suppliers in five currencies. The payment schedule for the contract stretched over a five-year period.
   a. How should General Electric establish the Swiss franc price of its $50-million bid?
   b. What exposure does GE face on this bid? How can it hedge that exposure?

15. Dell Computer produces its machines in Asia with components largely imported from the United States and sells its products in various Asian nations in local currencies.
   a. What is the likely impact on Dell’s Asian profits of a strengthened dollar? Explain.
   b. What hedging technique(s) can Dell employ to lock in a desired currency conversion rate for its Asian sales during the next year?
   c. Suppose Dell wishes to lock in a specific conversion rate but does not want to foreclose the possibility of profiting from future currency moves. What hedging technique would be most likely to achieve this objective?
   d. What are the limits of Dell’s hedging approach?

Problems

1. Suppose that at the start and at the end of the year, Bell U.K., the British subsidiary of Bell U.S., has current assets of £1 million, fixed assets of £2 million, and current liabilities of £1 million. Bell has no long-term liabilities.
   a. What is Bell U.K.’s translation exposure under the current/noncurrent, monetary/nonmonetary, temporal, and current rate methods?
   b. Assuming the pound is the functional currency, if the pound depreciates during the year from $1.50 to $1.30, what will be the FASB 52 translation gain (loss) to be included in the equity account of Bell’s U.S. parent?
   c. Redo part b assuming the dollar is the functional currency. Included in current assets is inventory of £0.5 million. The historical exchange rates for inventory and fixed assets are $1.45 and $1.65, respectively. If the dollar is the functional currency, where does Bell U.K.’s translation gain or loss show up on Bell U.S.’s financial statements?

2. Rolls-Royce, the British jet engine manufacturer, sells engines to U.S. airlines and buys parts from U.S. companies. Suppose it has accounts receivable of $1.5 billion and accounts payable of $740 million. It also has borrowed $600 million. The current spot rate is $1.5128/£.
10.7 • Summary and Conclusions

a. What is Rolls-Royce’s dollar transaction exposure in dollar terms? In pound terms?
b. Suppose the pound appreciates to $1.7642/£. What is Rolls-Royce’s gain or loss, in pound terms, on its dollar transaction exposure?

<table>
<thead>
<tr>
<th>Assets (Mex$ millions)</th>
<th>Liabilities (Mex$ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash, marketable securities</td>
<td>Mex$1,000</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>50,000</td>
</tr>
<tr>
<td>Inventory</td>
<td>32,000</td>
</tr>
<tr>
<td>Net fixed assets</td>
<td>111,000</td>
</tr>
<tr>
<td>Total assets</td>
<td>Mex$194,000</td>
</tr>
</tbody>
</table>

The exchange rate on January 1 was Mex$8,000 = $1.
a. What is Zapata’s FASB 52 peso translation exposure on January 1?
b. Suppose the exchange rate on December 31 is Mex$12,000. What will be Zapata’s translation loss for the year?
c. Zapata can borrow an additional Mex$15,000 (in millions). What will happen to its translation exposure if it uses the funds to pay a dividend to its parent? If it uses the funds to increase its cash position?

Walt Disney expects to receive a Mex$16 million theatrical fee from Mexico in 90 days. The current spot rate is $0.1321/Mex$, and the 90-day forward rate is $0.1242/Mex$.
a. What is Disney’s peso transaction exposure associated with this fee?
b. If the spot rate expected in 90 days is $0.1305, what is the expected U.S. dollar value of the fee?
c. What is the hedged dollar value of the fee?
d. What factors will influence the hedging decision?

A foreign exchange trader assesses the euro exchange rate three months hence as follows:

- $1.11 with probability 0.25
- $1.13 with probability 0.50
- $1.15 with probability 0.25

The 90-day forward rate is $0.12.
a. Will the trader buy or sell euros forward against the dollar if she is concerned solely with expected values? In what volume?
b. In reality, what is likely to limit the trader’s speculative activities?
c. Suppose the trader revises her probability assessment as follows:

- $1.09 with probability 0.33
- $1.13 with probability 0.33
- $1.17 with probability 0.33

If the forward rate remains at $1.12, will this new assessment affect the trader’s decision? Explain.

An investment manager hedges a portfolio of Bunds (German government bonds) with a six-month forward contract. The current spot rate is €0.84/$, and the 180-day forward rate is €0.81/$. At the end of the six-month period, the Bunds have risen in value by 3.75% (in euro terms), and the spot rate is now €0.76/$.
a. If the Bunds earn interest at the annual rate of 5%, paid semiannually, what is the investment manager’s total dollar return on the hedged Bunds?
b. What would the return on the Bunds have been without hedging?
c. What was the true cost of the forward contract?

c. What was the true cost of the forward contract?

Magnetronics, Inc., a U.S. company, owes its Taiwanese supplier NT$205 million in three months. The company wishes to hedge its NT$ payable. The current spot rate is NT$1 = US$0.03987, and the three-month forward rate is NT$1 = US$0.04051. Magnetronics can also borrow or lend U.S. dollars at an annualized interest rate of 12% and Taiwanese dollars at an annualized interest rate of 8%.
a. What is the U.S. dollar accounting entry for this payable?
b. What is the minimum U.S. dollar cost that Magnetronics can lock in for this payable? Describe the procedure it would use to get this price.
c. At what forward rate would interest rate parity hold given the interest rates?

Cooper Inc., a U.S. firm, has just invested £500,000 in a note that will come due in 90 days and is yielding 9.5% annualized. The current spot value of the pound is $1.5612, and the 90-day forward value is $1.5467.
a. What is the hedged dollar value of this note at maturity?
b. What is the annualized dollar yield on the hedged note?
c. Cooper anticipates that the value of the pound in 90 days will be $1.5500. Should it hedge? Why or why not?
d. Suppose that Cooper has a payable of £980,000 coming due in 180 days. Should this affect its decision of whether to hedge its sterling note? How and why?
9. American Airlines is trying to decide how to go about hedging $70 million in ticket sales receivable in 180 days. Suppose it faces the following exchange and interest rates.

<table>
<thead>
<tr>
<th>Rate Type</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot rate</td>
<td>$0.6433-42/SFr</td>
</tr>
<tr>
<td>Forward rate (180 days)</td>
<td>$0.6578-99/SFr</td>
</tr>
<tr>
<td>Swiss Franc 180-day interest</td>
<td>4.01%-3.97%</td>
</tr>
<tr>
<td>(annualized)</td>
<td></td>
</tr>
<tr>
<td>U.S. dollar 180-day interest</td>
<td>8.01%-7.98%</td>
</tr>
<tr>
<td>(annualized)</td>
<td></td>
</tr>
</tbody>
</table>

a. What is the hedged value of American’s ticket sales using a forward market hedge?

b. What is the hedged value of American’s ticket sales using a money market hedge? Assume the first interest rate is the rate at which money can be borrowed and the second one the rate at which it can be lent.

c. Which hedge is less expensive?

d. Is there an arbitrage opportunity here?

e. Suppose the expected spot rate in 180 days is $0.67/SFr, with a most likely range of $0.64 to $0.70/SFr. Should American hedge? What factors should enter into its decision?

10. Madison Inc. imports olive oil from Chilean firms, and the invoices are always denominated in pesos (Ch$). It currently has a payable in the amount of Ch$250 million that it would like to hedge. Unfortunately, there are no peso futures contracts available and Madison is having difficulty arranging a peso forward contract. Its treasurer, who recently received his MBA, suggests using the Brazilian real (R) to cross-hedge the peso exposure. He recently ran the following regression of the change in the exchange rate for the peso against the change in the real exchange rate:

\[ \Delta \text{Ch$/US$} = 1.6(\Delta \text{R/US$}) \]

a. There is an active market in the forward real. To cross-hedge Madison’s peso exposure, should the treasurer buy or sell the real forward?

b. What is the risk-minimizing amount of reals that the treasurer would have to buy or sell forward to hedge Madison’s peso exposure?

Web Resources

- www.reportgallery.com: Website that contains links to annual reports of more than 2,200 companies, many of which are multinationals.

Web Exercises

1. Go to General Electric’s home page (www.ge.com) and find its latest annual report. What is General Electric’s accumulated translation adjustment? Does General Electric use any functional currencies other than the dollar? What was GE’s reported currency translation gain or loss during the year? What exchange rates (year-end or average) did GE use to translate its asset and liability accounts and revenue and expense items?

2. What are the latest FASB pronouncements dealing with currency translations?

3. Review the annual reports on the websites of three of the multinational companies listed in www.reportgallery.com.
   a. Which types of currency exposure are these companies hedging?
   b. Which hedging techniques are they using?
   c. Which hedging strategy (if any) appears to underlie their hedging activities?

Bibliography


Appendix 10A


APPENDIX 10A

STATEMENT OF FINANCIAL ACCOUNTING STANDARDS NO. 52

The current translation standard—Statement of Financial Accounting Standards No. 52 (FASB 52)—was adopted in 1981. According to FASB 52, firms must use the current rate method to translate foreign-currency-denominated assets and liabilities into dollars. All foreign currency revenue and expense items on the income statement must be translated at either the exchange rate in effect on the date these items are recognized or at an appropriately weighted average exchange rate for the period. The most important aspect of this standard is that most FASB 52 translation gains and losses bypass the income statement and are accumulated in a separate equity account on the parent’s balance sheet. This account is usually called something like “cumulative translation adjustment.”

FASB 52 differentiates between the functional currency and the reporting currency. An affiliate’s functional currency is the currency of the primary economic environment in which the affiliate generates and expends cash. If the enterprise’s operations are relatively self-contained and integrated within a particular country, the functional currency will generally be the currency of that country. An example of this would be an English affiliate that both manufactures and sells most of its output in England. Alternatively, if the foreign affiliate’s operations are a direct and integral component or extension of the parent company’s operations, the functional currency will be the U.S. dollar. An example of this would be a Hong Kong assembly plant for radios that sources the components in the United States and sells the assembled radios in the United States. It is also possible that the functional currency is neither the local currency nor the dollar but, rather, a third currency. However, in the remainder of this appendix, we will assume that if the functional currency is not the local currency, then it is the U.S. dollar.

Guidelines for selecting the appropriate functional currency are presented in Exhibit 10A.1. There is sufficient ambiguity to give companies some leeway in selecting the functional currency. However, in the case of a hyperinflationary country—defined as one that has cumulative inflation of approximately 100% or more over a three-year period—the functional currency must be the dollar.

Companies will usually explain in the notes to their annual report how they accounted for foreign currency translation. A typical statement is that found in Dow Chemical’s 2007 Annual Report:

The local currency has been primarily used as the functional currency throughout the world. Translation gains and losses of those operations that use local currency as the functional currency, and the effects of exchange rate changes on transactions designated as hedges of net foreign investments, are included in “Accumulated other comprehensive income.” Where the U.S. dollar is used as the functional currency, foreign currency gains and losses are reflected in income.

The reporting currency is the currency in which the parent firm prepares its own financial statements—that is, U.S. dollars for an American firm. FASB 52 requires that the financial statements of a foreign unit first be stated in the functional currency, using generally accepted accounting principles of the United States. At each balance sheet date, any assets and liabilities denominated in a currency other than the functional currency of the recording entity must be adjusted to reflect the current exchange rate on that date. Transaction gains and losses that result from adjusting assets and liabilities denominated in a currency other than the functional currency, or from settling such items, generally must appear on the foreign unit’s income statement. The only exceptions to the general

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Exhibit 10A.1  Factors Indicating The Appropriate Functional Currency

<table>
<thead>
<tr>
<th>Foreign Unit’s</th>
<th>Local Currency Indicators</th>
<th>Dollar Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash flows</td>
<td>Primarily in the currency; do not directly affect parent company cash flows</td>
<td>Direct impact on parent company; cash flow available for remittance</td>
</tr>
<tr>
<td>Sales prices</td>
<td>Not responsive to exchange rate changes in the short run; determined more by local conditions</td>
<td>Determined more by worldwide competition; affected in the short run by exchange rate changes</td>
</tr>
<tr>
<td>Sales market</td>
<td>Active local market for entity’s products</td>
<td>Products sold primarily in the United States; sales contracts denominated in dollars</td>
</tr>
<tr>
<td>Expenses</td>
<td>Labor, materials, and other costs denominated primarily in local currency</td>
<td>Inputs primarily from sources in the United States or otherwise denominated in dollars</td>
</tr>
<tr>
<td>Financing</td>
<td>Primarily in local currency; operations generate sufficient funds to service these debts</td>
<td>Primarily from the parent company or otherwise denominated in dollars to service its dollars debts</td>
</tr>
<tr>
<td>Intercompany transactions</td>
<td>Few intracorporate transactions; little connection between local and parent operations</td>
<td>High volume of intracorporate transactions; extensive interrelationship between local and parent operations</td>
</tr>
</tbody>
</table>

requirement to include transaction gains and losses in income as they arise are listed as follows:

1. Gains and losses attributable to a foreign currency transaction that is designated as an economic hedge of a net investment in a foreign entity must be included in the separate component of shareholders’ equity in which adjustments arising from translating foreign currency financial statements are accumulated. An example of such a transaction would be a euro borrowing by a U.S. parent. The transaction would be designated as a hedge of the parent’s net investment in its German subsidiary.

2. Gains and losses attributable to intercompany foreign currency transactions that are of a long-term investment nature must be included in the separate component of shareholders’ equity. The parties to the transaction in this case are accounted for by the equity method in the reporting entity’s financial statements.

3. Gains and losses attributable to foreign currency transactions that hedge identifiable foreign currency commitments are to be deferred and included in the measurement of the basis of the related foreign transactions.

The requirements regarding translation of transactions apply both to transactions entered into by a U.S. company and denominated in a currency other than the U.S. dollar and to transactions entered into by a foreign affiliate of a U.S. company and denominated in a currency other than its functional currency. Thus, for example, if a German subsidiary of a U.S. company owed €180,000 and the euro declined from $1.20 to $1.00, the euro amount of the liability would increase from €150,000 (180,000/1.20) to €180,000 (180,000/1.00), for a loss of €30,000. If the subsidiary’s functional currency is the euro, the €30,000 loss must be translated into dollars at the average exchange rate for the period (say, $1.10), and the resulting amount ($33,000) must be included as a transaction loss in the U.S. company’s consolidated statement of income. This loss results even though the liability is denominated in the parent company’s reporting currency because the subsidiary’s functional currency is the euro, and its financial statements must be measured in terms of that currency. Similarly, under FASB 52, if the subsidiary’s functional currency is the U.S. dollar, no gain or loss will arise on the $180,000 liability.

After all financial statements have been converted into the functional currency, the functional currency statements are then translated into dollars, with translation gains and losses flowing directly into the parent’s foreign exchange equity account. If the functional currency is the dollar, the unit’s local currency financial statements must be remeasured in dollars. The objective of the remeasurement process is to produce the same results that would have been reported if the accounting records had been kept in dollars rather than the local currency. Translation of the local currency accounts into dollars takes place according to the temporal method; thus, the resulting translation gains and losses must be included in the income statement.

A large majority of firms have opted for the local currency as the functional currency for most of their subsidiaries. The major exceptions are those subsidiaries operating in Latin American and other highly inflationary countries; they must use the dollar as their functional currency.
Appendix 10A

Application of FASB 52

Sterling Ltd., the British subsidiary of a U.S. company, started business and acquired fixed assets at the beginning of a year when the exchange rate for the pound sterling was £1 = $1.50. The average exchange rate for the period was $1.40, the rate at the end of the period was $1.30, and the historical rate for inventory was $1.45. Refer to Exhibits 10A.2 and 10A.3 for the discussion that follows.

During the year, Sterling Ltd. has after-tax income of £20 million, which goes into retained earnings—that is, no dividends are paid. Thus, retained earnings rise from 0 to £20 million. Exhibit 10A.2 shows how the income statement would be translated into dollars under two alternatives: (1) The functional currency is the pound sterling and (2) the functional currency is the U.S. dollar.

If the functional currency is the pound sterling, Sterling Ltd. will have a translation loss of $22 million, which bypasses the income statement (because the functional currency is identical to the local currency) and appears on the balance sheet as a separate item called *cumulative translation adjustment* under the stockholders’ equity account. The translation loss is calculated as the number that reconciles

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**Exhibit 10A.2**  
**Translation of Sterling Ltd’s Income Statement Under FASB-52 (Millions)**

<table>
<thead>
<tr>
<th></th>
<th>Pound Sterling</th>
<th>U.S. Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>£120</td>
<td>$168</td>
</tr>
<tr>
<td><strong>Cost of goods sold</strong></td>
<td>(50)</td>
<td>(70)</td>
</tr>
<tr>
<td><strong>Depreciation</strong></td>
<td>(20)</td>
<td>(28)</td>
</tr>
<tr>
<td><strong>Other expenses, net</strong></td>
<td>(10)</td>
<td>(14)</td>
</tr>
<tr>
<td><strong>Foreign exchange gain</strong></td>
<td></td>
<td>108</td>
</tr>
<tr>
<td><strong>Income before taxes</strong></td>
<td>40</td>
<td>56</td>
</tr>
<tr>
<td><strong>Income taxes</strong></td>
<td>(20)</td>
<td>(28)</td>
</tr>
<tr>
<td><strong>Net income</strong></td>
<td>£20</td>
<td>$28</td>
</tr>
<tr>
<td><strong>Ratios</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net income to revenue</td>
<td>0.17</td>
<td>0.17</td>
</tr>
<tr>
<td>Gross profit to revenue</td>
<td>0.58</td>
<td>0.58</td>
</tr>
<tr>
<td>Debt to equity</td>
<td>7.33</td>
<td>4.07</td>
</tr>
</tbody>
</table>

**Exhibit 10A.3**  
**Translation of Sterling Ltd.’s Balance Sheet under FASB-52 (Millions)**

<table>
<thead>
<tr>
<th></th>
<th>Pound Sterling</th>
<th>U.S. Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>£100</td>
<td>$130</td>
</tr>
<tr>
<td>Receivables</td>
<td>200</td>
<td>260</td>
</tr>
<tr>
<td>Inventory</td>
<td>300</td>
<td>390</td>
</tr>
<tr>
<td>Fixed assets, net</td>
<td>400</td>
<td>520</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>£1,000</td>
<td>$1,425</td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current liabilities</td>
<td>180</td>
<td>234</td>
</tr>
<tr>
<td>Long-term debt</td>
<td>700</td>
<td>910</td>
</tr>
<tr>
<td><strong>Stockholders’ equity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common stock</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td><strong>Cumulative translation adjustment</strong></td>
<td>(22)</td>
<td>131</td>
</tr>
<tr>
<td><strong>Total liabilities plus equity</strong></td>
<td>£1,000</td>
<td>$1,425</td>
</tr>
</tbody>
</table>
the equity account with the remaining translated accounts to balance assets with liabilities and equity. Exhibit 10A.3 shows the balance sheet translations for Sterling Ltd. under the two alternative functional currencies.

Similarly, if the dollar is the functional currency, the foreign exchange translation gain of $108 million, which appears on Sterling Ltd.’s income statement (because the functional currency differs from the local currency), is calculated as the difference between translated income before currency gains ($23 million) and the retained earnings figure ($131 million). This amount just balances Sterling Ltd.’s books.

Two comments are appropriate here.

1. Fluctuations in reported earnings in the preceding example are reduced significantly under FASB 52 when the local currency is the functional currency, as compared with the case when the U.S. dollar is the functional currency.

2. Key financial ratios and relationships—such as net income-to-revenue, gross profit, and debt-to-equity—are the same when translated into dollars under FASB 52, using the local currency as the functional currency, as they are in the local currency financial statements. These ratios and relationships are significantly different if the dollar is used as the functional currency. The ratios appear at the bottom of Exhibit 10A.2.