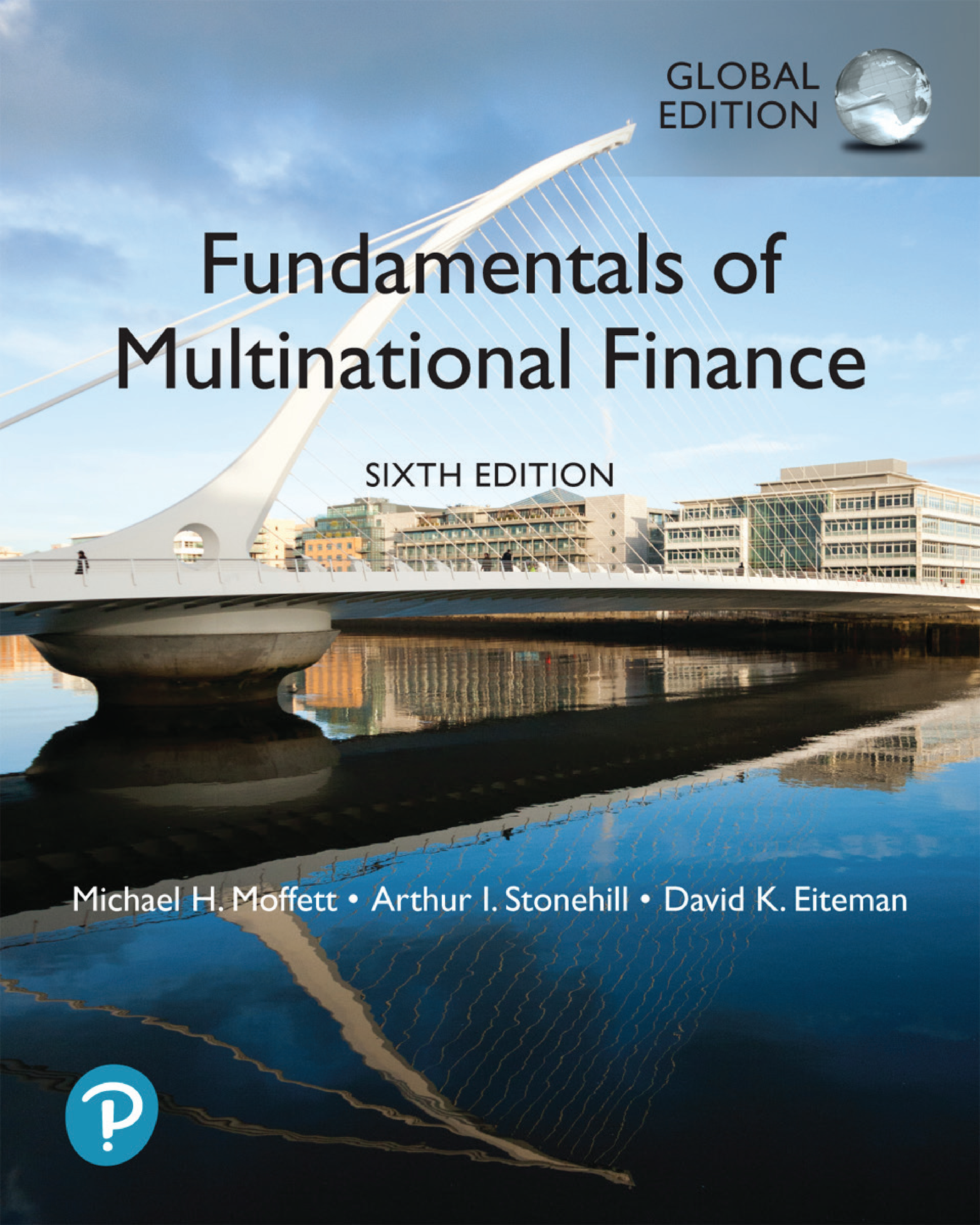

GLOBAL EDITION

Fundamentals of Multinational Finance

SIXTH EDITION

Michael H. Moffett • Arthur I. Stonehill • David K. Eiteman

with MyFinanceLab™

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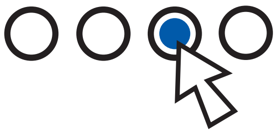

- **Algorithmic Test Bank**—Instructors have the ability to create multiple versions of a test or extra practice for students. Available with select titles.

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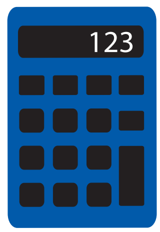

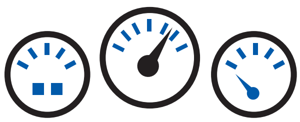

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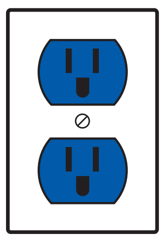

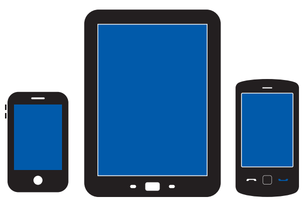

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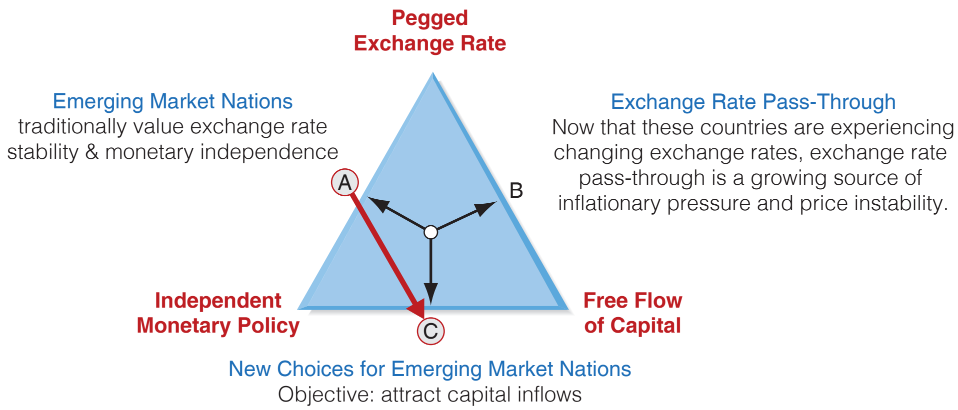
EXHIBIT 6.4 Pass-Through, The Impossible Trinity and Emerging Markets



Many emerging market countries have chosen to move from Point A to Point C, exchanging fixed exchange rates for the chance of attracting capital inflows. The result is that these countries are now the subject to varying levels of exchange rate pass-through.

The Fisher Effect

The Fisher effect, named after economist Irving Fisher, states that nominal interest rates in each country are equal to the required real rate of return plus compensation for expected inflation.

More formally, this is derived from $(1 + r)(1 + \pi) - 1$ as

$$i = r + \pi + r\pi$$

where i is the nominal rate of interest, r is the real rate of interest, and π is the expected rate of inflation over the period of time for which funds are to be lent. The final compound term, $r\pi$ is frequently dropped from consideration due to its relatively minor value. The Fisher effect then reduces to (approximate form):

$$i = r + \pi$$

The Fisher effect applied to the United States and Japan would be as follows:

$$i^{\$} = r^{\$} + \pi^{\$}; \quad i^{¥} = r^{¥} + \pi^{¥}$$

where the superscripts \$ and ¥ pertain to the respective nominal (i), real (r), and expected inflation (π) components of financial instruments denominated in dollars and yen, respectively. We need to forecast the future rate of inflation, not what inflation has been. Predicting the future is, well, difficult.

Empirical tests using *ex post* national inflation rates have shown that the Fisher effect usually exists for short-maturity government securities, such as Treasury bills and notes. Comparisons based on longer maturities suffer from the increased financial risk inherent in fluctuations of the market value of the bonds prior to maturity. Comparisons of private sector securities are influenced by unequal creditworthiness of the issuers. All the tests are inconclusive to the extent that recent past rates of inflation are not a correct measure of future expected inflation.

The International Fisher Effect

The relationship between the percentage change in the spot exchange rate over time and the differential between comparable interest rates in different national capital markets is known as the *international Fisher effect*. "Fisher-open," as it is often termed, states that the spot exchange rate should change in an equal amount but in the opposite direction to the difference in interest rates between two countries. More formally,

$$\frac{S_1 - S_2}{S_2} \times 100 = i^{\$} - i^{¥}$$

where $i^{\$}$ and $i^{¥}$ are the respective national interest rates, and S is the spot exchange rate using indirect quotes (an indirect quote on the dollar is, for example, ¥ = \$1.00) at the beginning of the period (S_1) and the end of the period (S_2). This is the approximation form commonly used in industry. The precise formulation is as follows:

$$\frac{S_1 - S_2}{S_2} = \frac{i^{\$} - i^{¥}}{1 + i^{¥}}$$

Justification for the international Fisher effect is that investors must be rewarded or penalized to offset the expected change in exchange rates. For example, if a dollar-based investor buys a 10-year yen bond earning 4% interest, instead of a 10-year dollar bond earning 6% interest, the investor must be expecting the yen to appreciate vis-à-vis the dollar by at least 2% per year during the 10 years. If not, the dollar-based investor would be better off remaining in dollars. If the yen appreciates 3% during the 10-year period, the dollar-based investor would earn a bonus of 1% higher return. However, the international Fisher effect predicts that, with unrestricted capital flows, an investor should be indifferent to whether his bond is in dollars or yen, because investors worldwide would see the same opportunity and compete it away.

Empirical tests lend some support to the relationship postulated by the international Fisher effect, although considerable short-run deviations occur. A more serious criticism has been posed, however, by recent studies that suggest the existence of a foreign exchange risk premium for most major currencies. Also, speculation in uncovered interest arbitrage creates distortions in currency markets. Thus, the expected change in exchange rates might consistently be greater than the difference in interest rates. *Global Finance in Practice 6.2* poses another recent challenge to the validity of the theory.

GLOBAL FINANCE IN PRACTICE 6.2

Was 2016 the Year of Textbook Failure?

A number of periodicals, including *The Wall Street Journal,* asked why expansionary monetary policy and resulting falling interest rates failed to lower currency values in 2016. International Fisher is very clear: *falling real rates of interest cause currencies to weaken*. Yet, in 2016, when a number of the world's market industrial countries kept expanding money supplies and pushing interest rates down—sometimes to negative levels—the domestic currencies often strengthened. Were the markets ignoring or breaking theory?

The theoretical explanation (or excuse as one expert termed it) was that, in addition to interest rates, the supply and demand for currencies is driven by many other economic and political factors. Central bank efforts to expand money and lower interest rates in 2015 and 2016 were largely focused on preventing recession—all being attempts at trying to kick-start or sustain economic growth. Improving prospects for economic growth may then have acted as magnets, attracting capital in an environment of overall slower economic prospects. It wasn't that lower interest rates attracted capital, it was that lower interest rates improved economic prospects. Stronger economic performance, which is largely a function of consumer and business spending activity, attracts capital investment.

Based upon "Textbook Failure: Why Rate Cuts Have Stopped Working on Currencies; In theory, loosening monetary policy should lower a currency's value, but this year the opposite has been happening," by Gregor Stuart, *The Wall Street Journal*, Aug. 11, 2016.

The Forward Rate

A *forward rate* (or *outright forward* as described in Chapter 5) is an exchange rate quoted today for settlement at some future date. A forward exchange agreement between currencies states the rate of exchange at which a foreign currency will be "bought forward" or "sold forward" at a specific date in the future (typically after 30, 60, 90, 180, 270, or 360 days).

The forward rate is calculated for any specific maturity by adjusting the current spot exchange rate by the ratio of euro currency interest rates of the same maturity for the two subject currencies. For example, the 90-day forward rate for the Swiss franc/U.S. dollar exchange rate ($F^{SF/\$}$) is found by multiplying the current spot rate ($S^{SF/\$}$) by the ratio of the 90-day euro-Swiss franc deposit rate (i^{SF}) over the 90-day eurodollar deposit rate

$$F_{90}^{SF/\$} = S^{SF/\$} \times \frac{\left[1 + \left(i^{SF} \times \frac{90}{360}\right)\right]}{\left[1 + \left(i^{\$} \times \frac{90}{360}\right)\right]}$$

Assuming a spot rate of SF1.4800/\$, a 90-day euro Swiss franc deposit rate of 4.00% per annum, and a 90-day eurodollar deposit rate of 8.00% per annum, the 90-day forward rate is SF1.4655/\$:

$$F_{90}^{SF/\$} = \text{SF}1.4800/\$ \times \frac{\left[1 + \left(0.0400 \times \frac{90}{360}\right)\right]}{\left[1 + \left(0.0800 \times \frac{90}{360}\right)\right]} = \text{SF}1.4800/\$ \times \frac{1.01}{1.02} = \text{SF}1.4655/\$$$

The *forward premium* or *discount* is the percentage difference between the spot and forward exchange rate, stated in annual percentage terms. When the foreign currency price of the home currency is used, as in this case of SF/\$, the formula for the percent-per-annum premium or discount becomes:

$$f^{SF} = \frac{\text{Spot} - \text{Forward}}{\text{Forward}} \times \frac{360}{\text{Days}} \times 100$$

Substituting the SF/\$ spot and forward rates, as well as the number of days forward (90),

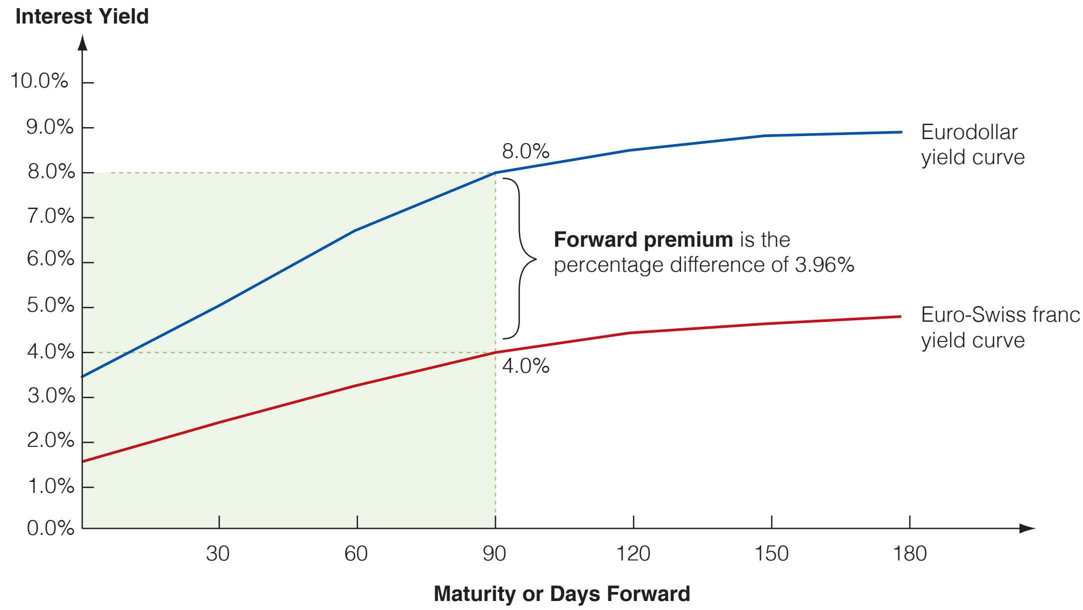
$$f^{SF} = \frac{\text{SF}1.4800/\$ - \text{SF}1.4655/\$}{\text{SF}1.4655/\$} \times \frac{360}{90} \times 100 = +3.96\% \text{ per annum}$$

The sign is positive, indicating that the Swiss franc is *selling forward* at a 3.96% per annum premium over the dollar (it takes 3.96% more dollars to get a franc at the 90-day forward rate).

As illustrated in Exhibit 6.5, the forward premium on the eurodollar forward arises from the differential between eurodollar and Swiss franc interest rates. Because the forward rate for any particular maturity utilizes the specific interest rates for that term, the forward premium or discount on a currency is visually obvious—the currency with the higher interest rate (in this case the U.S. dollar)—will sell forward at a discount, and the currency with the lower interest rate (here the Swiss franc) will sell forward at a premium.

The forward rate is calculated from three observable data items—the spot rate, the foreign currency deposit rate, and the home currency deposit rate—and is not a forecast of the future

EXHIBIT 6.5 Currency Yield Curves and the Forward Premium



spot exchange. However, the forward rate is frequently used as a forecast by managers, yielding mixed results, as the following section describes.

Calculation of Forward Premiums

The percent per annum deviation of the forward from the spot rate is termed the forward premium. However, as with the calculation of percentage changes in spot rates, the forward premium—which may be either a positive (a premium) or negative value (a discount)—depends upon the designated home (or base) currency.

Assume the following spot rate for our discussion of foreign currency terms and home currency terms.

	Foreign currency (price)/ home currency (unit)	Home currency (price)/ foreign currency (unit)
Spot rate	¥118.27/$	USD/JPY 0.0084552
3-month forward	¥116.84/$	USD/JPY 0.0085587

Foreign Currency Terms. Using the foreign currency as the price of the home currency (the unit), JPY/USD spot and forward rates, and 90 days forward, the forward premium on the yen, f^{JPY}, is calculated as follows:

$$f^{\text{JPY}} = \frac{\text{Spot} - \text{Forward}}{\text{Forward}} \times \frac{360}{90} \times 100 = \frac{118.27 - 116.84}{116.84} \times \frac{360}{90} \times 100 = +4.90\%$$

The sign is positive indicating that the Japanese yen is selling forward at a premium of 4.90% against the U.S. dollar.

Home Currency Terms. Using the *home currency* (the dollar) as the price for the *foreign currency* (the yen) and the reciprocals of the spot and forward rates from the previous calculation, the forward premium on the yen, f^{JPY}, is calculated as follows:

$$f^{\text{JPY}} = \frac{(\text{Forward} - \text{Spot})}{\text{Spot}} \times \frac{390}{90} \times 100 = \frac{\frac{1}{116.84} - \frac{1}{118.27}}{\frac{1}{118.27}} \times \frac{360}{90} \times 100 = +4.90\%$$

Again, the result is identical to the previous premium calculation: a positive 4.90% premium of the yen against the dollar.

Interest Rate Parity (IRP)

The theory of *interest rate parity* (IRP) provides the link between the foreign exchange markets and the international money markets. The theory states:

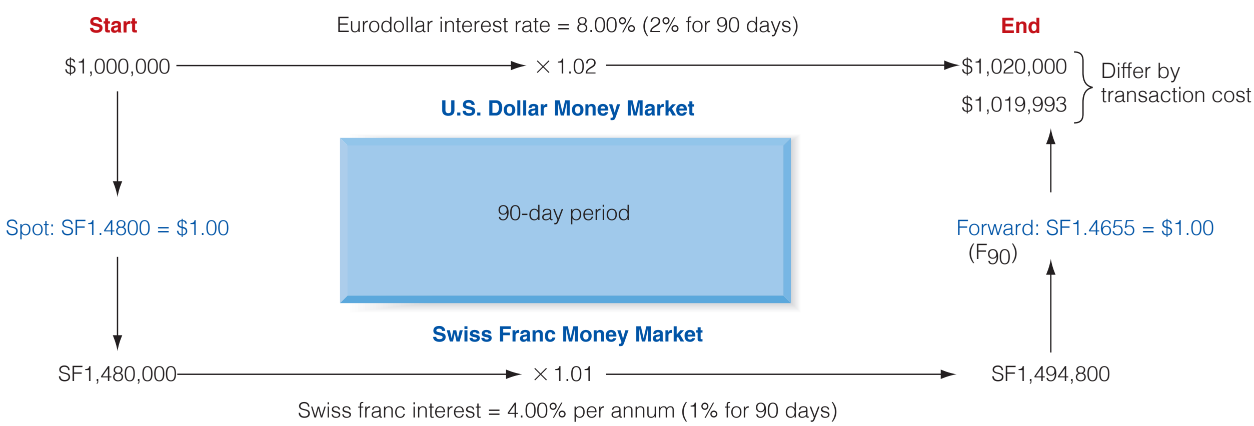
> *The difference in the national interest rates for securities of similar risk and maturity should be equal to, but opposite in sign to, the forward rate discount or premium for the foreign currency, except for transaction costs.*

Exhibit 6.6 shows how the theory of interest rate parity works. Assume that an investor has $1,000,000 and several alternative but comparable Swiss franc (SF) monetary investments. If the investor chooses to invest in a dollar money market instrument, the investor would earn the dollar rate of interest. This results in $(1 + I^{\$})$ at the end of the period, where $I^{\$}$ is the dollar rate of interest in decimal form.

The investor may, however, choose to invest in a Swiss franc money market instrument of identical risk and maturity for the same period. This action would require that the investor exchange the dollars for francs at the spot rate, invest the francs in a money market instrument, sell the francs forward (in order to avoid any risk that the exchange rate would change), and at the end of the period convert the resulting proceeds back to dollars.

A dollar-based investor would evaluate the relative returns of starting in the top-left corner and investing in the dollar market (straight across the top of the box) compared to

EXHIBIT 6.6 **Interest Rate Parity (IRP)**



investing in the Swiss franc market (going down and then around the box to the top-right corner). The comparison of returns would be as follows:

$$(1 + i^{\$}) = S^{SF/\$} \times (1 + i^{SF}) \times \frac{1}{F^{SF/\$}}$$

where S is the spot rate of exchange and F is the forward rate. Substituting in the spot rate (SF1.4800/$) and forward rate (SF1.4655/$) and respective interest rates from Exhibit 6.6, the *interest rate parity condition* is

$$(1 + 0.02) = 1.4800 \times (1 + 0.01) \times \frac{1}{1.4655}$$

The left-hand side of the equation is the gross return the investor would earn by investing in dollars. The right-hand side is the gross return the investor would earn by exchanging dollars for Swiss francs at the spot rate, investing the franc proceeds in the Swiss franc money market, and simultaneously selling the principal plus interest in Swiss francs forward for dollars at the current 90-day forward rate.

Ignoring transaction costs, if the returns in dollars are equal between the two alternative money market investments, the spot and forward rates are considered to be at IRP. The transaction is *covered*, because the exchange rate back to dollars is guaranteed at the end of the 90-day period. Therefore, as shown in Exhibit 6.6, in order for the two alternatives to be equal, any differences in interest rates must be offset by the difference between the spot and forward exchange rates (in approximate form):

$$\frac{F}{S} = \frac{(1 + i^{SF})}{(1 + i^{\$})}, \text{ or } \frac{\text{SF}1.4655/\$}{\text{SF}1.4800/\$} = \frac{1.01}{1.02} = 0.9902 \approx 1\%$$

Covered Interest Arbitrage (CIA)

The spot and forward exchange markets are not constantly in the state of equilibrium described by interest rate parity. When the market is not in equilibrium, the potential for "riskless" or arbitrage profit exists. The arbitrager who recognizes such an imbalance will move to take advantage of the disequilibrium by investing in whichever currency offers the higher return on a covered basis. This is called *covered interest arbitrage* (CIA).

Exhibit 6.7 describes the steps that a currency trader, most likely working in the arbitrage division of a large international bank, would implement to perform a CIA transaction. The currency trader, Fye Hong, may utilize any of a number of major eurocurrencies that his bank holds to conduct arbitrage investments. The morning conditions indicate to Fye Hong that a CIA transaction that exchanges 1 million U.S. dollars for Japanese yen, invested in a six-month euroyen account and sold forward back to dollars, will yield a profit of $4,638 ($1,044,638 − $1,040,000) over and above the profit available from a eurodollar investment. Conditions in the exchange markets and euromarkets change rapidly however, so if Fye Hong waits even a few minutes, the profit opportunity may disappear.

Fye Hong now executes the following transaction:

Step 1: Convert $1,000,000 at the spot rate of ¥106.00/$ to ¥106,000,000 (see "Start" in Exhibit 6.7).

Step 2: Invest the proceeds, ¥106,000,000, in a euroyen account for six months, earning 4.00% per annum, or 2% for 180 days.