Multinational Business Finance

SIXTEENTH EDITION

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Global Edition

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The *forward premium* or discount, f, 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 forward premium or discount on the Swiss franc, f^{SF}, 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.)

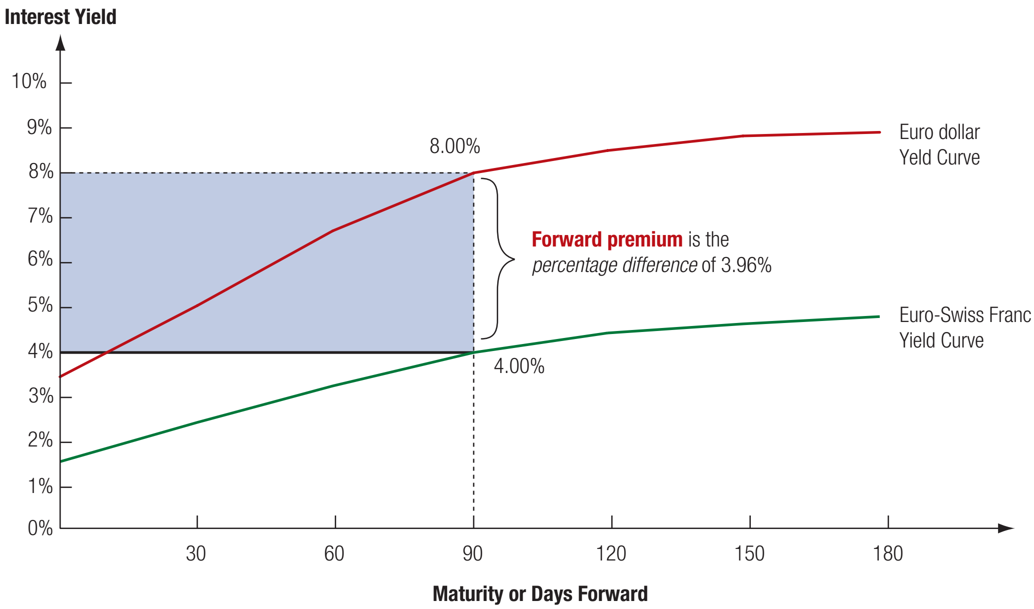
As illustrated in Exhibit 6.4, the forward premium on the eurodollar forward arises from the differential between eurodollar and Swiss franc interest rates. Because the forward rate for any particular maturity utilizes the specific interest rates for that term, the forward premium or discount on a currency 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 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

EXHIBIT 6.4 Currency Yield Curves and the Forward Premium



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 = $1.00	$0.0084552 = ¥1.00
3-month forward	¥116.84 = $1.00	$0.0085587 = ¥1.00

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:

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

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

Forward rates have been a pillar of multinational financial management for 50 years. Their rates or values, however, have structurally changed—fallen—as short-term money market interest rates have trended downward over time. That trend, described in *Global Finance in Practice 6.3*, continues.

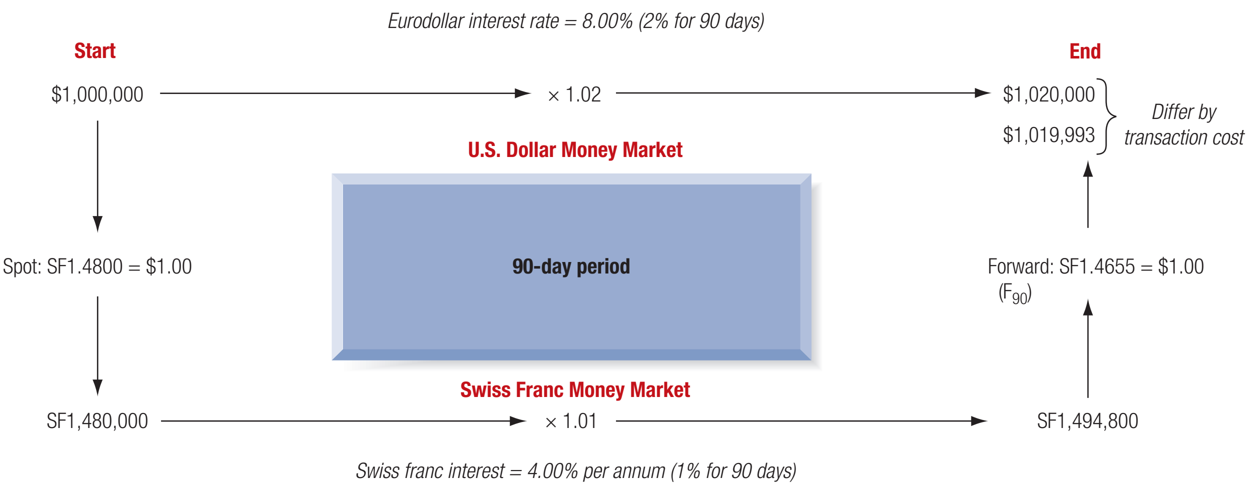
Interest Rate Parity (IRP)

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 6.5 shows how the theory of IRP works. Assume that an investor has $1,000,000 and several alternative but comparable Swiss franc (SF) monetary investments. If the investor

EXHIBIT 6.5 **Interest Rate Parity (IRP)**



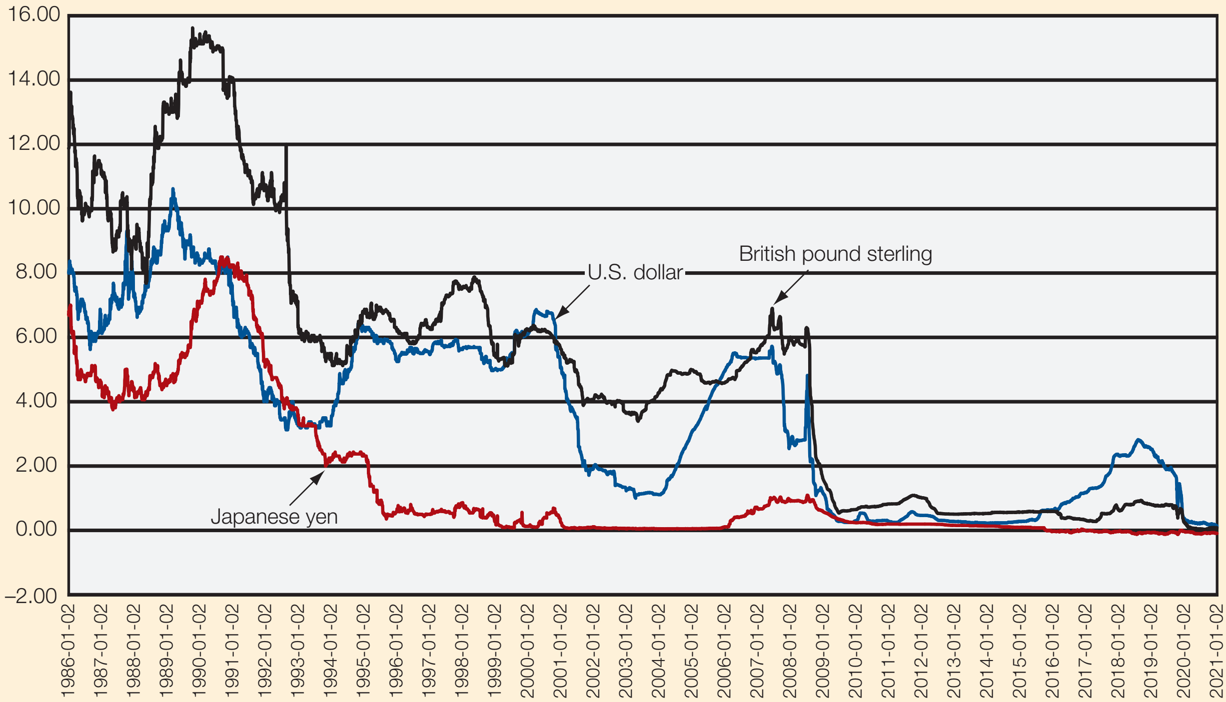
GLOBAL FINANCE IN PRACTICE 6.3

Global Money Market Interest Rates, 1986–2021

The price of money has clearly gotten cheaper over the past four decades. The most commonly used reference rate of interest for bank loans and financial derivatives, the 3-month London Interbank Offered Rate or LIBOR, has clearly trended down for three of the world's largest business-based currencies, the U.S. dollar, British pound sterling, and Japanese yen.

The drivers of change in the levels of these three major currency money rates lie with the Fisher effect $(j = r + \pi)$. First, major economies like those of the United Kingdom and United States suffered and then rid themselves of inflationary forces, the π. The source of that inflation was primarily that of political economy—economic stimulus in the pursuit of full employment. Those same concerns gave birth to the next downward drive in interest rates, the fall to near-zero in the real return to capital, r, in the aftermath of the global financial crisis of 2008–2010. And just when interest rates started to claw their way up from zero, the global pandemic of 2020 forced governments to open up the monetary spigots once more.

3-Month LIBOR, 1986–2021 (daily, percent per annum)



Source: FRED database, Federal Reserve Bank of St. Louis.

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 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 $(SF1.4800 = \$1.00)$ and forward rate $(SF1.4655 = \$1.00)$ and respective interest rates from Exhibit 6.5, the *interest rate parity condition* is

$$(1 + .02) = 1.4800 \times (1 + .01) \times \frac{1}{1.4655}$$

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):

$$\frac{F}{S} = \frac{(1 + i^{SF})}{(1 + i^{\$})}, \text{ or } \frac{SF1.4655}{SF1.4800} = \frac{1.01}{1.02} = 0.9902 \approx 1\%$$

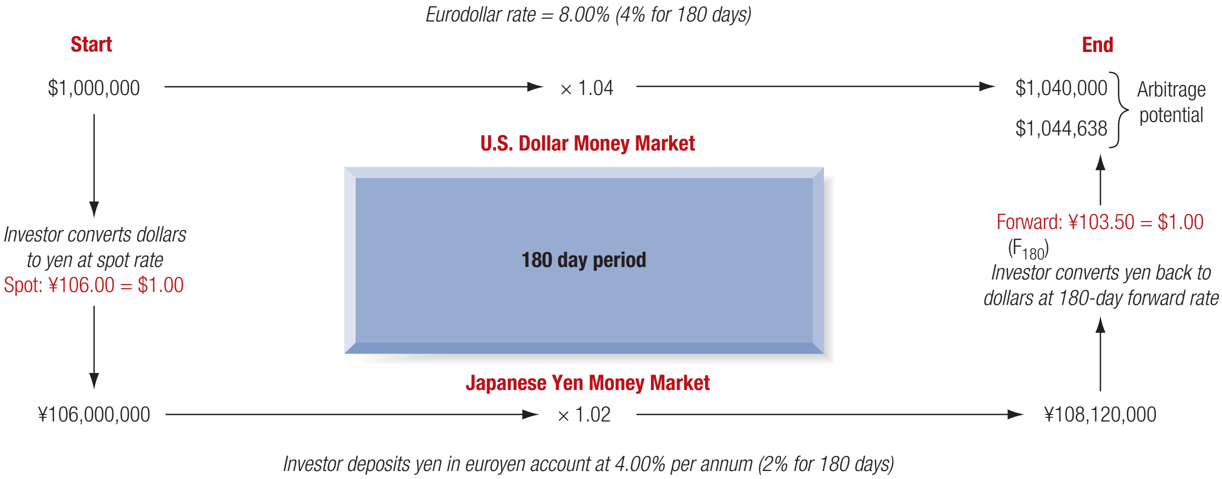
Covered Interest Arbitrage (CIA)

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 the currency offering the higher return on a covered basis. This is called *covered interest arbitrage* (CIA).

Exhibit 6.6 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 U.S.$1 million 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 euro dollar 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:

EXHIBIT 6.6 Covered Interest Arbitrage (CIA)



Step 1: Convert $1,000,000 at the spot rate of ¥106.00 = $1.00 to ¥106,000,000 (see "Start" in Exhibit 6.6).

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.

Step 3: Simultaneously sell the future yen proceeds (¥108,120,000) forward for dollars at the 180-day forward rate of ¥103.50 = $1.00. This action "locks in" gross dollar revenues of $1,044,638 (see "End" in Exhibit 6.6).

Step 4: Calculate the cost (opportunity cost) of funds used at the eurodollar rate of 8.00% per annum, or 4% for 180 days, with principal and interest then totaling $1,040,000. Profit on CIA ("End") is $4,638 ($1,044,638 − $1,040,000).

Note that all profits are stated in terms of the currency in which the transaction was initialized, but that a trader may conduct investments denominated in U.S. dollars, Japanese yen, or any other major currency. All that is required to make a covered interest arbitrage profit is for interest rate parity not to hold. Depending on the relative interest rates and forward premium, Fye Hong would have started in Japanese yen, invested in U.S. dollars, and sold the dollars forward for yen. The profit would then end up denominated in yen. But how would Fye Hong decide in which direction to go around the box in Exhibit 6.6?

Rule of Thumb. The key to determining whether to start in dollars or yen is to compare the differences in interest rates to the forward premium on the yen (the "cost of cover"). For example, in Exhibit 6.6, the difference in 180-day interest rates is 2.00% (dollar interest rates are higher by 2.00%). The premium on the yen for 180 days forward is as follows:

$$f^{¥} = \frac{\text{Spot} - \text{Forward}}{\text{Forward}} \times \frac{360}{180} \times 100 = \frac{¥106.00 - ¥103.50}{¥103.50} \times 200 = 4.8309\%$$

In other words, by investing in yen and selling the yen proceeds forward at the forward rate, Fye Hong earns more on the combined interest rate arbitrage and forward premium than if he continues to invest in dollars.

Arbitrage Rule of Thumb: *If the difference in interest rates is greater than the forward premium (or expected change in the spot rate), invest in the higher interest yielding currency. If the difference in interest rates is less than the forward premium (or expected change in the spot rate), invest in the lower interest yielding currency.*

Using this rule of thumb should enable Fye Hong to choose in which direction to go around the box in Exhibit 6.6. It also guarantees that he will always make a profit if he goes in the right direction. This rule assumes that the profit is greater than any transaction costs incurred. This process of CIA drives the international currency and money markets toward the equilibrium described by interest rate parity. Slight deviations from equilibrium provide opportunities for arbitragers to make small riskless profits. Such deviations provide the supply and demand forces that will move the market back toward parity (equilibrium).

Covered interest arbitrage opportunities continue until interest rate parity is reestablished, because the arbitragers are able to earn risk-free profits by repeating the cycle as often as possible. Their actions, however, nudge the foreign exchange and money markets back toward equilibrium for the following reasons:

1. The purchase of yen in the spot market and the sale of yen in the forward market narrows the premium on the forward yen. This is because the spot yen strengthens from the extra demand and the forward yen weakens because of the extra sales. A narrower premium on the forward yen reduces the foreign exchange gain previously captured by investing in yen.
2. The demand for yen-denominated securities causes yen interest rates to fall, and the higher level of borrowing in the U.S. causes dollar interest rates to rise. The net result is a wider interest differential in favor of investing in the dollar.

Uncovered Interest Arbitrage (UIA)

A deviation from covered interest arbitrage is *uncovered interest arbitrage* (UIA), wherein investors borrow in countries and currencies exhibiting relatively low interest rates and convert the proceeds into currencies that offer much higher interest rates. The transaction is "uncovered," because the investor does not sell the higher yielding currency proceeds forward, choosing to remain uncovered and accept the currency risk of exchanging the higher yield currency into the lower yielding currency at the end of the period. Exhibit 6.7 demonstrates the steps an uncovered interest arbitrager takes when undertaking what is called the "yen carry trade."

The "yen carry trade" is an age-old application of UIA. Investors, from both inside and outside Japan, take advantage of extremely low interest rates in Japanese yen (0.40% per annum) to raise capital. Investors exchange the capital they raise for other currencies like U.S. dollars or euros. Then they reinvest these dollar or euro proceeds in dollar or euro money markets where the funds earn substantially higher rates of return (5.00% per annum in Exhibit 6.7). At the end of the period—a year, in this case—they convert the dollar proceeds back into yen in the spot market. The result is a tidy profit over what it costs to repay the loan.

The trick, however, is that the spot exchange rate at the end of the year must not change significantly from what it was at the beginning of the year. If the yen were to appreciate significantly against the dollar, as it did in late 1999, moving from ¥120 = $1.00 to ¥105 = $1.00, these "uncovered" investors would suffer sizable losses when they convert their dollars into yen to repay the yen they borrowed. Higher return at higher risk. The mini-case at the end of this chapter details one of the most frequent carry trade structures, the Australian dollar/Japanese yen cross rate.