Chapter 1
Currency Exchange Rates

Note: In the sixth edition of *Global Investments*, the exchange rate quotation symbols differ from previous editions. We adopted the convention that the first currency is the quoted currency in terms of units of the second currency.

For example, €:$ = 1.4 indicates that one euro is priced at 1.4 dollars. In previous editions we used the reversed convention $/€ = 1.4, meaning 1.4 dollars per euro.

All problems in this test bank still use the old convention and have not been adapted to reflect the new quotation symbols used in the 6th edition.

■ Questions and Problems

1. You noticed that the exchange rate between the Korean won and the U.S. dollar has changed considerably. The won/dollar exchange rate has moved from 800 won per dollar to 1000 won per dollar.
   a. Has the Korean won appreciated or depreciated with respect to the dollar? By what percentage?
   b. By what percentage has the value of the dollar changed with respect to the won?

   Solution
   a. One won was worth 1/800 or 0.00125 dollars earlier. It is worth 1/1000 or 0.001 dollars now. Thus, the won has depreciated with respect to the dollar. Percentage change in the dollar value of the won

   $$= \left(\frac{0.001 - 0.00125}{0.00125} \right) 100\% = -20\%.$$

   b. One dollar was worth 800 won earlier and is worth 1000 won now. Percentage change in the value of the dollar

   $$= \left(\frac{1000 - 800}{800} \right) 100\% = 25.0\%.$$

2. Here are some quotes of the Japanese yen/U.S. dollar spot exchange rate given simultaneously on the phone by three banks:

Bank A:	121.15–121.30
Bank B:	121.22–121.35
Bank C:	121.20–121.25

   Are these quotes reasonable? Do you have an arbitrage opportunity?

Solution

These quotes are reasonable. There is no way to make a riskless arbitrage by buying dollars for yen from one bank at its ask rate and selling dollar for yen to another at its bid rate. If you need to buy dollars, you are better off buying them from Bank C at 121.25 yen per dollar. If you need to sell dollars, you are better off selling them from Bank B at 121.22 yen per dollar.

3. Here are some quotes of the Swiss franc/U.S. dollar spot exchange rate given simultaneously on the phone by three banks:

Bank A:	1.3435–1.3440
Bank B:	1.3435–1.3445
Bank C:	1.3445–1.3450

   Are these quotes reasonable? Do you have an arbitrage opportunity?

   Solution

   These quotes are unreasonable since they deviate from Bank A to Bank C by more than the spread; for example, Bank A's ask rate (1.3440 Swiss francs per dollar) is smaller than Bank C's bid rate (1.3445 Swiss francs per dollar). There is, therefore, an obvious arbitrage opportunity. One can buy Bank A's dollars for 1.3440 Swiss francs per dollar, sell these dollars to Bank C for 1.3445 Swiss francs per dollar, and thereby make a profit of 0.0005 franc per dollar traded. This is a riskless, instantaneous operation that requires no initial investment.

4. You visit the foreign exchange trading room of a major bank. A trader asks for quotations of the British pound from various correspondents and hears the following quotes:

From Bank A:	1.6580–1.6585
From Bank B:	1.6582–1.6587

   What do they mean?

   Solution

   These quotations mean that Bank A is willing to buy a pound for 1.6580 dollars (bid rate) or to sell one for 1.6585 dollars (ask rate). Bank B's $/€ bid rate is 1.6582; its ask rate is 1.6587. That is, Bank B is willing to buy a pound for 1.6582 dollars or to sell one for 1.6587 dollars.

5. The euro is quoted as $/€ = 1.1420–1.1425, and the Canadian dollar is quoted as C$/US$ = 1.3540–1.3545. What is the implicit C$/€ quotation?

   Solution

   The C$/€ quotation is obtained as follows. In obtaining this quotation, we keep in mind that C$/€ = C$/$ × $/€, and that the price for each transaction (bid or ask) is the one that is more advantageous to the trader.

   The C$/€ bid price is the number of Canadian dollars that a trader is willing to pay for one euro. This transaction (buy euro–sell Canadian dollars) is equivalent to selling Canadian dollars to buy U.S. dollars (at a bid rate of 1.3540), and then selling those U.S. dollars to buy euros (at a bid rate of 1.1420). Mathematically, the transaction is as follows:

   $$(\text{bid C\$/\$}) \times (\text{bid \$/€}) = 1.3540 \times 1.1420 = 1.54627.$$

The C\$/€ ask price is the number of Canadian dollars that a trader is asking for one euro. This transaction (sell euros–buy Canadian dollars) is equivalent to buying Canadian dollars with U.S. dollars (at an ask rate of 1.3545) and simultaneously purchasing these dollars against euros (at an ask rate of 1.1425). Mathematically, this can be expressed as follows:

$$(\text{ask C\$/\$}) \times (\text{ask \$/€}) = 1.3545 \times 1.1425 = 1.54752.$$

So the resulting quotation by the trader is:

$$\text{C\$/€} = 1.54627\text{–}1.54752.$$

6. The euro is quoted as €/\$ = 0.79610–0.79650, and the Australian dollar is quoted as A\$/\$ = 1.5675–1.5685. What is the implicit A\$/€ quotation?

    Solution
    The "bid" A\$/€ is given by:

    $$(\text{bid A\$/\$})/(\text{ask €/\$}) = 1.5675/0.79650 = 1.9680.$$

    The "ask" A\$/€ is given by:

    $$(\text{ask A\$/\$})/(\text{bid €/\$}) = 1.5685/0.79610 = 1.9702.$$

    So the implicit A\$/€ quotation is:

    $$\text{A\$/€} = 1.9680\text{–}1.9702.$$

7. A foreign exchange trader quotes the dollar value of one euro as \$/€ = 1.1510–1.1520.

    These are direct bid–ask rates for a New York trader. What would be the implicit indirect quotes for €/\$?

    Solution
    The indirect bid would be:

    $$(\text{bid €/\$}) = 1/(\text{ask \$/€}) = 1/1.520 = 0.86805.$$

    The indirect ask would be:

    $$(\text{ask €/\$}) = 1/(\text{bid \$/€}) = 1/1.1510 = 0.86881.$$

    The implicit €/\$ quote would be: 0.86805–0.86881.

8. The spot \$/€ is equal to 1.1795. The one-year interest rates on the Eurocurrency market are 4% in euros and 5% in U.S. dollars. The one-month interest rates are 3% in euros and 4% in U.S. dollars.
    a. What is the one-year forward exchange rate?
    b. What is the one-month forward exchange rate?

    Solution
    According to interest rate parity, the forward exchange rate is equal to the spot exchange rate adjusted by the interest rate differential.

Hence, the one-year $/€ forward rate is given by:

$$\$/€ = 1.1795\frac{1.05}{1.04} = 1.1908.$$

The one-month $/€ forward rate is given by:

$$\$/€ = 1.1795\frac{1+(4/12)\%}{1+(3/12)\%} = 1.1805.$$

9. The bid–ask rates are as follows:
    Spot exchange rate:

    ¥/$ 102.40–48

    Interest rates:

    One-year interest rate in ¥ $1\frac{1}{2} - \frac{5}{8}$
    One-year interest rate in $ $9\frac{1}{8} - \frac{1}{4}$

    What is the quotation for the one-year ¥/$ forward exchange rate?

    Solution
    The bid forward exchange rate is:

    $$\text{¥/\$} = 102.40\frac{1+1.5\%}{1+9.25\%} = 95.1359.$$

    The ask forward exchange rate is:

    $$\text{¥/\$} = 102.48\frac{1+1.625\%}{1+9.125\%} = 95.4367.$$

    Therefore, the quotation for the one-year ¥/$ forward exchange rate is 95.1359–95.4367.

10. The bid–ask rates are as follows:
    Spot exchange rate:

    CHF/USD: 1.4100–1.4140

    Interest rates:

    One-month CHF $1\frac{1}{2} - \frac{5}{8}$
    One-year CHF $1\frac{1}{4} - \frac{1}{2}$
    One-month USD $5\frac{1}{8} - \frac{1}{4}$
    One-year USD $5\frac{1}{2} - \frac{3}{4}$

    What are the quotations for the one-month and one-year CHF/USD forward exchange rates?

    Solution
    a. The bid one-month forward exchange rate is:

    $$\text{CHF/USD} = 1.4100\frac{1+(1.50/12)\%}{1+(5.25/12)\%} = 1.4056.$$

The ask one-month forward exchange rate is:

$$\text{CHF/USD} = 1.4140 \frac{1+(1.625/12)\%}{1+(5.125/12)\%} = 1.4099.$$

Hence, the quotation for the CHF/USD one-month forward exchange rate is: 1.4056–1.4099.

b. The bid one-year forward exchange rate is:

$$\text{CHF/USD} = 1.4100 \frac{1+1.25\%}{1+5.75\%} = 1.3500.$$

The ask one-year forward rate is:

$$\text{CHF/USD} = 1.4140 \frac{1+1.5\%}{1+5.5\%} = 1.3604.$$

Then, the quotation for the CHF/USD one-year forward exchange rate is: 1.3500–1.3604.

11. Here are some quotes for spot exchange rates and three-month interest rates:
Spot exchange rates:

\$/€	1.1865–1.1870
¥/\$	108.10–108.20

Interest rates:

Three-month euro-\$	$5-5^{1}/_{4}$
Three-month euro-€	$3^{1}/_{4}-3^{1}/_{2}$
Three-month euro-¥	$1^{1}/_{4}-1^{1}/_{2}$

What should the quotes be for:
a. The ¥/€ spot exchange rate?
b. The €/\$ three-month forward exchange rate?
c. The ¥/€ three-month forward exchange rate?

Solution

a. ¥/€ bid = 108.10 × 1.1865 = 128.2606.
    ¥/€ ask = 108.20 × 1.1870 = 128.4334.

b. €/\$ three-month bid $= 0.8425 \frac{1+(3.25/4)\%}{1+(5.25/4)\%} = 0.8383.$

    €/\$ three-month ask $= 0.8428 \frac{1+(3.50/4)\%}{1+(5.00/4)\%} = 0.8397.$

    The €/\$ three-month forward exchange rate is: 0.8383–0.8397.

c. ¥/€ three-month bid $= 128.2606 \frac{1+(1.25/4)\%}{1+(3.50/4)\%} = 127.5454.$

    ¥/€ three-month ask $= 128.4334 \frac{1+(1.50/4)\%}{1+(3.25/4)\%} = 127.8760.$

    The ¥/€ three-month forward exchange rate is: 127.5454–127.8760.

12. The bid–ask rates are as follows:

    Spot exchange rate:

CHF/USD:	1.5500–1.5540

    Interest rates:

One-month CHF	$3\frac{1}{2} - \frac{5}{8}$
One-year CHF	$4\frac{1}{4} - \frac{1}{2}$
One-month USD	$6\frac{1}{8} - \frac{1}{4}$
One-year USD	$6\frac{1}{2} - \frac{3}{4}$

    What are the quotations for the one-month and one-year CHF/USD forward exchange rates?

    Solution

    a. The bid one-month forward exchange rate is:

    $$\text{CHF/USD} = 1.5500 \frac{1 + (3.50/12)\%}{1 + (6.25/12)\%} = 1.5465.$$

    The ask one-month forward exchange rate is:

    $$\text{CHF/USD} = 1.5540 \frac{1 + (3.625/12)\%}{1 + (6.125/12)\%} = 1.5508.$$

    Hence, the quotation for the CHF/USD one-month forward exchange rate is: 1.5465–1.5508.

    b. The bid one-year forward exchange rate is:

    $$\text{CHF/USD} = 1.5500 \frac{1 + 4.25\%}{1 + 6.75\%} = 1.5137.$$

    The ask one-year forward rate is:

    $$\text{CHF/USD} = 1.5540 \frac{1 + 4.5\%}{1 + 6.5\%} = 1.5248.$$

    Then, the quotation for the CHF/USD one-year forward exchange rate is: 1.5137–1.5248.

13. A French company knows that it will have to pay 10 million Swiss francs in three months. The current spot exchange rate is 0.6000 €/SFr. The three-month forward rate is 0.603 €/SFr. The treasurer is worried that the euro will depreciate in the next few weeks.

    a. What action can be taken?

    b. Three months later, the spot exchange rate turns out to be 0.620 €/SF; was it a wise decision?

    Solution

    If the treasurer is worried that the euro might depreciate in the next three months, he will certainly be willing to hedge his foreign exchange position right away by trading this risk against the premium included in the forward exchange rate.

    a. He will therefore buy 10 million Swiss francs on the three-month forward market at the rate of 0.603 €/SFr. The transaction will be contracted as of the current date but delivery and settlement will only take place three months later. The forward premium is equal to 0.5% for three months, or 2% annualized.

b.   Since the spot exchange rate on the day of delivery (0.620 €/SFr) happens to be higher than the contract's forward rate (0.603 €/SFr), this decision can retrospectively be regarded as a wise one. The treasurer paid 10 M × 0.603 = 6.03 million euros on the forward market instead of 10 M × 0.620 = 6.20 million if he had paid on the spot market. 0.17 million euros were saved through this strategy.

14.   If the exchange rate value of the euro goes from U.S. $1.15 to U.S. $1.05, then:
   a.   The euro has appreciated, and Europeans will find U.S. goods cheaper.
   b.   The euro has appreciated, and Europeans will find U.S. goods more expensive.
   c.   The euro has depreciated, and Europeans will find U.S. goods more expensive.
   d.   The euro has depreciated, and Europeans will find U.S. goods cheaper.

Solution

Since the value of the euro in U.S. $ has gone down, it has depreciated with respect to the U.S. $. Therefore, Europeans will have to spend more euros to purchase U.S. goods. Accordingly, the correct answer is (c).

15.   You are a foreign exchange dealer. You see the following quote on your Reuter's screen:
   a.   The spot exchange rate of the Swedish krona is equal to 5.7 SKr per U.S. dollar. The three-month interest rates are 12% in SKr and 8% in dollars. What is the three-month forward exchange that you should quote?
   b.   In the language of currency traders would the Swedish krona be considered as "strong" or "weak" relative to the U.S. dollar?
   c.   Compute the annualized discount or premium on the dollar relative to the krona.
   d.   After a careful look at your screen, you discover that the spot exchange rate is really 5.7000– 5.7015. The 12-month interest rates are $12\frac{1}{4} - \frac{1}{2}\%$ in SKr and $8\frac{1}{4} - \frac{1}{2}\%$ in U.S. dollars. What should be the bid–ask quote on the one-year forward SKr/$ rate?
   e.   A Swedish exporting firm expects to be paid $1 million in three months. Please simulate the SKr value of this payment if in three months, the spot exchange rate is equal to SKr/$ = 5 and SKr/$ = 6. What would be the value of this payment if the firm had hedged against currency movements using the forward rate calculated in (a)?

Solution
   a.   The three-month forward exchange rate is equal to:

$$F = 5.7(1 + 12/4\%)/(1 + 8/4\%) = 5.7559 \text{ SKr/\$.}$$

   b.   The dollar is considered as "strong" relative to the Swedish krona because its forward value is higher than its spot value (5.7559 > 5.7000). Conversely, the Swedish krona is considered as "weak" relative to the dollar.
   c.   The dollar quotes at a premium relative to the krona, as the dollar forward value is higher than its spot value.

   Difference between the forward and spot rates = 0.0559.

$$\text{Annualized premium} = \left(\frac{\text{Difference between forward and spot rates}}{\text{Spot rate}}\right)\left(\frac{12}{\text{No. months forward}}\right)100\%$$

$$= \left(\frac{0.0559}{5.700}\right)\left(\frac{12}{3}\right)100\% = 3.9\%$$

d. The bid–ask quote on the one-year forward SKr/$ rate is:
    Bid forward:

$$(\text{bid SKr/\$}) = 5.7000\ (1 + 12\tfrac{1}{4}\%)/(1 + 8\tfrac{1}{2}\%) = 5.8970\ \text{SKr/\$}.$$

    Ask forward:

$$(\text{ask SKr/\$}) = 5.7015\ (1 + 12\tfrac{1}{2}\%)/(1 + 8\tfrac{1}{4}\%) = 5.9253\ \text{SKr/\$}.$$

e. The SKr value of the US $1 million payment:
    Spot exchange:

SKr/$	5.00	6.00
Value of the payment (SKr):	5 million	6 million

    If the firm had hedged using the three-month forward exchange rate, the value of the payment would be: 5,755,900 SKr.

16. A Turkish clothing company is buying material in Mexico. It needs to pay 1 million Mexican pesos. The exchange rates published in a local newspaper are as follows:

- One U.S. dollar is worth 1356 Turkish liras.
- One U.S. dollar is worth 129.64 Mexican pesos.

The Turkish company calls its local banker, who advises that it needs to do two foreign exchange transactions: One selling liras to buy dollars, and the other buying pesos with these dollars. The company is surprised that its banker does not engage directly in a single transaction from liras to pesos. Why would the bid–ask spread be much larger on the lira/peso transaction than the sum of the bid–ask spread of the two lira/dollar and peso/dollar transactions?

Solution

For each currency, there exists a "wholesale" foreign exchange market only against the U.S. dollar. This rule suffers very few exceptions, such as other European currencies against the euro, or some Asian currencies against the yen. This is motivated by liquidity.

A market between the Turkish lira and the Mexican peso would see very few daily transactions, if any. Hence, liquidity would be very limited. Any bank making a firm bid–ask quote would have to take a huge spread as it may take several days to unwind a position. In reality, all transactions involving the lira (and another foreign currency) are done against the U.S dollar. So, there are two transactions; first the lira against the dollar and then the foreign currency against the dollar (except of course when the foreign currency is the dollar itself). Similarly, any transaction involving the peso is done against the U.S. dollar. Because there are quite a few daily transactions involving the lira against all other currencies, the bid–ask spread on the lira/dollar exchange rate is fairly low. It is better to have to pay two small spreads than a single large one.