Chapter 1
Currency Exchange Rates

1. Since the value of the British pound in U.S. dollars has gone down, it has depreciated with respect to the U.S. dollar. Therefore, the British will have to spend more British pounds to purchase U.S. goods. Accordingly, the correct answer is (c).

2. Since the number of Australian dollars needed to purchase one U.S. dollar has decreased from 1.60 to 1.50, the Australian dollar has appreciated with respect to the U.S. dollar. Therefore, the Australians will have to spend fewer Australian dollars to purchase U.S. goods. Accordingly, the correct answer is (a).

3. The value of the dollar in Swiss francs has gone up from about 1.20 to about 1.60. Therefore, the dollar has appreciated relative to the Swiss franc, and the dollars needed by Americans to purchase Swiss goods have decreased. Thus, the statement is correct.

4. a. One baht was worth 1/25 or 0.04 dollars earlier. It is worth 1/30 or 0.0333 dollars now. Thus, the baht has depreciated with respect to the dollar. Percentage change in the dollar value of the baht = $((0.0333 - 0.04)/0.04)100\% = -16.7\%$.
   b. One dollar was worth 25 bahts earlier and is worth 30 bahts now. Percentage change in the value of the dollar = $((30 - 25)/25)100\% = 20.0\%$.

5. The increase in £:$ exchange rate implies that the pound has appreciated with respect to the dollar. This is unfavorable to the trader since the trader has a short position in pounds.

   Bank's liability in dollars initially was 5,000,0000 × 1.45 = $7,250,000

   Bank's liability in dollars now is 5,000,0000 × 1.51 = $7,550,000

   Thus, the bank's liability has increased by $300,000.

6. Three cross-exchange rates need to be computed: SFr/€, ¥/€, SFr/¥.
   a. €:SFr = $:SFr × €:$ = SFr 1.5971 per $ × $ 0.9119 per € = 1.4564
   b. €:¥ = $:¥ × €:$ = ¥ 128.17 per $ × $ 0.9119 per € = 116.88
   c. ¥:SFr = $:SFr × ¥:$ = ($:SFr) ÷ ($:¥) = (SFr 1.5971 per $)/(¥ 128.17 per $) = 0.0125

7. These quotations mean that Bank A is willing to buy one euro for 1.1210 dollars (bid rate) or to sell one for 1.1215 dollars (ask rate). Bank B's €:$ bid rate is 1.1212; its ask rate is 1.1217. That is, Bank B is willing to buy one euro for 1.1212 dollars or to sell one for 1.1217 dollars.

8. The percentage spread is considerably higher for the Polish zloty than for the British pound. The market for the Polish zloty is much less liquid than the market for the British pound. There is a lot more competition between market makers for the British pound than for the Polish zloty. Consequently, the percentage spread is considerably higher for the Polish zloty than for the British pound.

9. These quotes are unreasonable because they deviate from Bank A to Bank B by more than the spread; for example, Bank A's ask rate (121.25) is smaller than Bank B's bid rate (121.30). There is, therefore, an arbitrage opportunity. One can buy Bank A's dollars for 121.25 yen per dollar, sell these dollars to Bank B for 121.30 yen per dollar, and thereby make a profit of 0.05 yen per dollar traded. This is a riskless, instantaneous operation that requires no initial investment.

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

    The €:SFr bid price is the number of Swiss francs that a trader is willing to pay for one euro. This transaction (buy euro–sell Swiss francs) is equivalent to selling Swiss francs to buy dollars (at a bid rate of 1.4100), and then selling those dollars to buy euros (at a bid rate of 1.1610). Mathematically, the transaction is as follows:

    $$(\text{bid \$:SFr}) \times (\text{bid €:\$}) = 1.4100 \times 1.1610 = 1.6370$$

    The €:SFr ask price is the number of Swiss francs that a trader is asking for one euro. This transaction (sell euros–buy Swiss francs) is equivalent to buying Swiss francs with dollars (at an ask rate of 1.4120) and simultaneously purchasing these dollars against euros (at an ask rate of 1.1615). Mathematically, this can be expressed as follows:

    $$(\text{ask \$:SFr}) \times (\text{ask €:\$}) = 1.4120 \times 1.1615 = 1.6400$$

    So the resulting quotation by the trader is

    $$\text{€:SFr} = 1.6370 - 1.6400$$

11. The A\$:SFr quotation is obtained as follows. In obtaining this quotation, we keep in mind that A\$:SFr = (\$:SFr) ÷ (\$:A\$), and that the price (bid or ask) for each transaction is the one that is more advantageous to the bank.

    The A\$:SFr bid price is the number of SFr the bank is willing to pay to buy one A\$. This transaction (buy A\$–sell SFr) is equivalent to selling SFr to buy dollars (at a bid rate of 1.5960) and then selling those dollars to buy A\$ (at an ask rate of 1.8235). Mathematically, the transaction is as follows:

    $$\text{bid A\$:SFr} = (\text{bid \$:SFr}) \div (\text{ask \$:A\$}) = 1.5960/1.8235 = 0.8752$$

    The A\$:SFr ask price is the number of SFr that the bank is asking for one A\$. This transaction (sell A\$–buy SFr) is equivalent to buying SFr with dollars (at an ask rate of 1.5970) and simultaneously purchasing these dollars against A\$ (at a bid rate of 1.8225). This may be expressed as follows:

    $$\text{ask A\$:SFr} = (\text{ask \$:SFr}) \div (\text{bid \$:A\$}) = 1.5970/1.8225 = 0.8763$$

    The resulting quotation by the bank is

    $$\text{A\$:SFr} = 0.8752 - 0.8763$$

12. The SFr:A$ quotation is obtained as follows. In obtaining this quotation, we keep in mind that SFr:A$ = ($:As) ÷ ($:SFr), and that the price (bid or ask) for each transaction is the one that is more advantageous to the bank.

    The SFr:A$ bid price is the number of A$ the bank is willing to pay to buy one SFr. This transaction (buy SFr – sell A$) is equivalent to selling A$ to buy dollars (at a bid rate of 1.8225) and then selling those dollars to buy SFr (at an ask rate of 1.5970). Mathematically, the transaction is as follows:

    Bid SFr:A$ = (bid $:A$)/(ask $:SFr) = 1.8225/1.5970 = 1.1412

    The SFr:A$ ask price is the number of A$ that the bank is asking for one SFr. This transaction (sell SFr – buy A$) is equivalent to buying A$ with dollars (at an ask rate of 1.8235) and simultaneously purchasing these dollars against SFr (at a bid rate of 1.5960). This may be expressed as follows:

    Ask SFr:A$ = (ask $:A$)/(bid $:SFr) = 1.8235/1.5960 = 1.1425

    The resulting quotation by the bank is

    SFr:A$ = 1.1412 – 1.1425

13. The bid ¥:C$ rate would be the inverse of the ask C$:¥ rate, and the ask ¥:C$ rate would be the inverse of the bid C$:¥ rate. Therefore,

    bid ¥:C$ = 1/ask(C$:¥) = 1/82.5750 = 0.01211
    ask ¥:C$ = 1/bid(C$:¥) = 1/82.5150 = 0.01212

    Thus, the quote is ¥:C$ = 0.01211 – 0.01212.

14. a. There would be no arbitrage opportunities if cross rate SFr:DKr = $:DKr × SFr:$.

       Because $:SFr =1.65, SFr:$ = 1/1.65 = 0.6061.

       So, there would be no arbitrage opportunities if the cross rate SFr:DKr = 8.25 × 0.6061 = DKr 5 per SFr.

    b. In the DKr 5.20 per SFr cross rate, one SFr is worth DKr 5.20. The implicit rate computed in part (a) above indicates that one SFr should be worth DKr 5. Therefore, the SFr is overvalued with respect to the DKr at the exchange rate of DKr 5.20 per SFr.

15. The implicit cross rate between yen and pound is £:¥ = $:¥ × £:$ = 128.17 × 1.4570 = 186.74. However, Midland Bank is quoting a lower rate of ¥183 per £. So, triangular arbitrage is possible.

    In the cross rate of ¥183 per £ quoted by Midland, one pound is worth 183 yen, whereas the cross rate based on the direct rates implies that one pound is worth 186.74 yen. Thus, pound is undervalued relative to the yen in the cross rate quoted by Midland, and your strategy for triangular arbitrage should be based on using yen to buy pounds from Midland. Accordingly, the steps you would take for an arbitrage profit are as follows:

    a. Sell dollars to get yen: Sell $1,000,000 to get $1,000,000 × ¥128.17 per $ = ¥128,170,000.
    b. Use yen to buy pounds: Sell ¥128,170,000 to buy ¥128,170,000/(¥183 per £) = £700,382.51.
    c. Sell pounds for dollars: Sell £700,382.51 for £700,382.51 × ($1.4570 per £) = $1,020,457.32.

    Thus, your arbitrage profit is $1,020,457.32 – $1,000,000 = $20,457.32.

16. a. The implicit cross rate between Australian dollars and Swiss francs is SFr:A\$ = \$:A\$ × SFr:\$ = (\$:A\$) ÷ (\$:SFr) = 1.8215/1.5971 = 1.1405. However, the quoted cross rate is higher at A\$1.1450 per SFr. So, triangular arbitrage is possible.

    b. In the quoted cross rate of A\$1.1450 per SFr, one Swiss franc is worth A\$1.1450, whereas the cross rate based on the direct rates implies that one Swiss franc is worth A\$1.1405. Thus, the Swiss franc is overvalued relative to the A\$ in the quoted cross rate, and Jim Waugh's strategy for triangular arbitrage should be based on selling Swiss francs to buy A\$ as per the quoted cross rate. Accordingly, the steps Jim Waugh would take for an arbitrage profit are as follows:

       i. Sell dollars to get Swiss francs: Sell \$1,000,000 to get \$1,000,000 × (SFr 1.5971 per \$) = SFr 1,597,100.

       ii. Sell Swiss francs to buy Australian dollars: Sell SFr 1,597,100 to buy SFr 1,597,100 × (A\$1.1450 per SFr) = A\$1,828,679.50.

       iii. Sell Australian dollars for dollars: Sell A\$1,828,679.50 for A\$1,828,679.50/(A\$1.8215 per \$) = \$1,003,941.53.

    Thus, your arbitrage profit is \$1,003,941.53 – \$1,000,000 = \$3,941.53.

17. The value of the £ in \$ is worth less three months forward than it is now. Thus, the £ is trading at a forward discount relative to the \$. Therefore, the £ is "weak" relative to the \$. Because a \$ is worth SFr 1.60 now but worth SFr 1.65 three months forward, the \$ is "strong" relative to the SFr. That is, the SFr is "weak" relative to the \$.

18. The midpoint of the spot dollar to pound exchange rate is £:\$ = 1.4573. The midpoint of the six-month forward dollar to pound exchange rate is £:\$ = 1.4421.

    a. Based on the midpoints, the dollar value of a pound is 1.4573 now and only 1.4421 six months forward. Thus, the pound is worth less six months forward than now. That is, the pound is trading at a discount relative to the dollar in the forward market.

    b. Difference between midpoints of the forward and spot rates = 0.0152.

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

$$= \left(\frac{0.0152}{1.4573}\right)\left(\frac{12}{6}\right)100\% = 2.09\%$$

19. The midpoint of the spot Swiss franc to dollar exchange rate is \$:SFr = 1.5965. The midpoint of the three-month forward Swiss franc to dollar exchange rate is \$:SFr = 1.5947.

    a. Based on the midpoints, a dollar is worth SFr 1.5965 now and only 1.5947 three months forward. So, the dollar is trading at a discount relative to the SFr in the forward market. That is, the SFr is trading at a premium relative to the dollar in the forward market.

    b. Difference between midpoints of the forward and spot rates = 0.0018.

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

$$= \left(\frac{0.0018}{1.5965}\right)\left(\frac{12}{3}\right)100\% = 0.45\%$$

20. Let's first make sure we calculate the forward rate in the proper direction. The one-year forward rate \$:¥ is given by Equation (1.3), where the dollar is the quoted currency (a) measured in yen (currency b):

$$\text{Forward exchange rate} = \text{Spot exchange rate} \times \frac{1+r_{¥}}{1+r_{\$}}$$

A bank will quote bid – ask forward rates, where the bid is lower than the ask. The ask forward rate (ask forward \$:¥), is the ¥ price at which an investor can buy dollars forward and the bid forward rate is the ¥ price that an investor can obtain for dollars. Buying dollars forward (paying the ask forward) is equivalent to:

- Borrowing yen (and hence having to pay the ask interest rate: ask $r_{¥}$,
- Using these yen to buy dollars spot (and hence having to pay the ask exchange rate: ask spot \$:¥,
- Lending those dollars (and hence receiving the bid interest rate: bid $r_{\$}$.

The resulting ask-forward exchange rate (\$:¥) is

$$\text{Ask forward (\$:¥)} = 110.10\frac{1+1.25\%}{1+4.00\%} = 107.19$$

The bid-forward exchange rate (\$:¥) is

$$\text{Bid forward (\$:¥)} = 110\frac{1+1.00\%}{1+4.25\%} = 106.57$$

Thus, the one-year forward rate should be: \$:¥r = 106.57–107.19.