

## 4.2: Exchange Rate- Definitions

### Learning objective

1. Learn some of the basic definitions regarding currency markets and exchange rates.

Anyone who has ever traveled to another country has probably had to deal with an exchange rate between two currencies. (I say “probably” because a person who travels from, say, Italy to Spain continues to use euros.) In a sense, exchange rates are very simple. However, despite their simplicity they never fail to generate confusion. To overcome that confusion this chapter begins by offering straightforward definitions and several rules of thumb that can help with these problems.

The **exchange rate (ER)** represents the number of units of one currency that exchanges for a unit of another. There are two ways to express an exchange rate between two currencies (e.g., between the U.S. dollar [\$] and the British pound [£]). One can either write  $\$/\pounds$  or  $\pounds/\$$ . These are reciprocals of each other. Thus if  $E$  is the  $\$/\pounds$  exchange rate and  $V$  is the  $\pounds/\$$  exchange rate, then  $E = 1/V$ .

For example, on January 6, 2010, the following exchange rates prevailed:

$$E_{\$/\pounds} = 1.59, \text{ which implies } E_{\pounds/\$} = 0.63,$$

and

$$V_{\pounds/\$} = 92.7, \text{ which implies } E_{\$/\pounds} = 0.0108.$$

### Currency Value

It is important to note that the value of a currency is always given in terms of another currency. Thus the value of a U.S. dollar in terms of British pounds is the  $\pounds/\$$  exchange rate. The value of the Japanese yen in terms of dollar is the  $\$/\pounds$  exchange rate.

Note that we always express the value of all items in terms of something else. Thus the value of a quart of milk is given in dollars, not in quarts of milk. The value of car is also given in dollar terms, not in terms of cars. Similarly, the value of a dollar is given in terms of something else, usually another currency. Hence, the rupee/dollar exchange rate gives us the value of the dollar in terms of rupees.

This definition is especially useful to remember when one is dealing with unfamiliar currencies. Thus the value of the euro (€) in terms of British pounds is given as the  $\pounds/\pounds$  exchange rate.

Similarly, the peso/euro exchange rate refers to the value of the euro in terms of pesos.

**Currency appreciation** means that a currency *appreciates* with respect to another when *its value rises* in terms of the other. The dollar appreciates with respect to the yen if the  $\pounds/\pounds$  exchange rate rises.

**Currency depreciation**, on the other hand, means that a currency *depreciates* with respect to another when *its value falls* in terms of the other. The dollar depreciates with respect to the yen if the  $\pounds/\pounds$  exchange rate falls.

Note that if the  $\pounds/\pounds$  rate rises, then its reciprocal, the  $\pounds/\pounds$  rate, falls. Since the  $\pounds/\pounds$  rate represents the value of the yen in terms of dollars, this means that when the dollar appreciates with respect to the yen, the yen must depreciate with respect to the dollar.

The rate of appreciation (or depreciation) is the percentage change in the value of a currency over some period.

**Example 1:** U.S. dollar (US\$) to the Canadian dollar (C\$)

On January 6, 2010,  $(E_{C\$/US\$} = 1.03)$ . On January 6, 2009,  $(E_{C\$/US\$} = 1.19)$ .

Use the percentage change formula, (new value – old value)/old value:

Multiply by 100 to write as a percentage to get

$$-0.134 \times 100 = -13.4\%.$$

Since we have calculated the change in the value of the U.S. dollar in terms of Canadian dollar, and since the percentage change is negative, this means that the dollar has depreciated by 13.4 percent with respect to the C\$ during the previous year.

**Example 2:** U.S. dollar (\$) to the Pakistani rupee (R)

On January 6, 2010,  $E_{R/\$} = 84.7$ . On January 6, 2010,  $E_{R/\$} = 79.1$ .

Use the percentage change formula, (new value – old value)/old value:

Multiply by 100 to write as a percentage to get

$$+0.071 \times 100 = +7.1\%.$$

Since we have calculated the change in the value of the U.S. dollar, in terms of rupees, and since the percentage change is positive, this means that the dollar has appreciated by 7.1 percent with respect to the Pakistani rupee during the past year.

## Other Exchange Rate Terms

**Arbitrage** generally means buying a product when its price is low and then reselling it after its price rises in order to make a profit. Currency arbitrage means buying a currency in one market (e.g., New York) at a low price and reselling, moments later, in another market (e.g., London) at a higher price.

The **spot exchange rate** refers to the exchange rate that prevails *on the spot*, that is, for trades to take place immediately. (Technically, it is for trades that occur within two days.)

The **forward exchange rate** refers to the rate that appears on a contract to exchange currencies either 30, 60, 90, or 180 days in the future.

For example, a corporation might sign a contract with a bank to buy euros for U.S. dollars sixty days from now at a predetermined ER. The predetermined rate is called the sixty-day forward rate. Forward contracts can be used to reduce exchange rate risk.

For example, suppose an importer of BMWs is expecting a shipment in sixty days. Suppose that upon arrival the importer must pay €1,000,000 and the current spot ER is 1.20 \$/€.

Thus if the payment were made today it would cost \$1,200,000. Suppose further that the importer is fearful of a U.S. dollar depreciation. He doesn't currently have the \$1,200,000 but expects to earn more than enough in sales over the next two months. If the U.S. dollar falls in value to, say, 1.30 \$/€ within sixty days, how much would it cost the importer in dollars to purchase the BMW shipment?

The shipment would still cost €1,000,000. To find out how much this is in dollars, multiply €1,000,000 by 1.30 \$/€ to get \$1,300,000.

Note that this is \$100,000 more for the cars simply because the U.S. dollar value changed.

One way the importer could protect himself against this potential loss is to purchase a forward contract to buy euros for U.S. dollars in sixty days. The ER on the forward contract will likely be different from the current spot ER. In part, its value will reflect market expectations about the degree to which currency values will change in the next two months. Suppose the current sixty-day forward ER is 1.25 \$/€, reflecting the expectation that the U.S. dollar value will fall. If the importer purchases a sixty-day contract to buy €1,000,000, it will cost him \$1,250,000 (i.e.,  $\$1,000,000 \times 1.25 \text{ \$/€}$ ). Although this is higher than what it would cost if the exchange were made today, the importer does not have the cash available to make the trade today, and the forward contract would protect the importer from an even greater U.S. dollar depreciation.

When the forward ER is such that a forward trade costs more than a spot trade today costs, there is said to be a **forward premium**. If the reverse were true, such that the forward trade were cheaper than a spot trade, then there is a **forward discount**.

A currency trader is **hedging** if he or she enters into a forward contract to protect oneself from a downside loss. However, by hedging the trader also forfeits the potential for an upside gain. Suppose in the story above that the spot ER falls rather than rises. Suppose the ER fell to 1.10 \$/€. In this case, had the importer waited, the €1,000,000 would only have cost \$1,100,000 (i.e.,  $\$1,000,000 \times 1.10 \text{ \$/€}$ ). Thus hedging protects against loss but at the same time eliminates potential unexpected gain.

### Key takeaways

- An exchange rate denominated  $x/y$  gives the value of  $y$  in terms of  $x$ . When an exchange rate denominated  $x/y$  rises, then  $y$  has appreciated in value in terms of  $x$ , while  $x$  has depreciated in terms of  $y$ .
- Spot exchange rates represent the exchange rate prevailing for currency trades today. Forward, or future, exchange rates represent the exchange values on trades that will take place in the future to fulfill a predetermined contract.
- Currency arbitrage occurs when someone buys a currency at a low price and sells shortly afterward at a higher price to make a profit.

- Hedging refers to actions taken to reduce the risk associated with currency trades.

## ? Exercises

1. **Jeopardy Questions.** As in the popular television game show, you are given an answer to a question and you must respond with the question. For example, if the answer is “a tax on imports,” then the correct question is “What is a tariff?”
  - The term used to describe an increase in the value of the yen.
  - This currency value is expressed by the euro/peso exchange rate.
  - This has happened to the value of the U.S. dollar if the dollar/euro exchange rate rises from 1.10 \$/€ to 1.20 \$/€.
  - The term used to describe the process of buying low and selling high to make a profit.
  - The term used to describe the exchange rate that appears on a contract to exchange currencies either 30, 60, 90, or 180 days in the future.
  - The term used to describe the exchange rate that prevails for (almost) immediate trades.
  - The term used to describe process of protecting oneself from the riskiness of exchange rate movements.
2. Use the exchange rate data in the table to answer the following questions. The first two exchange rates are the spot rates on those dates. The third exchange rate is the one-year forward exchange rate as of February 2004.

	February 4, 2003	February 4, 2004	Forward February 4, 2005
United States–Europe	1.08 \$/€	1.25 \$/€	1.24 \$/€
South Africa–United States	8.55 rand/\$	6.95 rand/\$	7.42 rand/\$

- Calculate the rate of change in the euro value relative to the dollar between 2003 and 2004.
- Calculate the rate of change in the dollar value relative to the euro between 2003 and 2004.
- Calculate the rate of change in the dollar value relative to the South African rand between 2003 and 2004.
- Calculate the expected change in the dollar value relative to the euro between 2004 and 2005.
- Calculate the expected change in the dollar value relative to the rand between 2004 and 2005.

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