The Exchange Rate

The exchange rate is the relative price of two currencies. The exchange rate is the price of a unit foreign currency; how many dollars are needed to buy a Euro or some other currency. This will be denoted as $E_{\$/€}$. The exchange rate is the same as any other price: for example, the price of gasoline is the number of dollars needed to buy a unit of gasoline.

Expressing the Exchange Rate

The exchange rate can also be expressed as the number of dollars need to buy a Euro or the number of euros needed to buy a dollar. The latter can be written as $E_{€/\$}$. Note that $E_{€/\$}$ is the reciprocal of $E_{\$/€}$. We will generally use the first formulation, $E_{\$/€}$, to express the exchange rate.

Appreciation and Depreciation

An increase in E means that the price of the Euro has gone up; therefore the Euro has appreciated. Conversely the dollar has depreciated.

Conversion of Foreign Prices to Domestic Prices

To convert foreign prices into home prices, multiply the foreign price by the exchange rate.

$/Foreign Good = ($/€) * (€/Foreign Good)
Exchange rate Foreign prices

An increase in the exchange rate means that foreign prices are rising relative to domestic prices. This will increase domestic exports and decrease domestic imports.

To convert dollars into foreign currency, divide by the exchange rate.

Types of Exchange Rate Regimes

1. Fixed exchange rates
   The government fixes the exchange rate against some base currency.

2. Flexible exchange rates
   The exchange rate is determined by market forces

3. Managed floating
   The government allows some limited flexibility of the exchange rate.

Currency Unions and Dollarization

Most countries have their own separate currency. Some countries join together to use a common currency. The best known example is the Euro.

Other countries, especially if they are small, use the currency of another country. This is known as dollarization.

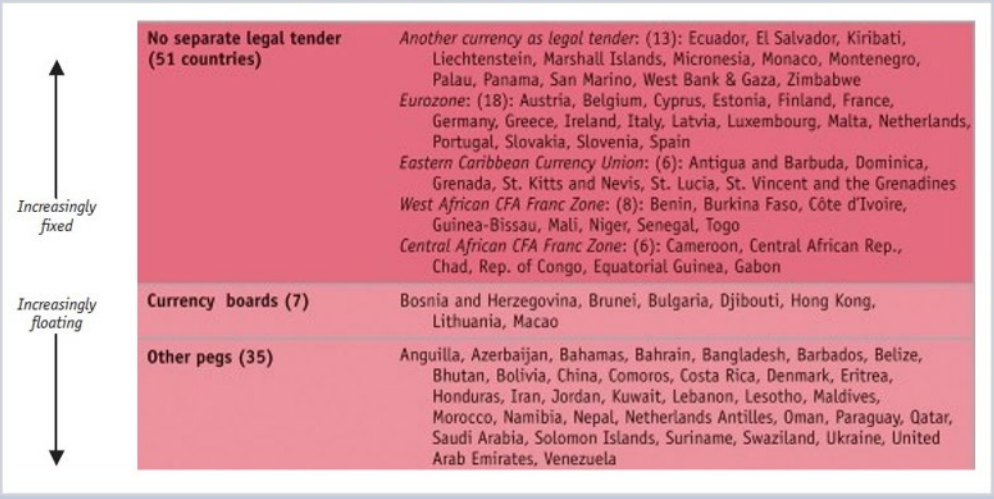
APPLICATION

FIGURE 10-2 (2 of 2) Exchange Rate Behavior: Selected Developed Countries, 1996–2012 (continued)

This figure shows exchange rates of three currencies against the euro, introduced in 1999. The pound and the yen float against the euro. The Danish krone provides an example of a fixed exchange rate. There is only a tiny variation around this rate, no more than plus or minus 2%. This type of fixed regime is known as a **band**.

APPLICATION

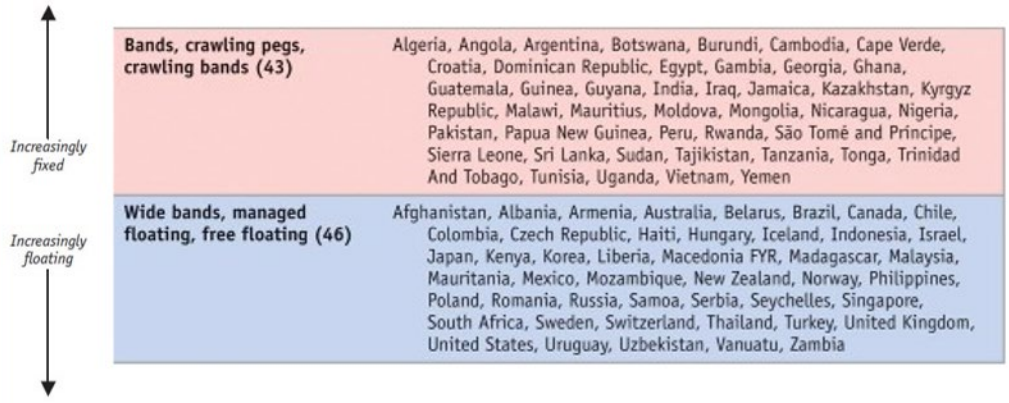
FIGURE 10-4 A Spectrum of Exchange Rate Regimes



This figure shows IMF classification of exchange rate regimes around the world for covers 192 economies in 2010. Regimes are ordered from the most rigidly fixed to the most freely floating. Seven countries use an ultrahard peg called a currency board, while 35 others have a hard peg.

APPLICATION

FIGURE 10-4 A Spectrum of Exchange Rate Regimes (continued)



An additional 43 counties have bands, crawling pegs or bands, while 46 countries have exchange rates that either float freely, are managed floats are allowed to float within wide bands.

Foreign Exchange Market

Why is foreign exchange needed?
1. Tourism
2. Trade in goods and services
3. Foreign investment.

The foreign exchange market is very large, around $5.3 trillion per day. This is 25 times larger than the volume of trading in global stock markets.

Major Players
1. Large Banks
2. Large Corporations
3. Nonbank Financial Institutions
4. Central Banks

Largest Foreign Exchange Trading Centers
1. London
2. New York
3. Tokyo
4. Singapore

Major Currencies

Major currencies traded, as a percentage of all trades:

1. U.S. dollar 87%
2. Euro 31%
3. Japanese yen 21%
4. British pound 13%
5. Australian dollar 7%
6. Swiss franc 5%

Major currency pairs:

1. Euro-U.S. dollar 23%
2. U.S. dollar – Japanese yen 17%
3. U.S. dollar-British pound 9%

Types of Foreign Exchange Rate Markets

Spot exchange rate is the current exchange rate.

The forward exchange rate is the exchange rate at a future date.

A swap is a combination of a spot rate sale with a forward exchange purchase.

A futures contract is a contract for foreign exchange at a specified date in the future. Unlike the forward rate, a futures contract is made for a fixed date, for a standardized amount and can be bought and sold on exchanges.

Exchange Rate Matrix

An exchange rate matrix expresses all the possible exchange rates between a group of countries.

		Domestic currency per foreign currency		
		U.S.	U.K	Europe
Foreign Currency Per domestic Currency	U.S.	$E_{\$/\$}$	$E_{£/\$}$	$E_{€/\$}$
	U.K.	$E_{\$/£}$	$E_{£/£}$	$E_{€/£}$
	Europe	$E_{\$/€}$	$E_{£/€}$	$E_{€/€}$

		Domestic currency per foreign currency		
		U.S.	U.K	Europe
Foreign Currency Per domestic Currency	U.S.	1	.78	.86
	U.K.	1.27	1	1.09
	Europe	1.16	.92	1

Arbitrage

Arbitrage is exploiting price differences in different markets by buying low and selling high.

Two-country Arbitrage
Buying and selling foreign exchange in different locations
Example
$E_{\$/€}$ = 1.1 in New York and $E_{\$/€}$ = 1.12 in Frankfurt.
Buy Euros in New York and sell in Frankfurt.

With $1,000,000 can buy 1,000,000/1.1 = 909,090€ at New York.
Wire transfer Take 909,090€ to Frankfurt and get 909,090*1.12 = $1,018,181 = Profit of $18,181

The process of arbitrage will eliminate these price differences. The purchase of Euros in New York will drive up the price of Euros in New York and the sale of Euros in Frankfurt will drive down the price of Euros in Frankfurt.

Triangular Arbitrage

Two ways to change dollars into pounds.
1. Convert dollars into pounds at the exchange rate $E_{\$/£}$
2. Convert dollars into a third currency such as Euros and then convert Euros into pounds. The cost of a Euro is $E_{\$/€}$. The cost of a pound is Euros is $E_{€/£}$. The total cost of a pound is therefore $E_{\$/€} * E_{€/£}$. This can be expressed algebraically as

Indirect cost of a pound = $\$/€ * €/£ = \$/£$

Which method should you use? Use the cheaper method.
Buy pounds directly if

$E_{\$/£} < E_{\$/€} * E_{€/£}$

Direct rate — Indirect rate

Buy pounds indirectly using the Euro if

$E_{\$/£} > E_{\$/€} * E_{€/£}$

Example:
$E_{\$/£} = 1.4$, $E_{\$/€} = 1.1$, $E_{€/£} = 1.2$
Then $E_{\$/€} * E_{€/£} = 1.1*1.2 = 1.32$
It is cheaper to buy pounds via the Euro than to buy pounds directly.

How to Profit with Triangular Arbitrage

Buy pounds indirectly using the Euro at a price of $1.32. Sell pounds directly at $1.40. This involves converting dollars into Euros, Euros into pounds and pounds back into dollars.

$ → € → £ → $

Buy € w/ $ Buy £ w/€ Buy $ w/£

Note that if the direct cost of a pound, $E_{\$/£}$, < 1.32, you could also make money by arbitrage, this time by exchanging dollars for pounds, pounds for euros and euros back to dollars.

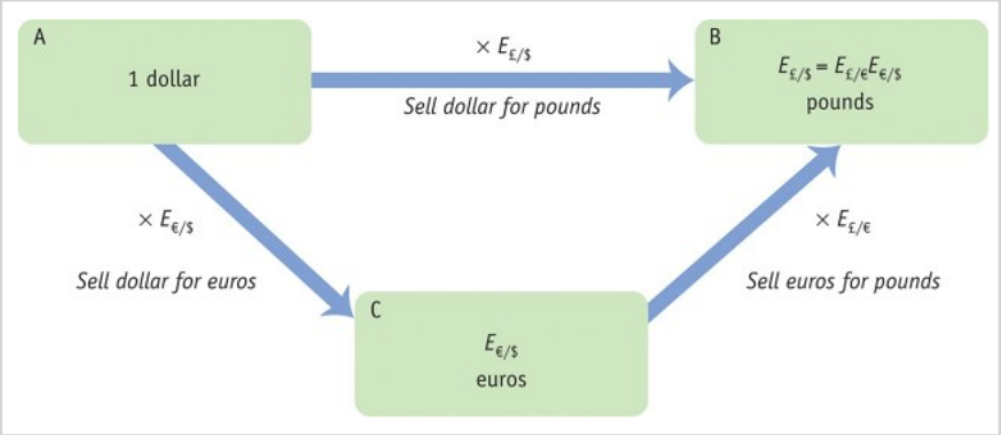
$ → £ → € → $

Foreign exchange traders will eliminate these arbitrage profits. For example, if $E_{\$/£} > E_{\$/€} * E_{€/£}$,
traders will use dollars to buy Euros, and sell pounds to buy dollars. The purchase of Euros will drive up the dollar price of Euros ($E_{\$/€}$). The sale of pounds will drive down the dollar price of pounds ($E_{\$/£}$).

$E_{\$/£} > E_{\$/€} * E_{€/£}$
↓ ↑ ↑

4 Arbitrage and Spot Exchange Rates

FIGURE 10-7



Arbitrage and Cross Rates Triangular arbitrage ensures that the direct trade of currencies along the path AB occurs at the same exchange rate as via a third currency along path ACB. The pounds received at B must be the same on both paths, and

$$E_{£/\$} = E_{£/€}E_{€/\$}$$

The Cross Rate

In equilibrium there will be no arbitrage profits. Then
$E_{\$/£} = E_{\$/€} * E_{€/£}$

Or equivalently
$E_{€/£} = E_{\$/£} / E_{\$/€}$

The right-hand side is known as the cross-rate

The cross-rate is used to exchange lesser-used currencies. If a currency is used to facilitate exchange between other currencies, it is known as a vehicle currency.

Exchange Rates are Inter-Connected

The cross-rate equation shows that all exchange rates are linked. If you know the exchange rate of the dollar against all other currencies, you will also know the exchange rate of all currencies against each other.

For example, suppose you know the dollar-pound and dollar-Euro exchange rates. The rest of the exchange rate matrix can be completed as follows:

		Domestic currency per foreign currency		
		U.S.	U.K	Europe
Foreign Currency Per domestic Currency	U.S.	$E_{\$/\$}$	$E_{£/\$}$	$E_{€/\$}$
	U.K.	$E_{\$/£}$	$E_{£/£}$	$E_{€/£}$
	Europe	$E_{\$/€}$	$E_{£/€}$	$E_{€/€}$

		Domestic currency per foreign currency		
		U.S.	U.K	Europe
Foreign Currency Per domestic Currency	U.S.	1	Reciprocal	Reciprocal
	U.K.	$E_{\$/£}$	1	Cross-rate
	Europe	$E_{£/€}$	Cross-rate	1