CHAPTER 6:
THE *IS–LM* MODEL IN AN OPEN ECONOMY

The *IS–LM* Model in an Open Economy

Openness has three distinct dimensions:

1. **Openness in goods markets**. Free trade restrictions include **tariffs** and **quotas**.

2. **Openness in financial markets**. **Capital controls** place restrictions on the ownership of foreign assets.

3. **Openness in factor markets**. The ability of firms to choose where to locate production, and workers to choose where to work.

6.1 Openness in Goods Markets (Continued)

- A good index of openness is the proportion of aggregate output composed of tradable goods—or goods that compete with foreign goods in either domestic or foreign markets.

6.1 Openness in Goods Markets (Continued)

Exports and imports

Country	Export ratio (%)	Country	Export ratio (%)
Ireland	101	Norway	41
Belgium	80	Finland	40
Netherlands	78	UK	30
Sweden	50	Spain	27
Germany	47	Japan	15
Italy	27	USA	13

Table 6.1 **Ratios of exports to GDP (%) for selected OECD countries, 2010**
Source: Eurostat.

- **The main factors behind differences in export ratios are geography and country size:**

- **Distance from other markets.**

- **Size also matters: The smaller the country, the more it must specialize in producing and exporting only a few products and rely on imports for other products.**

Can Exports Exceed GDP?

- **Countries can have export ratios larger than the value of their GDP because exports and imports may include exports and imports of intermediate goods.**

- **In 2007, the ratio of exports to GDP in Singapore was 229%!**

6.1 Openness in Goods Markets (Continued)

The choice between domestic goods and foreign goods

- When goods markets are open, domestic consumers must decide not only how much to consume and save but also whether to buy domestic goods or foreign goods.

- Central to the second decision is the price of domestic goods relative to foreign goods, or the real exchange rate.

6.1 Openness in Goods Markets (Continued)

Nominal exchange rates between two currencies can be quoted in one of two ways:

- As the price of the domestic currency in terms of the foreign currency.

- As the price of the foreign currency in terms of the domestic currency.

6.1 Openness in Goods Markets (Continued)

The nominal exchange rate is *the price of the foreign currency in terms of the domestic currency*.

- An **appreciation** of the domestic currency is a decrease in the price of the foreign currency in terms of the domestic currency, which corresponds to a *decrease* in the exchange rate.

- A **depreciation** of the domestic currency is an increase in the price of the foreign currency in terms of the domestic currency, or a increase in the exchange rate.

6.1 Openness in Goods Markets (Continued)

When countries operate under fixed exchange rates, that is, maintain a constant exchange rate between them, two other terms used are:

- **Revaluations**, rather than appreciations, which are decreases in the exchange rate, and

- **Devaluations**, rather than depreciations, which are increases in the exchange rate.

6.1 Openness in Goods Markets (Continued)

Nominal exchange rates

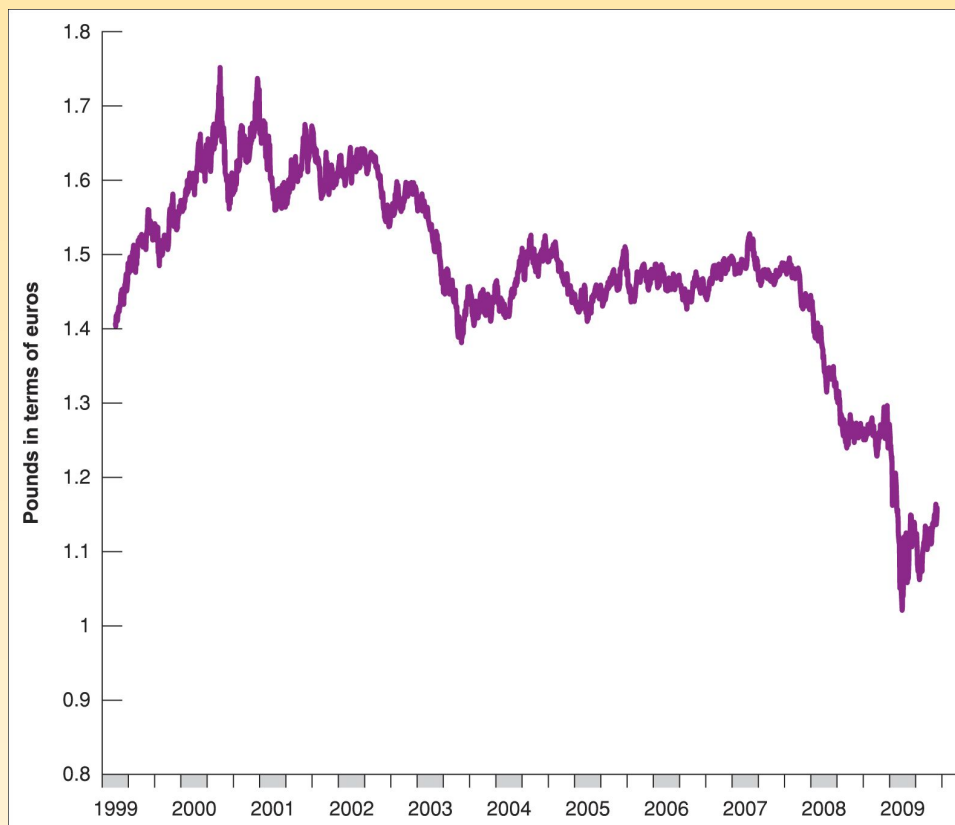**Figure 6.2** **The nominal exchange rate between the British pound and the euro since 1999**

Source: European Central Bank.
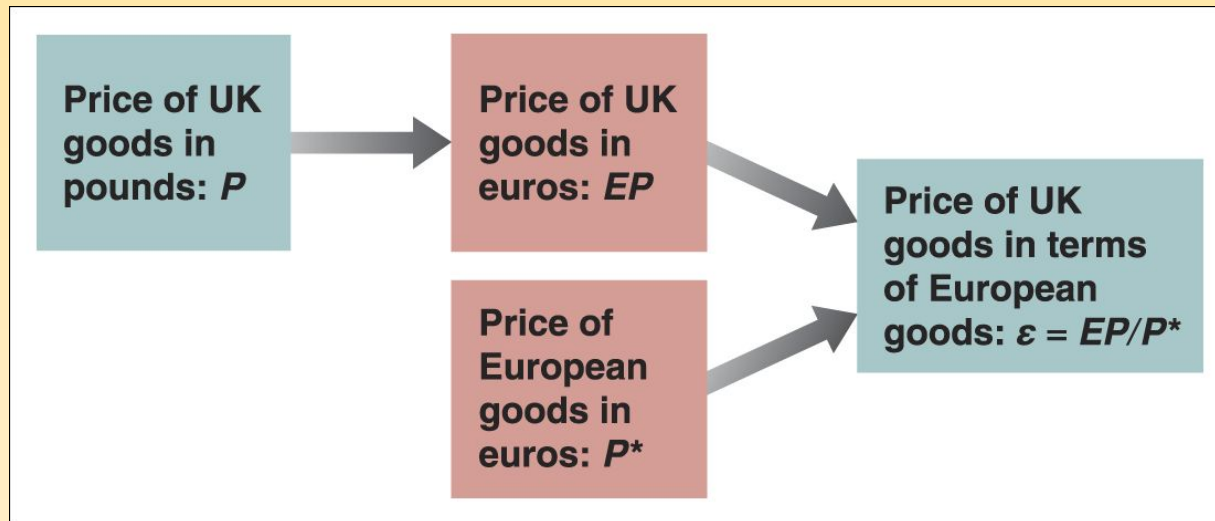
6.1 Openness in Goods Markets (Continued)

Note the two main characteristics of the figure:

- *The trend decrease in the exchange rate*—there was a depreciation of the pound vis-à-vis the euro over the period.

- *The large fluctuations in the exchange rate*—there was a very large appreciation of the pound at the end of the 1990s, followed by a large depreciation in the following decade.

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates

1. *P* = price of UK goods in pounds

2. *P** = price of European goods in euros

$$\varepsilon \;=\; \frac{EP}{P^*}$$

Figure 6.3 **The construction of the real exchange rate**

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates

Let's look at the real exchange rate between Kazakhstan and USA.

- If the price of a Ford in USA is $50,000 and dollar is worth 350 tenge, then the price of a Ford in tenge is $50,000 X 350 = KZT17.5 millions.

- If the price of a Chevrolet in the Kazakhstan is KZT 5 millions, then the price of a Ford in terms of Chevrolet would be KZT 17.5 millions/KZT5 millions = 3.5.

To generalize this example to *all* of the goods in the economy, we use a price index for the economy, or the GDP deflator.

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates

Like nominal exchange rates, real exchange rates move over time. **Given that real exchange rate is price of foreign good in terms of domestic good:**

- An decrease in the relative price of foreign goods in terms of domestic goods is called a **real appreciation**, which corresponds to a decrease in the real exchange rate, ε.

- A increase in the relative price of foreign goods in terms of domestic goods is called a **real depreciation**, which corresponds to an increase in the real exchange rate, ε.

6.1 Openness in Goods Markets (Continued)

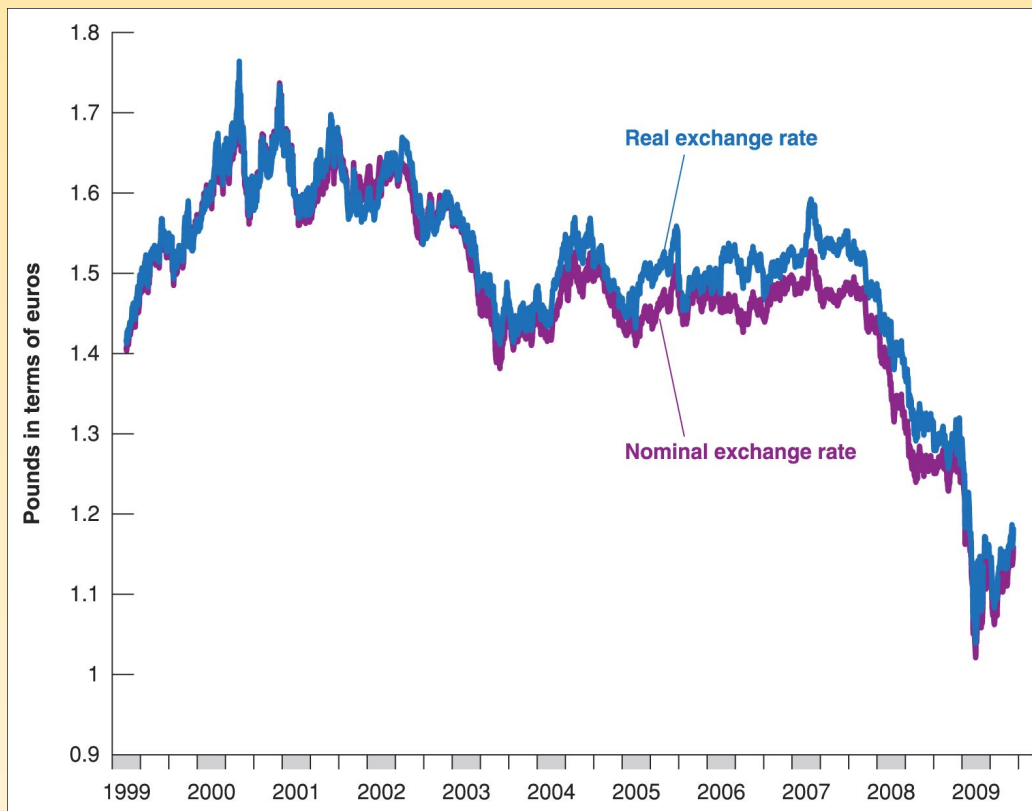From nominal to real exchange rates

Figure 6.4 Real and nominal exchange rates in the UK since 1999
The nominal and the real exchange rates in the UK have moved largely together since 1999.
Source: ECB, Eurostat, Bank of England.

Blanchard, Amighini and Giavazzi, *Macroeconomics: A European Perspective PowerPoints on the Web*, 2nd edition © Pearson Education Limited 2014

6.1 Openness in Goods Markets (Continued)

From nominal to real exchange rates

Note the two main characteristics of Figure 6.4:

- The large nominal and real appreciation of the pound at the end of the 1990s and the collapse of the pound in 2008–2009.

- The large fluctuations in the nominal exchange rate also show up in the real exchange rate.

6.1 Openness in Goods Markets (Continued)

From bilateral to multilateral exchange rates

- **Bilateral exchange rates are exchange rates between two countries. Multilateral exchange rates are exchange rates between several countries.**

- **For example, to measure the average price of UK goods relative to the average price of goods of UK trading partners, we use the UK share of import and export trade with each country as the weight for that country, or the multilateral real UK exchange rate.**

6.1 Openness in Goods Markets (Continued)

From bilateral to multilateral exchange rates

Equivalent names for the relative price of foreign goods vis-á-vis Kazakhstan goods are:

- The real multilateral **Kazakhstan** exchange rate.

- The **Kazakhstan trade-weighted real exchange rate**.

- The **Kazakhstan effective real exchange rate**.

6.2 Openness in Financial Markets

- **The purchase and sale of foreign assets implies buying or selling foreign currency—sometimes called** foreign exchange**.**

- **Openness in financial markets allows:**

  Financial investors to diversify—to hold both domestic and foreign assets and speculate on foreign interest rate movements.

  Allows countries to run trade surpluses and deficits. A country that buys more than it sells must pay for the difference by borrowing from the rest of the world.

6.2 Openness in Financial Markets (Continued)

The balance of payments

- The balance of payments account summarizes a country's transactions with the rest of the world.

- It consists of current account and capital account.

- The current account balance and the capital account balance should be equal, but because of data gathering errors they aren't. For this reason, the account shows a statistical discrepancy.

6.2 Openness in Financial Markets (Continued)

The balance of payments

The current account

- record payments to and from the rest of the world are called current account transactions:

  - The first two lines record the exports and imports of goods and services.

  - UK residents receive **investment income** on their holdings of foreign assets and vice versa.

  - Countries give and receive foreign aid; the net value is recorded as **net transfers received**.

6.2 Openness in Financial Markets (Continued)

The balance of payments

The current account

The sum of net payments in the *current account balance* can be positive, in which case the country has a *current account surplus*, or negative—a *current account deficit*.

A positive current account balance indicates that the nation is a net lender to the rest of the world, while a negative current account balance indicates that it is a net borrower from the rest of the world.

6.2 Openness in Financial Markets (Continued)

The balance of payments

The capital account

- A capital account shows the net change in physical or financial asset ownership for a nation.

- The capital account balance, also known as net capital flows, can be positive (negative) if foreign holdings of US assets are greater (less) than US holdings of foreign assets, in which case there is a capital account surplus (deficit). Negative net capital flows are called a capital account deficit.

- The numbers for current and capital account transactions are constructed using different sources; although they should give the same answers, they typically do not. The difference between the two is called the statistical discrepancy.

6.2 Openness in Financial Markets (Continued)

The choice between domestic and foreign assets

The decision or whether to invest abroad or at home depends not only on interest rate differences but also on your expectation of what will happen to the nominal exchange rate.
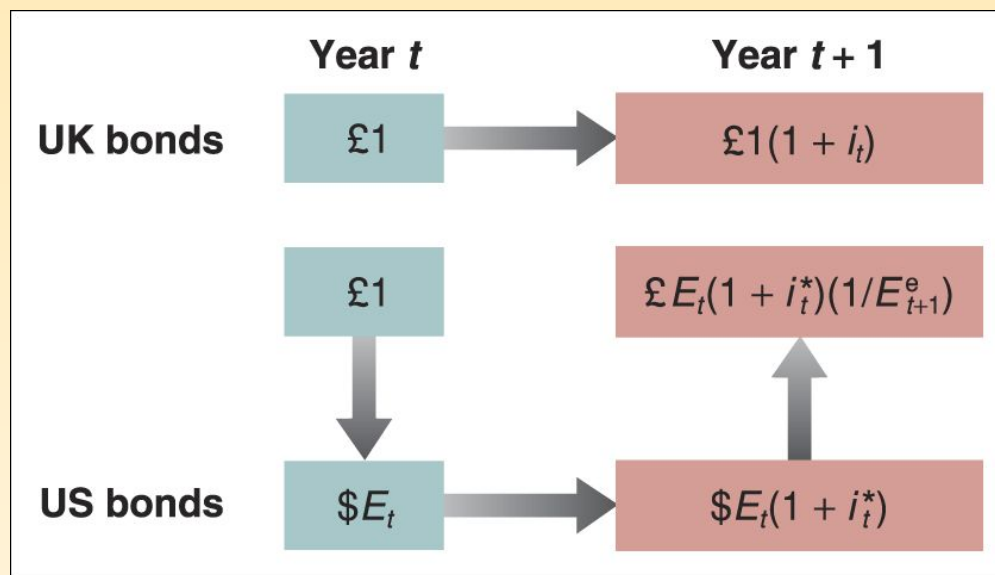

Figure 6.6 **Expected returns from holding one-year UK bonds or one-year US bonds**

6.2 Openness in Financial Markets (Continued)

The choice between domestic and foreign assets

- If both UK bonds and US bonds are to be held, they must have the same expected rate of return, so that the following arbitrage relation must hold:

$$(1 + i_t) = (E_t)(1 + i_t^*)\left(\frac{1}{E_{t+1}^{\text{e}}}\right)$$

- Rearranging the equation, we obtain the uncovered interest parity relation, or interest parity condition:

$$(1 + i_t) = (1 + i_t^*)\left(\frac{E_t}{E_{t+1}^{\text{e}}}\right)$$

6.2 Openness in Financial Markets (Continued)

The choice between domestic and foreign assets

The assumption that financial investors will hold only the bonds with the highest expected rate of return is obviously too strong, for two reasons:

- It ignores transaction costs.

- It ignores risk.

6.2 Openness in Financial Markets (Continued)

Interest rates and exchange rates

The relation between the domestic nominal interest rate, the foreign nominal interest rate and the expected rate of depreciation of the domestic currency is stated as:

$$(1 + i_t) = \frac{(1 + i_t^*)}{[1 + (E_{t+1}^e - E_t) / E_t)]}$$

A good approximation of the equation above is given by:

$$i_t \approx i_t^* - \frac{E_{t+1}^e - E_t}{E_t}$$

6.2 Openness in Financial Markets (Continued)

Interest rates and exchange rates

This is the relation you must remember: Arbitrage implies that the domestic interest rate must be (approximately) equal to the foreign interest rate plus the expected depreciation rate of the domestic currency.

If $E_{t+1}^e = E_t$, then $i_t = i_t^*$

6.2 Openness in Financial Markets (Continued)
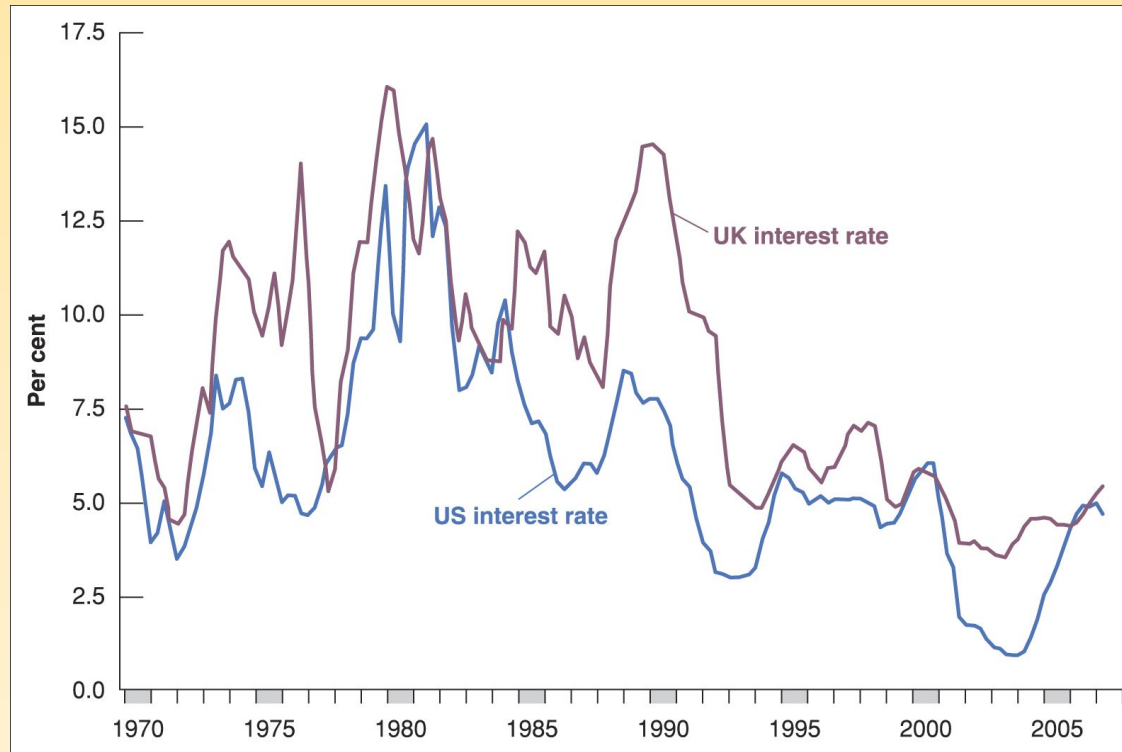
Interest rates and exchange rates

Figure 6.7 **Three-months' nominal interest rates in the USA and in the UK since 1970**
UK and US nominal interest rates have largely moved together over the past 40 years.

6.2 Openness in Financial Markets (Continued)

Interest rates and exchange rates

Should you hold UK bonds or US bonds?

- It depends whether you expect the pound to depreciate vis-á-vis the dollar over the coming year.

- If you expect the pound to depreciate by more than 3.0%, then investing in UK bonds is less attractive than investing in US bonds.

- If you expect the pound to depreciate by less than 3.0% or even to appreciate, then the reverse holds, and UK bonds are more attractive than US bonds.

GDP versus GNP: The Example of Ireland

Gross domestic product (GDP) is the measure that corresponds to value added products, domestically.

Gross national product (GNP) corresponds to the value added products by domestically owned factors of production.

Year	GDP	GNP	Net factor income
2002	130,258	106,562	−23,696
2003	139,763	118,039	−21,724
2004	149,098	126,219	−22,879
2005	162,091	137,188	−24,903
2006	176,759	152,529	−24,230
2007	189,751	161,244	−28,507
2008	181,815	154,596	−27,218

Note: numbers are in millions of euros.

Table 6.4 **GDP, GNP and net factor income in Ireland, 2002–2008**
Source: Central Statistics Office Ireland.

6.3 The IS Relation in an Open Economy

Buying Brazilian bonds

Shouldn't you be buying Brazilian bonds at a monthly interest rate of 36.9%?

What rate of depreciation of the cruzeiro should you expect over the coming month? A reasonable assumption is to expect the rate of depreciation during the coming month to be equal to the rate of depreciation during last month.

The expected rate of return in dollars from holding Brazilian bonds is only (1.017 – 1) = 1.7% per month.

Think of the risk and the transaction costs—all the elements we ignored when we wrote the arbitrage condition. When these are taken into account, you may well decide to keep your funds out of Brazil.

6.3 The IS Relation in an Open Economy (Continued)

In an open economy, the demand for domestic goods is given by:

$$Z = C + I + G - \frac{IM}{\varepsilon} + X$$

Where $\frac{IM}{\varepsilon}$ is imports in terms of domestic goods and X is exports. The determinants of consumption and investment remain the same as in the closed economy.

We can rewrite the equilibrium condition as:

$$Y = C(Y - T) + I(Y, i) + G + NX(Y, Y^*, \varepsilon)$$

$$\quad\quad + \quad - \quad\quad\quad + \; - \quad\quad\quad\quad\quad - \quad + \; -$$

Where $NX(Y, Y^*, \varepsilon) = X(Y^*, \varepsilon) - IM(Y, \varepsilon)/\varepsilon$ is "net exports"

6.4 The LM Relation in an Open Economy

In an open economy, the demand for money is given by :
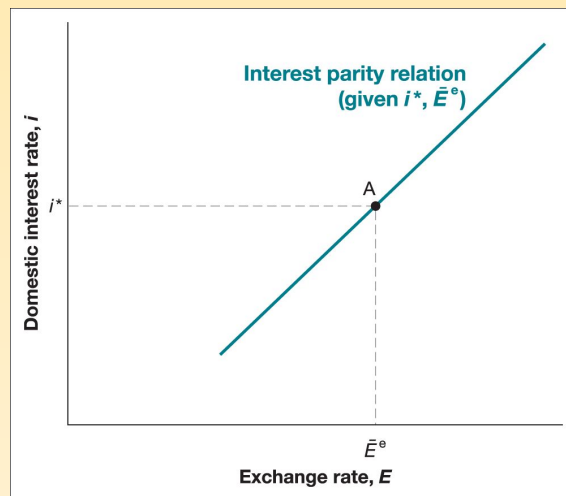
$$\frac{M}{P} = YL\,(i)$$

Figure 6.10 **The relation between the interest rate and exchange rate implied by interest parity**

A higher domestic interest rate leads to a higher exchange rate – an appreciation

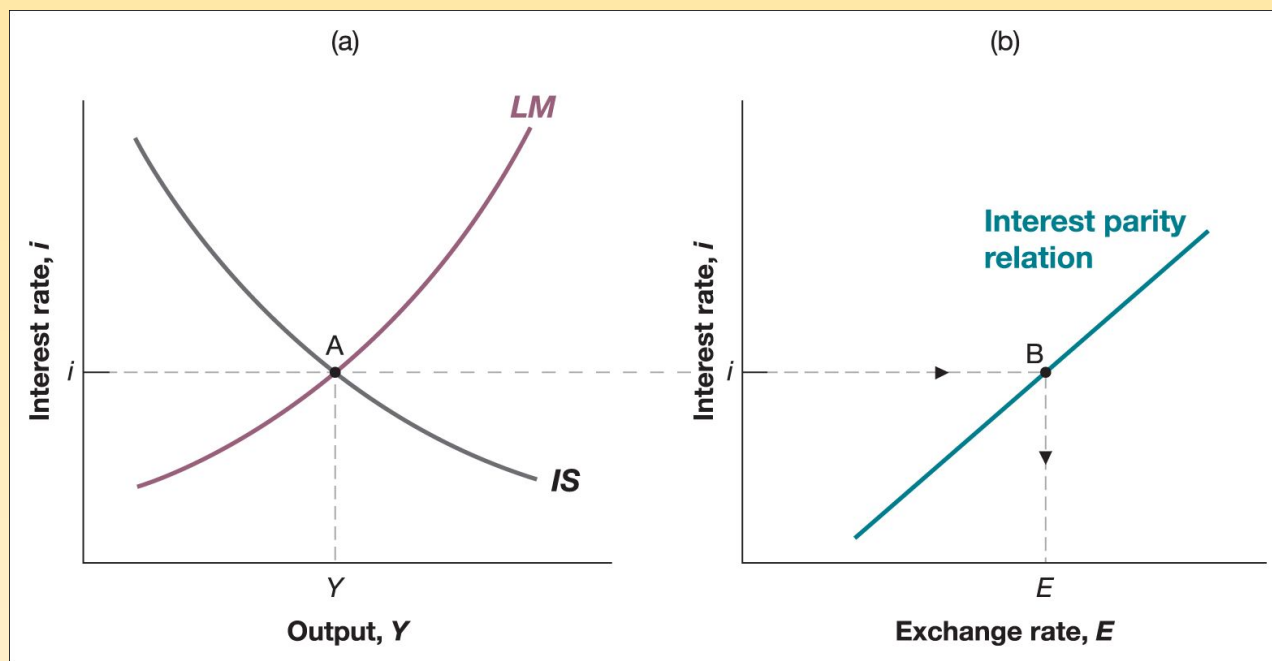# 6.5 Putting Goods and Financial Market Together in an Open Economy

Figure 6.11 **The *IS*–*LM* model in an open economy**

An increase in the interest rate reduces output both directly and indirectly (through the exchange rate): the *IS* curve is downward sloping. Given the real money stock, an increase in output increases the interest rate: the *LM* curve is upward sloping.