Chapter 6

THE *IS–LM* MODEL IN AN OPEN ECONOMY

We have assumed until now that the economy was *closed* – that it did not interact with the rest of the world. We started this way to keep things simple and build up your intuition for the basic macroeconomic mechanisms. In fact, most economies, and most European economies in particular, are very *open* – they trade both goods and assets with the rest of the world (and also, actually mostly, with each other).

'Openness' has three distinct dimensions:

1. **Openness in goods markets** – The ability of consumers and firms to choose between domestic goods and foreign goods.
2. **Openness in financial markets** – The ability of financial investors to choose between domestic assets and foreign assets.
3. **Openness in factor markets** – The ability of firms to choose where to locate production, and of workers to choose where to work.

The EU is the biggest ever common market among sovereign countries, with 27 member states. Within the EU, goods, services and factors are free to circulate without **tariffs** or impediments. Since the Schengen Agreement in 1995, citizens from any member states can freely circulate inside the EU.

However, in most other countries the choice between domestic and foreign goods is not completely free of restrictions: even the countries with the strongest commitment to free trade have tariffs – taxes on imported goods – and **quotas** – restrictions on the quantity of goods that can be imported – on at least some foreign goods. At the same time, in most countries, average tariffs are low and getting lower.

In financial markets, openness is much higher than in goods markets. Most world financial markets are closely integrated, although some countries still forbid the free movement of financial assets. China for example prohibits its citizens from buying foreign financial assets.

Factors markets are also increasingly integrated. Multinational companies operate plants in many countries and move their operations around the world to take advantage of lower production costs. Much of the debate about the accession to the EU of countries in central and Eastern Europe centred on the extent to which this would induce European firms to relocate abroad. And immigration from low-wage countries is a hot political issue in France, Germany and Italy.

In this chapter, we study the main macroeconomic implications of openness in goods and financial markets. This chapter has five sections:

- Section 6.1 looks at openness in goods markets, the determinants of the choice between domestic goods and foreign goods and the role of the real exchange rate.
- Section 6.2 looks at openness in financial markets, the determinants of the choice between domestic goods and foreign goods and the role of the real exchange rate.
- Section 6.3 characterises equilibrium in the goods market for an open economy.
- Section 6.4 looks at equilibrium in financial markets, including the foreign exchange market.
- Section 6.5 puts the two equilibrium conditions together and looks at the determination of output, the interest rate and the exchange rate.

6.1 OPENNESS IN GOODS MARKETS

Let's start by looking at how much an open economy, such as the UK, sells to and buys from the rest of the world. Then we will be better able to think about the choice between domestic goods and foreign goods and the role of the relative price of domestic goods in terms of foreign goods – the real exchange rate.

Exports and imports

Figure 6.1 plots the evolution of UK exports and UK imports, as ratios to GDP, since 1960. ('UK exports' means exports *from* the UK; 'UK imports' means imports *into* the UK.) The figure suggests two main conclusions:

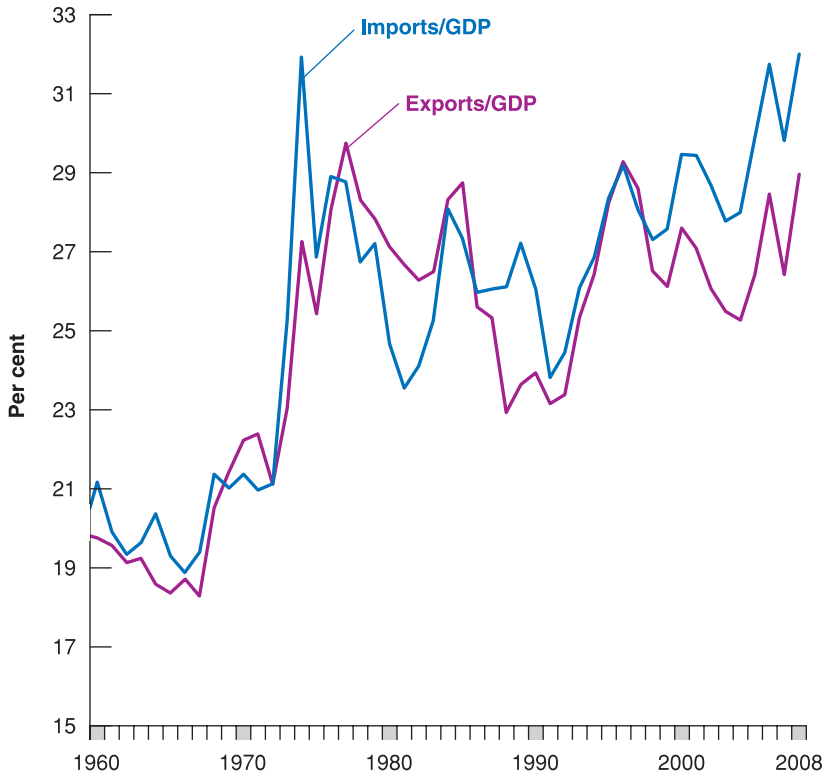

Figure 6.1

UK exports and imports as ratios of GDP since 1960

Since 1948, exports and imports have increased by around 10 percentage points in relation to GDP.

Source: UK Office for National Statistics.

- The UK economy has become more open over time. Exports and imports, which were around 20% of GDP in 1960 are now equal to about 30% of GDP (29% for exports, 32% for imports). In other words, the UK trades much more (relative to its GDP) with the rest of the world than it did just 50 years ago. Notice the large increase in both exports and imports in the early 1970s, which corresponds to the time the UK joined the European Union.
- Although imports and exports have broadly followed the same upward trend, they have also diverged for long periods of time, generating sustained trade surpluses and trade deficits. Three episodes stand out:
  - The large surplus in the early 1980s – The ratio of the trade surplus to GDP reached 3.1% in 1981.
  - The large trade deficits at the end of the 1980s – The ratio of the trade deficit to GDP reached 3.6% in 1989 and then decreased to less than 1% in the early 1990s.
  - The large and increasing trade deficits since the mid-1990s – The ratio of the trade deficit to GDP reached 3.4% in 2005 and remained relatively high in the following years.

From Chapter 3: the trade balance is the difference between exports and imports. If exports exceed imports, there is a trade surplus (equivalently, a positive trade balance). If imports exceed exports, there is a trade deficit (equivalently, a negative trade balance).

Understanding the sources and implications of these trade imbalances (especially the case of trade deficits) is a central issue in macroeconomics today, and one to which we shall return later.

Given all the talk in the media about *globalisation*, a volume of trade (measured by the average of the ratios of exports and imports to GDP) around 30% of GDP might strike you as small. However, the volume of trade is not necessarily a good measure of openness. Many firms are exposed to foreign competition but, by being competitive and keeping their prices low enough, these firms are able to retain their domestic market share and limit imports. This suggests that a better index of openness than export or import ratios is the proportion of aggregate output composed of **tradable goods** – goods that compete with foreign goods in either domestic markets or foreign markets.

- Tradable goods: cars, computers, and so on.
- Non-tradable goods: housing, most medical services, haircuts, restaurants, and so on.

With exports around 26% of GDP, it is true that the UK has one of the smallest ratios of exports to GDP among the rich countries of the world. Table 6.1 gives ratios for a number of OECD countries.

The USA is at the low end of the range of export ratios, with 12%, followed by Japan with 18%. In Europe, most of the largest economies have export ratios around 50%, including Germany, Switzerland, Denmark, Finland, Norway and Sweden. In this picture, the UK stands out as having the smallest export ratio within Europe. Finally, the smaller European countries have the highest ratios (89% in Belgium, 79% in Ireland and 75% in the Netherlands). (Belgium's 89% ratio of exports to GDP raises an odd possibility: can a country have exports larger than its GDP? In other words, can a country have an export ratio greater than 1? The answer is yes. The reason is given in the Focus box 'Can exports exceed GDP?')

Do these numbers indicate that the UK has more trade barriers than, say, Germany or Belgium? No. The main factors behind these differences are geography and size. Distance from other markets explains a good part of the low Japanese ratio. Size also matters: the smaller the country, the more it must specialise in producing and exporting only a few

Iceland is both isolated and small. What would you expect its export ratio to be? (Answer: 44% in 2008.)

Table 6.1 Ratios of exports to GDP for selected OECD countries, 2007

Country	Export ratio (%)	Country	Export ratio (%)
Belgium	89	Netherlands	75
Denmark	52	Norway	46
Finland	46	Sweden	53
Germany	47	Switzerland	56
Ireland	79	UK	26
Japan	18	USA	12

Source: OECD *Economic Outlook* database.

products and rely on imports for other products. Belgium can hardly afford to produce the range of goods produced by Germany, a country roughly seven times bigger.

The choice between domestic goods and foreign goods

How does openness in goods markets force us to rethink the way we look at equilibrium in the *goods market*?

In a closed economy, people face one decision:

- Save or buy (consume).

In an open economy, they face two decisions:

- Save or buy.
- Buy domestic or buy foreign.

Until now, when we were thinking about consumers' decisions in the goods market we focused on their decision to save or to consume. When goods markets are open, domestic consumers face a second decision: whether to buy domestic goods or to buy foreign goods. Indeed, all buyers – including domestic and foreign firms and governments – face a similar decision. This decision has a direct effect on domestic output: if buyers decide to buy more domestic goods, the demand for domestic goods increases, and so does domestic output. If they decide to buy more foreign goods, then foreign output increases instead of domestic output.

FOCUS
Can exports exceed GDP?

Can a country have exports larger than its GDP – that is, can it have an export ratio greater than 1?

It would seem that the answer must be no: a country cannot export more than it produces, so the export ratio must be less than 1. Not so. The key to the answer is to realise that exports and imports may include exports and imports of intermediate goods.

Take, for example, a country that imports intermediate goods for €1 billion. Suppose it then transforms them into final goods using only labour. Say labour is paid €200 million and that there are no profits. The value of these final goods is thus equal to €1200 million. Assume that €1 billion worth of final goods is exported and the rest, €200 million, is consumed domestically.

Exports and imports therefore both equal €1 billion. What is GDP in this economy? Remember that GDP is value added in the economy (see Chapter 2). So, in this example, GDP equals €200 million, and the ratio of exports to GDP equals €1000/€200 = 5.

Hence, exports can exceed GDP. This is actually the case for a number of small countries where most economic activity is organised around a harbour and import–export activities, such as the Netherlands, where the ratio of exports to GDP in 2008 was 75%. This is even the case for small countries such as Malaysia, where the ratio of exports to GDP exceeded 100%. In 2007, the ratio of exports to GDP in Singapore was 229%!

Central to the decision of whether to buy domestic goods or foreign goods is the price of domestic goods relative to foreign goods. We call this relative price the **real exchange rate**. The real exchange rate is not directly observable, and you will not find it in newspapers. What you will find in newspapers are *nominal exchange rates*, the relative prices of currencies. We start by looking at nominal exchange rates and then see how we can use them to construct real exchange rates.

Nominal exchange rates

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 – If, for example, we look at the UK and the euro area and think of the pound as the domestic currency and the euro as the foreign currency, we can express the nominal exchange rate as the price of a pound in terms of euros. In June 2009, the exchange rate defined this way was 1.15. In other words, £1 was worth €1.15.

- As the price of the foreign currency in terms of the domestic currency – Continuing with the same example, we can express the nominal exchange rate as the price of a euro in terms of pounds. In June 2009, the exchange rate defined this way was 0.86. In other words, €1 was worth £0.86.

Warning: There is no agreed-upon rule among economists or among newspapers as to which of the two definitions to use. You will encounter both. Usually, the first definition is preferred in the UK, the second definition is preferred in the rest of Europe. Always check which definition is used.

Either definition is fine; the important thing is to remain consistent. In this book, we adopt the first definition: we define the **nominal exchange rate** as *the price of the domestic currency in terms of foreign currency* and denote it by E. When looking, for example, at the exchange rate between the UK and the euro area (from the viewpoint of the UK, so the pound is the domestic currency), E denotes the price of a pound in terms of euros (so, for example, E was 1.15 in June 2009).

E: Nominal exchange rate – price of domestic currency in terms of foreign currency. (From the point of view of the UK looking at the USA, the price of a pound in terms of dollars.)

Exchange rates between most foreign currencies change every day and every minute of the day. These changes are called *nominal appreciations* or *nominal depreciations* – *appreciations* or *depreciations* for short:

- An **appreciation** of the domestic currency is an increase in the price of the domestic currency in terms of a foreign currency. Given our definition of the exchange rate, an appreciation corresponds to an *increase* in the exchange rate.

Appreciation of the domestic currency ⇔ Increase in the price of the domestic currency in terms of foreign currency ⇔ Increase in the exchange rate.

- A **depreciation** of the domestic currency is a decrease in the price of the domestic currency in terms of a foreign currency. So, given our definition of the exchange rate, a depreciation of the domestic currency corresponds to a decrease in the exchange rate, E.

Depreciation of the domestic currency ⇔ Decrease in the price of the domestic currency in terms of foreign currency ⇔ Decrease in the exchange rate.

You may have encountered two other words to denote movements in exchange rates: 'revaluations' and 'devaluations.' These two terms are used when countries operate under **fixed exchange rates** – a system in which two or more countries maintain a constant exchange rate between their currencies. Under such a system, increases in the exchange rate – which are infrequent by definition – are called **revaluations** (rather than appreciations). Decreases in the exchange rate are called **devaluations** (rather than depreciations).

We shall discuss fixed exchange rates in Chapter 19.

Figure 6.2 plots the nominal exchange rate between the pound and the euro since 1999. Note the two main characteristics of the figure:

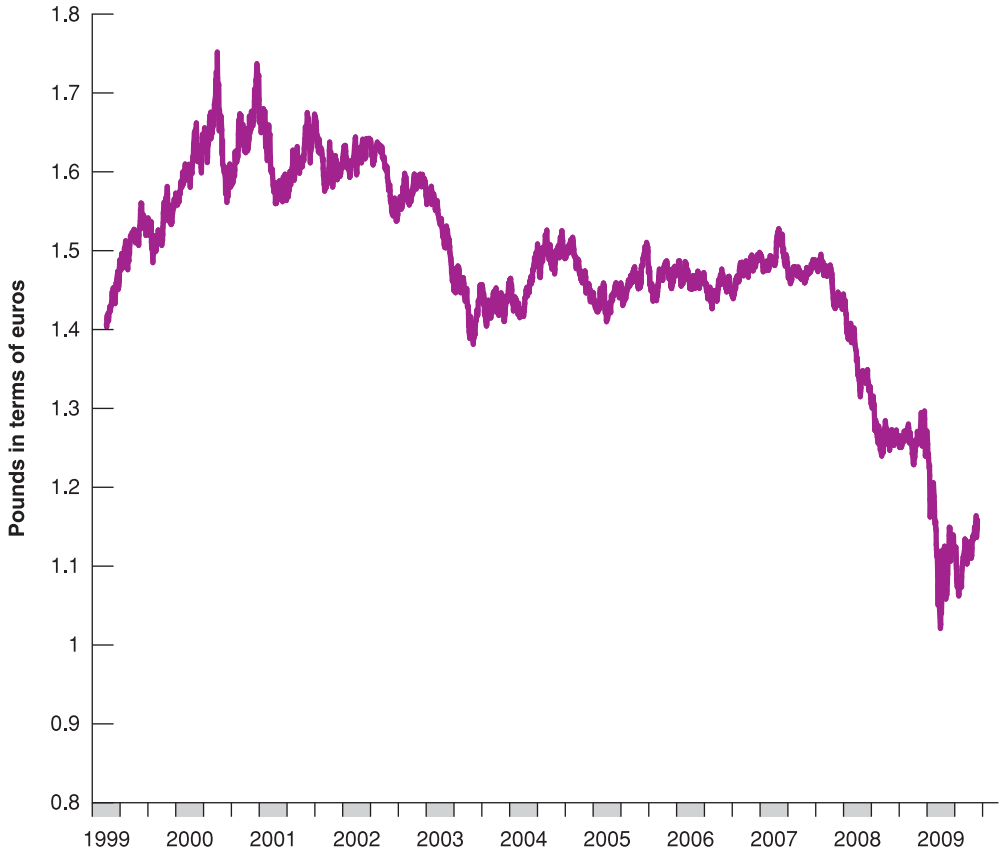

Figure 6.2

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

Source: European Central Bank.

- *The trend decrease in the exchange rate* – In 1999, £1 was worth €1.4. In 2009, £1 was worth €1.15. Put another way, there was a depreciation of the pound vis-à-vis the euro over the period.
- *The large fluctuations in the exchange rate* – In the space of a few years, from 1999 to 2003, the value of the pound increased from £1.4 in 1999 to £1.75 in 2000, back down to £1.5 in mid-2001 and to £1.3 in mid-2003. Put another way, there was a very large appreciation of the pound at the end of the 1990s, followed by a large depreciation in the following decade.

If we are interested, however, in the choice between domestic goods and foreign goods, the nominal exchange rate gives us only part of the information we need. Figure 6.2, for example, tells us only about movements in the relative price of the two currencies, the pound and the euro. To British tourists thinking of visiting Italy, France or Greece the question is not only how many euros they will get in exchange for their pounds, but how much goods will cost in the euro area relative to how much they cost in the UK. This takes us to our next step – the construction of real exchange rates.

From nominal to real exchange rates

How can we construct the real exchange rate between the UK and the euro area – the price of UK goods in terms of European goods?

Suppose the UK produced only one good, a Jaguar, and the euro area also produced only one good, a Mercedes. (This is one of those 'suppose' statements that run completely against the facts, but we shall become more realistic shortly.) Constructing the real exchange rate, the price of the UK goods (Jaguars) in terms of European goods (Mercedes), would be straightforward. We would express both goods in terms of the same currency and then compute their relative price.

Suppose, for example, we expressed both goods in terms of pounds. Then:

If we expressed both in terms of euros instead, we would get the same result for the real exchange rate.

- The first step would be to take the price of a Mercedes in euros and convert it to a price in pounds. The price of a Mercedes in the euro area is €50 000. A pound is worth €1.15, so the price of a Mercedes in pounds is €50 000/1.15 = £43 000.
- The second step would be to compute the ratio of the price of the Mercedes in pounds to the price of the Jaguar in pounds. The price of a Jaguar in the UK is £30 000. So the price of a Mercedes in terms of Jaguars – that is, the real exchange rate between the UK and the euro area – would be £43 000/£30 000 = 1.4. In other words, a Mercedes is 40% more expensive relative to a Jaguar in the UK.

The example is straightforward, but how do we generalise it? The UK and the euro area produce more than Jaguars and Mercedes, and we want to construct a real exchange rate that reflects the relative price of *all* the goods produced in the UK in terms of *all* the goods produced in the euro area.

The computation we just went through tells us how to proceed. Rather than use the price of a Jaguar and the price of a Mercedes, we must use a price index for all goods produced in the UK and a price index for all goods produced in the euro area. This is exactly what the GDP deflators we introduced in Chapter 2 do: they are, by definition, price indexes for the set of final goods and services produced in the economy.

Let P be the GDP deflator for the UK, P^* be the GDP deflator for the euro area (as a rule, we shall denote foreign variables with an asterisk) and E be the pound–euro nominal exchange rate. Figure 6.3 goes through the steps needed to construct the real exchange rate:

ε: real exchange rate – price of domestic goods in terms of foreign goods. (For example, from the point of view of the UK looking at the euro area, the price of UK goods in terms of European goods.)

1. The price of UK goods in pounds is P. Multiplying it by the exchange rate, E – the price of pounds in terms of euros – gives us the price of UK goods in euros, EP.
2. The price of European goods in euros is P^*. The *real exchange rate*, the price of UK goods in terms of European goods, which we shall call ε (the Greek lowercase epsilon), is thus given by

$$\varepsilon = \frac{EP}{P^*} \qquad [6.1]$$

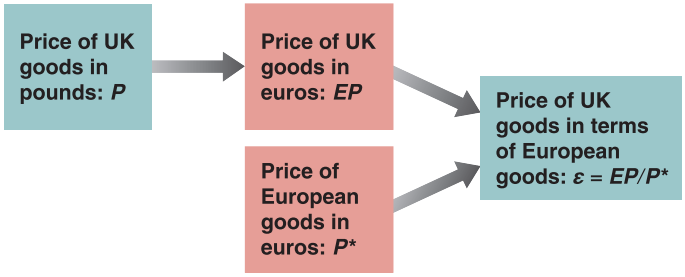

Figure 6.3
The construction of the real exchange rate

The real exchange rate is constructed by multiplying the domestic price level by the nominal exchange rate and then dividing by the foreign price level – a straightforward extension of the computation we made in our Jaguar/Mercedes example.

Note, however, an important difference between our Jaguar/Mercedes example and this more general computation. Unlike the price of Jaguars in terms of Mercedes, the real exchange rate is an index number: that is, its level is arbitrary and, therefore, uninformative. It is uninformative because the GDP deflators used to construct the real exchange rate are themselves index numbers; as we saw in Chapter 2, they are equal to 1 (or 100) in whatever year is chosen as the base year.

But all is not lost. Although the level of the real exchange rate is uninformative, the rate of change of the real exchange rate is informative. If, for example, the real exchange rate between the UK and the euro area increases by 10%, this tells us UK goods are now 10% more expensive relative to European goods than they were before.

Like nominal exchange rates, real exchange rates move over time. These changes are called *real appreciations* or *real depreciations*:

- An increase in the real exchange rate – that is, an increase in the relative price of domestic goods in terms of foreign goods – is called a **real appreciation**.
- A decrease in the real exchange rate – that is, a decrease in the relative price of domestic goods in terms of foreign goods – is called a **real depreciation**.

Figure 6.4 plots the evolution of the real exchange rate between the UK and the euro area since 1999, constructed using equation (6.1). For convenience, it also reproduces the evolution of the nominal exchange rate from Figure 6.2.

Two aspects stand out in 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 we saw in Figure 6.2 also show up in the real exchange rate. This not surprising: year-to-year movements in the price ratio, P/P^*, are typically small compared to the often-sharp movements in the nominal exchange rate, E. Thus, from year to year, or even over the course of a few years, movements in the real exchange rate, ε, tend to be driven mostly by movements in the nominal exchange rate, E. Note that, since 1999, the nominal exchange rate and the real exchange rate have moved nearly together. This reflects the fact that, since then, inflation rates have been very similar – and low – in both areas.

If inflation rates were exactly equal, P/P^* would be constant, and ε and E would move together exactly.

From bilateral to multilateral exchange rates

We need to take one last step. We have so far concentrated on the exchange rate between the UK and the euro area, but the euro area is just one of many partners the UK trades with.

Table 6.2 shows the geographic composition of UK trade for both exports and imports. The main message of the table is that the UK does most of its trade with two countries: the USA and Germany (which together account for 25% of UK exports and 21% of UK imports). The second largest group of export partners includes the closest countries of Western Europe, such as Ireland, the Netherlands, France and Belgium.

How do we go from **bilateral exchange rates**, like the real exchange rate between the UK and the euro area we focused on earlier, to **multilateral exchange rates** that reflect this

These are all equivalent names for the relative price of domestic goods in terms of foreign goods:

- The real multilateral exchange rate.
- The **trade-weighted real exchange rate**.
- The **effective real exchange rate**.

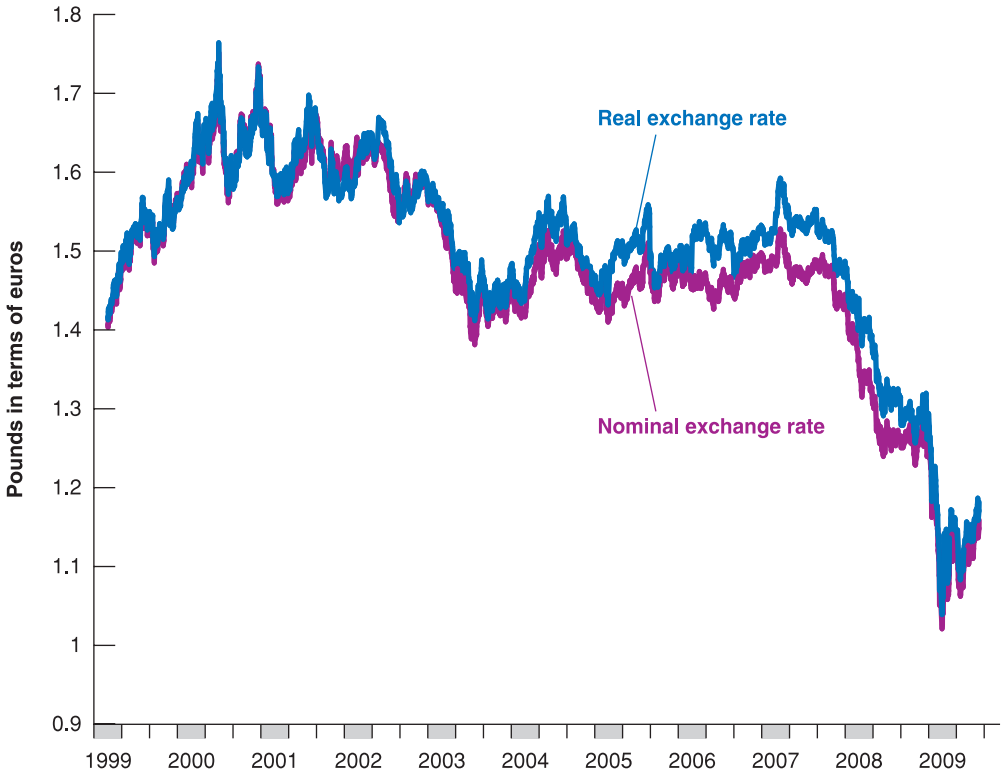

Figure 6.4

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.

Table 6.2 The country composition of UK exports and imports, 2008

	Proportion of exports to (%)	Proportion of imports from (%)
USA	14	8
Germany	11	13
Netherlands	8	8
Ireland	8	4
France	7	7
Belgium	5	5
Spain	4	3
Italy	4	4
Sweden	2	2
China	2	7
Russia	2	2
India	2	1
Japan	2	3
Hong Kong	2	2
Norway	1	6
TOTAL	73	74

Source: UK Office for National Statistics.

composition of trade? The principle we want to use is simple, even if the details of construction are complicated: we weigh each country by how much each country trades with the UK and how much it competes with the UK in other countries. The variable constructed in this way is called the **multilateral real exchange rate**, or the real exchange rate for short.

Figure 6.5 shows the evolution of this multilateral real exchange rate, the price of domestic goods in terms of foreign goods for the UK, since 1980. Like the bilateral real exchange rate we saw in Figure 6.4, it is an index number. So its level is also arbitrary; here it is set equal to 1 in January 2005. The most striking aspect of the figure is the large swing in the real exchange rate in the 1980s and 1990s, compared to the relative stability between the

Figure 6.5

The UK multilateral real exchange rate since 1980

The 1980s and 1990s were characterised by large swings in the real exchange rate. The real exchange rate was much more stable since the end of the 1990s, until the large real depreciation in 2009.

Source: Bank of England.

mid-1990s and 2007. The second remarkable aspect of the figure is the collapse of the real exchange rate in 2009.

6.2 OPENNESS IN FINANCIAL MARKETS

Openness in financial markets allows financial investors to hold both domestic assets and foreign assets, to diversify their portfolios, to speculate on movements in foreign interest rates versus domestic interest rates, to speculate on movements in exchange rates, and so on.

Diversify and speculate they do. Given that buying or selling foreign assets implies buying or selling foreign currency – sometimes called **foreign exchange** – the volume of transactions in foreign exchange markets gives us a sense of the importance of international financial transactions. In 2005, for example, the recorded *daily* volume of foreign exchange transactions in the world was €4 trillion, of which 37% – about €1.6 trillion – involved euros on one side of the transaction (and 86% involved dollars on one side of the transation).

To get a sense of the magnitude of these numbers, the sum of exports and imports of the euro area with the rest of the world in 2007 totalled €3 trillion *for the year*, or about €8 billion per day. Suppose the only euro transactions in foreign exchange markets had been, on one side, by euro area exporters selling their foreign currency earnings, and on the other side by euro area importers buying the foreign currency they needed to buy foreign goods. Then, the volume of transactions involving euros in foreign exchange markets would have been €8 billion per day, or about 0.5% of the actual daily total volume of transactions (€1.6 trillion) involving euros in foreign exchange markets. This computation tells us that most of the transactions are associated not with trade but with purchases and sales of financial assets. Moreover, the volume of transactions in foreign exchange markets is not only high but also rapidly increasing. The volume of foreign exchange transactions has more than doubled since 2001. Again, this increase in activity reflects mostly an increase in financial transactions rather than an increase in trade.

For a country as a whole, openness in financial markets has another important implication. It allows the country to run trade surpluses and trade deficits. Recall that a country running a trade deficit is buying more from the rest of the world than it is selling to the rest of the world. In order to pay for the difference between what it buys and what it sells, the country must borrow from the rest of the world. It borrows by making it attractive for foreign financial investors to increase their holdings of domestic assets – in effect, to lend to the country.

Table 6.3 The UK balance of payments, 2008 (in billions of pounds)

Current account		
Exports	422	
Inports	459	
Trade balance (deficit = –) (1)		–37
Investment income received	263	
Investment income paid	236	
Net investment income (2)		27
Net transfers received (3)		–14
Current account balance (deficit = –) (1) + (2) + (3)		–24
Capital account		
Increase in foreign holdings of UK assets (4)	650	
Increase in UK holdings of foreign assets (5)	620	
Capital account balance (deficit = –) (4) – (5)		30
Statistical discrepancy		–6

Source: UK Office of National Statistics (*http://www.statistics.gov.uk/pdfdir/bop0909.pdf*).

Let's start by looking more closely at the relation between trade flows and financial flows. When this is done, we shall look at the determinants of these financial flows.

The balance of payments

A country's transactions with the rest of the world, including both trade flows and financial flows, are summarised by a set of accounts called the **balance of payments**. Table 6.3 presents the UK balance of payments for 2008. The table has two parts, separated by a line. Transactions are referred to as being either **above the line** or **below the line**.

The current account

The transactions above the line record payments to and from the rest of the world. They are called **current account** transactions:

- The first two lines record the exports and imports of goods and services. Exports lead to payments from the rest of the world, and imports lead to payments to the rest of the world. In 2008, imports exceeded exports, leading to a UK trade deficit of £37 billion – roughly 8.4% of UK GDP.
- Exports and imports are not the only sources of payments to and from the rest of the world. UK residents receive **investment income** on their holdings of foreign assets, and foreign residents receive UK investment income on their holdings of UK assets. In 2008, UK investment income received from the rest of the world was £263 billion, and investment income paid to foreigners was £236 billion, for a net balance of £27 billion.
- Finally, countries give and receive foreign aid; the net value of these payments is recorded as **net transfers received**. These net transfers amounted in 2008 to –£14 billion. This negative amount reflects the fact that, in 2008, the UK was – as it has traditionally been – a net donor of foreign aid.

Can a country have:

- A trade deficit and no current account deficit?
- A current account deficit and no trade deficit?

(The answer to both questions: Yes.)

The sum of net payments to and from the rest of the world is called the **current account balance**. If net payments from the rest of the world are positive, the country is running a **current account surplus**; if they are negative, the country is running a **current account deficit**. Adding all payments to and from the rest of the world, net payments from the UK to the rest of the world were equal in 2008 to £37 – £27 + £14 = £24 billion. Put another way, in 2008, the UK ran a current account deficit of £24 billion – roughly 5.4% of its GDP.

The capital account

The fact that the UK had a current account deficit of £24 billion in 2008 implies that it had to borrow £24 billion from the rest of the world – or, equivalently, that net foreign holdings

of UK assets had to increase by £24 billion. The numbers below the line describe how this was achieved. Transactions below the line are called **capital account** transactions.

The decrease in foreign holdings of UK assets was £620 billion: foreign investors, be they foreign private investors, foreign governments or foreign central banks, sold £620 billion worth of UK stocks, UK bonds and other UK assets. At the same time, there was a decrease in UK holdings of foreign assets of £650 billion: UK investors, private and public, sold £650 billion worth of foreign stocks, bonds and other assets. The result was an increase in net UK foreign indebtedness (the increase in foreign holdings of UK assets minus the decrease in UK holdings of foreign assets), also called **net capital flows**, to the UK of £(−620) − £(−650) = £30 billion. Another name for net capital flows is the **capital account balance**: positive net capital flows are called a **capital account surplus**; negative net capital flows are called a **capital account deficit**. So, put another way, in 2008, the UK ran a capital account surplus of £30 billion.

◀ A country that runs a current account deficit must finance it through positive net capital flows. Equivalently, it must run a capital account surplus.

Shouldn't net capital flows (equivalently, the capital account surplus) be exactly equal to the current account deficit (which we saw earlier was equal to £24 billion in 2008)? In principle, yes; in practice, no.

The numbers for current and capital account transactions are constructed using different sources; although they should give the same answers, typically they do not. In 2008, the difference between the two – the **statistical discrepancy** – was £6 billion, about 25% of the current account balance. This is yet another reminder that, even for a rich country such as the UK, economic data are far from perfect. (This problem of measurement manifests itself in another way as well. The sum of the current account deficits of all the countries in the world should be equal to 0: one country's deficit should show up as a surplus for the other countries taken as a whole. However, this is not the case in the data: if we just add the published current account deficits of all the countries in the world, it would appear that the world is running a large current account deficit and the answer cannot be that we are exporting to Mars less than we are importing!)

Now that we have looked at the current account, we can return to an issue we touched on in Chapter 2: the difference between GDP, the measure of output we have used so far, and GNP, another measure of aggregate output. This is done in the following Focus box 'GDP versus GNP: the example of Ireland.'

The choice between domestic and foreign assets

Openness in financial markets implies that people (or financial institutions, for example investment trusts, that act on their behalf) face a new financial decision: whether to hold domestic assets or foreign assets.

Remembering what we learned in Chapter 5, it would appear that we actually have to think about at least *two* new decisions. The choice of holding domestic *money* versus foreign *money*, and the choice of holding domestic *interest-paying assets* versus foreign *interest-paying assets*. But remember why people hold money: to engage in transactions. For someone who lives in the UK and whose transactions are mostly or fully in pounds, there is little point in holding foreign currency: foreign currency cannot be used for transactions in the UK and, if the goal is to hold foreign assets, holding foreign currency is clearly less desirable than holding foreign bonds, which pay interest. This leaves us with only one new choice to think about, the choice between domestic interest-paying assets and foreign interest-paying assets.

Let's think of these assets for now as domestic one-year bonds and foreign one-year bonds. Consider, for example, the choice between US one-year bonds and UK one-year bonds, from your point of view, as a UK investor:

- Suppose you decide to hold UK bonds.

  Let i_t be the one-year UK nominal interest rate in year t (the subscript t refers to the year). Then, as Figure 6.6 shows, for every £1 you put in UK bonds, you will get £$(1 + i_t)$ next year. (This is represented by the arrow pointing to the right at the top of the figure.)

FOCUS

GDP versus GNP: the example of Ireland

Should value added in an open economy be defined as:

- the value added domestically (that is, within the country), or
- the value added by domestically owned factors of production?

The two definitions are not the same: some domestic output is produced with capital owned by foreigners, while some foreign output is produced with capital owned by domestic residents.

The answer is that either definition is fine, and economists use both. **Gross domestic product (GDP)**, the measure we have used so far, corresponds to value added domestically. **Gross national product (GNP)** corresponds to the value added by domestically owned factors of production. To go from GDP to GNP, one must start from GDP, add factor payments received from the rest of the world, and subtract factor payments paid to the rest of the world. Put another way, GNP is equal to GDP plus net factor payments from the rest of the world. While GDP is now the measure most commonly mentioned, GNP was widely used until the early 1990s, and you will still encounter it in newspapers and academic publications.

For most countries, the difference between GNP and GDP is typically small because factor payments to and from the rest of the world roughly cancel one another. There are a few exceptions. Among them is Ireland. Ireland has received a great amount of foreign direct investment during the last two decades. Therefore, the country now pays substantial factor income to the rest of the world. Table 6.4 gives GDP, GNP and net factor payments for Ireland from 2002 to 2008. Note how much larger GDP is compared to GNP throughout the period. Net factor payment now exceed 15% of GDP.

Table 6.4 GDP, GNP and net factor income in Ireland, 2002–2008

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.

Source: Central Statistics Office Ireland.

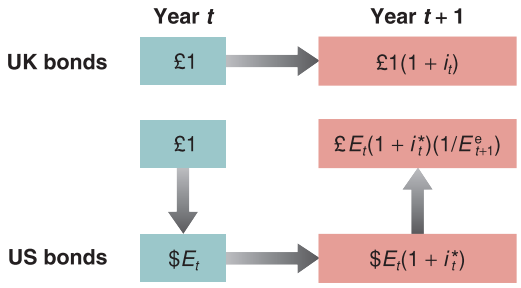

Figure 6.6

Expectecd returns from holding one-year UK bonds or one-year US bonds

The decision about whether to invest abroad or at home depends on more than interest rates. It also depends on the expected movements in the exchange rate in the future. ➤

- Suppose you decide instead to hold US bonds.

To buy US bonds, you must first buy dollars. Let E_t be the nominal exchange rate between the pound and the dollar at the start of year t. For every £1, you get $\$E_t$. (This is represented by the arrow pointing downward in the figure.)

Let i_t^* denote the one-year nominal interest rate on US bonds (in dollars) in year t. When next year comes, you will have $\$E_t(1 + i_t^*)$. (This is represented by the arrow pointing to the right at the bottom of the figure.)

You will then have to convert your dollars back into pounds. If you expect the nominal exchange rate next year to be E_{t+1}^e (the superscript e indicates that it is an expectation: you do not yet know what the pound/dollar exchange rate will be in year $t + 1$), each

dollar will be worth £$(1/E^e_{t+1})$. So you can expect to have £$E_t(1+i^*_t)(1/E^e_{t+1})$ next year for every £1 you invest now. (This is represented by the arrow pointing upward in the figure.) We shall look at the expression we just derived in more detail soon, but note its basic implication already: In assessing the attractiveness of US versus UK bonds, you cannot look just at the US interest rate and the UK interest rate; you must also assess what you think will happen to the pound/dollar exchange rate between this year and next.

Let's now assume that you and other financial investors care only about the expected rate of return and therefore want to hold only the asset with the highest expected rate of return. In that case, if both US bonds and UK bonds are to be held, they must have the same expected rate of return. In other words the following relation must hold:

$$(1+i_t) = (E_t)(1+i^*_t)\left(\frac{1}{E^e_{t+1}}\right)$$

Reorganising, we have

$$(1+i_t) = (1+i^*_t)\left(\frac{E_t}{E^e_{t+1}}\right) \qquad [6.2]$$

Equation (6.2) is called the **uncovered interest parity** relation, or simply the **interest parity condition**.

The word *uncovered* is to distinguish this relation from another relation called the *covered interest parity* condition. The covered interest parity condition is derived by looking at the following choice:

Buy and hold UK bonds for one year. Or buy dollars today, buy one-year US bonds with the proceeds and agree to sell the dollars for pounds a year ahead at a predetermined price, called the *forward exchange rate*. The rate of return on these two alternatives, which can both be realised at *no risk today*, must be the same. The covered interest parity condition is a *riskless arbitrage* condition.

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. Going into and out of US bonds requires three separate transactions, each with a transaction cost.
- It ignores risk. The exchange rate a year from now is uncertain; holding US bonds is therefore more risky, in terms of pounds, than holding UK bonds.

Whether holding US bonds or UK bonds is more risky actually depends on which investors we are looking at. Holding UK bonds is more risky from the point of view of US investors. Holding US bonds is more risky from the point of view of UK investors. (Why?)

However, as a characterisation of capital movements among the major world financial markets (New York, Frankfurt, London and Tokyo), the assumption is not far off. Small changes in interest rates and rumours of impending appreciation or depreciation can lead to movements of billions of dollars within minutes. For the rich countries of the world, the assumption in equation (6.2) is a good approximation of reality. Other countries whose capital markets are smaller and less developed, or countries that have various forms of **capital controls**, have more leeway in choosing their domestic interest rate than is implied by equation (6.2). We shall return to this issue at the end of Chapter 18.

Interest rates and exchange rates

Let's get a better sense of what the interest parity condition implies. First, rewrite E_t/E^e_{t+1} as $1/[1+(E^e_{t+1}-E_t)/E_t]$. Replacing in equation (6.2) gives

$$(1+i_t) = \frac{(1+i^*_t)}{[1+(E^e_{t+1}-E_t)/E_t]} \qquad [6.3]$$

This gives us a relation between the domestic nominal interest rate, i_t, the foreign nominal interest rate, i^*_t, and the expected rate of appreciation of the domestic currency, $(E^e_{t+1}-E_t)/E_t$. As long as interest rates and the expected rate of depreciation are not too large – say below 20% per year – a good approximation to this equation is given by

$$i_t \approx i^*_t - \frac{E^e_{t+1}-E_t}{E_t} \qquad [6.4]$$

This is the form of the interest parity condition you must remember: *arbitrage by investors implies that the domestic interest rate must be equal to the foreign interest rate minus the expected appreciation rate of the domestic currency*.

If the pound is expected to depreciate by 3% vis-à-vis the dollar, then the dollar is expected to appreciate by 3% vis-à-vis the pound.

Note that the expected appreciation rate of the domestic currency is also the expected depreciation rate of the foreign currency. So equation (6.4) can be equivalently stated as saying that *the domestic interest rate must be equal to the foreign interest rate minus the expected depreciation rate of the foreign currency*.

Let's apply this equation to US bonds versus UK bonds. Suppose the one-year nominal interest rate is 1.0% in the USA, and it is 2.0% in the UK. Should you hold UK bonds or US bonds? The answer:

- It depends whether you expect the pound to depreciate vis-à-vis the dollar over the coming year by more or less than the difference between the US interest rate and the UK interest rate, 1.0% in this case (2.0% – 1.0%).
- If you expect the pound to depreciate by more than 1.0%, then, despite the fact that the interest rate is higher in the UK than in the USA, investing in UK bonds is less attractive than investing in US bonds. By holding UK bonds, you will get higher interest payments next year, but the pound will be worth less in terms of dollars next year, making investing in UK bonds less attractive than investing in US bonds.
- If you expect the pound to depreciate by less than 1.0% or even to appreciate, then the reverse holds, and UK bonds are more attractive than US bonds.

Looking at it another way: if the uncovered interest parity condition holds, and the US one-year interest rate is 1% lower than the UK interest rate, it must be that financial investors are expecting on average an appreciation of the dollar vis-à-vis the pound over the coming year of about 1%, and this is why they are willing to hold US bonds despite their lower interest rate. (Another application of the uncovered interest parity condition is provided in the Focus box 'Buying Brazilian bonds.')

FOCUS
Buying Brazilian bonds

Let's go back to September 1993 because the very high interest rate in Brazil at the time helps make the point we want to get across here. Brazilian bonds are paying a *monthly* interest rate of 36.9%. This seems very attractive compared to the *annual* rate of 3% on US bonds – corresponding to a monthly interest rate of about 0.2%. Shouldn't you buy Brazilian bonds?

The discussion in this chapter tells you that, in order to decide, you need one more crucial element: the expected rate of depreciation of the *cruzeiro* (the name of the Brazilian currency at the time; the currency is now called the *real*) in terms of dollars.

You need this information because, as we saw in equation (6.3), the return in dollars from investing in Brazilian bonds for a month is equal to 1 plus the Brazilian interest rate, divided by 1 plus the expected rate of depreciation of the *cruzeiro* relative to the *dollar*:

$$\frac{1+i_1^*}{[1+(E_{t+1}^e - E_t)/E_t]}$$

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 dollar was worth 100 000 cruzeiros at the end of July 1993, and it was worth 134 600 cruzeiros at the end of August 1993, so the rate of appreciation of the dollar vis-à-vis the cruzeiro – equivalently, the rate of depreciation of the cruzeiro vis-à-vis the dollar – in August was 34.6%. If depreciation is expected to continue at the same rate in September as it did in August, the expected return from investing in Brazilian bonds for a month is

$$\frac{1.369}{1.346} = 1.017$$

The expected rate of return in dollars from holding Brazilian bonds is only (1.017 – 1) = 1.7% per month, not the 36.9% per month that initially looked so attractive. Note that 1.7% per month is still much higher than the monthly interest rate on US bonds (about 0.2%). But 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.

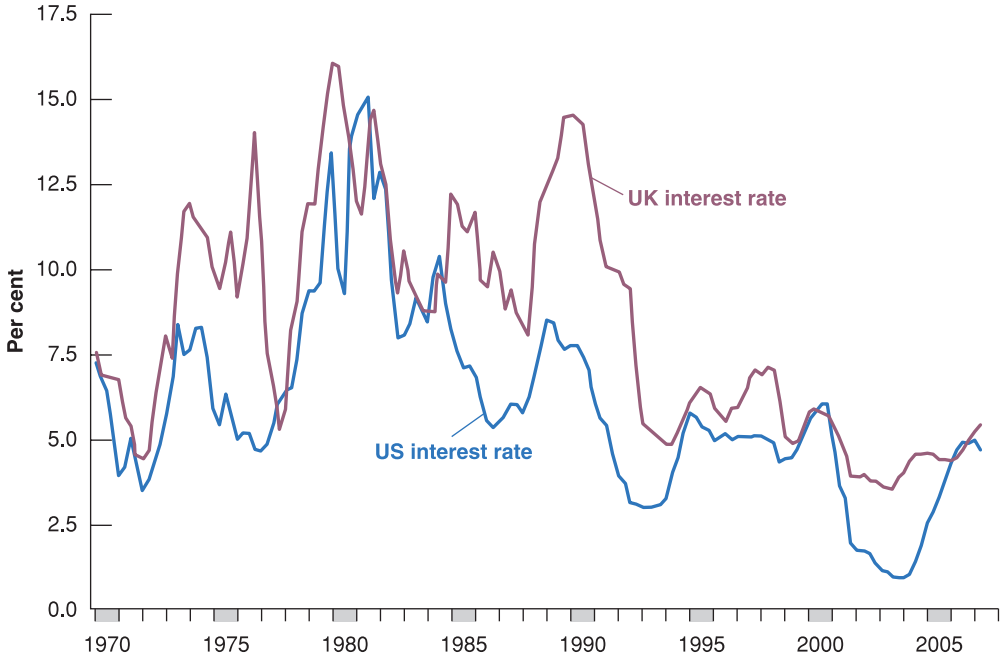

Figure 6.7

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

The arbitrage relation between interest rates and exchange rates, either in the form of equation (6.2) or equation (6.4), will play a central role in the following chapters. It suggests that, unless countries are willing to tolerate large movements in their exchange rates, domestic and foreign interest rates are likely to move very much together. Take the extreme case of two countries that commit to maintaining their bilateral exchange rates at a fixed value. If markets have faith in this commitment, they will expect the exchange rate to remain constant: the expected depreciation will then be equal to zero. In this case, the arbitrage condition implies that interest rates in the two countries will have to move exactly together. Most of the time, as we shall see, governments do not make such absolute commitments to maintain the exchange rate, but they often do try to avoid large movements in the exchange rate. This puts sharp limits on how much they can allow their interest rates to deviate from interest rates elsewhere in the world.

◀ If $E^e_{t+1} = E_t$, then the interest parity condition implies that $i_t = i^*_t$.

How much do nominal interest rates actually move together in major countries? Figure 6.7 plots the three-month nominal interest rate in the USA and the three-month nominal interest rate in the UK (both expressed at annual rates) since 1970. The figure shows that the movements are related but not identical. Interest rates were very high in both countries in the early 1980s, and they were high again – although much more so in the UK than in the USA – in the late 1990s. They have been low in both countries since the mid-1990s. At the same time, differences between the two have sometimes been quite large: in 1990, for example, the UK interest rate was nearly 7% higher than the US interest rate. In the coming chapters, we shall return to why such differences emerge and what their implications may be. For the time being all you have studied so far in this chapter allows us to describe equilibrium in the goods market in an open economy.

◀ Meanwhile, do the following. Look at the back pages of a recent issue of *The Economist* for short-term interest rates in different countries relative to the currency of your country. Assume that uncovered interest parity holds. Which currencies are expected to appreciate against your currency?

6.3 THE *IS* RELATION IN AN OPEN ECONOMY

When we were assuming that the economy was closed to trade, there was no need to distinguish between the *domestic demand for goods* and the *demand for domestic goods*: they were clearly the same thing. Now, we must distinguish between the two. Some domestic demand falls on foreign goods, and some of the demand for domestic goods comes from foreigners. Let's look at this distinction more closely.

◀ 'The domestic demand for goods' and 'the demand for domestic goods' sound close but are not the same. Part of domestic demand falls on foreign goods. Part of foreign demand falls on domestic goods.

The demand for domestic goods

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

$$Z = C + I + G - \frac{IM}{\varepsilon} + X \qquad [6.5]$$

The first three terms – consumption, C, investment, I, and government spending, G – constitute the **domestic demand for goods**. If the economy were closed, $C + I + G$ would also be the demand for domestic goods. This is why, until now, we have only looked at $C + I + G$, but now we have to make two adjustments:

In Chapter 3, we ignored the real exchange rate and subtracted IM, not IM/ε. But that was a cheat; we did not want to have to talk about the real exchange rate – and complicate matters – so early in the book.

- First, we must subtract imports – that part of the domestic demand that falls on foreign goods rather than on domestic goods.

  We must be careful here: foreign goods are different from domestic goods, so we cannot just subtract the quantity of imports, IM. If we were to do so, we would be subtracting apples (foreign goods) from oranges (domestic goods). We must first express the value of imports in terms of domestic goods. This is what IM/ε in equation (6.5) stands for: recall from Section 6.1 that ε, the real exchange rate, is defined as the price of domestic goods in terms of foreign goods. Equivalently, $1/\varepsilon$ is the price of foreign goods in terms of domestic goods. So IM $(1/\varepsilon)$ – or, equivalently, IM/ε – is the value of imports in terms of domestic goods.
- Second, we must add exports – that part of the demand for domestic goods that comes from abroad. This is captured by the term X in equation (6.5).

Domestic demand for goods, $C + I + G$
Minus domestic demand for foreign goods (imports), IM/ε
Plus foreign demand for domestic goods (exports), X.
Equals demand for domestic goods, $C + I + G - IM/\varepsilon + X$

The determinants of C, I and G

Having listed the five components of demand, our next task is to specify their determinants. Let's start with the first three: C, I and G. Now that we are assuming that the economy is open, how should we modify our earlier descriptions of consumption, investment and government spending? The answer: not very much, if at all. How much consumers decide to spend still depends on their income and their wealth. While the real exchange rate surely affects the *composition* of consumption spending between domestic goods and foreign goods, there is no obvious reason why it should affect the overall *level* of consumption. The same is true of investment: the real exchange rate may affect whether firms buy domestic machines or foreign machines, but it should not affect total investment.

This is good news because it implies that we can use the descriptions of consumption, investment and government spending that we developed earlier. Therefore,

$$\text{Domestic demand: } C + I + G = \underset{(+)}{C}(Y - T) + \underset{(+,-)}{I}(Y, i) + G$$

We assume that consumption depends positively on disposable income, $Y - T$, and that investment depends positively on production, Y, and negatively on the interest rate, i. We continue to take government spending, G, as given.

The determinants of imports

Imports are the part of domestic demand that falls on foreign goods. What do they depend on? They clearly depend on domestic income: higher domestic income leads to a higher domestic demand for all goods, both domestic and foreign. So a higher domestic income leads to higher imports. Imports also clearly depend on the real exchange rate – the price of domestic goods in terms of foreign goods. The more expensive domestic goods are relative to foreign goods – equivalently, the cheaper foreign goods are relative to domestic goods – the higher the domestic demand for foreign goods. So a higher real exchange rate leads to higher imports. Thus, we write imports as

$$IM = IM(Y, \varepsilon) \quad [6.6]$$
$$(+, +)$$

- An increase in domestic income, Y (equivalently, an increase in domestic output – income and output are still equal in an open economy), leads to an increase in imports. This positive effect of income on imports is captured by the positive sign under Y in equation (6.6).
- An increase in the real exchange rate, ε, leads to an increase in imports, IM. This positive effect of the real exchange rate on imports is captured by the positive sign under ε in equation (6.6). (As ε goes up, note that IM goes up, but $1/\varepsilon$ goes down, so what happens to IM/ε, the *value* of imports in terms of domestic goods, is ambiguous. We will return to this point shortly.)

The determinants of exports

Exports are the part of foreign demand that falls on domestic goods. What do they depend on? They depend on foreign income: higher foreign income means higher foreign demand for all goods, both foreign and domestic. So higher foreign income leads to higher exports. Exports also depend on the real exchange rate: the higher the price of domestic goods in terms of foreign goods, the lower the foreign demand for domestic goods. In other words, the higher the real exchange rate, the lower the exports.

Let Y^* denote foreign income (equivalently, foreign output). We therefore write exports as

$$X = X(Y^*, \varepsilon) \quad [6.7]$$
$$(+, -)$$

◀ Recall that asterisks refer to foreign variables.

- An increase in foreign income, Y^*, leads to an increase in exports.
- An increase in the real exchange rate, ε, leads to a decrease in exports.

Putting the components together

Figure 6.8 puts together what we have learned so far. It plots the various components of demand against output, keeping constant all other variables (the interest rate, taxes, government spending, foreign output and the real exchange rate) that affect demand.

In Figure 6.8(a), the line DD plots domestic demand, $C + I + G$, as a function of output, Y. This relation between demand and output is familiar from Chapter 3. Under our standard assumptions, the slope of the relation between demand and output is positive but less than 1. An increase in output – equivalently, an increase in income – increases demand but less than one-for-one. (In the absence of good reasons to the contrary, we draw the relation between demand and output, and the other relations in this chapter, as lines rather than curves. This is purely for convenience, and none of the discussions that follow depends on this assumption.)

◀ For a given real exchange rate ε, IM/ε – the value of imports in terms of domestic goods – moves exactly with IM – the quantity of imports.

To arrive at the demand for domestic goods, we must first *subtract imports*. This is done in Figure 6.8(b), and it gives us the line AA. The line AA represents the domestic demand for domestic goods. The distance between DD and AA equals the value of imports, IM/ε. Because the quantity of imports increases with income, the distance between the two lines increases with income. We can establish two facts about line AA, which will be useful later in the chapter:

- AA is flatter than DD: as income increases, some of the additional domestic demand falls on foreign goods rather than on domestic goods. In other words, as income increases, the domestic demand for domestic goods increases less than total domestic demand.
- As long as some of the additional demand falls on domestic goods, AA has a positive slope: an increase in income leads to some increase in the demand for domestic goods.

Finally, we must *add exports*. This is done in Figure 6.8(c), and it gives us the line ZZ, which is above AA. The line ZZ represents the demand for domestic goods. The distance

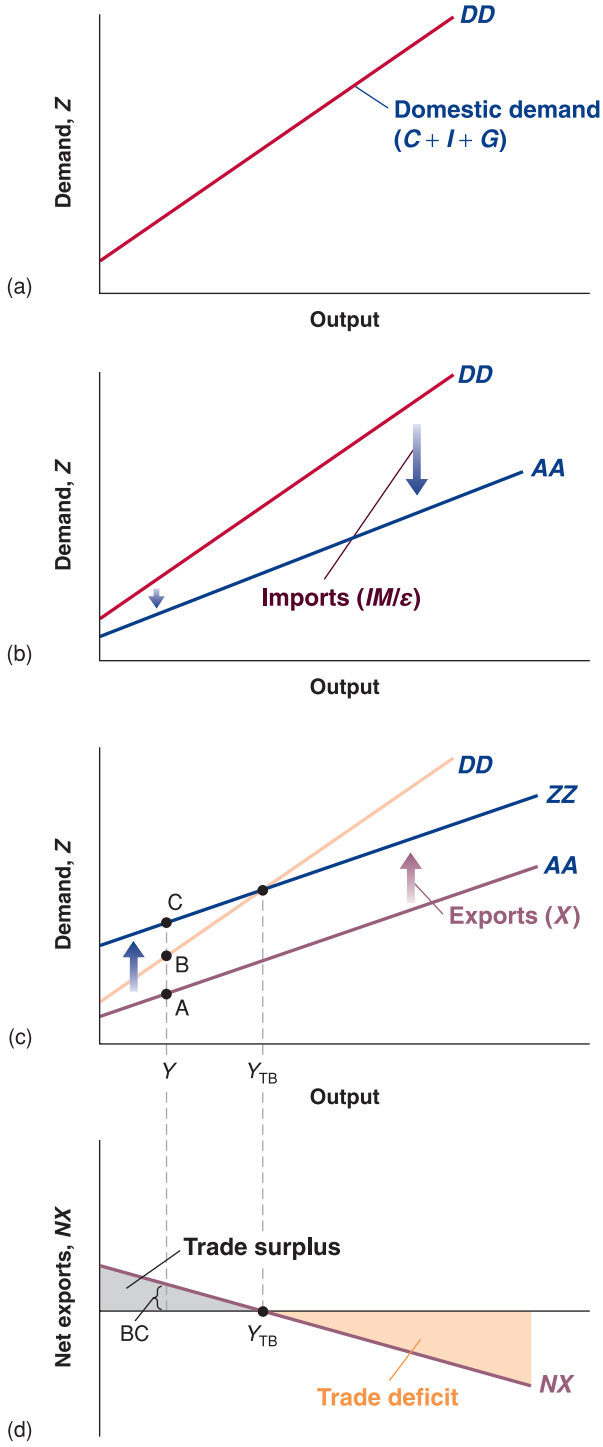

Figure 6.8

The demand for domestic goods and net exports

Panel (a): The domestic demand for goods is an increasing function of income (output).

Panels (b) and (c): The demand for domestic goods is obtained by subtracting the value of imports from domestic demand and then adding exports.

Panel (d): The trade balance is a decreasing function of output.

between *ZZ* and *AA* equals exports. Because exports do not depend on domestic income (they depend on foreign income), the distance between *ZZ* and *AA* is constant, which is why the two lines are parallel. Because *AA* is flatter than *DD*, *ZZ* is also flatter than *DD*.

From the information in Figure 6.8(c), we can characterise the behaviour of net exports – the difference between exports and imports – as a function of output. At output level *Y*, for example, exports are given by the distance AC and imports ($X - IM/\varepsilon$) by the distance AB, so net exports are given by the distance BC.

Recall that net exports is synonymous with trade balance. Positive net exports correspond to a trade surplus, whereas negative net exports correspond to a trade deficit. ➤

This relation between net exports and output is represented as the line *NX* (for Net Exports) in Figure 6.8(d). Net exports are a decreasing function of output: as output

increases, imports increase, and exports are unaffected, so net exports decrease. Call Y_{TB} (TB for trade balance) the level of output at which the value of imports equals the value of exports, so that net exports are equal to 0. Levels of output above Y_{TB} lead to higher imports and to a trade deficit. Levels of output below Y_{TB} lead to lower imports and to a trade surplus.

To determine the equilibrium output in an open economy, you just have to recall what you learned in Chapter 5. The goods market is in equilibrium when domestic output equals the demand – both domestic and foreign – for domestic goods:

$$Y = Z$$

Collecting the relations we derived for the components of the demand for domestic goods, Z, we get

$$\underset{(+)}{Y = C(Y-T)} + \underset{(+,-)}{I(Y, i)} + G - \underset{(+,+)}{IM(Y, \varepsilon)/\varepsilon} + \underset{(+,-)}{X(Y^*, \varepsilon)} \qquad [6.8]$$

For the goods market to be in equilibrium, output (the left side of the equation) must be equal to the demand for domestic goods (the right side of the equation). The demand for domestic goods is equal to consumption, C, plus investment, I, plus government spending, G, minus the value of imports, IM/ε, plus exports, X:

- Consumption, C, depends positively on disposable income, $Y - T$.
- Investment, I, depends positively on output, Y, and negatively on the interest rate, i.
- Government spending, G, is taken as given.
- The quantity of imports, IM, depends positively on both output, Y, and the real exchange rate, ε. The value of imports in terms of domestic goods is equal to the quantity of imports divided by the real exchange rate.
- Exports, X, depend positively on foreign output, Y^*, and negatively on the real exchange rate, ε.

This equilibrium condition determines output as a function of all the variables we take as given, from taxes to the real exchange rate to foreign output. This is not a simple relation; Figure 6.9 represents it graphically, in a more user-friendly way.

In Figure 6.9(a), demand is measured on the vertical axis, and output (equivalently production or income) is measured on the horizontal axis. The line ZZ plots demand as a function of output; this line simply replicates the line ZZ in Figure 6.8; ZZ is upward-sloping but with slope less than 1.

Equilibrium output is at the point where demand equals output, at the intersection of the line ZZ and the 45° line: point A in the figure, with associated output level Y.

Figure 6.9(b) replicates Figure 6.8(d), drawing net exports as a decreasing function of output. There is, in general, no reason why the equilibrium level of output, Y, should be the same as the level of output at which trade is balanced, Y_{TB}. As we have drawn the figure, equilibrium output is associated with a trade deficit, equal to the distance BC. Note that we could have drawn it differently, so equilibrium output was associated instead with a trade surplus.

◀ The equilibrium level of output is given by the condition $Y = Z$. The level of output at which there is trade balance is given by the condition $X = IM/\varepsilon$. These are two different conditions.

It will be convenient in what follows to regroup the last two terms under 'net exports,' defined as exports minus the value of imports:

$$NX(Y, Y^*, \varepsilon) \equiv X(Y^*, \varepsilon) - IM(Y, \varepsilon)/\varepsilon$$

It follows from our assumptions about imports and exports that net exports, NX, depend on domestic output, Y, foreign output, Y^*, and the real exchange rate, ε. An increase in domestic output increases imports, thus decreasing net exports. An increase in foreign output increases exports, thus increasing net exports. An increase in the real exchange rate leads to a decrease in net exports.

◀ We shall assume, throughout the chapter, that an increase in the real exchange rate – a real appreciation – leads to a decrease in net exports (this condition is called the Marshall–Lerner condition, as we will learn in Chapter 18).

Using this definition of net exports, we can rewrite the equilibrium condition as

$$\underset{(+)}{Y = C(Y-T)} + \underset{(+,-)}{I(Y, i)} + G + \underset{(-,+,-)}{NX(Y, Y^*, \varepsilon)} \qquad [6.9]$$

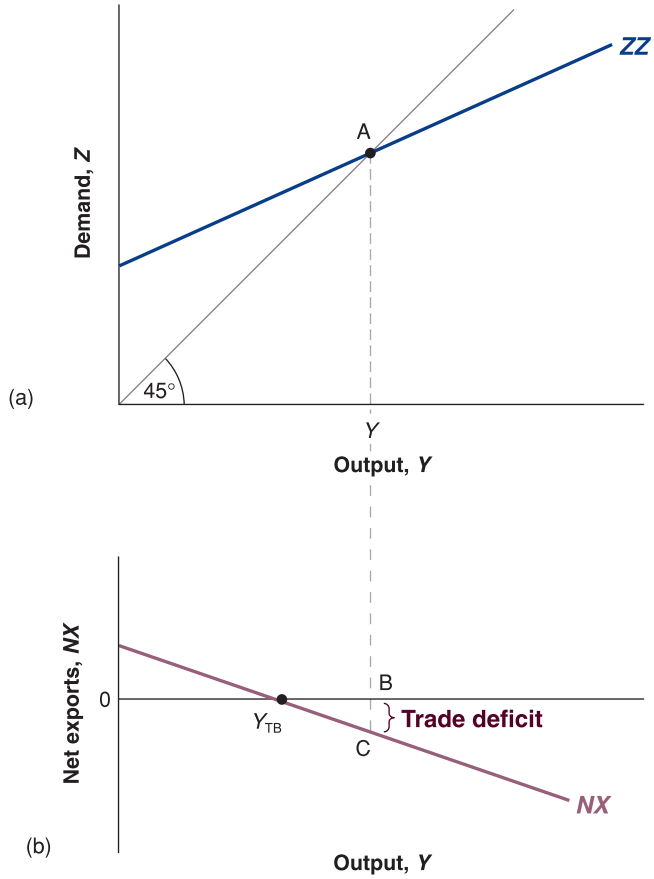

Figure 6.9

Equilibrium output and net exports

The goods market is in equilibrium when domestic output is equal to the demand for domestic goods. At the equilibrium level of output, the trade balance may show a deficit or a surplus.

For our purposes, the main implication of equation (6.9) is that both the interest rate and the real exchange rate affect demand and, in turn, equilibrium output:

- An increase in the real interest rate leads to a decrease in investment spending and, as a result, to a decrease in the demand for domestic goods. This leads, through the multiplier, to a decrease in output.
- An increase in the exchange rate leads to a shift in demand toward foreign goods and, as a result, to a decrease in net exports. The decrease in net exports decreases the demand for domestic goods. This leads, through the multiplier, to a decrease in output.

For the remainder of the chapter, we shall make a simplification to equation (6.9):

$P = P^*$, so $\varepsilon = E$

- As we are still studying the short run, when prices are assumed to be constant, the real exchange rate, $\varepsilon \equiv EP/P^*$, and the nominal exchange rate, E, move together. A decrease in the nominal exchange rate – a nominal depreciation – leads, one-for-one, to a decrease in the real exchange rate – a real depreciation. Conversely, an increase in the nominal exchange rate – a nominal appreciation – leads, one-for-one, to an increase in the real exchange rate – a real appreciation. If, for notational convenience, we choose P and P^* so that $P/P^* = 1$ (and we can do so because both are index numbers), then $\varepsilon = E$, and we can replace ε by E in equation (6.9).

With these two simplifications, equation (6.9) becomes

$$\underset{(+)}{Y = C(Y - T)} + \underset{(+,-)}{I(Y, i)} + G + \underset{(-,+,-)}{NX(Y, Y^*, E)}$$

In words: Goods market equilibrium implies that output depends negatively on both the nominal interest rate and the nominal exchange rate.

6.4 EQUILIBRIUM IN FINANCIAL MARKETS

When we looked at financial markets in the *IS–LM* model for a closed economy, we assumed that people chose between only two financial assets, money and bonds. Now that we are looking at a financially open economy, we must also take into account the fact that people have a choice between domestic bonds and foreign bonds. Let's consider each choice in turn.

Money versus bonds

When we looked at the determination of the interest rate in the *IS–LM* model in Chapter 5, we wrote the condition that the supply of money be equal to the demand for money as

$$\frac{M}{P} = YL(i) \qquad [6.10]$$

We took the real supply of money [the left side of equation (6.10)] as given. We assumed that the real demand for money [the right side of equation (6.10)] depended on the level of transactions in the economy, measured by real output, Y, and on the opportunity cost of holding money rather than bonds – that is, the interest rate on bonds, i.

How should we change this characterisation now that the economy is open? You will like the answer: not very much, if at all.

In an open economy, the demand for domestic money is still mostly a demand by domestic residents. There is not much reason for, say, the residents of the UK to hold euro currency or demand deposits. Transactions in the UK require payment in pounds, not in euros. If residents of the UK want to hold euro-denominated assets, they are better off holding euro bonds, which at least pay a positive interest rate. And the demand for money by domestic residents in any country still depends on the same factors as before: their level of transactions, which we measure by domestic real output, and the opportunity cost of holding money, the interest rate on bonds.

Therefore, we can still use equation (6.10) to think about the determination of the interest rate in an open economy. The interest rate must be such that the supply of money and the demand for money are equal. An increase in the money supply leads to a decrease in the interest rate. An increase in money demand, say as a result of an increase in output, leads to an increase in the interest rate.

Domestic bonds versus foreign bonds

As we look at the choice between domestic bonds and foreign bonds, we shall rely on the assumption we introduced in Section 6.2: financial investors, domestic or foreign, go for the highest expected rate of return. This implies that, in equilibrium, both domestic bonds and foreign bonds must have the same expected rate of return; otherwise, investors would be willing to hold only one or the other, but not both, and this could not be an equilibrium. (Like most other economic relations, this relation is only an approximation to reality and does not always hold. More on this in the Focus box 'Sudden stops, the strong dollar and limits to the interest parity condition' in Section 6.5.)

As we saw earlier [equation (6.2)], this assumption implies that the following arbitrage relation – the *interest parity condition* – must hold:

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

where i_t is the domestic interest rate, i_t^* is the foreign interest rate, E_t is the current exchange rate and E_{t+1}^e is the future expected exchange rate. The left side gives the return, in terms of domestic currency, from holding domestic bonds. The right side gives the expected return, also in terms of domestic currency, from holding foreign bonds. In equilibrium, the two expected returns must be equal.

The presence of E_t comes from the fact that, in order to buy the foreign bond, you must first exchange domestic currency for foreign currency. The presence of E_{t+1}^e comes from the fact that, in order to bring the funds back next period, you will have to exchange foreign currency for domestic currency.

Multiply both sides by E_{t+1}^e and reorganise, to get

$$E_t = \frac{1 + i_t}{1 + i_t^*} E_{t+1}^e \qquad [6.11]$$

For now, we shall take the expected future exchange rate as given and denote it as $\bar{E}^e$ (we shall relax this assumption in Chapter 18). Under this assumption, and dropping time indexes, the interest parity condition becomes

$$E = \frac{1 + i}{1 + i^*} \bar{E}^e \qquad [6.12]$$

This relation tells us that the current exchange rate depends on the domestic interest rate, on the foreign interest rate and on the expected future exchange rate:

- An increase in the domestic interest rate leads to an increase in the exchange rate.
- An increase in the foreign interest rate leads to a decrease in the exchange rate.
- An increase in the expected future exchange rate leads to an increase in the current exchange rate.

This relation plays a central role in the real world and will play a central role in this chapter. To understand the relation further, consider the following example.

Consider financial investors – investors, for short – choosing between UK bonds and Japanese bonds. Suppose that the one-year interest rate on UK bonds is 5% and the one-year interest rate on Japanese bonds is also 5%. Suppose that the current exchange rate is 100 (1 pound is worth 100 yen), and the expected exchange rate a year from now is also 100. Under these assumptions, both UK and Japanese bonds have the same expected return in pounds, and the interest parity condition holds.

Suppose that investors now expect the exchange rate to be 10% higher a year from now, so E^e is now equal to 110. At an unchanged current exchange rate, UK bonds are now much more attractive than Japanese bonds: UK bonds offer an interest rate of 5% in pounds. Japanese bonds still offer an interest rate of 5% in yen, but yen a year from today are now expected to be worth 10% less in terms of pounds. In terms of pounds, the return on Japanese bonds is therefore 5% (the interest rate) – 10% (the expected depreciation of the yen relative to the pound), or –5%.

So what will happen? At the initial exchange rate of 100, investors want to shift out of Japanese bonds into UK bonds. To do so, they must first sell Japanese bonds for yen, then sell yen for pounds, and then use the pounds to buy UK bonds. As investors sell yen and buy pounds, the pound appreciates. By how much? Equation (6.12) gives us the answer: $E = (1.05/1.05)\ 110 = 110$. The current exchange rate must increase in the same proportion as the expected future exchange rate. Put another way, the pound must appreciate today by 10%. When it has appreciated by 10%, so, $E = \bar{E}^e = 110$, the expected returns on UK and Japanese bonds are again equal, and there is equilibrium in the foreign exchange market.

Suppose instead that, as a result of a UK monetary contraction, the UK interest rate increases from 5% to 8%. Assume that the Japanese interest rate remains unchanged at 5%, and that the expected future exchange rate remains unchanged at 100. At an unchanged current exchange rate, UK bonds are now again much more attractive than Japanese bonds. UK bonds yield a return of 8% in pounds. Japanese bonds give a return of 5% in yen and – because the exchange rate is expected to be the same next year as it is today – an expected return of 5% in pounds as well.

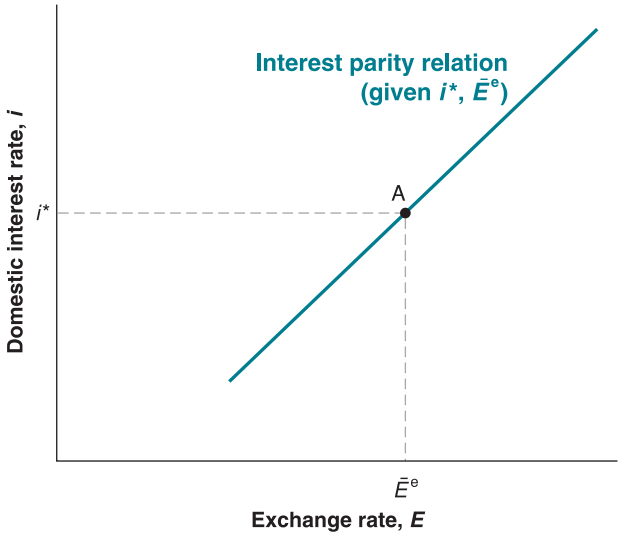

Figure 6.10

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.

So what will happen? Again, at the initial exchange rate of 100, investors want to shift out of Japanese bonds into UK bonds. As they do so, they sell yen for pounds, and the pound appreciates. By how much? Equation (6.12) gives the answer: $E = (1.08/1.05)100 \approx 103$. The current exchange rate increases by approximately 3%. Why 3%? Think of what happens when the pound appreciates. If, as we have assumed, investors do not change their expectation of the future exchange rate, then the more the pound appreciates today, the more investors expect it to depreciate in the future (as it is expected to return to the same value in the future). When the pound has appreciated by 3% today, investors expect it to depreciate by 3% during the coming year. Equivalently, they expect the yen to appreciate vis-à-vis the pound by 3% over the coming year. The expected rate of return in pounds from holding Japanese bonds is therefore 5% (the yen interest rate) + 3% (the expected yen appreciation), or 8%. This expected rate of return is the same as the rate of return on holding UK bonds, so there is equilibrium in the foreign exchange market.

◀ Make sure you understand the argument. Why doesn't the pound appreciate by, say, 20%?

Note that our argument relies heavily on the assumption that, when the interest rate changes, the expected exchange rate remains unchanged. This implies that an appreciation today leads to an expected depreciation in the future – because the exchange rate is expected to return to the same, unchanged, value. We shall relax the assumption that the future exchange rate is fixed in Chapter 18. But the basic conclusion will remain: *an increase in the domestic interest rate relative to the foreign interest rate leads to an appreciation*.

Figure 6.10 plots the relation between the domestic interest rate, i, and the exchange rate, E, implied by equation (6.12) – the interest parity relation. The relation is drawn for a given expected future exchange rate, $\bar{E}^e$, and a given foreign interest rate, i^*, and is represented by an upward-sloping line: the higher the domestic interest rate, the higher the exchange rate. Equation (6.12) also implies that when the domestic interest rate is equal to the foreign interest rate ($i = i^*$), the exchange rate is equal to the expected future exchange rate ($E = \bar{E}^e$). This implies that the line corresponding to the interest parity condition goes through point A in the figure.

◀ What happens to the line if i^* increases? What happens to the line if $\bar{E}^e$ increases?

6.5 PUTTING GOODS AND FINANCIAL MARKETS TOGETHER

We now have the elements we need to understand the movements of output, the interest rate, and the exchange rate.

Goods market equilibrium implies that output depends, among other factors, on the interest rate and the exchange rate:

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

The interest rate, in turn, is determined by the equality of money supply and money demand:

$$\frac{M}{P} = YL(i)$$

And the interest parity condition implies a negative relation between the domestic interest rate and the exchange rate:

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

Together, these three relations determine output, the interest rate and the exchange rate. Working with three relations is not very easy, but we can easily reduce them to two by using the interest parity condition to eliminate the exchange rate in the goods market equilibrium relation. Doing this gives us the following two equations, the open-economy versions of our familiar *IS* and *LM* relations:

$$IS: \quad Y = C(Y-T) + I(Y, i) + G + NX\left(Y, Y^*, \frac{1+i}{1+i^*}\bar{E}^e\right)$$

$$LM: \frac{M}{P} = YL(i)$$

Take the *IS* relation first and consider the effects of an increase in the interest rate on output. An increase in the interest rate now has two effects:

- The first effect, which was already present in a closed economy, is the direct effect on investment: a higher interest rate leads to a decrease in investment, a decrease in the demand for domestic goods and a decrease in output.
- The second effect, which is present only in the open economy, is the effect through the exchange rate: an increase in the domestic interest rate leads to an increase in the exchange rate – an appreciation. The appreciation, which makes domestic goods more expensive relative to foreign goods, leads to a decrease in net exports and, therefore, to a decrease in the demand for domestic goods and a decrease in output.

Both effects work in the same direction: an increase in the interest rate decreases demand directly and indirectly – through the adverse effect of the appreciation on demand.

An increase in the interest rate leads, both directly and indirectly (through the exchange rate), to a decrease in output.

The *IS* relation between the interest rate and output is drawn in Figure 6.11(a), for given values of all the other variables in the relation – namely T, G, Y^*, i^* and $\bar{E}^e$. The *IS* curve is downward-sloping: an increase in the interest rate leads to lower output. The curve looks very much the same in an open economy as in a closed economy, but it hides a more complex relation than before: the interest rate affects output not only directly but also indirectly through the exchange rate.

The *LM* relation is exactly the same in an open economy as in a closed economy. The *LM* curve is upward-sloping. For a given value of the real money stock, M/P, an increase in output leads to an increase in the demand for money and to an increase in the equilibrium interest rate.

Equilibrium in the goods and financial markets is attained at point A in Figure 6.11(a), with output level Y and interest rate i. The equilibrium value of the exchange rate cannot be read directly from the graph, but it is easily obtained from Figure 6.11(b), which replicates Figure 6.10, and gives the exchange rate associated with a given interest rate. The exchange rate associated with the equilibrium interest rate, i, is equal to E.

Let's summarise: we have derived the *IS* and the *LM* relations for an open economy.

- The *IS* curve is downward-sloping – An increase in the interest rate leads directly and indirectly (through the exchange rate) to a decrease in demand and a decrease in output.
- The *LM* curve is upward-sloping – An increase in income increases the demand for money, leading to an increase in the equilibrium interest rate.

FOCUS

Sudden stops, the strong dollar and the limits to the interest parity condition

The interest parity condition assumes that financial investors care only about expected returns. As we discussed in Section 6.2, investors care not only about returns but also about risk and about liquidity – how easy it is to buy or sell an asset.

Much of the time, we can ignore these other factors. Sometimes, however, these factors play a big role in investors' decisions and in determining exchange rate movements.

Perceptions of risk often play an important role in the decisions of large financial investors – for example, pension funds – to invest or not to invest at all in a country. Sometimes the perception that risk has decreased leads many foreign investors to simultaneously buy assets in a country, leading to a large increase in demand for the assets of that country. Sometimes the perception that risk has increased leads the same investors to want to sell all the assets they have in that country, no matter what the interest rate. These episodes, which have affected many Latin American and Asian emerging economies, are known as sudden stops. During these episodes, the interest parity condition fails, and the exchange rate may decrease a lot, without any change in domestic or foreign interest rates.

Large countries can also be affected. For example, the appreciation of the dollar in the 1990s came not so much from an increase in US interest rates over foreign interest rates, as from an increased foreign demand for dollar assets at a given interest rate. Many private foreign investors wanted to have some proportion of their wealth in US assets: they perceived US assets as being relatively safe. Many foreign central banks wanted to hold a large proportion of their reserves in US T-bills. The reason they did so is because the T-bill market is very liquid, so they could buy and sell T-bills without affecting the price. This very high demand for US assets, at a given interest rate, was behind the 'strong dollar' in the 1990s. Even while US interest rates are relatively low, foreign investors are still eager to increase their holdings of US assets, and thus to finance the large US trade deficit. How long they are willing to do so will determine what happens to the dollar and to the US trade balance.

Equilibrium output and the equilibrium interest rate are given by the intersection of the *IS* and the *LM* curves. Given the foreign interest rate and the expected future exchange rate, the equilibrium interest rate determines the equilibrium exchange rate.

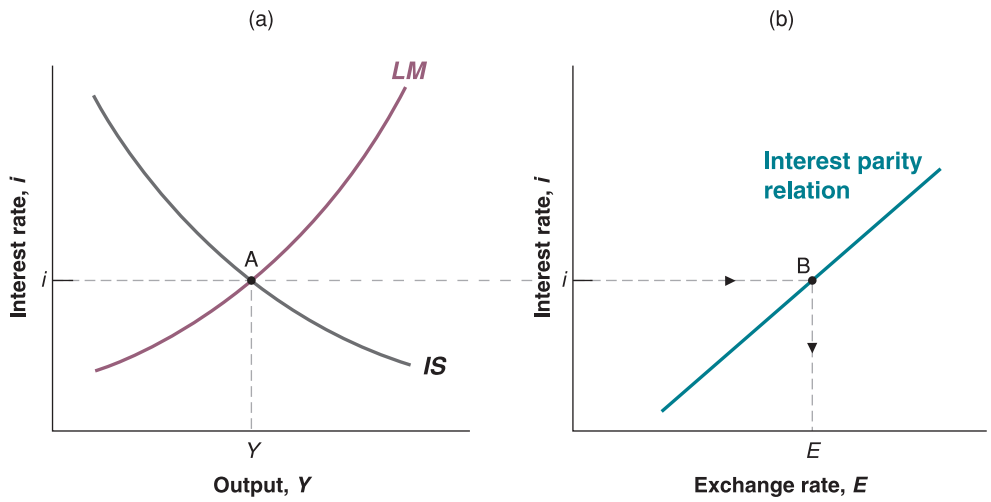

Figure 6.11

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.

SUMMARY

- Openness in goods markets allows people and firms to choose between domestic goods and foreign goods. Openness in financial markets allows financial investors to hold domestic financial assets or foreign financial assets.
- The nominal exchange rate is the price of the domestic currency in terms of foreign currency. From the viewpoint of the UK, the nominal exchange rate between the UK and the USA is the price of a pound in terms of dollars.
- A nominal appreciation (an appreciation, for short) is an increase in the price of the domestic currency in terms of foreign currency. In other words, it corresponds to an increase in the exchange rate. A nominal depreciation (a depreciation, for short) is a decrease in the price of the domestic currency in terms of foreign currency. It corresponds to a decrease in the exchange rate.
- The real exchange rate is the relative price of domestic goods in terms of foreign goods. It is equal to the nominal exchange rate times the domestic price level divided by the foreign price level.
- A real appreciation is an increase in the relative price of domestic goods in terms of foreign goods – i.e. an increase in the real exchange rate. A real depreciation is a decrease in the relative price of domestic goods in terms of foreign goods – i.e. a decrease in the real exchange rate.
- The multilateral real exchange rate, or real exchange rate for short, is a weighted average of bilateral real exchange rates, with the weight for each foreign country equal to its share in trade.
- In an open economy, the demand for domestic goods is equal to the domestic demand for goods (consumption plus investment plus government spending) minus the value of imports (in terms of domestic goods) plus exports.
- In an open economy, an increase in domestic demand leads to a smaller increase in output than it would in a closed economy because some of the additional demand falls on imports. For the same reason, an increase in domestic demand also leads to a deterioration of the trade balance.

KEY TERMS

openness in goods markets 107
openness in financial markets 107
openness in factor markets 107
tariffs 107
quotas 107
tradable goods 109
real exchange rate 110
nominal exchange rate 111
appreciation (nominal) 111
depreciation (nominal) 111
fixed exchange rate 111
revaluation 111
devaluation 111
real appreciation 113
real depreciation 113
bilateral exchange rate 113
multilateral exchange rate 113
multilateral real exchange rate 114
foreign exchange 115
balance of payments 116
above the line, below the line 116
current account 116
investment income 116
net transfers received 116
current account balance 116
current account surplus 116
current account deficit 116
capital account 117
net capital flows 117
capital account balance 117
capital account surplus 117
capital account deficit 117
statistical discrepancy 117
gross domestic product (GDP) 118
gross national product (GNP) 118
uncovered interest parity 119
interest parity condition 119
capital controls 119
demand for domestic goods 122
domestic demand for goods 122

QUESTIONS AND PROBLEMS

QUICK CHECK

1. *Using the information in this chapter, label each of the following statements true, false or uncertain. Explain briefly.*

a. The national income identity implies that budget deficits cause trade deficits.

b. Opening the economy to trade tends to increase the multiplier because an increase in expenditure leads to more exports.

c. If the trade deficit is equal to zero, then the domestic demand for goods and the demand for domestic goods are equal.

d. A real depreciation leads to an immediate improvement in the trade balance.

e. A small open economy can reduce its trade deficit through fiscal contraction at a smaller cost in output than can a large open economy.

f. While the export ratio can be larger than one – as it is in Singapore – the same cannot be true of the ratio of imports to GDP.

g. That a rich country like Japan has such a small ratio of imports to GDP is clear evidence of an unfair playing field for European exporters to Japan.

h. Given the definition of the exchange rate adopted in this chapter, if the dollar is the domestic currency and the euro the foreign currency, a nominal exchange rate of 0.75 means that \$0.75 is worth €0.75.

i. A real appreciation means that domestic goods become less expensive relative to foreign goods.

2. Real and nominal exchange rates and inflation

Using the definition of the real exchange rate (and Propositions 7 and 8 in Appendix 1 at the end of the book), you can show that

$$\frac{(\varepsilon_t - \varepsilon_{t-1})}{\varepsilon_{t-1}} = \frac{(E_t - E_{t-1})}{E_{t-1}} + \pi_t - \pi_t^*$$

In words: the percentage real appreciation equals the percentage nominal appreciation plus the difference between domestic and foreign inflation.

a. If domestic inflation is higher than foreign inflation, but the domestic country has a fixed exchange rate, what happens to the real exchange rate over time? Assume that the Marshall–Lerner condition holds. What happens to the trade balance over time? Explain in words.

b. Suppose the real exchange rate is constant – say, at the level required for net exports (or the current account) to equal zero. In this case, if domestic inflation is higher than foreign inflation, what must happen to the nominal exchange rate over time?

DIG DEEPER

3. *Consider a world with three equal-sized economies (A, B and C) and three goods (clothes, cars and computers). Assume that consumers in all three economies want to spend an equal amount on all three goods.*

The value of production of each good in the three economies is given below.

	A	B	C
Clothes	10	0	5
Cars	5	10	0
Computers	0	5	10

a. What is GDP in each economy? If the total value of GDP is consumed and no country borrows from abroad, how much will consumers in each economy spend on each of the goods?

b. If no country borrows from abroad, what will be the trade balance in each country? What will be the pattern of trade in this world (i.e., which good will each country export and to whom)?

c. Given your answer to part (b), will country A have a zero trade balance with country B? With country C? Will any country have a zero trade balance with any other country?

d. The USA has a large trade deficit. It has a trade deficit with each of its major trading partners, but the deficit is much larger with some countries (e.g. China) than with others. Suppose the USA eliminates its overall trade deficit (with the world as a whole). Do you expect it to have a zero trade balance with every one of its trading partners? Does the especially large trade deficit with China necessarily indicate that China does not allow US goods to compete on an equal basis with Chinese goods?

4. Net exports and foreign demand

a. Suppose there is an increase in foreign output. Show the effect on the domestic economy (i.e. replicate Figure 6.4). What is the effect on domestic output? On domestic net exports?

b. If the interest rate remains constant, what will happen to domestic investment? If taxes are fixed, what will happen to the domestic budget deficit?

c. Using equation (6.5), what must happen to private saving? Explain.

d. Foreign output does not appear in equation (6.5), yet it evidently affects net exports. Explain how this is possible.

5. Eliminating a trade deficit

a. Consider an economy with a trade deficit ($NX < 0$) and with output equal to its natural level. Suppose that, even though output may deviate from its natural level in the short run, it returns to its natural level in the medium run. Assume that the natural level is unaffected by the real exchange rate. What must happen to the real exchange rate over the medium run to eliminate the trade deficit (i.e., to increase NX to 0)?

b. Now write down the national income identity. Assume again that output returns to its natural level in the medium run. If NX increases to 0, what must happen to domestic demand ($C + I + G$) in the medium run? What government policies are available to reduce domestic demand in the medium run? Identify which components of domestic demand each of these policies affect.

EXPLORE FURTHER

6. *Retrieve the nominal exchange rates between Japan and the USA from the Internet. A useful and free Canadian site that allows you to construct graphs online is the Pacific Exchange Rate Service* ***(fx.sauder.ubc.ca)****, provided by Werner Antweiler at the Sauder School of Business, University of British Columbia.*

a. Plot the yen versus the dollar since 1979. During which times period(s) did the yen appreciate? During which period(s) did the yen depreciate?

b. Given the current Japanese slump (although there are some encouraging signs at the time of writing), one way of increasing demand would be to make Japanese goods more attractive. Does this require an appreciation or a depreciation of the yen?

c. What has happened to the yen during the past few years? Has it appreciated or depreciated? Is this good or bad for Japan?

7. Saving and investment throughout the world

*Retrieve the most recent World Economic Outlook (WEO) from the website of the International Monetary Fund (**www.imf.org**). In the Statistical Appendix, find the table titled 'Summary of Sources and Uses of World Saving', which lists saving and investment (as a percentage of GDP) around the world. Use the data for the most recent year available to answer parts (a) and (b).*

a. Does world saving equal investment? (You may ignore small statistical discrepancies.) Offer some intuition for your answer.

b. How does US saving compare to US investment? How is the USA able to finance its investment? *(We explain this explicitly in the next chapter, but your intuition should help you figure it out now.)*

*We invite you to visit the Blanchard page on the Prentice Hall website, at **www.prenhall.com/blanchard** for this chapter's World Wide Web exercises.*

FURTHER READING

- If you want to learn more about international trade and international economics, read the very good textbook by **Paul Krugman and Maurice Obstfeld, *International Economics, Theory and Policy*, 7th ed., Pearson Addison-Wesley, New York, 2007**.
- If you want to know current exchange rates between nearly any pair of currencies in the world, look at the currency converter at ***www.oanda.com***.
- A good discussion of the relation among trade deficits, budget deficits, private saving and investment is given in **Barry Bosworth, *Saving and Investment in a Global Economy*, Brookings Institution, Washington, DC, 1993**.
- A good discussion of the US trade deficit and its implications for the future is given in **William Cline, *The United States as a Debtor Nation*, Peterson Institute, Washington, DC, 2005**.