Chapter 18

Open-Economy Macroeconomics: Basic Concepts

Chapter Outline

Print This Chapter

Chapter Introduction

When you decide to buy a car, you may compare the latest models offered by Ford and Toyota. When you take your next vacation, you may consider spending it on a beach in Florida or in Mexico. When you start saving for your retirement, you may choose between a mutual fund that buys stock in U.S. companies and one that buys stock in foreign companies. In all these cases, you are participating not just in the U.S. economy but in economies around the world.

Openness to international trade yields clear benefits: Trade allows people to produce what they produce best and to consume the great variety of goods and services produced around the world. Indeed, one of the *Ten Principles of Economics* highlighted in Chapter 1 is that trade can make everyone better off. International trade can raise living standards in all countries by allowing each country to specialize in producing those goods and services in which it has a comparative advantage.

So far, our development of macroeconomics has largely ignored the economy's interaction with other economies around the world. For most questions in macroeconomics, international issues are peripheral. For instance, when we discussed the natural rate of unemployment and the causes of inflation, the effects of international trade could safely be ignored. Indeed, to keep their models simple, macroeconomists often assume a **closed economy**—an economy that does not interact with other economies.

Yet new macroeconomic issues arise in an **open economy**—an economy that interacts freely with other economies around the world. This chapter and the next, therefore, provide an introduction to open-economy macroeconomics. We begin in this chapter by discussing the key macroeconomic variables that describe an open economy's interactions in world markets. You may have noticed mention of these variables —exports, imports, the trade balance, and exchange rates—when reading news reports or watching the nightly news. Our first job is to understand what these data mean. In the next chapter, we develop a model to explain how these variables are determined and how they are affected by various government policies.

18-1 The International Flows of Goods and Capital

An open economy interacts with other economies in two ways: It buys and sells goods and services in world product markets, and it buys and sells capital assets such as stocks and bonds in world financial markets. Here we discuss these two activities and the close relationship between them.

18-1a The Flow of Goods: Exports, Imports, and Net Exports

Exports are domestically produced goods and services that are sold abroad, and **imports** are foreign-produced goods and services that are sold domestically. When Boeing, the U.S. aircraft manufacturer, builds a plane and sells it to Air France, the sale is an export for the United States and an import for France. When Volvo, the Swedish car manufacturer, makes a car and sells it to a U.S. resident, the sale is an import for the United States and an export for Sweden.

The **net exports** of any country are the difference between the value of its exports and the value of its imports:

Net exports = Value of country's exports – Value of country's imports.

The Boeing sale raises U.S. net exports, and the Volvo sale reduces U.S. net exports. Because net exports tell us whether a country is, in total, a seller or a buyer in world markets for goods and services, net exports are also called the **trade balance**. If net exports are positive, exports are greater than imports, indicating that the country sells more goods and services abroad than it buys from other countries. In this case, the country is said to run a **trade surplus**. If net exports are negative, exports are less than imports, indicating that the country sells fewer goods and services abroad than it buys from other countries. In this case, the country is said to run a **trade deficit**. If net exports are zero, its exports and imports are exactly equal, and the country is said to have **balanced trade**.

In the next chapter, we develop a theory that explains an economy's trade balance, but even at this early stage, it is easy to think of many factors that might influence a country's exports, imports, and net exports. Those factors include the following:

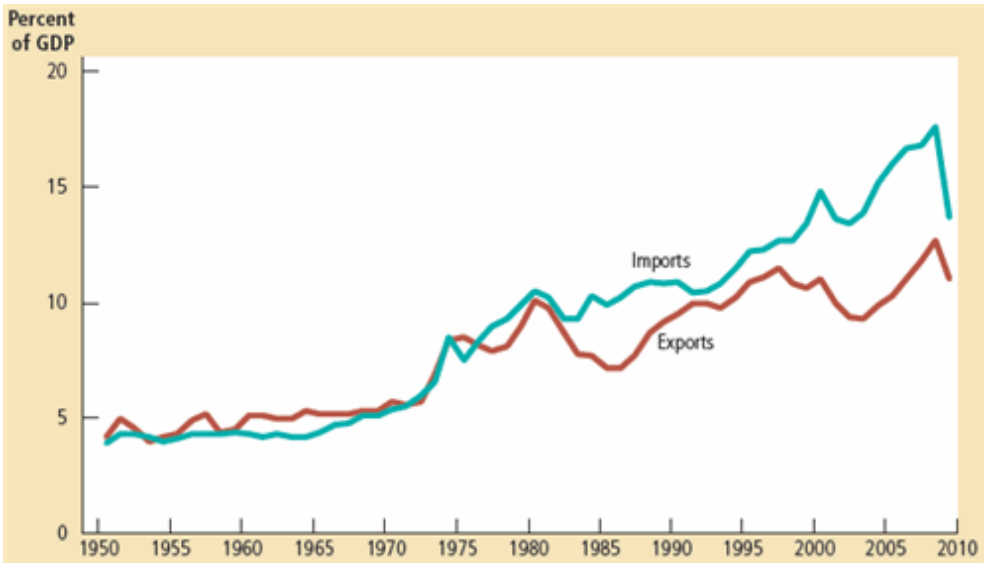
- The tastes of consumers for domestic and foreign goods
- The prices of goods at home and abroad
- The exchange rates at which people can use domestic currency to buy foreign currencies
- The incomes of consumers at home and abroad
- The cost of transporting goods from country to country
- Government policies toward international trade

As these variables change, so does the amount of international trade.

Case Study: The Increasing Openness of the U.S. Economy

One dramatic change in the U.S. economy over the past six decades has been the increasing importance of international trade and finance. This change is illustrated in Figure 1, which shows the total value of goods and services exported to other countries and imported from other countries expressed as a percentage of gross domestic product. In the 1950s, imports and exports of goods and services were typically between 4 and 5 percent of GDP. In recent years, they have been more than twice that level. The trading partners of the United States include a diverse group of countries. As of 2009, the largest trading partner, as measured by imports and exports combined, was Canada, followed by China, Mexico, Japan, Germany, and the United Kingdom.

Figure 1. The Internationalization of the U.S. Economy
This figure shows exports and imports of the U.S. economy as a percentage of U.S. gross domestic product since 1950. The substantial increases over time show the increasing importance of international trade and finance.



The increase in international trade over the past several decades is partly due to improvements in transportation. In 1950, the average merchant ship carried less than 10,000 tons of cargo; today, many ships carry more than 100,000 tons. The long-distance jet was introduced in 1958, and the wide-body jet in 1967, making air transport far cheaper than it had been. Because of these developments, goods that once had to be produced locally can now be traded around the world. Cut flowers grown in Israel are flown to the United States to be sold. Fresh fruits and vegetables that can grow only in summer can now be consumed in winter as well because they can be shipped to the United States from countries in the Southern Hemisphere.

The increase in international trade has also been influenced by advances in telecommunications, which have allowed businesses to reach overseas customers more easily. For example, the first transatlantic telephone cable was not laid until 1956. As recently as 1966, the technology allowed only 138 simultaneous conversations between North America and Europe. Today, communications satellites permit more than 1 million conversations to occur at the same time.

Technological progress has also fostered international trade by changing the kinds of goods that economies produce. When bulky raw materials (such as steel) and perishable goods (such as foodstuffs) were a large part of the world's output, transporting goods was often costly and sometimes impossible. By contrast, goods produced with modern technology are often light and easy to transport. Consumer electronics, for instance, have low weight for every dollar of value, which makes them easy to produce in one country and sell in another. An even more extreme example is the film industry. Once a studio in Hollywood makes a movie, it can send copies of the film around the world at almost zero cost. And indeed, movies are a major export of the United States.

The government's trade policies have also been a factor in increasing international trade. As we discussed earlier in this book, economists have long believed that free trade between countries is mutually beneficial. Over time, most policymakers around the world have come to accept these conclusions. International agreements, such as the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT), have gradually lowered tariffs, import quotas, and other trade barriers. The pattern of increasing trade illustrated in Figure 1 is a phenomenon that most economists and policymakers endorse and encourage.

In the News: Breaking Up the Chain of Production

Some goods are manufactured not in one country but in many.

An iPod Has Global Value. Ask the (Many) Countries That Make It.

By Hal R. Varian

Who makes the Apple iPod? Here's a hint: It is not Apple. The company outsources the entire manufacture of the device to a number of Asian

enterprises, among them Asustek, Inventec Appliances and Foxconn.

But this list of companies isn't a satisfactory answer either: They only do final assembly. What about the 451 parts that go into the iPod? Where are they made and by whom?

Three researchers at the University of California, Irvine—Greg Linden, Kenneth L. Kraemer, and Jason Dedrick—applied some investigative cost accounting to this question, using a report from Portelligent Inc. that examined all the parts that went into the iPod.

Their study, sponsored by the Sloan Foundation, offers a fascinating illustration of the complexity of the global economy, and how difficult it is to understand that complexity by using only conventional trade statistics.

The retail value of the 30-gigabyte video iPod that the authors examined was $299. The most expensive component in it was the hard drive, which was manufactured by Toshiba and costs about $73. The next most costly components were the display module (about $20), the video/multimedia processor chip ($8) and the controller chip ($5). They estimated that the final assembly, done in China, cost only about $4 a unit.

One approach to tracing supply chain geography might be to attribute the cost of each component to the country of origin of its maker. So $73 of the cost of the iPod would be attributed to Japan since Toshiba is a Japanese company, and the $13 cost of the two chips would be attributed to the United States, since the suppliers, Broadcom and PortalPlayer, are American companies, and so on.

But this method hides some of the most important details. Toshiba may be a Japanese company, but it makes most of its hard drives in the Philippines and China. So perhaps we should also allocate part of the cost of that hard drive to one of those countries. The same problem arises regarding the Broadcom chips, with most of them manufactured in Taiwan. So how can one distribute the costs of the iPod components across the countries where they are manufactured in a meaningful way?

To answer this question, let us look at the production process as a sequence of steps, each possibly performed by a different company operating in a different country. At each step, inputs like computer chips and a bare circuit board are converted into outputs like an assembled circuit board. The difference between the cost of the inputs and the value of the outputs is the "value added" at that step, which can then be attributed to the country where that value was added.

The profit margin on generic parts like nuts and bolts is very low, since these items are produced in intensely competitive industries and can be manufactured anywhere. Hence, they add little to the final value of the iPod. More specialized parts, like the hard drives and controller chips, have much higher value added.

According to the authors' estimates, the $73 Toshiba hard drive in the iPod contains about $54 in parts and labor. So the value that Toshiba added to the hard drive was $19 plus its own direct labor costs. This $19 is attributed to Japan since Toshiba is a Japanese company.

Continuing in this way, the researchers examined the major components of the iPod and tried to calculate the value added at different stages of the production process and then assigned that value added to the country where the value was created. This isn't an easy task, but even based on their initial examination, it is quite clear that the largest share of the value added in the iPod goes to enterprises in the United States, particularly for units sold here.

The researchers estimated that $163 of the iPod's $299 retail value in the United States was captured by American companies and workers, breaking it down to $75 for distribution and retail costs, $80 to Apple, and $8 to various domestic component makers. Japan contributed about $26 to the value added (mostly via the Toshiba disk drive), while Korea contributed less than $1.

The unaccounted-for parts and labor costs involved in making the iPod came to about $110. The authors hope to assign those labor costs to

the appropriate countries, but as the hard drive example illustrates, that's not so easy to do.

This value added calculation illustrates the futility of summarizing such a complex manufacturing process by using conventional trade statistics. Even though Chinese workers contribute only about 1 percent of the value of the iPod, the export of a finished iPod to the United States directly contributes about $150 to our bilateral trade deficit with the Chinese.

Ultimately, there is no simple answer to who makes the iPod or where it is made. The iPod, like many other products, is made in several countries by dozens of companies, with each stage of production contributing a different amount to the final value.

The real value of the iPod doesn't lie in its parts or even in putting those parts together. The bulk of the iPod's value is in the conception and design of the iPod. That is why Apple gets $80 for each of these video iPods it sells, which is by far the largest piece of value added in the entire supply chain.

Those clever folks at Apple figured out how to combine 451 mostly generic parts into a valuable product. They may not make the iPod, but they created it. In the end, that's what really matters.

New York Times, June 28, 2007.

18-1b The Flow of Financial Resources: Net Capital Outflow

So far, we have been discussing how residents of an open economy participate in world markets for goods and services. In addition, residents of an open economy participate in world financial markets. A U.S. resident with $20,000 could use that money to buy a car from Toyota, or he could instead use that money to buy stock in the Toyota Corporation. The first transaction would represent a flow of goods, whereas the second would represent a flow of capital.

The term **net capital outflow** refers to the difference between the purchase of foreign assets by domestic residents and the purchase of domestic assets by foreigners:

$$\text{Net capital outflow} = \text{Purchase of foreign assets by domestic residents} - \text{Purchase of domestic assets by foreigners.}$$

When a U.S. resident buys stock in Telmex, the Mexican telecommunications company, the purchase increases the first term on the right side of this equation and, therefore, increases U.S. net capital outflow. When a Japanese resident buys a bond issued by the U.S. government, the purchase increases the second term on the right side of this equation and, therefore, decreases U.S. net capital outflow.

The flow of capital between the U.S. economy and the rest of the world takes two forms. If McDonald's opens up a fast-food outlet in Russia, that is an example of *foreign direct investment*. Alternatively, if an American buys stock in a Russian corporation, that is an example of *foreign portfolio investment*. In the first case, the American owner (McDonald's Corporation) actively manages the investment, whereas in the second case, the American owner (the stockholder) has a more passive role. In both cases, U.S. residents are buying assets located in another country, so both purchases increase U.S. net capital outflow.

The net capital outflow (sometimes called *net foreign investment*) can be either positive or negative. When it is positive, domestic residents are buying more foreign assets than foreigners are buying domestic assets. Capital is said to be flowing out of the country. When the net capital outflow is negative, domestic residents are buying less foreign assets than foreigners are buying domestic assets. Capital is said to be flowing into the country. That is, when net capital outflow is negative, a country is experiencing a capital inflow.

We develop a theory to explain net capital outflow in the next chapter. Here let's consider briefly some of the more important variables that influence net capital outflow:

- The real interest rates paid on foreign assets
- The real interest rates paid on domestic assets
- The perceived economic and political risks of holding assets abroad
- The government policies that affect foreign ownership of domestic assets

For example, consider U.S. investors deciding whether to buy Mexican government bonds or U.S. government bonds. (Recall that a bond is, in effect, an IOU of the issuer.) To make this decision, U.S. investors compare the real interest rates offered on the two bonds. The higher a bond's real interest rate, the more attractive it is. While making this comparison, however, U.S. investors must also take into account the risk that one of these governments might default on its debt (that is, not pay interest or principal when it is due), as well as any restrictions that the Mexican government has imposed, or might impose in the future, on foreign investors in Mexico.

18-1c The Equality of Net Exports and Net Capital Outflow

We have seen that an open economy interacts with the rest of the world in two ways—in world markets for goods and services and in world financial markets. Net exports and net capital outflow each measure a type of imbalance in these markets. Net exports measure an imbalance between a country's exports and its imports. Net capital outflow measures an imbalance between the amount of foreign assets bought by domestic residents and the amount of domestic assets bought by foreigners.

An important but subtle fact of accounting states that, for an economy as a whole, net capital outflow (NCO) must always equal net exports (NX):

$$NCO = NX$$

This equation holds because every transaction that affects one side of this equation affects the other side by exactly the same amount. This equation is an *identity*—an equation that must hold because of the way the variables in the equation are defined and measured.

To see why this accounting identity is true, let's consider an example. Imagine that you are a computer programmer residing in the United States. One day, you write some software and sell it to a Japanese consumer for 10,000 yen. The sale of software is an export of the United States, so it increases U.S. net exports. What else happens to ensure that this identity holds? The answer depends on what you do with the 10,000 yen you are paid.

First, let's suppose that you simply stuff the yen in your mattress. (We might say you have a yen for yen.) In this case, you are using some of your income to invest in the Japanese economy. That is, a domestic resident (you) has acquired a foreign asset (the Japanese currency). The increase in U.S. net exports is matched by an increase in the U.S. net capital outflow.

More realistically, however, if you want to invest in the Japanese economy, you won't do so by holding on to Japanese currency. More likely, you would use the 10,000 yen to buy stock in a Japanese corporation, or you might buy a Japanese government bond. Yet the result of your decision is much the same: A domestic resident ends up acquiring a foreign asset. The increase in U.S. net capital outflow (the purchase of the Japanese stock or bond) exactly equals the increase in U.S. net exports (the sale of software).

Let's now change the example. Suppose that instead of using the 10,000 yen to buy a Japanese asset, you use it to buy a good made in Japan, such as a Nintendo Wii. As a result of the Wii purchase, U.S. imports increase. The software export and the Wii import represent balanced trade. Because exports and imports increase by the same amount, net exports are unchanged. In this case, no American ends up acquiring a foreign asset and no foreigner ends up acquiring a U.S. asset, so there is also no impact on U.S. net capital outflow.

A final possibility is that you go to a local bank to exchange your 10,000 yen for U.S. dollars. But this doesn't change the situation because the bank now has to do something with the 10,000 yen. It can buy Japanese assets (a U.S. net capital outflow); it can buy a Japanese good (a U.S. import); or it can sell the yen to another American who wants to make such a transaction. In the end, U.S. net exports must equal U.S. net capital outflow.

This example all started when a U.S. programmer sold some software abroad, but the story is much the same when Americans buy goods and services from other countries. For example, if Walmart buys $50 million of clothing from China and sells it to American consumers, something must happen to that $50 million. One possibility is that China could use the $50 million to invest in the U.S. economy. This capital inflow from China might take the form of Chinese purchases of U.S. government bonds. In this case, the sale of the clothing reduces U.S. net exports, and the sale of bonds reduces U.S. net capital outflow. Alternatively, China could use the $50 million to buy a plane from Boeing, the U.S. aircraft manufacturer. In this case, the U.S. import of clothing balances the U.S. export of aircraft, so net exports and net capital outflow are both unchanged. In all cases, the transaction has the same effect on net exports and net capital outflow.

We can summarize these conclusions for the economy as a whole.

- When a nation is running a trade surplus ($NX > 0$), it is selling more goods and services to foreigners than it is buying from them. What is it doing with the foreign currency it receives from the net sale of goods and services abroad? It must be using it to buy foreign assets. Capital is flowing out of the country ($NCO > 0$).

- When a nation is running a trade deficit ($NX < 0$), it is buying more goods and services from foreigners than it is selling to them. How is it financing the net purchase of these goods and services in world markets? It must be selling assets abrod. Capital is flowing into the country ($NCO < 0$).

The international flow of goods and services and the international flow of capital are two sides of the same coin.

18-1d Saving, Investment, and Their Relationship to the International Flows

A nation's saving and investment are crucial to its long-run economic growth. As we have seen earlier in this book, saving and investment are equal in a closed economy. But matters are not as simple in an open economy. Let's now consider how saving and investment are related to the international flows of goods and capital as measured by net exports and net capital outflow.

As you may recall, the term *net exports* appeared earlier in the book when we discussed the components of gross domestic product. The economy's gross domestic product (Y) is divided among four components: consumption (C), investment (I), government purchases (G), and net exports (NX). We write this as

$$Y = C + I + G + NX.$$

Total expenditure on the economy's output of goods and services is the sum of expenditure on consumption, investment, government purchases, and net exports. Because each dollar of expenditure is placed into one of these four components, this equation is an accounting identity: It must be true because of the way the variables are defined and measured.

Recall that national saving is the income of the nation that is left after paying for current consumption and government purchases. National saving (S) equals $Y - C - G$. If we rearrange the equation to reflect this fact, we obtain

$$\begin{aligned} Y - C - G &= I + NX \\ S &= I + NX. \end{aligned}$$

Because net exports (NX) also equal net capital outflow (NCO), we can write this equation as

$$\begin{aligned} S &= I + NCO \\ \text{Saving} &= \text{Domestic investment} + \text{Net capital outflow}. \end{aligned}$$

This equation shows that a nation's saving must equal its domestic investment plus its net capital outflow. In other words, when U.S. citizens save a dollar of their income for the future, that dollar can be used to finance accumulation of domestic capital or it can be used to finance the purchase of capital abroad.

This equation should look somewhat familiar. Earlier in the book, when we analyzed the role of the financial system, we considered this identity for the special case of a closed economy. In a closed economy, net capital outflow is zero ($NCO = 0$), so saving equals investment ($S = I$). By contrast, an open economy has two uses for its saving: domestic investment and net capital outflow.

As before, we can view the financial system as standing between the two sides of this identity. For example, suppose the Smith family decides to save some of its income for retirement. This decision contributes to national saving, the left side of our equation. If the Smiths deposit their saving in a mutual fund, the mutual fund may use some of the deposit to buy stock issued by General Motors, which uses the proceeds to build a factory in Ohio. In addition, the mutual fund may use some of the Smiths' deposit to buy stock issued by Toyota, which uses the proceeds to build a factory in Osaka. These transactions show up on the right side of the equation. From the standpoint of U.S. accounting, the General Motors expenditure on a new factory is domestic investment, and the purchase of Toyota stock by a U.S. resident is net capital outflow. Thus, all saving in the U.S. economy shows up as investment in the U.S. economy or as U.S. net capital outflow.

The bottom line is that saving, investment, and international capital flows are inextricably linked. When a nation's saving exceeds its domestic investment, its net capital outflow is positive, indicating that the nation is using some of its saving to buy assets abroad. When a nation's domestic investment exceeds its saving, its net capital outflow is negative, indicating that foreigners are financing some of this investment by purchasing domestic assets.

18-1e Summing Up

Table 1 summarizes many of the ideas presented so far in this chapter. It describes the three possibilities for an open economy: a country with a trade deficit, a country with balanced trade, and a country with a trade surplus.

Table 1. International Flows of Goods and Capital: Summary
This table shows the three possible outcomes for an open economy.

Trade Deficit	Balanced Trade	Trade Surplus
Exports < Imports	Exports = Imports	Exports > Imports
Net Exports < 0	Net Exports = 0	Net Exports > 0
$Y < C + I + G$	$Y = C + I + G$	$Y > C + I + G$
Saving < Investment	Saving = Investment	Saving > Investment
Net Capital Outflow < 0	Net Capital Outflow = 0	Net Capital Outflow > 0

Consider first a country with a trade surplus. By definition, a trade surplus means that the value of exports exceeds the value of imports. Because net exports are exports minus imports, net exports NX are greater than zero. As a result, income $Y = C + I + G + NX$ must be greater than domestic spending $C + I + G$. But if income Y is more than spending $C + I + G$, then saving $S = Y - C - G$ must be more than investment I. Because the country is saving more than it is investing, it must be sending some of its saving abroad. That is, the net capital outflow must be greater than zero.

The converse logic applies to a country with a trade deficit (such as the U.S. economy in recent years). By definition, a trade deficit means that the value of exports is less than the value of imports. Because net exports are exports minus imports, net exports NX are negative. Thus, income $Y = C + I + G + NX$ must be less than domestic spending $C + I + G$. But if income Y is less than spending $C + I + G$, then saving $S = Y - C - G$ must be less than investment I. Because the country is investing more than it is saving, it must be financing some domestic investment by selling assets abroad. That is, the net capital outflow must be negative.

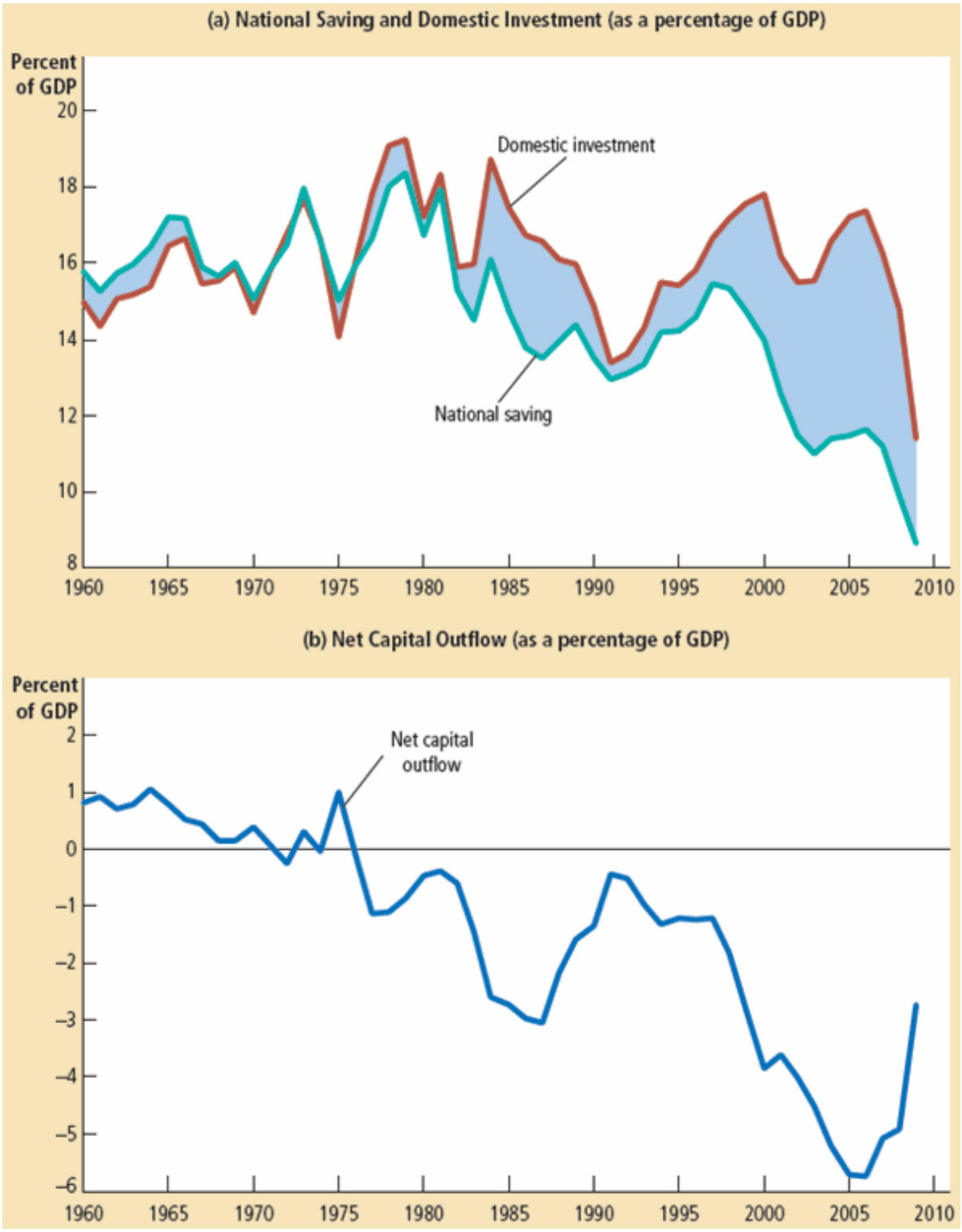
A country with balanced trade is between these cases. Exports equal imports, so net exports are zero. Income equals domestic spending, and saving equals investment. The net capital outflow equals zero.

Case Study: Is the U.S. Trade Deficit a National Problem?

You may have heard the press call the United States "the world's largest debtor." The nation earned that description by borrowing heavily in world financial markets during the past three decades to finance large trade deficits. Why did the United States do this, and should this event give Americans reason to worry?

To answer these questions, let's see what the macroeconomic accounting identities tell us about the U.S. economy. Panel (a) of Figure 2 shows national saving and domestic investment as a percentage of GDP since 1960. Panel (b) shows net capital outflow (that is, the trade balance) as a percentage of GDP. Notice that, as the identities require, net capital outflow always equals national saving minus domestic investment.

Figure 2. National Saving, Domestic Investment, and Net Capital Outflow
Panel (a) shows national saving and domestic investment as a percentage of GDP. Panel (b) shows net capital outflow as a percentage of GDP. You can see from the figure that national saving has been lower since 1980 than it was before 1980. This fall in national saving has been reflected primarily in reduced net capital outflow rather than in reduced domestic investment.



The figure shows a dramatic change beginning in the early 1980s. Before 1980, national saving and domestic investment were close, and so net capital outflow was small. Yet after 1980, national saving fell substantially below investment, and net capital outflow became a large negative number. That is, there was a capital inflow: Foreigners were buying more capital assets in the United States than Americans were buying abroad. The United States was going into debt.

History shows that changes in capital flows arise sometimes from changes in saving and sometimes from changes in investment. From 1980 to 1987, the flow of capital into the United States went from 0.5 to 3.1 percent of GDP. This 2.6 percentage point change is largely attributable to a fall in saving of 3.2 percentage points. This decline in national saving, in turn, is often explained by the decline in public saving—that is, the increase in the government budget deficit.

A different story explains the events of the following decade. From 1991 to 2000, the capital flow into the United States went from 0.5 to 3.9 percent of GDP. None of this 3.4 percentage point change is attributable to a decline in saving; in fact, saving increased over this time, as the government's budget switched from deficit to surplus. But investment went from 13.4 to 17.7 percent of GDP, as the economy enjoyed a boom in information technology and many firms were eager to make these high-tech investments.

From 2000 to 2006, the capital flow into the United States increased further, reaching a record 5.7 percent of GDP. The investment boom abated after 2000, but once again, the federal government started running budget deficits, and national saving fell to extraordinarily low levels by historical standards.

This trend has reversed somewhat in recent years. From 2007 to 2009, the trade deficit shrank as the economy experienced a substantial decline in housing prices and a deep recession, both of which led to a dramatic fall in investment.

Are these trade deficits a problem for the U.S. economy? To answer this question, it is important to keep an eye on the nation's saving and investment.

Consider first a trade deficit induced by a fall in saving, as occurred during the 1980s and the early 2000s. Lower saving means that the nation is putting away less of its income to provide for its future. Once national saving has fallen, however, there is no reason to deplore the resulting trade deficits. If national saving fell without inducing a trade deficit, investment in the United States would have to fall. This fall in investment, in turn, would adversely affect the growth in the capital stock, labor productivity, and real wages. In other words, given that U.S. saving has declined, it is better to have foreigners invest in the U.S. economy than no one at all.

Now consider a trade deficit induced by an investment boom, such as the trade deficits of the 1990s. In this case, the economy is borrowing from abroad to finance the purchase of new capital goods. If this additional capital provides a good return in the form of higher production of goods and services, then the economy should be able to handle the debts that are being accumulated. On the other hand, if the investment projects fail to yield the expected returns, the debts will look less desirable, at least with the benefit of hindsight.

There is no simple and correct answer to the question posed in the title to this case study. Just as an individual can go into debt in either a prudent or a profligate manner, so can a nation. The trade deficit is not a problem in itself, but sometimes it can be a symptom of a problem.

QUICK QUIZ

Define net exports *and* net capital outflow. *Explain how they are related.*

18-2 The Prices for International Transactions: Real and Nominal Exchange Rates

So far, we have discussed measures of the flow of goods and services and the flow of capital across a nation's border. In addition to these quantity variables, macroeconomists also study variables that measure the prices at which these international transactions take place. Just as the price in any market serves the important role of coordinating buyers and sellers in that market, international prices help coordinate the decisions of consumers and producers as they interact in world markets. Here we discuss the two most important international prices: the nominal and real exchange rates.

18-2a Nominal Exchange Rates

The **nominal exchange rate** is the rate at which a person can trade the currency of one country for the of one country for the currency of another. For example, if you go to a bank, you currency of another might see a posted exchange rate of 80 yen per dollar. If you give the bank one U.S. dollar, it will give you 80 Japanese yen; and if you give the bank 80 Japanese yen, it will give you one U.S. dollar. (In actuality, the bank will post slightly different prices for buying and selling yen. The difference gives the bank some profit for offering this service. For our purposes here, we can ignore these differences.)

An exchange rate can always be expressed in two ways. If the exchange rate is 80 yen per dollar, it is also 1/80 (= 0.0125) dollar per yen. Throughout this book, we always express the nominal exchange rate as units of foreign currency per U.S. dollar, such as 80 yen per dollar.

If the exchange rate changes so that a dollar buys more foreign currency, that change is called an **appreciation** of the dollar. If the exchange rate changes so that a dollar buys less foreign currency, that change is called a **depreciation** of the dollar. For example, when the exchange rate rises from 80 to 90 yen per dollar, the dollar is said to appreciate. At the same time, because a Japanese yen now buys less of the U.S. currency, the yen is said to depreciate. When the exchange rate falls from 80 to 70 yen per dollar, the dollar is said to depreciate, and the yen is said to appreciate.

FYI: The Euro

You may have once heard of, or perhaps even seen, currencies such as the French franc, the German mark, or the Italian lira. These types of money no longer exist. During the 1990s, many European nations decided to give up their national currencies and use a common currency called the *euro*. The euro started circulating on January 1, 2002. Monetary policy for the euro area is now set by the European Central Bank (ECB), with representatives from all of the participating countries. The ECB issues the euro and controls the supply of this money, much as the Federal Reserve controls the supply of dollars in the U.S. economy.

Why did these countries adopt a common currency? One benefit of a common currency is that it makes trade easier. Imagine that each of the fifty U.S. states had a different currency. Every time you crossed a state border, you would need to change your money and perform the kind of exchange-rate calculations discussed in the text. This would be inconvenient, and it might deter you from buying goods and services outside your own state. The countries of Europe decided that as their economies became more integrated, it would be better to avoid this inconvenience.

To some extent, the adoption of a common currency in Europe was a political decision based on concerns beyond the scope of standard economics. Some advocates of the euro wanted to reduce nationalistic feelings and to make Europeans appreciate more fully their shared history and destiny. A single money for most of the continent, they argued, would help achieve this goal.

There are, however, costs of choosing a common currency. If the nations of Europe have only one money, they can have only one monetary policy. If they disagree about what monetary policy is best, they will have to reach some kind of agreement, rather than each going its own way. Because adopting a single money has both benefits and costs, there is debate among economists about whether Europe's adoption of the euro was a good decision.

In 2010, the euro question heated up as several European nations dealt with a variety of economic difficulties. Greece, in particular, had run up a large government debt and found itself facing possible default. As a result, it had to raise taxes and cut back government spending substantially. Some observers suggested that dealing with these problems would have been easier if the government had an additional tool—a national monetary policy. The possibility of Greece's leaving the euro area and reintroducing its own currency was even discussed. As this book was going to press, however, that outcome looked unlikely.

At times, you may have heard the media report that the dollar is either "strong" or "weak." These descriptions usually refer to recent changes in the nominal exchange rate. When a currency appreciates, it is said to *strengthen* because it can then buy more foreign currency. Similarly, when a currency depreciates, it is said to *weaken*.

For any country, there are many nominal exchange rates. The U.S. dollar can be used to buy Japanese yen, British pounds, Mexican pesos, and so on. When economists study changes in the exchange rate, they often use indexes that average these many exchange rates. Just as the consumer price index turns the many prices in the economy into a single measure of the price level, an exchange rate index turns these many exchange rates into a single measure of the international value of a currency. So when economists talk about the dollar appreciating or depreciating, they often are referring to an exchange rate index that takes into account many individual exchange rates.

18-2b Real Exchange Rates

BBC Video: Chinese Currency

The **real exchange rate** is the rate at which a person can trade the goods and services of one country for the goods and services of another. For example, if you go shopping and find that a pound of Swiss cheese is twice as expensive as a pound of American cheese, the real exchange rate is ½ pound of Swiss cheese per pound of American cheese. Notice that, like the nominal exchange rate, we express the real exchange rate as units of the foreign item per unit of the domestic item. But in this instance, the item is a good rather than a currency.

Real and nominal exchange rates are closely related. To see how, consider an example. Suppose that a bushel of American rice sells for $100, and a bushel of Japanese rice sells for 16,000 yen. What is the real exchange rate between American and Japanese rice? To answer this question, we must first use the nominal exchange rate to convert the prices into a common currency. If the nominal exchange rate is 80 yen per dollar, then a price for American rice of $100 per bushel is equivalent to 8,000 yen per bushel. American rice is half as expensive as Japanese rice. The real exchange rate is ½ bushel of Japanese rice per bushel of American rice.

We can summarize this calculation for the real exchange rate with the following formula:

$$\text{Real exchange rate} = \frac{\text{Nominal exchange rate} \times \text{Domestic price}}{\text{Foreign price}}.$$

Using the numbers in our example, the formula applies as follows:

$$\text{Real exchange rate} = \frac{(80 \text{ yen/dollar}) \times (\$100/\text{bushel of American rice})}{16{,}000 \text{ yen/bushel of Japanese rice}}$$

$$= \frac{8000 \text{ yen/bushel of American rice}}{16{,}000 \text{ yen/bushel of Japanese rice}}$$

$$= \text{½ bushel of Japanese rice/bushel of American rice.}$$

Thus, the real exchange rate depends on the nominal exchange rate and on the prices of goods in the two countries measured in the local currencies.

Why does the real exchange rate matter? As you might guess, the real exchange rate is a key determinant of how much a country exports and imports. When Uncle Ben's, Inc., is deciding whether to buy U.S. rice or Japanese rice to put into its boxes, for example, it will ask which rice is cheaper. The real exchange rate gives the answer. As another example, imagine that you are deciding whether to take a seaside vacation in Miami, Florida, or in Cancún, Mexico. You might ask your travel agent the price of a hotel room in Miami (measured in dollars), the price of a hotel room in Cancún (measured in pesos), and the exchange rate between pesos and dollars. If you decide where to vacation by comparing costs, you are basing your decision on the real exchange rate.

When studying an economy as a whole, macroeconomists focus on overall prices rather than the prices of individual items. That is, to measure the real exchange rate, they use price indexes, such as the consumer price index, which measure the price of a basket of goods and services. By

using a price index for a U.S. basket (P), a price index for a foreign basket (P^*), and the nominal exchange rate between the U.S. dollar and foreign currencies (e), we can compute the overall real exchange rate between the United States and other countries as follows:

$$\text{Real exchange rate} = (e \times P)/P^*.$$

This real exchange rate measures the price of a basket of goods and services available domestically relative to a basket of goods and services available abroad.

As we examine more fully in the next chapter, a country's real exchange rate is a key determinant of its net exports of goods and services. A depreciation (fall) in the U.S. real exchange rate means that U.S. goods have become cheaper relative to foreign goods. This change encourages consumers both at home and abroad to buy more U.S. goods and fewer goods from other countries. As a result, U.S. exports rise, and U.S. imports fall; both of these changes raise U.S. net exports. Conversely, an appreciation (rise) in the U.S. real exchange rate means that U.S. goods have become more expensive compared to foreign goods, so U.S. net exports fall.

QUICK QUIZ

Define nominal exchange rate *and* real exchange rate, *and explain how they are related.* • *If the nominal exchange rate goes from 100 to 120 yen per dollar, has the dollar appreciated or depreciated?*

18-3 A First Theory of Exchange-Rate Determination: Purchasing-Power Parity

Ask the Author: Is it better for a country to have a trade surplus rather than a trade deficit?

Exchange rates vary substantially over time. In 1970, a U.S. dollar could be used to buy 3.65 German marks or 627 Italian lira. In 1998, as both Germany and Italy were getting ready to adopt the euro as their common currency, a U.S. dollar bought 1.76 German marks or 1,737 Italian lira. In other words, over this period, the value of the dollar fell by more than half compared to the mark, while it more than doubled compared to the lira.

What explains these large and opposite changes? Economists have developed many models to explain how exchange rates are determined, each emphasizing just some of the many forces at work. Here we develop the simplest theory of exchange rates, called **purchasing-power parity**. This theory states that a unit of any given currency should be able to buy the same quantity of goods in all countries. Many economists believe that purchasing-power parity describes the forces that determine exchange rates in the long run. We now consider the logic on which this long-run theory of exchange rates is based, as well as the theory's implications and limitations.

18-3a The Basic Logic of Purchasing-Power Parity

The theory of purchasing-power parity is based on a principle called the *law of one price*. This law asserts that a good must sell for the same price in all locations. Otherwise, there would be opportunities for profit left unexploited. For example, suppose that coffee beans sold for less in Seattle than in Boston. A person could buy coffee in Seattle for, say, $4 a pound and then sell it in Boston for $5 a pound, making a profit of $1 per pound from the difference in price. The process of taking advantage of price differences for the same item in different markets is called *arbitrage*. In our example, as people took advantage of this arbitrage opportunity, they would increase the demand for coffee in Seattle and increase the supply in Boston. The price of coffee would rise in Seattle (in response to greater demand) and fall in Boston (in response to greater supply). This process would continue until, eventually, the prices were the same in the two markets.

Now consider how the law of one price applies to the international marketplace. If a dollar (or any other currency) could buy more coffee in the United States than in Japan, international traders could profit by buying coffee in the United States and selling it in Japan. This export of coffee from the United States to Japan would drive up the U.S. price of coffee and drive down the Japanese price. Conversely, if a dollar could buy more coffee in Japan than in the United States, traders could buy coffee in Japan and sell it in the United States. This import of coffee into the United States from Japan would drive down the U.S. price of coffee and drive up the Japanese price. In the end, the law of one price tells us that a dollar must buy the same amount of coffee in all countries.

This logic leads us to the theory of purchasing-power parity. According to this theory, a currency must have the same purchasing power in all countries. That is, a U.S. dollar must buy the same quantity of goods in the United States and Japan, and a Japanese yen must buy the same quantity of goods in Japan and the United States. Indeed, the name of this theory describes it well. *Parity* means equality, and *purchasing power* refers to the value of money in terms of the quantity of goods it can buy. *Purchasing-power parity* states that a unit of a currency must have the same real value in every country.

18-3b Implications of Purchasing-Power Parity

What does the theory of purchasing-power parity say about exchange rates? It tells us that the nominal exchange rate between the currencies of two countries depends on the price levels in those countries. If a dollar buys the same quantity of goods in the United States (where prices are measured in dollars) as in Japan (where prices are measured in yen), then the number of yen per dollar must reflect the prices of goods in the United States and Japan. For example, if a pound of coffee costs 500 yen in Japan and $5 in the United States, then the nominal exchange rate must be 100 yen per dollar (500 yen/$5 = 100 yen per dollar). Otherwise, the purchasing power of the dollar would not be the same in the two countries.

To see more fully how this works, it is helpful to use just a bit of mathematics. Suppose that P is the price of a basket of goods in the United States (measured in dollars), P^* is the price of a basket of goods in Japan (measured in yen), and e is the nominal exchange rate (the number of yen a dollar can buy). Now consider the quantity of goods a dollar can buy at home and abroad. At home, the price level is P, so the purchasing power of $1 at home is $1/P$. That is, a dollar can buy $1/P$ quantity of goods. Abroad, a dollar can be exchanged into e units of foreign currency, which in turn have purchasing power e/P^*. For the purchasing power of a dollar to be the same in the two countries, it must be the case that

$$1/P = e/P^*.$$

With rearrangement, this equation becomes

$$1 = eP/P^*.$$

Notice that the left side of this equation is a constant, and the right side is the real exchange rate. Thus, *if the purchasing power of the dollar is always the same at home and abroad, then the real exchange rate—the relative price of domestic and foreign goods—cannot change.*

To see the implication of this analysis for the nominal exchange rate, we can rearrange the last equation to solve for the nominal exchange rate:

$$e = P^*/P.$$

That is, the nominal exchange rate equals the ratio of the foreign price level (measured in units of the foreign currency) to the domestic price level (measured in units of the domestic currency). *According to the theory of purchasing-power parity, the nominal exchange rate between the currencies of two countries must reflect the price levels in those countries.*

A key implication of this theory is that nominal exchange rates change when price levels change. As we saw in the preceding chapter, the price level in any country adjusts to bring the quantity of money supplied and the quantity of money demanded into balance. Because the nominal exchange rate depends on the price levels, it also depends on the money supply and money demand in each country. When a central bank in any country increases the money supply and causes the price level to rise, it also causes that country's currency to depreciate relative to other currencies in the world. In other words, *when the central bank prints large quantities of money, that money loses value both in terms of the goods and services it can buy and in terms of the amount of other currencies it can buy.*

We can now answer the question that began this section: Why did the U.S. dollar lose value compared to the German mark and gain value compared to the Italian lira? The answer is that Germany pursued a less inflationary monetary policy than the United States, and Italy pursued a more inflationary monetary policy. From 1970 to 1998, inflation in the United States was 5.3 percent per year. By contrast, inflation was 3.5 percent in Germany and 9.6 percent in Italy. As U.S. prices rose relative to German prices, the value of the dollar fell relative to the mark. Similarly, as U.S. prices fell relative to Italian prices, the value of the dollar rose relative to the lira.

Germany and Italy now have a common currency—the euro. This means that the two countries share a single monetary policy and that the inflation rates in the two countries will be closely linked. But the historical lessons of the lira and the mark will apply to the euro as well. Whether the U.S. dollar buys more or fewer euros twenty years from now than it does today depends on whether the European Central Bank produces more or less inflation in Europe than the Federal Reserve does in the United States.

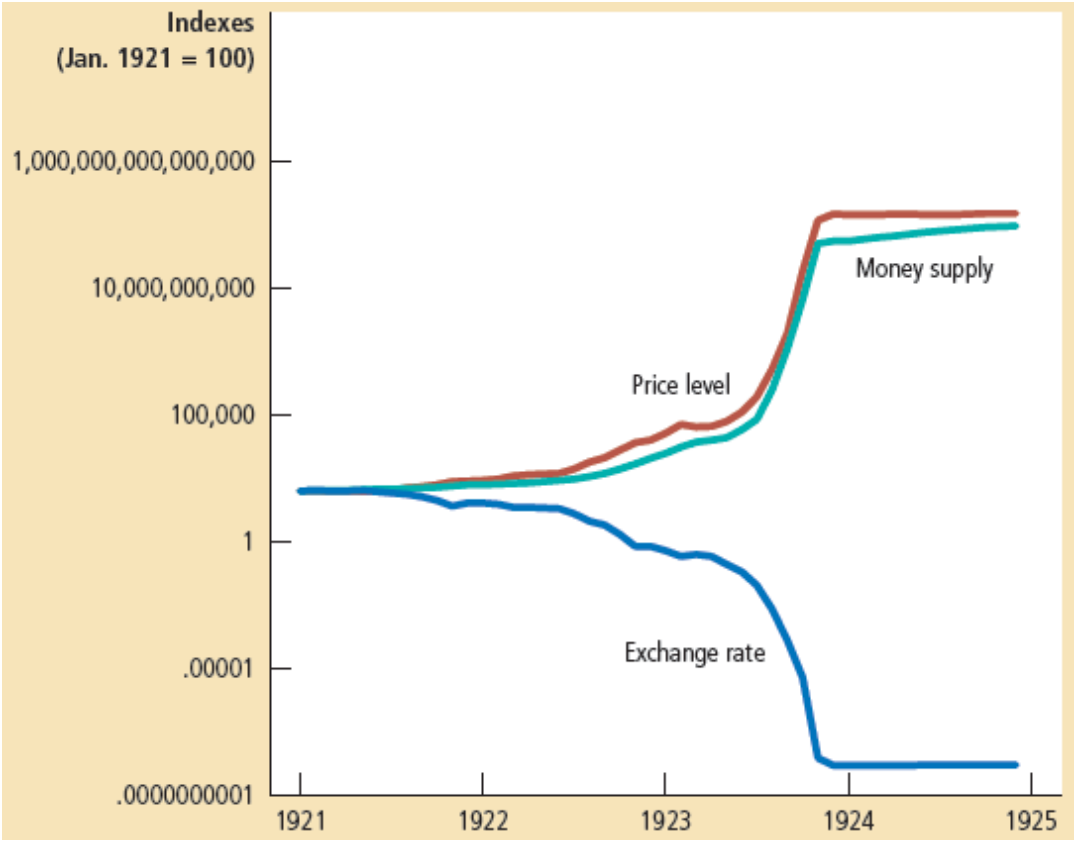
Case Study: The Nominal Exchange Rate during a Hyperinflation

Macroeconomists can only rarely conduct controlled experiments. Most often, they must glean what they can from the natural experiments that history gives them. One natural experiment is hyperinflation—the high inflation that arises when a government turns to the printing press to pay for large amounts of government spending. Because hyperinflations are so extreme, they illustrate some basic economic principles with clarity.

Consider the German hyperinflation of the early 1920s. Figure 3 shows the German money supply, the German price level, and the nominal exchange rate (measured as U.S. cents per German mark) for that period. Notice that these series move closely together. When the supply of money starts growing quickly, the price level also takes off, and the German mark depreciates. When the money supply stabilizes, so do the price level and the exchange rate.

Figure 3. Money, Prices, and the Nominal Exchange Rate during the German Hyperinflation

This figure shows the money supply, the price level, and the nominal exchange rate (measured as U.S. cents per mark) for the German hyperinflation from January 1921 to December 1924. Notice how similarly these three variables move. When the quantity of money started growing quickly, the price level followed, and the mark depreciated relative to the dollar. When the German central bank stabilized the money supply, the price level and exchange rate stabilized as well.



The pattern shown in this figure appears during every hyperinflation. It leaves no doubt that there is a fundamental link among money, prices, and the nominal exchange rate. The quantity theory of money discussed in the previous chapter explains how the money supply affects the price level. The theory of purchasing-power parity discussed here explains how the price level affects the nominal exchange rate.

18-3c Limitations of Purchasing-Power Parity

Purchasing-power parity provides a simple model of how exchange rates are determined. For understanding many economic phenomena, the theory works well. In particular, it can explain many long-term trends, such as the depreciation of the U.S. dollar against the German mark and the appreciation of the U.S. dollar against the Italian lira. It can also explain the major changes in exchange rates that occur during hyperinflations.

Yet the theory of purchasing-power parity is not completely accurate. That is, exchange rates do not always move to ensure that a dollar has the same real value in all countries all the time. There are two reasons the theory of purchasing-power parity does not always hold in practice.

The first reason is that many goods are not easily traded. Imagine, for instance, that haircuts are more expensive in Paris than in New York. International travelers might avoid getting their haircuts in Paris, and some haircutters might move from New York to Paris. Yet such arbitrage would be too limited to eliminate the differences in prices. Thus, the deviation from purchasing-power parity might persist, and a dollar (or euro) would continue to buy less of a haircut in Paris than in New York.

The second reason that purchasing-power parity does not always hold is that even tradable goods are not always perfect substitutes when they are produced in different countries. For example, some consumers prefer German cars, and others prefer American cars. Moreover, consumer tastes can change over time. If German cars suddenly become more popular, the increase in demand will drive up the price of German cars compared to American cars. Despite this difference in prices in the two markets, there might be no opportunity for profitable arbitrage because consumers do not view the two cars as equivalent.

Thus, both because some goods are not tradable and because some tradable goods are not perfect substitutes with their foreign counterparts, purchasing-power parity is not a perfect theory of exchange-rate determination. For these reasons, real exchange rates fluctuate over time. Nonetheless, the theory of purchasing-power parity does provide a useful first step in understanding exchange rates. The basic logic is persuasive: As the real exchange rate drifts from the level predicted by purchasing-power parity, people have greater incentive to move goods across national borders. Even if the forces of purchasing-power parity do not completely fix the real exchange rate, they provide a reason to expect that changes in the real exchange rate are most often small or temporary. As a result, large and persistent movements in nominal exchange rates typically reflect changes in price levels at home and abroad.

Case Study: The Hamburger Standard

When economists apply the theory of purchasing-power parity to explain exchange rates, they need data on the prices of a basket of goods available in different countries. One analysis of this sort is conducted by *The Economist*, an international newsmagazine. The magazine occasionally collects data on a basket of goods consisting of "two all-beef patties, special sauce, lettuce, cheese, pickles, onions, on a sesame seed bun." It's called the "Big Mac" and is sold by McDonald's around the world.

You can find a Big Mac almost anywhere you look.

Once we have the prices of Big Macs in two countries denominated in the local currencies, we can compute the exchange rate predicted by the theory of purchasing-power parity. The predicted exchange rate is the one that makes the cost of the Big Mac the same in the two countries. For instance, if the price of a Big Mac is $3 in the United States and 300 yen in Japan, purchasing-power parity would predict an exchange rate of 100 yen per dollar.

How well does purchasing-power parity work when applied using Big Mac prices? Here are some examples from July 2009, when the price of a Big Mac was $3.57 in the United States:

Country	Price of a Big Mac	Predicted Exchange Rate	Actual Exchange Rate
Indonesia	20,900 rupiah	5,854 rupiah/$	10,200 rupiah/$
South Korea	3,400 won	952 won/$	1315 won/$
Japan	320 yen	89.6 yen/$	92.6 yen/$
Sweden	39 krona	10.9 krona/$	7.9 krona/$
Mexico	33 pesos	9.2 pesos/$	13.8 pesos/$
Euro area	3.31 euros	0.93 euros/$	0.72 euros/$
Britain	2.29 pounds	0.64 pound/$	0.62 pound/$

You can see that the predicted and actual exchange rates are not exactly the same. After all, international arbitrage in Big Macs is not easy. Yet the two exchange rates are usually in the same ballpark. Purchasing-power parity is not a precise theory of exchange rates, but it often provides a reasonable first approximation.

QUICK QUIZ

Over the past twenty years, Mexico has had high inflation, and Japan has had low inflation. What do you predict has happened to the number of Mexican pesos a person can buy with a Japanese yen?

18-4 Conclusion

The purpose of this chapter has been to develop some basic concepts that macroeconomists use to study open economies. You should now understand how a nation's trade balance is related to the international flow of capital and how national saving can differ from domestic investment in an open economy. You should understand that when a nation is running a trade surplus, it must be sending capital abroad, and that when it is running a trade deficit, it must be experiencing a capital inflow. You should also understand the meaning of the nominal and real exchange rates, as well as the implications and limitations of purchasing-power parity as a theory of how exchange rates are determined.

The macroeconomic variables defined here offer a starting point for analyzing an open economy's interactions with the rest of the world. In the next chapter, we develop a model that can explain what determines these variables. We can then discuss how various events and policies affect a country's trade balance and the rate at which nations make exchanges in world markets.

Chapter Recap: Summary

- Net exports are the value of domestic goods and services sold abroad (exports) minus the value of foreign goods and services sold domestically (imports). Net capital outflow is the acquisition of foreign assets by domestic residents (capital outflow) minus the acquisition of domestic assets by foreigners (capital inflow). Because every international transaction involves an exchange of an asset for a good or service, an economy's net capital outflow always equals its net exports.

- An economy's saving can be used either to finance investment at home or to buy assets abroad. Thus, national saving equals domestic investment plus net capital outflow.

- The nominal exchange rate is the relative price of the currency of two countries, and the real exchange rate is the relative price of the goods and services of two countries. When the nominal exchange rate changes so that each dollar buys more foreign currency, the dollar is said to *appreciate* or *strengthen*. When the nominal exchange rate changes so that each dollar buys less foreign currency, the dollar is said to *depreciate* or *weaken*.

- According to the theory of purchasing-power parity, a dollar (or a unit of any other currency) should be able to buy the same quantity of goods in all countries. This theory implies that the nominal exchange rate between the currencies of two countries should reflect the price levels in those countries. As a result, countries with relatively high inflation should have depreciating currencies, and countries with relatively low inflation should have appreciating currencies.

Ask the Instructor: How is our economy related to the rest of the world?

Ask the Instructor: What circumstances would cause the demand for a country's currency to change?

Chapter Recap: Questions for Review

1. Define *net exports* and *net capital outflow*. Explain how and why they are related.
2. Explain the relationship among saving, investment, and net capital outflow.
3. If a Japanese car costs 500,000 yen, a similar American car costs $10,000, and a dollar can buy 100 yen, what are the nominal and real exchange rates?
4. Describe the economic logic behind the theory of purchasing-power parity.
5. If the Fed started printing large quantities of U.S. dollars, what would happen to the number of Japanese yen a dollar could buy? Why?

Chapter Recap: Problems and Applications

1. How would the following transactions affect U.S. exports, imports, and net exports?
   a. An American art professor spends the summer touring museums in Europe.
   b. Students in Paris flock to see the latest movie from Hollywood.
   c. Your uncle buys a new Volvo.
   d. The student bookstore at Oxford University in England sells a pair of Levi's 501 jeans.
   e. A Canadian citizen shops at a store in northern Vermont to avoid Canadian sales taxes.
2. Would each of the following transactions be included in net exports or net capital outflow? Be sure to say whether it would represent an increase or a decrease in that variable.
   a. An American buys a Sony TV.
   b. An American buys a share of Sony stock.
   c. The Sony pension fund buys a bond from the U.S. Treasury.
   d. A worker at a Sony plant in Japan buys some Georgia peaches from an American farmer.
3. Describe the difference between foreign direct investment and foreign portfolio investment. Who is more likely to engage in foreign direct investment—a corporation or an individual investor? Who is more likely to engage in foreign portfolio investment?
4. How would the following transactions affect U.S. net capital outflow? Also, state whether each involves direct investment or portfolio investment.
   a. An American cellular phone company establishes an office in the Czech Republic.
   b. Harrods of London sells stock to the General Electric pension fund.
   c. Honda expands its factory in Marysville, Ohio.
   d. A Fidelity mutual fund sells its Volkswagen stock to a French investor.
5. The business section of most major newspapers contains a table showing U.S. exchange rates. Find such a table in a paper or online and use it to answer the following questions.
   a. Does this table show nominal or real exchange rates? Explain.
   b. What are the exchange rates between the United States and Canada and between the United States and Japan? Calculate the exchange rate between Canada and Japan.
   c. If U.S. inflation exceeds Japanese inflation over the next year, would you expect the U.S. dollar to appreciate or depreciate relative to the Japanese yen?
6. Would each of the following groups be happy or unhappy if the U.S. dollar appreciated? Explain.
   a. Dutch pension funds holding U.S. government bonds
   b. U.S. manufacturing industries
   c. Australian tourists planning a trip to the United States
   d. An American firm trying to purchase property overseas
7. What is happening to the U.S. real exchange rate in each of the following situations? Explain.
   a. The U.S. nominal exchange rate is unchanged, but prices rise faster in the United States than abroad.

b. The U.S. nominal exchange rate is unchanged, but prices rise faster abroad than in the United States.

c. The U.S. nominal exchange rate declines, and prices are unchanged in the United States and abroad.

d. The U.S. nominal exchange rate declines, and prices rise faster abroad than in the United States.

8. A can of soda costs $0.75 in the United States and 12 pesos in Mexico. What would the peso-dollar exchange rate be if purchasing-power parity holds? If a monetary expansion caused all prices in Mexico to double, so that soda rose to 24 pesos, what would happen to the peso-dollar exchange rate?

9. Assume that American rice sells for $100 per bushel, Japanese rice sells for 16,000 yen per bushel, and the nominal exchange rate is 80 yen per dollar.
   a. Explain how you could make a profit from this situation. What would be your profit per bushel of rice? If other people exploit the same opportunity, what would happen to the price of rice in Japan and the price of rice in the United States?

   b. Suppose that rice is the only commodity in the world. What would happen to the real exchange rate between the United States and Japan?

10. A case study in the chapter analyzed purchasing-power parity for several countries using the price of Big Macs. Here are data for a few more countries:

Country	Price of a Big Mac	Predicted Exchange Rate	Actual Exchange Rate
Chile	1,750 pesos	_____ pesos/$	549 pesos/$
Hungary	720 forints	_____ forints/$	199 forints/$
Czech Republic	67.9 korunas	_____ korunas/$	18.7 korunas/$
Brazil	8.03 real	_____ real/$	2.00 real/$
Canada	3.89 C$	_____ C$/$	1.16 C$/$

   a. For each country, compute the predicted exchange rate of the local currency per U.S. dollar. (Recall that the U.S. price of a Big Mac was $3.57.)

   b. According to purchasing-power parity, what is the predicted exchange rate between the Hungarian forint and the Canadian dollar? What is the actual exchange rate?

   c. How well does the theory of purchasing-power parity explain exchange rates?

11. Purchasing-power parity holds between the nations of Ectenia and Wiknam, where the only commodity is Spam.
   a. In 2000 a can of Spam costs 2 dollars in Ectenia and 6 pesos in Wiknam. What is the exchange rate between Ectenian dollars and Wiknamian pesos?

   b. Over the next 20 years, inflation is 3.5 percent per year in Ectenia and 7 percent per year in Wiknam. What will happen over this period to the price of Spam and the exchange rate? (Hint: Recall the rule of 70 from Chapter 14.)

   c. Which of these two nations will likely have a higher nominal interest rate? Why?

   d. A friend of yours suggests a get-rich-quick scheme: Borrow from the nation with the lower nominal interest rate, invest in the nation with the higher nominal interest rate, and profit from the interest-rate differential. Do you see any potential problems with this idea? Explain.

For further information on topics in this chapter, additional problems, applications, examples, online quizzes, and more, please visit our

website at **www.cengage.com/economics/mankiw** **(http://www.cengage.com/economics/mankiw).**

Chapter Recap: Key Terms

- appreciation

  an increase in the value of a currency as measured by the amount of foreign currency it can buy

- balanced trade

  a situation in which exports equal imports

- closed economy

  an economy that does not interact with other economies in the world

- depreciation

  a decrease in the value of a currency as measured by the amount of foreign currency it can buy

- exports

  goods and services that are produced domestically and sold abroad

- imports

  goods and services that are produced abroad and sold domestically

- net capital outflow

  the purchase of foreign assets by domestic residents minus the purchase of domestic assets by foreigners

- net exports

  spending on domestically produced goods by foreigners (exports) minus spending on foreign goods by domestic residents (imports); the value of a nation's exports minus the value of its imports; also called the trade balance

- nominal exchange rate

  the rate at which a person can trade the currency of one country for the currency of another

- open economy

  an economy that interacts freely with other economies around the world

- purchasing-power parity

  a theory of exchange rates whereby a unit of any given currency should be able to buy the same quantity of goods in all countries

- real exchange rate

  the rate at which a person can trade the goods and services of one country for the goods and services of another

- trade balance

  the value of a nation's exports minus the value of its imports; also called net exports

- trade deficit

  an excess of imports over exports

- trade surplus

  an excess of exports over imports