section 3

Measurement of Economic Performance

In December 1975 the government of Portugal—a provisional government in the process of establishing a democracy—feared that it was facing an economic crisis. Business owners, alarmed by the rise of leftist political parties, issued dire warnings about plunging production. Newspapers speculated that the economy had shrunk 10 to 15% since the 1974 revolution that had overthrown the country's long-standing dictatorship.

In the face of these reports of economic collapse, some Portuguese were pronouncing democracy itself a failure. Others declared that capitalism was the culprit, demanding that the government seize control of the nation's factories and force them to produce more. But how bad was the situation, really?

Guy LeQuerrec/Magnum


dpa photos/Newscom

To answer this question, Portugal's top monetary official invited his old friend Richard Eckaus, an economist at the Massachusetts Institute of Technology, and two other MIT economists to look at the country's national accounts, the set of data collected on the country's economic activity. The visiting experts had to engage in a lot of educated guesswork: Portugal's economic data collection had always been somewhat incomplete, and it had been further disrupted by political upheavals. For example, the country's statisticians normally tracked construction with data on the sales of structural steel and concrete. But in the somewhat chaotic situation of 1975, these indicators were moving in opposite directions because many builders were ignoring the construction regulations and using very little steel. (Travel tip: If you find yourself visiting Portugal, try to avoid being in a 1975-vintage building during an earthquake.)

Still, they went to work with the available data, and within a week they were able to make a rough estimate: aggregate output had declined only 3% from 1974 to 1975. The economy had indeed suffered a serious setback, but its decline was much less drastic than the calamity being portrayed in the newspapers. (While later revisions pushed the decline up to 4.5%, that was still much less than feared.) The Portuguese government certainly had work to do, but there was no need to abandon either democracy or a market economy. In fact, the economy soon began to recover. Over the past three decades, Portugal has, on the whole, been a success story. A once-backward dictatorship is now a fairly prosperous, solidly democratic member of the European Union.

What's the lesson of this story? It is that economic measurement matters. If the government of Portugal had believed the scare stories some were telling during 1975, it might have made major policy mistakes. Good macroeconomic policy depends on good measurement of what is happening in the economy as a whole. This section presents three of the most important macroeconomic measures: gross domestic product, unemployment, and inflation.

What you will learn in this **Module:**

- How economists use aggregate measures to track the performance of the economy
- The circular flow diagram of the economy
- What gross domestic product, or GDP, is and the three ways of calculating it

Module 10
The Circular Flow and Gross Domestic Product

The National Accounts

Almost all countries calculate a set of numbers known as the *national income and product accounts.* In fact, the accuracy of a country's accounts is a remarkably reliable indicator of its state of economic development—in general, the more reliable the accounts, the more economically advanced the country. When international economic agencies seek to help a less developed country, typically the first order of business is to send a team of experts to audit and improve the country's accounts.

In the United States, these numbers are calculated by the Bureau of Economic Analysis, a division of the U.S. government's Department of Commerce. The **national income and product accounts,** often referred to simply as the **national accounts,** keep track of the spending of consumers, sales of producers, business investment spending, government purchases, and a variety of other flows of money among different sectors of the economy. Let's see how they work.

National income and product accounts, or **national accounts,** keep track of the flows of money between different sectors of the economy.

The Circular-Flow Diagram

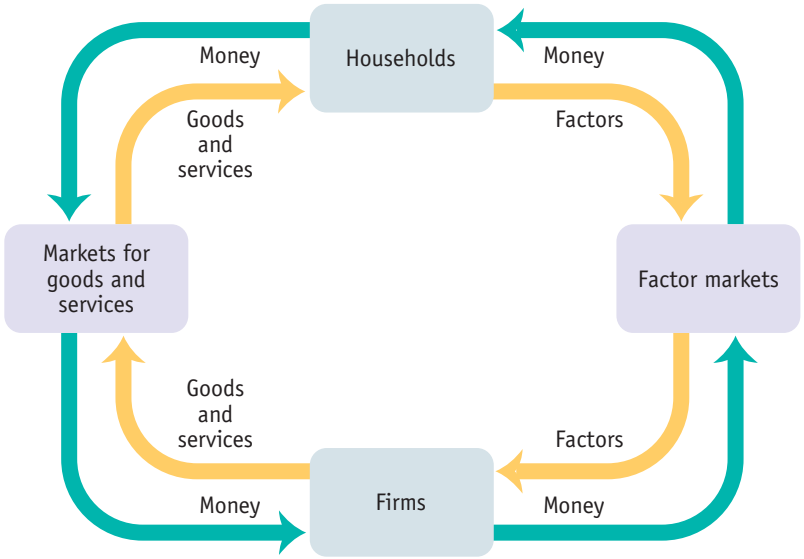
To understand the principles behind the national accounts, it helps to look at a graphic called a *circular-flow diagram.* This diagram is a simplified representation of the macroeconomy. It shows the flows of money, goods and services, and factors of production through the economy. It allows us to visualize the key concepts behind the national accounts. The underlying principle is that the flow of money into each market or sector is equal to the flow of money coming out of that market or sector.

The Simple Circular Flow Diagram The U.S. economy is a vastly complex entity, with more than a hundred million workers employed by millions of companies, producing millions of different goods and services. Yet you can learn some very important things about the economy by considering a simple diagram, shown in Figure 10.1.

figure 10.1

The Circular-Flow Diagram

This diagram represents the flows of money and goods and services in the economy. In the markets for goods and services, households purchase goods and services from firms, generating a flow of money to the firms and a flow of goods and services to the households. The money flows back to households as firms purchase factors of production from the households in factor markets.



This simple model of the macroeconomy represents the transactions that take place by two kinds of flows around a circle: flows of physical things such as goods, services, labor, or raw materials in one direction, and flows of money that pay for these things in the opposite direction. In this case, the physical flows are shown in yellow, the money flows in green.

The simplest circular-flow diagram illustrates an economy that contains only two kinds of "inhabitants": households and firms. A **household** consists of either an individual or a group of people who share their income. A **firm** is an organization that produces goods and services for sale—and that employs members of households.

As you can see in Figure 10.1, there are two kinds of markets in this simple economy. On one side (here the left side) there are markets for goods and services (also known as **product markets**) in which households buy the goods and services they want from firms. This produces a flow of goods and services to the households and a return flow of money to firms.

On the other side, there are **factor markets** in which firms buy the resources they need to produce goods and services. The best known factor market is the *labor market,* in which workers are paid for their time. Besides labor, we can think of households as owning and selling the other factors of production to firms.

This simple circular-flow diagram omits a number of real-world complications in the interest of simplicity. However, it is a useful aid to thinking about the economy—and we can use it as the starting point for developing a more realistic (and therefore more complicated) circular-flow diagram.

The Expanded Circular-Flow Diagram Figure 10.2 on the next page is a revised and expanded circular-flow diagram. This diagram shows only the flows of money in the economy, but is expanded to include extra elements that were ignored in the interest of simplicity in the simple circular-flow diagram. The underlying principle that the inflow of money into each market or sector must equal the outflow of money coming from that market or sector still applies in this model.

In Figure 10.2, the circular flow of money between households and firms illustrated in Figure 10.1 remains. In the product markets, households engage in **consumer spending,** buying goods and services from domestic firms and from firms in the rest of the world. Households also own factors of production—land, labor, and capital.

A **household** is a person or group of people who share income.

A **firm** is an organization that produces goods and services for sale.

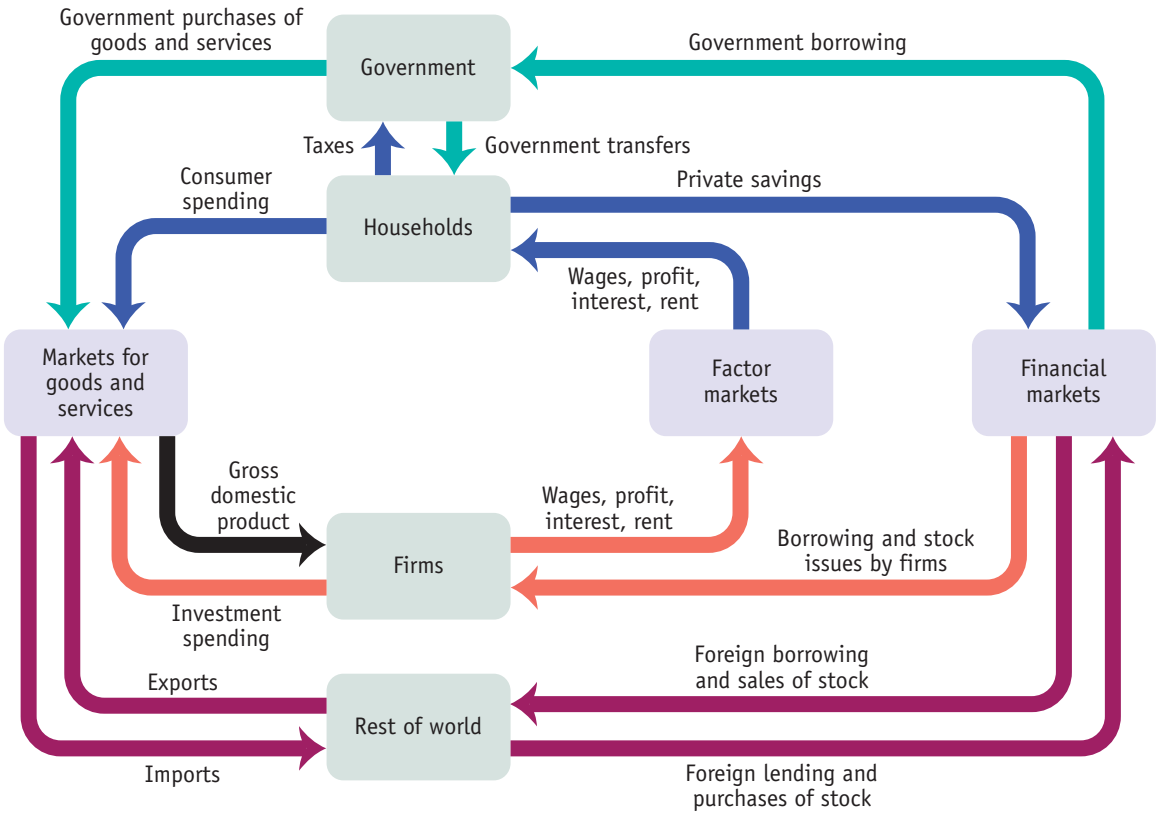
Product markets are where goods and services are bought and sold.

Factor markets are where resources, especially capital and labor, are bought and sold.

Consumer spending is household spending on goods and services.

figure 10.2

An Expanded Circular-Flow Diagram: How Money Flows Through the Economy



A circular flow of funds connects the four sectors of the economy—households, firms, government, and the rest of the world—via three types of markets: the factor markets, the markets for goods and services, and the *financial markets.* Funds flow from firms to households in the form of wages, profit, interest, and rent through the factor markets. After paying taxes to the government and receiving *government transfers,* households allocate the remaining income—*disposable income*—to private savings and consumer spending. Via the financial markets, *private savings* and funds from the rest of the world are channeled into investment spending by firms, government borrowing, foreign borrowing and lending, and foreign transactions of stocks. In turn, funds flow from the government and households to firms to pay for purchases of goods and services. Finally, exports to the rest of the world generate a flow of funds into the economy and imports lead to a flow of funds out of the economy. We can determine the total flow of funds by adding all spending—consumer spending on goods and services, investment spending by firms, government purchases of goods and services, and exports—and then subtracting the value of imports. This is the value of all the final goods and services produced in the United States—that is, the *gross domestic product* of the economy.

A **stock** is a share in the ownership of a company held by a shareholder.

A **bond** is a loan in the form of an IOU that pays interest.

They sell the use of these factors of production to firms, receiving rent, wages, and interest payments in return. Firms buy, and pay households for, the use of those factors of production in factor markets, represented to the right of center in the diagram. Most households derive the bulk of their income from wages earned by selling labor. Some households derive additional income from their indirect ownership of the physical capital used by firms, mainly in the form of **stocks**—shares in the ownership of a company—and **bonds**—loans to firms in the form of an IOU that pays interest. In other words, the income households receive from the factor markets includes profit distributed to company shareholders and the interest payments on any bonds that they hold. Finally, households receive rent from firms in exchange for the use of land or structures that the households own. So in factor markets, households receive income in the form of wages, profit, interest, and rent via factor markets.

Households spend most of the income received from factors of production on goods and services. However, in Figure 10.2 we see two reasons why the markets for goods and services don't in fact absorb *all* of a household's income. First, households don't get to keep all the income they receive via the factor markets. They must pay part of their income to the government in the form of taxes, such as income taxes and sales taxes. In addition, some households receive **government transfers**—payments that the government makes to individuals without expecting a good or service in return. Unemployment insurance payments are one example of a government transfer. The total income households have left after paying taxes and receiving government transfers is **disposable income.**

The second reason that the markets for goods and services do not absorb all household income is that many households set aside a portion of their income for **private savings.** These private savings go into **financial markets** where individuals, banks, and other institutions buy and sell stocks and bonds as well as make loans. As Figure 10.2 shows, the financial markets (on the far right of the circular flow diagram) also receive funds from the rest of the world and provide funds to the government, to firms, and to the rest of the world.

Before going further, we can use the box representing households to illustrate an important general characteristic of the circular-flow diagram: the total sum of flows of money out of a given box is equal to the total sum of flows of money into that box. It's simply a matter of accounting: what goes in must come out. So, for example, the total flow of money out of households—the sum of taxes paid, consumer spending, and private savings—must equal the total flow of money into households—the sum of wages, profit, interest, rent, and government transfers.

Now let's look at the other inhabitants in the circular-flow diagram, including the government and the rest of the world. The government returns a portion of the money it collects from taxes to households in the form of government transfers. However, it uses much of its tax revenue, plus additional funds borrowed in the financial markets through **government borrowing,** to buy goods and services. **Government purchases of goods and services,** the total of purchases made by federal, state, and local governments, includes everything from military spending on ammunition to your local public school's spending on chalk, erasers, and teacher salaries.

The rest of the world participates in the U.S. economy in three ways. First, some of the goods and services produced in the United States are sold to residents of other countries. For example, more than half of America's annual wheat and cotton crops are sold abroad. Goods and services sold to other countries are known as **exports.** Export sales lead to a flow of funds from the rest of the world into the United States to pay for them. Second, some of the goods and services purchased by residents of the United States are produced abroad. For example, many consumer goods are now made in China. Goods and services purchased from residents of other countries are known as **imports.** Import purchases lead to a flow of funds out of the United States to pay for them. Third, foreigners can participate in U.S. financial markets. Foreign lending—lending by foreigners to borrowers in the United States and purchases by foreigners of shares of stock in American companies—generates a flow of funds into the United States from the rest of the world. Conversely, foreign borrowing—borrowing by foreigners from U.S. lenders and purchases by Americans of stock in foreign companies—leads to a flow of funds out of the United States to the rest of the world.

Notice that like households, firms also buy goods and services in our economy. For example, an automobile company that is building a new factory will buy investment goods—machinery like stamping presses and welding robots—from companies that manufacture these items. It will also accumulate an inventory of finished cars in preparation for shipment to dealers. **Inventories,** then, are goods and raw materials that

Government transfers are payments that the government makes to individuals without expecting a good or service in return.

Disposable income, equal to income plus government transfers minus taxes, is the total amount of household income available to spend on consumption and to save.

Private savings, equal to disposable income minus consumer spending, is disposable income that is not spent on consumption.

The banking, stock, and bond markets, which channel private savings and foreign lending into investment spending, government borrowing, and foreign borrowing, are known as the **financial markets.**

Government borrowing is the amount of funds borrowed by the government in the financial markets.

Government purchases of goods and services are total expenditures on goods and services by federal, state, and local governments.

Goods and services sold to other countries are **exports.** Goods and services purchased from other countries are **imports.**

Inventories are stocks of goods and raw materials held to facilitate business operations.

Thinkstock/Comstock/Getty Images

Supplies used in public schools, such as the chalk shown here, are among the goods and services purchased by the government.

Investment spending is spending on new productive physical capital, such as machinery and structures, and on changes in inventories.

Final goods and services are goods and services sold to the final, or end, user.

Intermediate goods and services are goods and services bought from one firm by another firm to be used as inputs into the production of final goods and services.

Gross domestic product, or **GDP,** is the total value of all final goods and services produced in the economy during a given year.

Aggregate spending—the total spending on domestically produced final goods and services in the economy—is the sum of consumer spending (C), investment spending (I), government purchases of goods and services (G), and exports minus imports ($X - IM$).

firms hold to facilitate their operations. The national accounts count this **investment spending**—spending on new productive physical capital, such as machinery and buildings, and on changes in *inventories*—as part of total spending on goods and services.

You might ask why changes in inventories are included in investment spending—finished cars aren't, after all, used to produce more cars. Changes in inventories of finished goods are counted as investment spending because, like machinery, they change the ability of a firm to make future sales. So spending on additions to inventories is a form of investment spending by a firm. Conversely, a drawing-down of inventories is counted as a fall in investment spending because it leads to lower future sales. It's also important to understand that investment spending includes spending on the construction of any structure, regardless of whether it is an assembly plant or a new house. Why include the construction of homes? Because, like a plant, a new house produces a future stream of output—housing services for its occupants.

Suppose we add up consumer spending on goods and services, investment spending, government purchases of goods and services, and the value of exports, then subtract the value of imports. This gives us a measure of the overall market value of the goods and services the economy produces. That measure has a name: it's a country's *gross domestic product.* But before we can formally define gross domestic product, or GDP, we have to examine an important distinction between classes of goods and services: the difference between *final goods and services* versus *intermediate goods and services.*

Gross Domestic Product

A consumer's purchase of a new car from a dealer is one example of a sale of **final goods and services:** goods and services sold to the final, or end, user. But an automobile manufacturer's purchase of steel from a steel foundry or glass from a glassmaker is an example of a sale of **intermediate goods and services:** goods and services that are inputs into the production of final goods and services. In the case of intermediate goods and services, the purchaser—another firm—is *not* the final user.

Gross domestic product, or **GDP,** is the total value of all *final goods and services* produced in an economy during a given period, usually a year. In 2009 the GDP of the United States was $14,259 billion, or about $46,372 per person.

There are three ways to calculate GDP. The first way is to *survey firms and add up the total value of their production of final goods and services.* The second way is to *add up* ***aggregate spending*** *on domestically produced final goods and services in the economy*—the sum of consumer spending, investment spending, government purchases of goods and services, and exports minus imports. The third way of calculating GDP is to *sum the total factor income earned by households from firms in the economy.*

Government statisticians use all three methods. To illustrate how they work, we will consider a hypothetical economy, shown in Figure 10.3. This economy consists of three firms—American Motors, Inc., which produces one car per year; American Steel, Inc., which produces the steel that goes into the car; and American Ore, Inc., which mines the iron ore that goes into the steel. GDP in this economy is $21,500, the value of the one car per year the economy produces. Let's look at how the three different methods of calculating GDP yield the same result.

Measuring GDP as the Value of Production of Final Goods and Services The first method for calculating GDP is to add up the value of all the final goods and services produced in the economy—a calculation that excludes the value of intermediate goods and services. Why are intermediate goods and services excluded? After all, don't they represent a very large and valuable portion of the economy?

To understand why only final goods and services are included in GDP, look at the simplified economy described in Figure 10.3. Should we measure the GDP of this economy by adding up the total sales of the iron ore producer, the steel producer, and the auto producer? If we did, we would in effect be counting the value of the steel twice—once when it is sold by the steel plant to the auto plant and again when the steel auto body is sold to a consumer as a finished car. And we would be counting the value of the

figure 10.3

Calculating GDP

In this hypothetical economy consisting of three firms, GDP can be calculated in three different ways: measuring GDP as the value of production of final goods and services by summing each firm's value added; measuring GDP as aggregate spending on domestically produced final goods and services; and measuring GDP as factor income earned by households from firms in the economy.

Aggregate spending on domestically produced final goods and services = $21,500

	American Ore, Inc.	American Steel, Inc.	American Motors, Inc.	Total factor income
Value of sales	$4,200 (ore)	$9,000 (steel)	$21,500 (car)	
Intermediate goods	0	4,200 (iron ore)	9,000 (steel)	
Wages	2,000	3,700	10,000	$15,700
Interest payments	1,000	600	1,000	2,600
Rent	200	300	500	1,000
Profit	1,000	200	1,000	2,200
Total expenditure by firm	4,200	9,000	21,500	
Value added per firm = Value of sales – cost of intermediate goods	4,200	4,800	12,500	

Total payments to factors = $21,500

Sum of value added = $21,500

iron ore *three* times—once when it is mined and sold to the steel company, a second time when it is made into steel and sold to the auto producer, and a third time when the steel is made into a car and sold to the consumer. So counting the full value of each producer's sales would cause us to count the same items several times and artificially inflate the calculation of GDP.

In Figure 10.3, the total value of all sales, intermediate and final, is $34,700: $21,500 from the sale of the car, plus $9,000 from the sale of the steel, plus $4,200 from the sale of the iron ore. Yet we know that GDP—the total value of all final goods and services in a given year—is only $21,500. To avoid double-counting, we count only each producer's **value added** in the calculation of GDP: the difference between the value of its sales and the value of the inputs it purchases from other businesses. That is, at each stage of the production process we subtract the cost of inputs—the intermediate goods—at that stage. In this case, the value added of the auto producer is the dollar value of the cars it manufactures *minus* the cost of the steel it buys, or $12,500. The value added of the steel producer is the dollar value of the steel it produces *minus* the cost of the ore it buys, or $4,800. Only the ore producer, who we have assumed doesn't buy any inputs, has value added equal to its total sales, $4,200. The sum of the three producers' value added is $21,500, equal to GDP.

The **value added** of a producer is the value of its sales minus the value of its purchases of inputs.

Digitalvision

Steel is an intermediate good because it is sold to other product manufacturers like automakers or refrigerator makers, and rarely to the final consumer.

Measuring GDP as Spending on Domestically Produced Final Goods and Services Another way to calculate GDP is by adding up aggregate spending on domestically produced final goods and services. That is, GDP can be measured by the flow of funds into firms. Like the method that estimates GDP as the value of domestic production of final goods and services, this measurement must be carried out in a way that avoids double-counting. In terms of our steel and auto example, we don't want to count both consumer spending on a car (represented in Figure 10.3 by the sales price of the car) and the auto producer's

spending on steel (represented in Figure 10.3 by the price of a car's worth of steel). If we counted both, we would be counting the steel embodied in the car twice. We solve this problem by counting only the value of sales to *final buyers,* such as consumers, firms that purchase investment goods, the government, or foreign buyers. In other words, in order to avoid the double-counting of spending, we omit sales of inputs from one business to another when estimating GDP using spending data. You can see from Figure 10.3 that aggregate spending on final goods and services—the finished car—is $21,500.

As we've already pointed out, the national accounts *do* include investment spending by firms as a part of final spending. That is, an auto company's purchase of steel to make a car isn't considered a part of final spending, but the company's purchase of new machinery for its factory *is* considered a part of final spending. What's the difference? Steel is an input that is used up in production; machinery will last for a number of years. Since purchases of capital goods that will last for a considerable time aren't closely tied to current production, the national accounts consider such purchases a form of final sales.

What types of spending make up GDP? Look again at the markets for goods and services in Figure 10.2, and you will see that one source of sales revenue for firms is consumer spending. Let's denote consumer spending with the symbol *C.* Figure 10.2 shows three other components of sales: sales of investment goods to other businesses, or investment spending, which we will denote by *I;* government purchases of goods and services, which we will denote by *G;* and sales to foreigners—that is, exports—which we will denote by *X.*

In reality, not all of this final spending goes toward domestically produced goods and services. We must take account of spending on imports, which we will denote by *IM.* Income spent on imports is income not spent on domestic goods and services—it is income that has "leaked" across national borders. So to calculate domestic production using spending data, we must subtract spending on imports. Putting this all together gives us the following equation, which breaks GDP down by the four sources of aggregate spending:

$$\textbf{(10-1)} \quad GDP = C + I + G + X - IM$$

where C = consumer spending, I = investment spending, G = government purchases of goods and services, X = sales to foreigners, or exports, and IM = spending on imports. Note that the value of $X - IM$—the difference between the value of exports and the value of imports—is known as **net exports.** We'll be seeing a lot of Equation 10-1 in later modules!

Measuring GDP as Factor Income Earned from Firms in the Economy A final way to calculate GDP is to add up all the income earned by factors of production in the economy—the wages earned by labor; the interest earned by those who lend their savings to firms and the government; the rent earned by those who lease their land or structures to firms; and the profit earned by the shareholders, the owners of the firms' physical capital. This is a valid measure because the money firms earn by selling goods and services must go somewhere; whatever isn't paid as wages, interest, or rent is profit. And part of profit is paid out to shareholders as *dividends.*

Figure 10.3 shows how this calculation works for our simplified economy. The shaded column at the far right shows the total wages, interest, and rent paid by all these firms as well as their total profit. Summing up all of these yields a total factor income of $21,500—again, equal to GDP.

We won't emphasize the income method as much as the other two methods of calculating GDP. It's important to keep in mind, however, that all the money spent on domestically produced goods and services generates factor income to households—that is, there really is a circular flow.

Net exports are the difference between the value of exports and the value of imports ($X - IM$).

The Components of GDP Now that we know how GDP is calculated in principle, let's see what it looks like in practice.

Figure 10.4 shows the first two methods of calculating GDP side by side. The height of each bar above the horizontal axis represents the GDP of the U.S. economy in 2009: $14,259 billion. Each bar is divided to show the breakdown of that total in terms of where the value was added and how the money was spent.

In the left bar in Figure 10.4, we see the breakdown of GDP by value added according to sector, the first method of calculating GDP. Of the $14,259 billion, $10,669 billion consisted of value added by businesses. Another $1,760 billion consisted of value added by government, in the form of military, education, and other government services. Finally, $1,830 billion of value added was added by households and institutions. For example, the value added by households includes the value of work performed in homes by professional gardeners, maids, and cooks.

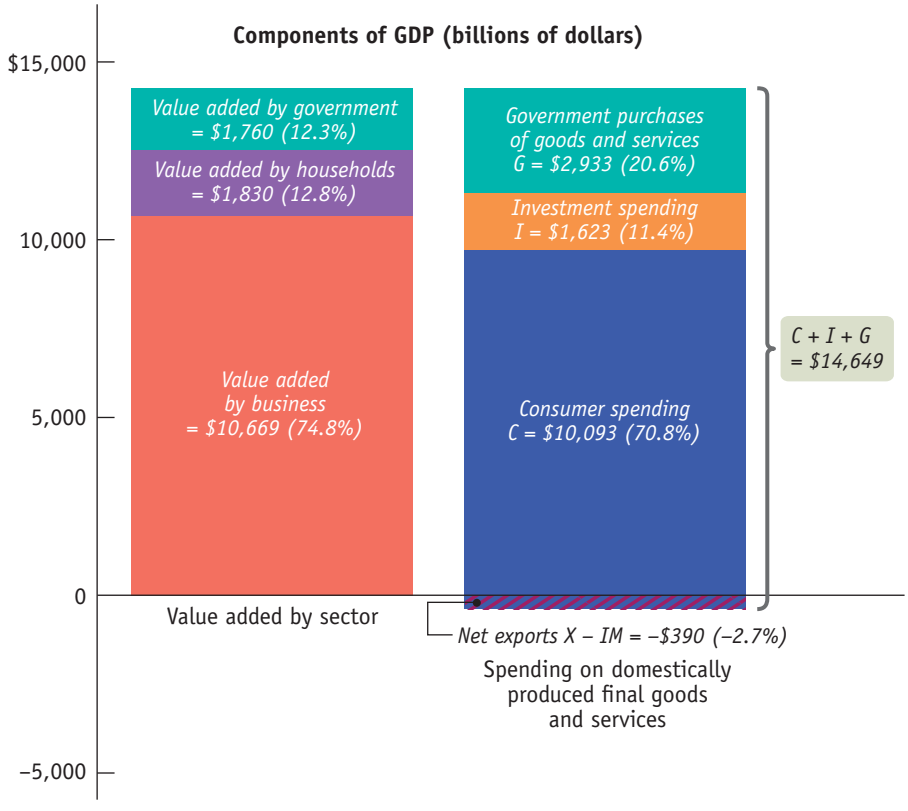
The right bar in Figure 10.4 corresponds to the second method of calculating GDP, showing the breakdown by the four types of aggregate spending. The total length of the right bar is longer than the total length of the left bar, a difference of $390 billion (which, as you can see, extends below the horizontal axis). That's because the total length of the right bar represents total spending in the economy, spending on both domestically produced and foreign-produced—imported—final goods and services. Within the bar, consumer spending (C), which is 70. 8% of GDP, dominates the picture. But some of that spending was absorbed by foreign-produced goods and services. In 2009, the value of net exports, the difference between the value of exports and the value of imports ($X - IM$ in Equation 10-1), was negative—the United States was a net importer of foreign goods and services. The 2009 value of $X - IM$ was −$390 billion, or −2.7% of GDP. Thus, a portion of the right bar extends below the horizontal axis by $390 billion to represent the amount

figure 10.4

U.S. GDP in 2009: Two Methods of Calculating GDP

The two bars show two equivalent ways of calculating GDP. The height of each bar above the horizontal axis represents $14,259 billion, U.S. GDP in 2009. The left bar shows the breakdown of GDP according to the value added of each sector of the economy. The right bar shows the breakdown of GDP according to the four types of aggregate spending: $C + I + G + X - IM$. The right bar has a total length of $14,259 billion + $390 billion = $14,649 billion. The $390 billion, shown as the area extending below the horizontal axis, is the amount of total spending absorbed by net imports (negative net exports) in 2009. (Percentages don't add up to 100 due to rounding.)

Source: Bureau of Economic Analysis.



of total spending that was absorbed by net imports and so did not lead to higher U.S. GDP. Investment spending (I) constituted 11.4% of GDP; government purchases of goods and services (G) constituted 20.6% of GDP.

GDP: What's In and What's Out? It's easy to confuse what is included and what isn't included in GDP. So let's stop here and make sure the distinction is clear. Don't confuse investment spending with spending on inputs. Investment spending—spending on productive physical capital, the construction of structures (residential as well as commercial), and changes to inventories—is included in GDP. But spending on inputs is not. Why the difference? Recall the distinction between resources that are *used up* and those that are *not used up* in production. An input, like steel, is used up in production. A metal-stamping machine, an investment good, is not. It will last for many years and will be used repeatedly to make many cars. Since spending on productive physical capital—investment goods—and the construction of structures is not directly tied to current output, economists consider such spending to be spending on final goods. Spending on changes to inventories is considered a part of investment spending so it is also included in GDP. Why? Because, like a machine, additional inventory is an investment in future sales. And when a good is released for sale from inventories, its value is subtracted from the value of inventories and so from GDP. Used goods are not included in GDP because, as with inputs, to include them would be to double-count: counting them once when sold as new and again when sold as used.

Photo by Feng Li/Getty Images

The U.S. is a net importer of goods and services, such as these toys made on a production line in China.

Also, financial assets such as stocks and bonds are not included in GDP because they don't represent either the production or the sale of final goods and services. Rather, a bond represents a promise to repay with interest, and a stock represents a proof of ownership. And for obvious reasons, foreign-produced goods and services are not included in calculations of gross *domestic* product.

Here is a summary of what's included and not included in GDP:

Included

- Domestically produced final goods and services, including capital goods, new construction of structures, and changes to inventories

Not Included

- Intermediate goods and services
- Inputs
- Used goods
- Financial assets such as stocks and bonds
- Foreign-produced goods and services

Module 10 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. Explain why the three methods of calculating GDP produce the same estimate of GDP.
2. Identify each of the sectors to which firms make sales. What are the various ways in which households are linked with other sectors of the economy?
3. Consider Figure 10.3. Explain why it would be incorrect to calculate total value added as $30,500, the sum of the sales price of a car and a car's worth of steel.

Tackle the Test: Multiple-Choice Questions

1. Which of the following is true? The simple circular-flow diagram
   I. includes only the product markets.
   II. includes only the factor markets.
   III. is a simplified representation of the macroeconomy.
   a. I only
   b. II only
   c. III only
   d. I and III only
   e. none of the above
2. GDP is equal to
   a. the total value of all goods and services produced in an economy during a given period.
   b. $C + I + G + IM$.
   c. the total value of intermediate goods plus final goods.
   d. the total income received by producers of final goods and services.
   e. none of the above.
3. Which of the following is included in GDP?
   a. changes to inventories
   b. intermediate goods
   c. used goods
   d. financial assets (stocks and bonds)
   e. foreign-produced goods
4. Which of the following is *not* included in GDP?
   a. capital goods such as machinery
   b. imports
   c. the value of domestically produced services
   d. government purchases of goods and services
   e. the construction of structures
5. Which of the following components makes up the largest percentage of GDP measured by aggregate spending?
   a. consumer spending
   b. investment spending
   c. government purchases of goods and services
   d. exports
   e. imports

Tackle the Test: Free-Response Questions

1. Will each of the following transactions be included in GDP for the United States? Explain why or why not.
   a. Coca-Cola builds a new bottling plant in the United States.
   b. Delta sells one of its existing airplanes to Korean Air.
   c. Ms. Moneybags buys an existing share of Disney stock.
   d. A California winery produces a bottle of Chardonnay and sells it to a customer in Montreal, Canada.
   e. An American buys a bottle of French perfume in Tulsa.
   f. A book publisher produces too many copies of a new book; the books don't sell this year, so the publisher adds the surplus books to inventories.

Answer (6 points)

1 point: Yes. New structures built in the United States are included in U.S. GDP.

1 point: No. The airplane is used, and sales of used goods are not included in GDP.

1 point: No. This is a transfer of ownership—not new production.

1 point: Yes. This is an export.

1 point: No. This is an import—it was not produced in the United States.

1 point: Yes. Additions to inventories are considered investments.

2. Draw a correctly labeled circular-flow diagram showing the flows of funds between the markets for goods and services and the factor markets. Add the government to your diagram, and show how money leaks out of the economy to the government and how money is injected back into the economy by the government.

What you will learn in this **Module:**

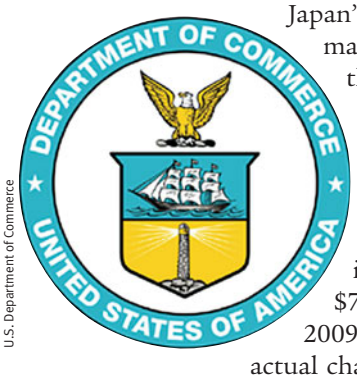
- The difference between real GDP and nominal GDP
- Why real GDP is the appropriate measure of real economic activity

Module 11
Interpreting Real Gross Domestic Product

What GDP Tells Us

Now we've seen the various ways that gross domestic product is calculated. But what does the measurement of GDP tell us?

The most important use of GDP is as a measure of the size of the economy, providing us a scale against which to compare the economic performance of other years or other countries. For example, in 2009, as we've seen, U.S. GDP was $14,259 billion, Japan's GDP was $5,049 billion, and the combined GDP of the 25 countries that make up the European Union was $16,191 billion. This comparison tells us that Japan, although it has the world's second-largest national economy, carries considerably less economic weight than does the United States. When taken in aggregate, Europe's economy is larger than the U.S. economy.



U.S. Department of Commerce

Still, one must be careful when using GDP numbers, especially when making comparisons over time. That's because part of the increase in the value of GDP over time represents increases in the *prices* of goods and services rather than an increase in output. For example, U.S. GDP was $7,085 billion in 1994 and had approximately doubled to $14,259 billion by 2009. But U.S. production didn't actually double over that period. To measure actual changes in aggregate output, we need a modified version of GDP that is adjusted for price changes, known as *real GDP*. We'll see how real GDP is calculated next.

Real GDP: A Measure of Aggregate Output

At the beginning of this section we described the economic troubles that afflicted Portugal in 1975. While the economy wasn't in as bad shape as many people thought, output was declining. Strange to say, however, GDP was up. In fact, between 1974 and 1975 Portugal's GDP as measured in escudos (the national currency at the time, now replaced by the euro) rose 11 percent.

How was that possible? The answer is that Portugal had serious inflation. As a result, the escudo value of GDP rose even though output fell.

fyi

Creating the National Accounts

The national accounts, like modern macroeconomics, owe their creation to the Great Depression. As the economy plunged into depression, government officials found their ability to respond crippled not only by the lack of adequate economic theories but also by the lack of adequate information. All they had were scattered statistics: railroad freight car loadings, stock prices, and incomplete indexes of industrial production. They could only guess at what was happening to the economy as a whole.

In response to this perceived lack of information, the Department of Commerce commissioned Simon Kuznets, a young Russian-born economist, to develop a set of national income accounts. (Kuznets later won the Nobel Prize in Economics for his work.) The first version of these accounts was presented to Congress in 1937 and in a research report titled *National Income, 1929–35.*

Kuznets's initial estimates fell short of the full modern set of accounts because they focused on income, not production. The push to complete the national accounts came during World War II, when policy makers were in even more need of comprehensive measures of the economy's performance. The federal government began issuing estimates of gross domestic product and gross national product in 1942.

In January 2000, in its publication *Survey of Current Business,* the Department of Commerce ran an article titled "GDP: One of the Great Inventions of the 20th Century." This may seem a bit over the top, but national income accounting, invented in the United States, has since become a tool of economic analysis and policy making around the world.

The moral of this story is that the commonly cited GDP number is an interesting and useful statistic, one that provides a good way to compare the size of different economies, but it's not a good measure of the economy's growth over time. GDP can grow because the economy grows, but it can also grow simply because of inflation. Even if an economy's output doesn't change, GDP will go up if the prices of the goods and services the economy produces increase. Likewise, GDP can fall either because the economy is producing less or because prices have fallen.

To measure the economy's growth with accuracy, we need a measure of **aggregate output:** the total quantity of final goods and services the economy produces. The measure that is used for this purpose is known as *real GDP.* By tracking real GDP over time, we avoid the problem of changes in prices distorting the value of changes in production over time. Let's look first at how real GDP is calculated and then at what it means.

Aggregate output is the total quantity of final goods and services produced within an economy.

Calculating Real GDP

To understand how real GDP is calculated, imagine an economy in which only two goods, apples and oranges, are produced and in which both goods are sold only to final consumers. The outputs and prices of the two fruits for two consecutive years are shown in Table 11.1.

table **11.1**

Calculating GDP and Real GDP in a Simple Economy

	Year 1	Year 2
Quantity of apples (billions)	2,000	2,200
Price of an apple	$0.25	$0.30
Quantity of oranges (billions)	1,000	1,200
Price of an orange	$0.50	$0.70
GDP (billions of dollars)	$1,000	$1,500
Real GDP (billions of year 1 dollars)	$1,000	$1,150

The first thing we can say about these data is that the value of sales increased from year 1 to year 2. In the first year, the total value of sales was (2,000 billion × \$0.25) + (1,000 billion × \$0.50) = \$1,000 billion; in the second, it was (2,200 billion × \$0.30) + (1,200 billion × \$0.70) = \$1,500 billion, which is 50% larger. But it is also clear from the table that this increase in the dollar value of GDP overstates the real growth in the economy. Although the quantities of both apples and oranges increased, the prices of both apples and oranges also rose. So part of the 50% increase in the dollar value of GDP simply reflects higher prices, not higher production of output.


Alamy

To estimate the true increase in aggregate output produced, we have to ask the following question: How much would GDP have gone up if prices had *not* changed? To answer this question, we need to find the value of output in year 2 expressed in year 1 prices. In year 1, the price of apples was \$0.25 each and the price of oranges \$0.50 each. So year 2 output *at year 1 prices* is (2,200 billion × \$0.25) + (1,200 billion × \$0.50) = \$1,150 billion. And output in year 1 at year 1 prices was \$1,000 billion. So in this example, GDP measured in year 1 prices rose 15%—from \$1,000 billion to \$1,150 billion.

Now we can define **real GDP:** it is the total value of final goods and services produced in the economy during a year, calculated as if prices had stayed constant at the level of some given base year. A real GDP number always comes with information about what the base year is. A GDP number that has not been adjusted for changes in prices is calculated using the prices in the year in which the output is produced. Economists call this measure **nominal GDP,** GDP at current prices. If we had used nominal GDP to measure the true change in output from year 1 to year 2 in our apples and oranges example, we would have overstated the true growth in output: we would have claimed it to be 50%, when in fact it was only 15%. By comparing output in the two years using a common set of prices—the year 1 prices in this example—we are able to focus solely on changes in the quantity of output by eliminating the influence of changes in prices.

Real GDP is the total value of all final goods and services produced in the economy during a given year, calculated using the prices of a selected base year.

Nominal GDP is the total value of all final goods and services produced in the economy during a given year, calculated with the prices current in the year in which the output is produced.

Table 11.2 shows a real-life version of our apples and oranges example. The second column shows nominal GDP in 2001, 2005, and 2009. The third column shows real GDP for each year in 2005 dollars (that is, using the value of the dollar in the year 2005). For 2005 the nominal GDP and the real GDP are the same. But real GDP in 2001 expressed in 2005 dollars was higher than nominal GDP in 2001, reflecting the fact that prices were in general higher in 2005 than in 2001. Real GDP in 2009

table **11.2**

Nominal versus Real GDP in 2001, 2005, and 2009

	Nominal GDP (billions of current dollars)	Real GDP (billions of 2005 dollars)
2001	\$10,286	\$11,347
2005	12,683	12,638
2009	14,259	12,989

Source: Bureau of Economic Analysis.

expressed in 2005 dollars, however, was less than nominal GDP in 2009 because prices in 2005 were lower than in 2009.

You might have noticed that there is an alternative way to calculate real GDP using the data in Table 11.1. Why not measure it using the prices of year 2 rather than year 1 as the base-year prices? This procedure seems equally valid. According to that calculation, real GDP in year 1 at year 2 prices is (2,000 billion × $0.30) + (1,000 billion × $0.70) = $1,300 billion; real GDP in year 2 at year 2 prices is $1,500 billion, the same as nominal GDP in year 2. So using year 2 prices as the base year, the growth rate of real GDP is equal to ($1,500 billion − $1,300 billion)/$1,300 billion = 0.154, or 15.4%. This is slightly higher than the figure we got from the previous calculation, in which year 1 prices were the base-year prices. In that calculation, we found that real GDP increased by 15%. Neither answer, 15.4% versus 15%, is more "correct" than the other. In reality, the government economists who put together the U.S. national accounts have adopted a method to measure the change in real GDP known as **chain-linking,** which uses the average between the GDP growth rate calculated using an early base year and the GDP growth rate calculated using a late base year. As a result, U.S. statistics on real GDP are always expressed in *chained dollars,* which splits the difference between using early and late base years.

Chain-linking is the method of calculating changes in real GDP using the average between the growth rate calculated using an early base year and the growth rate calculated using a late base year.

GDP per capita is GDP divided by the size of the population; it is equivalent to the average GDP per person.

What Real GDP Doesn't Measure

GDP is a measure of a country's aggregate output. Other things equal, a country with a larger population will have higher GDP simply because there are more people working. So if we want to compare GDP across countries but want to eliminate the effect of differences in population size, we use the measure **GDP per capita**—GDP divided by the size of the population, equivalent to the average GDP per person. Correspondingly, real GDP per capita is the average real GDP per person.

Real GDP per capita can be a useful measure in some circumstances, such as in a comparison of labor productivity between two countries. However, despite the fact that it is a rough measure of the average real output per person, real GDP per capita has well-known limitations as a measure of a country's living standards. Every once in a while economists are accused of believing that growth in real GDP per capita is the only thing that matters—that is, thinking that increasing real GDP per capita is a goal in itself. In fact, economists rarely make that mistake; the idea that economists care only about real GDP per capita is a sort of urban legend. Let's take a moment to be clear about why a country's real GDP per capita is not a sufficient measure of human welfare in that country and why growth in real GDP per capita is not an appropriate policy goal in itself.

istockphoto

Real GDP does not include many of the things that contribute to happiness, such as leisure time, volunteerism, housework, and natural beauty. And real GDP increases with expenditures on some things that make people unhappy, including disease, divorce, crime, and natural disasters.

Real GDP per capita is a measure of an economy's average aggregate output per person—and so of what it *can* do. A country with a high GDP can afford to be healthy, to be well educated, and in general to have a good quality of life. But there is not a one-to-one match between real GDP and the quality of life. Real GDP doesn't address how a country uses that output to affect living standards, it doesn't include some sources of well-being, and it does include some things that are detriments to well-being.

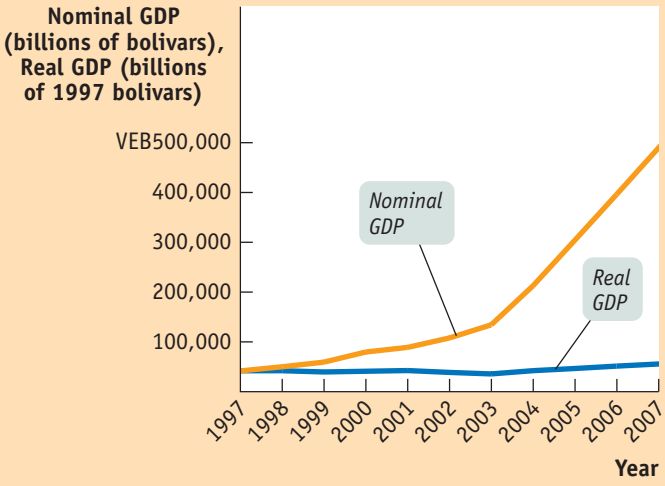
fyi

Miracle in Venezuela?

The South American nation of Venezuela has a distinction that may surprise you: in recent years, it has had one of the world's fastest-growing nominal GDPs. Between 1997 and 2007, Venezuelan nominal GDP grew by an average of 28% each year—much faster than nominal GDP in the United States or even in booming economies like China.

So is Venezuela experiencing an economic miracle? No, it's just suffering from unusually high inflation. The figure shows Venezuela's nominal and real GDP from 1997 to 2007, with real GDP measured in 1997 prices. Real GDP did grow over the period, but at an annual rate of only 2.9%. That's about the same as the U.S. growth rate over the same period and far short of China's 9% growth.

Source: Banco Central de Venezuela.



Module 11 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. Assume there are only two goods in the economy, french fries and onion rings. In 2009, 1,000,000 servings of french fries were sold for $0.40 each and 800,000 servings of onion rings were sold for $0.60 each. From 2009 to 2010, the price of french fries rose to $0.50 and the servings sold fell to 900,000; the price of onion rings fell to $0.51 and the servings sold rose to 840,000.
   a. Calculate nominal GDP in 2009 and 2010. Calculate real GDP in 2010 using 2009 prices.
   b. Why would an assessment of growth using nominal GDP be misguided?
2. From 1990 to 2000 the price of housing rose dramatically. What are the implications of this in deciding whether to use 1990 or 2000 as the base year in calculating 2010 real GDP?

Tackle the Test: Multiple-Choice Questions

1. Which of the following is true of real GDP?
   I. It is adjusted for changes in prices.
   II. It is always equal to nominal GDP.
   III. It increases whenever aggregate output increases.
   a. I only
   b. II only
   c. III only
   d. I and III
   e. I, II, and III
2. The best measure for comparing a country's aggregate output over time is
   a. nominal GDP.
   b. real GDP.
   c. nominal GDP per capita.
   d. real GDP per capita.
   e. average GDP per capita.
3. Use the information provided in the table below for an economy that produces only apples and oranges. Assume year 1 is the base year.

	Year 1	Year 2
Quantity of apples	3,000	4,000
Price of an apple	$0.20	$0.30
Quantity of oranges	2,000	3,000
Price of an orange	$0.40	$0.50

What was the value of real GDP in each year?

	Year 1	*Year 2*
a.	$1,400	$2,700
b.	1,900	2,700
c.	1,400	2,000
d.	1,900	2,000
e.	1,400	1,900

4. Real GDP per capita is an imperfect measure of the quality of life in part because it
   a. includes the value of leisure time.
   b. excludes expenditures on education.
   c. includes expenditures on natural disasters.
   d. excludes expenditures on entertainment.
   e. includes the value of housework.

5. Refer to the 2009 data in the table below.

	Nominal GDP in billions of dollars
United States	$14,259
Japan	5,049
European Union	16,191

Which of the following must be true?

I. Residents of Japan were worse off than residents of the United States or the European Union.
II. The European Union had a higher nominal GDP per capita than the United States.
III. The European Union had a larger economy than the United States.

a. I only
b. II only
c. III only
d. II and III
e. I, II, and III

Tackle the Test: Free-Response Questions

1. The economy of Britannica produces three goods: computers, DVDs, and pizza. The accompanying table shows the prices and output of the three goods for the years 2008, 2009, and 2010.

	Computers		DVDs		Pizza	
Year	Price	Quantity	Price	Quantity	Price	Quantity
2008	$900	10	$10	100	$15	2
2009	1,000	10.5	12	105	16	2
2010	1,050	12	14	110	17	3

   a. What is the percent change in computer production from 2008 to 2009?
   b. What is the percent change in the price of pizza from 2009 to 2010?
   c. Calculate nominal GDP in Britannica for 2008.
   d. Calculate real GDP in Britannica for 2008 using 2008 as the base year.
   e. Calculate real GDP in Britannica for 2010 using 2008 as the base year.

Answer (5 points)

1 point: $0.5/10 \times 100 = 5\%$

1 point: $\$1/\$16 \times 100 = 6.25\%$

1 point: $(\$900 \times 10) + (\$10 \times 100) + (\$15 \times 2) = \$9{,}000 + \$1{,}000 + \$30 = \$10{,}030$

1 point: Real GDP equals nominal GDP in the base year, so this answer is the same as in part c.

1 point: $(\$900 \times 12) + (\$10 \times 110) + (\$15 \times 3) = \$10{,}800 + \$1{,}100 + \$45 = \$11{,}945$

2. Use the information in the table below to answer the following questions.
   a. Calculate the percent increase in nominal GDP between 2005 and 2010 for each country.
   b. What happened to the price level in each country between 2005 and 2010?
   c. Calculate real GDP in each country in 2010, using 2005 as the base year.
   d. Calculate the percent increase in real GDP between 2005 and 2010 for each country.
   e. Compare the two countries' real GDP per capita in 2010 using 2005 as the base year.

Year	Nominal GDP	Price Level	Population
Country A			
2005	$2,000	$100	10
2010	4,000	100	20
Country B			
2005	$2,000	$100	10
2010	6,000	200	15

What you will learn in this **Module:**

- How unemployment is measured
- How the unemployment rate is calculated
- The significance of the unemployment rate for the economy
- The relationship between the unemployment rate and economic growth

Module 12
The Meaning and Calculation of Unemployment

The Unemployment Rate

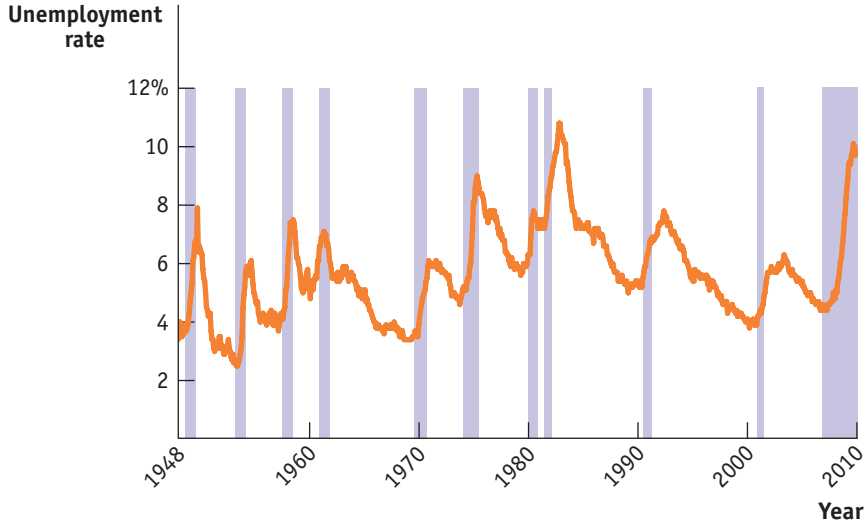
One of the most important issues in the 2008 presidential election was the growing unemployment rate. Figure 12.1 shows the U.S. unemployment rate from 1948 to the early part of 2010; as you can see, the labor market hit a difficult patch starting in

figure 12.1

The U.S. Unemployment Rate, 1948–2010

The unemployment rate has fluctuated widely over time. It always rises during recessions, which are shown by the shaded bars. It usually, but not always, falls during periods of economic expansion.

Source: Bureau of Labor Statistics; National Bureau of Economic Research.



mid-2008, with the unemployment rate rising from 4.8% in February 2008 to 10.1% in October 2009. What did the rise in the unemployment rate mean, and why was it such a big factor in people's lives? To understand why policy makers pay so much attention to employment and unemployment, we need to understand how they are both defined and measured.

Employed people are currently holding a job in the economy, either full time or part time.

Unemployed people are actively looking for work but aren't currently employed.

The **labor force** is equal to the sum of the employed and the unemployed.

The **labor force participation rate** is the percentage of the population aged 16 or older that is in the labor force.

The **unemployment rate** is the percentage of the total number of people in the labor force who are unemployed.

Defining and Measuring Unemployment

It's easy to define employment: you're **employed** if and only if you have a job.

Unemployment, however, is a more subtle concept. Just because a person isn't working doesn't mean that we consider that person unemployed. For example, in December 2008 there were 32 million retired workers in the United States receiving Social Security checks. Most of them were probably happy that they were no longer working, so we wouldn't consider someone who has settled into a comfortable, well-earned retirement to be unemployed. There were also 7 million disabled U.S. workers receiving benefits because they were unable to work. Again, although they weren't working, we wouldn't normally consider them to be unemployed.

The U.S. Census Bureau, the federal agency that collects data on unemployment, considers the unemployed to be those who are "jobless, looking for jobs, and available for work." Retired people don't count because they aren't looking for jobs; the disabled don't count because they aren't available for work. More specifically, an individual is considered unemployed if he or she doesn't currently have a job and has been actively seeking a job during the past four weeks. So the **unemployed** are people who are actively looking for work but aren't currently employed.

A country's **labor force** is the sum of the employed and the unemployed—that is, the people who are currently working and the people who are currently looking for work. The **labor force participation rate,** defined as the share of the working-age population that is in the labor force, is calculated as follows:

$$\textbf{(12-1)}\quad \text{Labor force participation rate} = \frac{\text{Labor force}}{\text{Population age 16 and older}} \times 100$$

The **unemployment rate,** defined as the percentage of the total number of people in the labor force who are unemployed, is calculated as follows:

$$\textbf{(12-2)}\quad \text{Unemployment rate} = \frac{\text{Number of unemployed workers}}{\text{Labor force}} \times 100$$

To estimate the numbers that go into calculating the unemployment rate, the U.S. Census Bureau carries out a monthly survey called the Current Population Survey, which involves interviewing a random sample of 60,000 American families. People are asked whether they are currently employed. If they are not employed, they are asked whether they have been looking for a job during the past four weeks. The results are then scaled up, using estimates of the total population, to estimate the total number of employed and unemployed Americans.

The Significance of the Unemployment Rate

In general, the unemployment rate is a good indicator of how easy or difficult it is to find a job given the current state of the economy. When the unemployment rate is low, nearly everyone who wants a job can find one. In 2000, when the unemployment rate averaged 4%, jobs were so abundant that employers spoke of a "mirror test" for getting a job: if you were breathing (therefore, your breath would fog a mirror), you could find work. By contrast, in 2009, the unemployment rate in 17 states rose to over 10% (over 15% in Michigan), with many highly qualified workers having lost their jobs and having a hard time finding new ones. Although the unemployment rate is a good indicator of current labor market conditions, it is not a perfect measure.

Discouraged workers are nonworking people who are capable of working but have given up looking for a job due to the state of the job market.

Marginally attached workers would like to be employed and have looked for a job in the recent past but are not currently looking for work.

The **underemployed** are people who work part time because they cannot find full-time jobs.

How the Unemployment Rate Can Overstate the True Level of Unemployment If you are searching for work, it's normal to take at least a few weeks to find a suitable job. Yet a worker who is quite confident of finding a job, but has not yet accepted a position, is counted as unemployed. As a consequence, the unemployment rate never falls to zero, even in boom times when jobs are plentiful. Even in the buoyant labor market of 2000, when it was easy to find work, the unemployment rate was still 4%. Later, we'll discuss in greater depth the reasons that measured unemployment persists even when jobs are abundant.

How the Unemployment Rate Can Understate the True Level of Unemployment Frequently, people who would like to work but aren't working still don't get counted as unemployed. In particular, an individual who has given up looking for a job for the time being because there are no jobs available isn't counted as unemployed because he or she has not been searching for a job during the previous four weeks. Individuals who want to work but aren't currently searching because they see little prospect of finding a job given the state of the job market are known as **discouraged workers.** Because it does not count discouraged workers, the measured unemployment rate may understate the percentage of people who want to work but are unable to find jobs.

Discouraged workers are part of a larger group known as **marginally attached workers.** These are people who say they would like to have a job and have looked for work in the recent past but are not currently looking for work. They are also not included when calculating the unemployment rate.

© Inspirestock Inc./Alamy

Finally, another category of workers who are frustrated in their ability to find work but aren't counted as unemployed are the **underemployed:** workers who would like to find full-time jobs but are currently working part time "for economic reasons"—that is, they can't find a full-time job. Again, they aren't counted in the unemployment rate.

The Bureau of Labor Statistics is the federal agency that calculates the official unemployment rate. It also calculates broader "measures of labor underutilization" that include the three categories of frustrated workers. Figure 12.2 shows what happens to the measured unemployment rate once marginally attached workers (including discouraged workers) and the underemployed are counted. The broadest measure of unemployment and underemployment, known as *U6,* is the sum of these three measures plus the unemployed; it is substantially higher than the rate usually quoted by the news media. But U6 and the unemployment rate move very much in parallel, so changes in the unemployment rate remain a good guide to what's happening in the overall labor market.

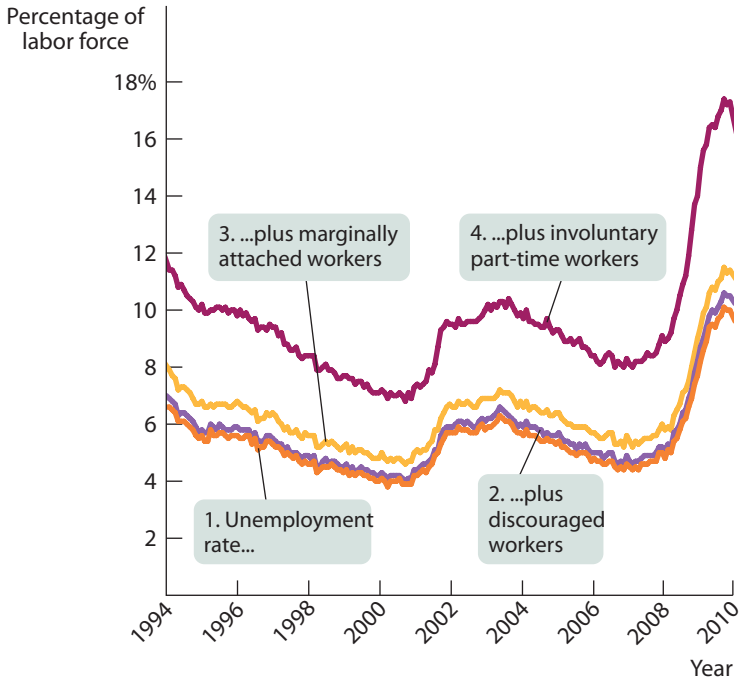
Finally, it's important to realize that the unemployment rate varies greatly among demographic groups. Other things equal, jobs are generally easier to find for more experienced workers and for workers during their "prime" working years, from ages 25 to 54. For younger workers, as well as workers nearing retirement age, jobs are typically harder to find, other things equal. Figure 12.3 shows unemployment rates for different groups in August 2007, when the overall unemployment rate of 4.7% was low by historical standards. As you can see, in August 2007 the unemployment rate for African-American workers was much higher than the national average; the unemployment rate for White teenagers (ages 16–19) was more than three times the national average; and the unemployment rate for African-American teenagers, at more than 30%, was over six times the national average. (Bear in mind that a teenager isn't considered unemployed, even if he or she isn't working, unless that teenager is looking for work but can't find

figure 12.2

Alternative Measures of Unemployment, 1994–2010

The unemployment number usually quoted in the news media counts someone as unemployed only if he or she has been looking for work during the past four weeks. Broader measures also count discouraged workers, marginally attached workers, and the underemployed. These broader measures show a higher unemployment rate—but they move closely in parallel with the standard rate.

Source: Bureau of Labor Statistics.



it.) So even at a time when the overall unemployment rate was relatively low, jobs were hard to find for some groups.

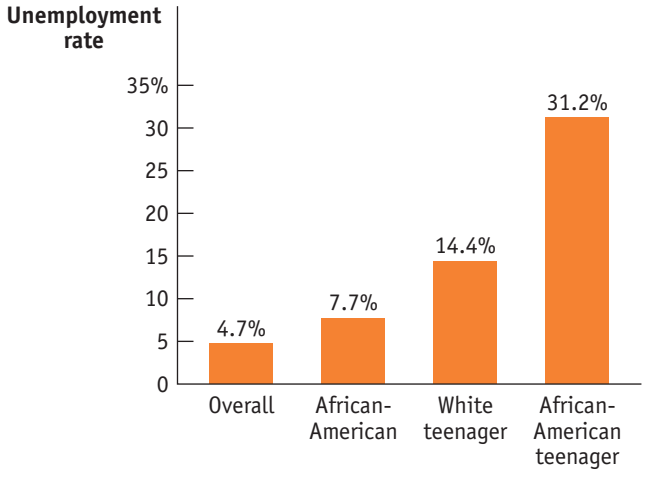
So although the unemployment rate is not an exact, literal measure of the percentage of people unable to find jobs, it is a good indicator of overall labor market conditions. The ups and downs of the unemployment rate closely reflect economic changes that have a significant impact on people's lives. Let's turn now to the causes of these fluctuations.

figure 12.3

Unemployment Rates of Different Groups, 2007

Unemployment rates vary greatly among different demographic groups. For example, although the overall unemployment rate in August 2007 was 4.7%, the unemployment rate among African-American teenagers was 31.2%. As a result, even during periods of low overall unemployment, unemployment remains a serious problem for some groups.

Source: Bureau of Labor Statistics.



Growth and Unemployment

Compared to Figure 12.1, Figure 12.4 shows the U.S. unemployment rate over a somewhat shorter period, the 30 years from 1978 to 2010. The shaded bars represent periods of recession. As you can see, during every recession, without exception, the unemployment rate rose. The recession of 1981–1982, the most severe one shown, pushed the unemployment rate into double digits: unemployment peaked in November 1982 at 10.8%. And during the most recent recession shown, in late 2009 the unemployment rate rose to above 10%.

Correspondingly, during periods of economic expansion the unemployment rate usually falls. The long economic expansion of the 1990s eventually brought the unemployment rate below 4%. However, it's important to recognize that *economic expansions aren't always periods of falling unemployment.* Look at the periods immediately following two recent recessions, those of 1990–1991 and 2001. In each case the unemployment rate continued to rise for more than a year after the recession was officially over. The explanation in both cases is that although the economy was growing, it was not growing fast enough to reduce the unemployment rate.

Figure 12.5 is a scatter diagram showing U.S. data for the period from 1949 to 2009. The horizontal axis measures the annual rate of growth in real GDP—the percent by which each year's real GDP changed compared to the previous year's real GDP. (Notice that there were nine years in which growth was negative—that is, real GDP shrank.) The vertical axis measures the *change* in the unemployment rate over the previous year in percentage points. Each dot represents the observed growth rate of real GDP and change in the unemployment rate for a given year. For example, in 2000 the average unemployment rate fell to 4.0% from 4.2% in 1999; this is shown as a value of –0.2 along the vertical axis for the year 2000. Over the same period, real GDP grew by 4.1%; this is the value shown along the horizontal axis for the year 2000.

figure 12.4

Unemployment and Recessions, 1978–2010

This figure shows a close-up of the unemployment rate since the 1970s, with the shaded bars indicating recessions. It's clear that unemployment always rises during recessions and *usually* falls during expansions. But in both the early 1990s and the early 2000s, unemployment continued to rise for some time after the recession was officially declared over.

Source: Bureau of Labor Statistics; National Bureau of Economic Research.

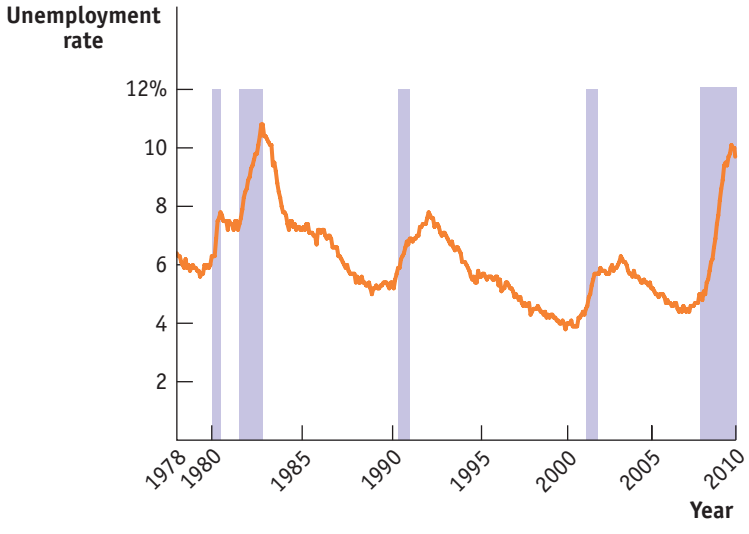
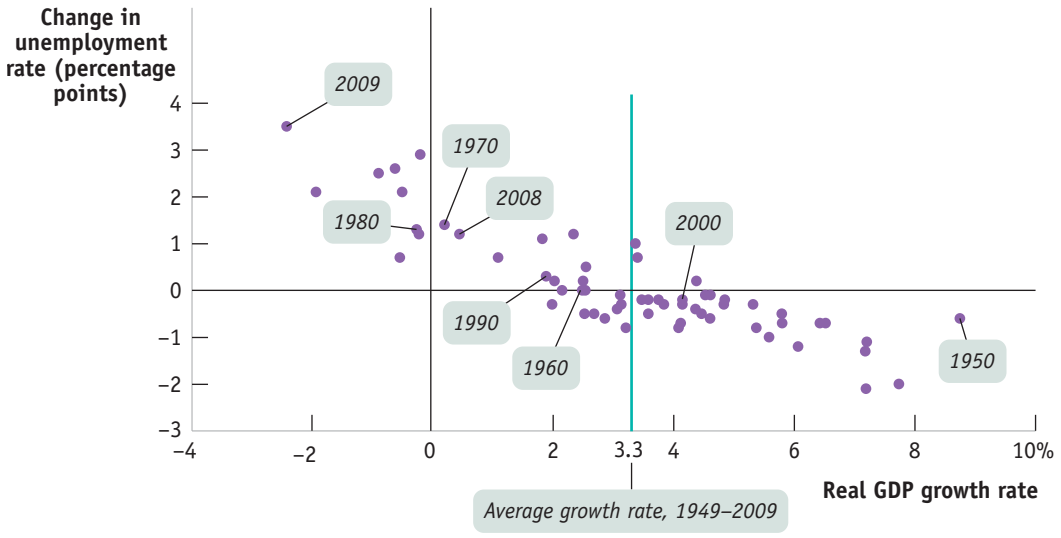


figure 12.5 Growth and Changes in Unemployment, 1949–2009



Each dot shows the growth rate of the economy and the change in the unemployment rate for a specific year between 1949 and 2009. For example, in 2000 the economy grew 4.1% and the unemployment rate fell 0.2 percentage points, from 4.2% to 4.0%. In general, the unemployment rate fell when growth was above its average rate of 3.3% a year and rose when growth was below average. Unemployment always rose when real GDP fell.

Source: Bureau of Labor Statistics; Bureau of Economic Analysis.

The downward trend of the scatter points in Figure 12.5 shows that there is a generally strong negative relationship between growth in the economy and the rate of unemployment. Years of high growth in real GDP were also years in which the unemployment rate fell, and years of low or negative growth in real GDP were years in which the unemployment rate rose. The green vertical line in Figure 12.5 at the value of 3.3% indicates the average growth rate of real GDP over the period from 1949 to 2009. Points lying to the right of the vertical line are years of above-average growth. In these years, the value on the vertical axis is usually negative, meaning that the unemployment rate fell. That is, years of above-average growth were usually years in which the unemployment rate was falling. Conversely, points lying to the left of the vertical line were years of below-average growth. In these years, the value on the vertical axis is usually positive, meaning that the unemployment rate rose. That is, years of below-average growth were usually years in which the unemployment rate was rising. There are periods in which GDP is growing, but at a below-average rate; these are periods in which the economy isn't in a recession but unemployment is still rising—sometimes called a "growth recession." But true recessions, periods when real GDP falls, are especially painful for workers. As illustrated by the points to the left of the vertical axis in Figure 12.5, falling real GDP is always associated with a rising rate of unemployment, causing a great deal of hardship to families.

fyi

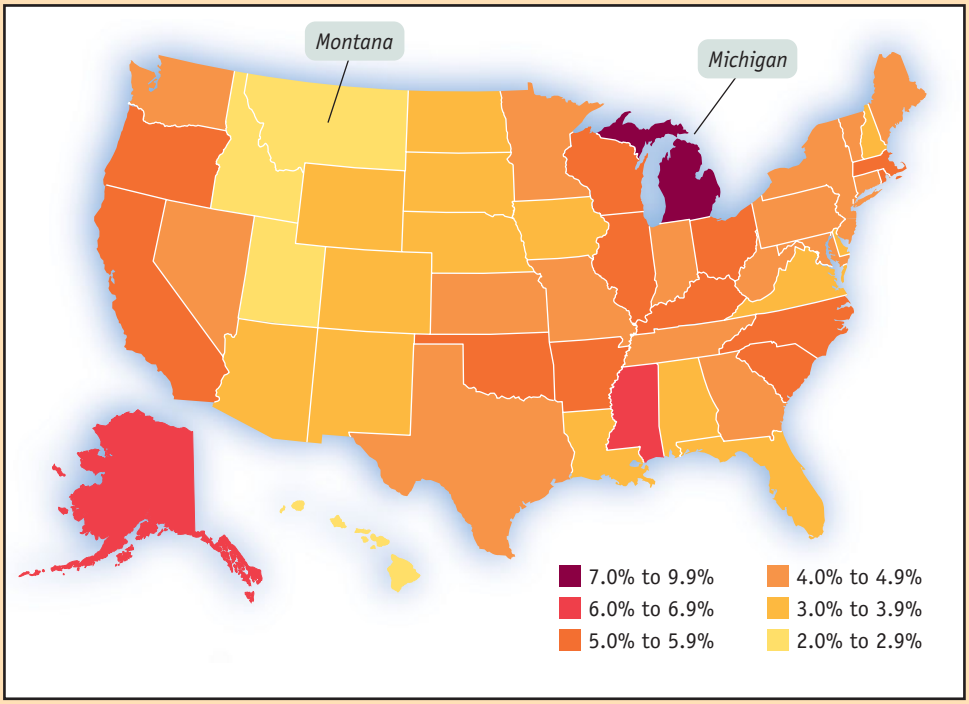
Rocky Mountain Low

In addition to estimating the unemployment rate for the nation as a whole, the U.S. government also estimates unemployment rates for each state. These state unemployment rates often differ considerably—and the differences correspond to real differences in the condition of local labor markets. The figure shows how unemployment rates varied across the United States in July 2007.

As you can see from the figure, Montana had one of the lowest unemployment rates in the United States, only 2.7% in July 2007, mainly because the state's booming oil business was creating new jobs even as the state's aging population reduced the size of the labor force. And this low unemployment rate created a seller's market in labor. According to the Associated Press, the owner of the McDonald's franchise in Sidney, Montana, desperate to find workers, "tried advertising in the local newspaper and even offered up to $10 an hour to compete with higher-paying oil field jobs. Yet the only calls were from other business owners upset they would have to raise wages, too."

Michigan was at the opposite extreme. Layoffs by auto manufacturers, the traditional mainstay of Michigan's economy, had given the state the highest unemployment rate in the nation: 7.2% in July 2007. And this high unemployment rate did indeed correspond to a very poor labor market. A poll taken by the *Detroit Free Press* in early 2007 found that 3 out of every 10 young Michigan residents were considering leaving the state, including almost half of poor job prospects. These state-to-state comparisons show that the unemployment rate is indeed a good indicator of how easy or hard it is to find a job.

One thing you should know, however, is that differences in state unemployment rates don't tend to persist, in large part because, as that Michigan poll suggested, Americans tend to move to where the jobs are. As recently as 2000, Michigan had an unemployment rate of only 3.7%, well below the national average of 4.0%, while Montana had an unemployment rate of 4.8%, above the national average.



Module 12 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. Suppose that employment websites enable job-seekers to find suitable jobs more quickly. What effect will this have on the unemployment rate over time? Also suppose that these websites encourage job-seekers who had given up their searches to begin looking again. What effect will this have on the unemployment rate?
2. In which of the following cases would the worker be counted as unemployed? Explain.
   a. Rosa, an older worker, has been laid off and gave up looking for work months ago.
   b. Anthony, a schoolteacher, is not working during his three-month summer break.
   c. Grace, an investment banker, has been laid off and is currently searching for another position.
   d. Sergio, a classically trained musician, can only find work playing for local parties.

e. Natasha, a graduate student, went back to school because jobs were scarce.

3. Which of the following are consistent with the observed relationship between growth in real GDP and changes in the unemployment rate? Which are not?
   a. A rise in the unemployment rate accompanies a fall in real GDP.
   b. An exceptionally strong business recovery is associated with a greater percentage of the labor force being employed.
   c. Negative real GDP growth is associated with a fall in the unemployment rate.

Tackle the Test: Multiple-Choice Questions

1. To be considered unemployed, a person must
   I. not be working.
   II. be actively seeking a job.
   III. be available for work.
   a. I only
   b. II only
   c. III only
   d. II and III
   e. I, II, and III

Use the information for a hypothetical economy presented in the following table to answer questions 2, 3, and 4.

Population age 16 and older = 200,000
Labor Force = 100,000
Number of people working part time = 20,000
Number of people working full time = 70,000

2. What is the labor force participation rate?
   a. 70%
   b. 50%
   c. 20%
   d. 10%
   e. 5%

3. How many people are unemployed?
   a. 10,000
   b. 20,000
   c. 30,000
   d. 100,000
   e. 110,000

4. What is the unemployment rate?
   a. 70%
   b. 50%
   c. 20%
   d. 10%
   e. 5%

5. The unemployment problem in an economy may be understated by the unemployment rate due to
   a. people lying about seeking a job.
   b. discouraged workers.
   c. job candidates with one offer but waiting for more.
   d. overemployed workers.
   e. none of the above.

Tackle the Test: Free-Response Questions

1. Use the data provided below to calculate each of the following. Show how you calculate each.
   a. the size of the labor force
   b. the labor force participation rate
   c. the unemployment rate

   Population age 16 and older = 12 million
   Employment = 5 million
   Unemployment = 1 million

Answer (6 points)

1 point: 6 million

1 point: employment + unemployment = 5 million + 1 million = 6 million

1 point: 50%

1 point: (labor force/population) × 100 = ((5 million + 1 million)/12 million) × 100 = (6 million/12 million) × 100 = 50%

1 point: 17%

1 point: (unemployment/labor force) × 100 = (1 million/(5 million +1 million)) × 100 = (1 million/6 million) × 100 = 17%

2. What is the labor market classification of each of the following individuals? Be as specific as possible, and explain your answer.
   a. Julie has a graduate degree in mechanical engineering. She works full-time mowing lawns.
   b. Jeff was laid off from his previous job. He would very much like to work at any job, but, after looking for work for a year, has stopped looking for work.
   c. Ian is working 25 hours per week at a bookstore, and has no desire to work full time.
   d. Raj has decided to take a year off from work to stay home with his daughter.

What you will learn in this **Module:**

- The three different types of unemployment and their causes
- The factors that determine the natural rate of unemployment

Module 13 The Causes and Categories of Unemployment

The Natural Rate of Unemployment

Fast economic growth tends to reduce the unemployment rate. So how low can the unemployment rate go? You might be tempted to say zero, but that isn't feasible. Over the past half-century, the national unemployment rate has never dropped below 2.9%.

Can there be unemployment even when many businesses are having a hard time finding workers? To answer this question, we need to examine the nature of labor markets and why they normally lead to substantial measured unemployment even when jobs are plentiful. Our starting point is the observation that even in the best of times, jobs are constantly being created and destroyed.

Job Creation and Job Destruction

In early 2010 the unemployment rate hovered close to 10%. Even during good times, most Americans know someone who has lost his or her job. The U.S. unemployment rate in July 2007 was only 4.7%, relatively low by historical standards, yet in that month there were 4.5 million "job separations"—terminations of employment that occurred because a worker was either fired or quit voluntarily.

There are many reasons for such job loss. One is structural change in the economy: industries rise and fall as new technologies emerge and consumers' tastes change. For example, employment in high-tech industries such as telecommunications surged in the late 1990s but slumped severely after 2000. However, structural change also brings the creation of new jobs: since 2000, the number of jobs in the American healthcare sector has surged as new medical technologies have emerged and the aging of the population has increased the demand for medical care. Poor management performance or bad luck at individual companies also leads to job loss for their employees. For example, in 2005 General Motors announced plans to eliminate 30,000 jobs after several years of

lagging sales, even as Japanese companies such as Toyota announced plans to open new plants in North America to meet growing demand for their cars.

This constant churning of the workforce is an inevitable feature of the modern economy. And this churning, in turn, is one source of *frictional unemployment*—one main reason that there is a considerable amount of unemployment even when jobs are abundant.

Workers who spend time looking for employment are engaged in **job search.**

Frictional unemployment is unemployment due to the time workers spend in job search.

Frictional Unemployment

Workers who lose a job involuntarily due to job destruction often choose not to take the first new job offered. For example, suppose a skilled programmer, laid off because her software company's product line was unsuccessful, sees a help-wanted ad for clerical work in the local newspaper. She might respond to the ad and get the job—but that would be foolish. Instead, she should take the time to look for a job that takes advantage of her skills and pays accordingly. In addition, individual workers are constantly leaving jobs voluntarily, typically for personal reasons—family moves, dissatisfaction, and better job prospects elsewhere.

Economists say that workers who spend time looking for employment are engaged in **job search.** If all workers and all jobs were alike, job search wouldn't be necessary; if information about jobs and workers were perfect, job search would be very quick. In practice, however, it's normal for a worker who loses a job, or a young worker seeking a first job, to spend at least a few weeks searching.

Frictional unemployment is unemployment due to the time workers spend in job search. A certain amount of frictional unemployment is inevitable, for two reasons. One is the constant process of job creation and job destruction. The other is the fact that new workers are always entering the labor market. For example, in January 2010, when unemployment was high, out of 14.8 million workers counted as unemployed, 1.2 million were new entrants to the workforce and another 3.6 million were "re-entrants"—people who had come back after being out of the workforce for a time.

A limited amount of frictional unemployment is relatively harmless and may even be a good thing. The economy is more productive if workers take the time to find jobs that are well matched to their skills, and workers who are unemployed for a brief period while searching for the right job don't experience great hardship. In fact, when there is a low unemployment rate, periods of unemployment tend to be quite short, suggesting that much of the unemployment is frictional. Figure 13.1 shows the composition of unemployment in

istockphoto

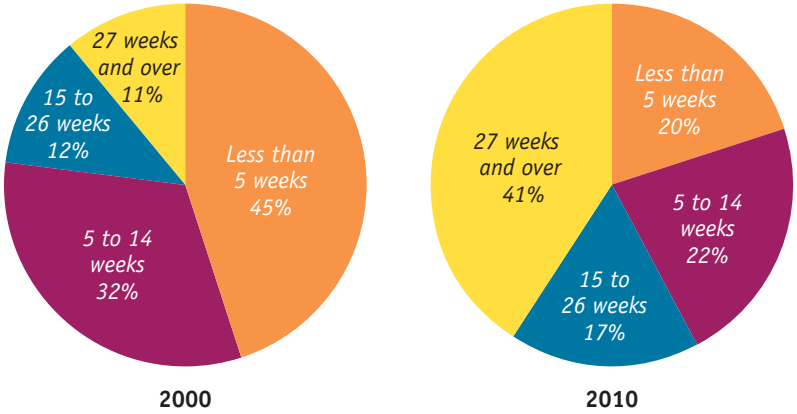
During the housing slump of 2009 when unemployment was running very high, many construction workers resorted to more traditional methods of finding work.

figure 13.1

Distribution of the Unemployed by Duration of Unemployment, 2000 and 2010

In years when the unemployment rate is low, most unemployed workers are unemployed for only a short period. In 2000, a year of low unemployment, 45% of the unemployed had been unemployed for less than 5 weeks and 77% for less than 15 weeks. The short duration of unemployment for most workers suggests that most unemployment in 2000 was frictional. In early 2010, by contrast, only 20% of the unemployed had been unemployed for less than 5 weeks, but 41% had been unemployed for 27 or more weeks, indicating that during periods of high unemployment, a smaller share of unemployment is frictional.

Source: Bureau of Labor Statistics.



Structural unemployment is unemployment that results when there are more people seeking jobs in a labor market than there are jobs available at the current wage rate.

2000, when the unemployment rate was only 4%. Forty-five percent of the unemployed had been unemployed for less than 5 weeks and only 23% had been unemployed for 15 or more weeks. Just 11% were considered to be "long-term unemployed"—unemployed for 27 or more weeks. The picture looked very different in January 2010, after unemployment had been high for an extended period of time.

In periods of higher unemployment, workers tend to be jobless for longer periods of time, suggesting that a smaller share of unemployment is frictional. By early 2010, when unemployment had been high for several months, for instance, the fraction of unemployed workers considered "long-term unemployed" had jumped to 41%.

Structural Unemployment

Frictional unemployment exists even when the number of people seeking jobs is equal to the number of jobs being offered—that is, the existence of frictional unemployment doesn't mean that there is a surplus of labor. Sometimes, however, there is a *persistent surplus* of job-seekers in a particular labor market. For example, there may be more workers with a particular skill than there are jobs available using that skill, or there may be more workers in a particular geographic region than there are jobs available in that region. **Structural unemployment** is unemployment that results when there are more people seeking jobs in a labor market than there are jobs available at the current wage rate.

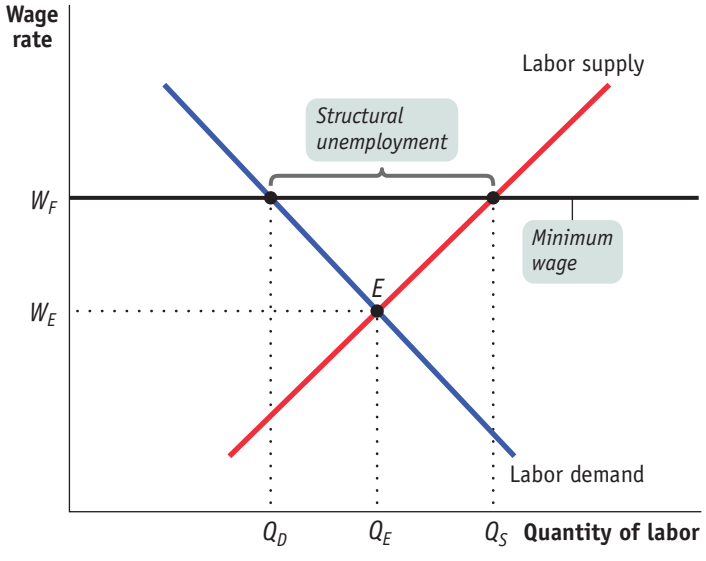
The supply and demand model tells us that the price of a good, service, or factor of production tends to move toward an equilibrium level that matches the quantity supplied with the quantity demanded. This is equally true, in general, of labor markets. Figure 13.2 shows a typical market for labor. The labor demand curve indicates that when the price of labor—the wage rate—increases, employers demand less labor. The labor supply curve indicates that when the price of labor increases, more workers are willing to supply labor at the prevailing wage rate. These two forces coincide to lead to an equilibrium wage rate for any given type of labor in a particular location. That equilibrium wage rate is shown as W_E.

Even at the equilibrium wage rate, W_E, there will still be some frictional unemployment. That's because there will always be some workers engaged in job search even when the number of jobs available is equal to the number of workers seeking jobs. But there wouldn't be any structural unemployment in this labor market. *Structural unemployment*

figure 13.2

The Effect of a Minimum Wage on the Labor Market

When the government sets a minimum wage, W_F, that exceeds the market equilibrium wage rate, W_E, the number of workers, Q_S, who would like to work at that minimum wage is greater than the number of workers, Q_D, demanded at that wage rate. This surplus of labor is considered structural unemployment.



occurs when the wage rate is, for some reason, persistently above W_E. Several factors can lead to a wage rate in excess of W_E, the most important being minimum wages, labor unions, *efficiency wages,* and the side effects of government policies.

Minimum Wages As explained in Module 8, a minimum wage is a government-mandated floor on the price of labor. In the United States, the national minimum wage in 2009 was $7.25 an hour. For many American workers, the minimum wage is irrelevant; the market equilibrium wage for these workers is well above this price floor. But for less skilled workers, the minimum wage may be binding—it affects the wages that people are actually paid and can lead to structural unemployment. In countries that have higher minimum wages, the range of workers for whom the minimum wage is binding is larger.

Figure 13.2 shows the effect of a binding minimum wage. In this market, there is a legal floor on wages, W_F, which is above the equilibrium wage rate, W_E. This leads to a persistent surplus in the labor market: the quantity of labor supplied, Q_S, is larger than the quantity demanded, Q_D. In other words, more people want to work than can find jobs at the minimum wage, leading to structural unemployment.

Given that minimum wages—that is, binding minimum wages—generally lead to structural unemployment, you might wonder why governments impose them. The rationale is to help ensure that people who work can earn enough income to afford at least a minimally comfortable lifestyle. However, this may come at a cost, because it may eliminate employment opportunities for some workers who would have willingly worked for lower wages. As illustrated in Figure 13.2, not only are there more sellers of labor than there are buyers, but there are also fewer people working at a minimum wage (Q_D) than there would have been with no minimum wage at all (Q_E).

Although economists broadly agree that a high minimum wage has the employment-reducing effects shown in Figure 13.2, there is some question about whether this is a good description of how the minimum wage actually works in the United States. The minimum wage in the United States is quite low compared with that in other wealthy countries. For three decades, from the 1970s to the mid-2000s, the U.S. minimum wage was so low that it was not binding for the vast majority of workers. In addition, some researchers have produced evidence that increases in the minimum wage actually lead to higher employment when, as was the case in the United States at one time, the minimum wage is low compared to average wages. They argue that firms that employ low-skilled workers sometimes restrict their hiring in order to keep wages low and that, as a result, the minimum wage can sometimes be increased without any loss of jobs. Most economists, however, agree that a sufficiently high minimum wage *does* lead to structural unemployment.

Labor Unions The actions of *labor unions* can have effects similar to those of minimum wages, leading to structural unemployment. By bargaining collectively for all of a firm's workers, unions can often win higher wages from employers than workers would have obtained by bargaining individually. This process, known as *collective bargaining,* is intended to tip the scales of bargaining power more toward workers and away from employers. Labor unions exercise bargaining power by threatening firms with a *labor strike,* a collective refusal to work. The threat of a strike can have very serious consequences for firms that have difficulty replacing striking workers. In such cases, workers acting collectively can exercise more power than they could if they acted individually.

When workers have greater bargaining power, they tend to demand and receive higher wages. Unions also bargain over benefits, such as health care and pensions, which we can think of as additional wages. Indeed, economists who study the effects of unions on wages find that unionized workers earn higher wages and more generous benefits than non-union workers with similar skills. The result of these increased wages can be the same as the result of a minimum wage: labor unions

Bill Pugliano/Stringer/Getty Images

Members of the United Auto Workers (UAW) union march on a picket line during a strike to protest unfair labor practices.

Efficiency wages are wages that employers set above the equilibrium wage rate as an incentive for better employee performance.

The **natural rate of unemployment** is the unemployment rate that arises from the effects of frictional plus structural unemployment.

Cyclical unemployment is the deviation of the actual rate of unemployment from the natural rate.

push the wage that workers receive above the equilibrium wage. Consequently, there are more people willing to work at the wage being paid than there are jobs available. Like a binding minimum wage, this leads to structural unemployment.

Efficiency Wages Actions by firms may also contribute to structural unemployment. Firms may choose to pay **efficiency wages**—wages that employers set above the equilibrium wage rate as an incentive for their workers to deliver better performance.

Employers may feel the need for such incentives for several reasons. For example, employers often have difficulty observing directly how hard an employee works. They can, however, elicit more work effort by paying above-market wages: employees receiving these higher wages are more likely to work harder to ensure that they aren't fired, which would cause them to lose their higher wages.

When many firms pay efficiency wages, the result is a pool of workers who want jobs but can't find them. So the use of efficiency wages by firms leads to structural unemployment.

Side Effects of Public Policy In addition, public policy designed to help workers who lose their jobs can lead to structural unemployment as an unintended side effect. Most economically advanced countries provide benefits to laid-off workers as a way to tide them over until they find a new job. In the United States, these benefits typically replace only a small fraction of a worker's income and expire after 26 weeks. In other countries, particularly in Europe, benefits are more generous and last longer. The drawback to this generosity is that it reduces the incentive to quickly find a new job, and by keeping more people searching for longer, the benefits increase structural and frictional unemployment. Generous unemployment benefits in some European countries are widely believed to be one of the main causes of "Eurosclerosis," the persistent high unemployment that afflicts a number of European economies.

The Natural Rate of Unemployment

Because some frictional unemployment is inevitable and because many economies also suffer from structural unemployment, a certain amount of unemployment is normal, or "natural. " Actual unemployment fluctuates around this normal level. The **natural rate of unemployment** is the normal unemployment rate around which the actual unemployment rate fluctuates. It is the rate of unemployment that arises from the effects of frictional plus structural unemployment. **Cyclical unemployment** is the deviation of the actual rate of unemployment from the natural rate; that is, it is the difference between the actual and natural rates of unemployment. As the name suggests, cyclical unemployment is the share of unemployment that arises from the business cycle. We'll see later that public policy cannot keep the unemployment rate persistently below the natural rate without leading to accelerating inflation.

We can summarize the relationships between the various types of unemployment as follows:

(13-1) Natural unemployment =
Frictional unemployment + Structural unemployment

(13-2) Actual unemployment =
Natural unemployment + Cyclical unemployment

Perhaps because of its name, people often imagine that the natural rate of unemployment is a constant that doesn't change over time and can't be affected by policy. Neither proposition is true. Let's take a moment to stress two facts: the natural rate of unemployment changes over time, and it can be affected by economic policies.

Changes in the Natural Rate of Unemployment

Private-sector economists and government agencies need estimates of the natural rate of unemployment both to make forecasts and to conduct policy analyses. Almost all these estimates show that the U.S. natural rate rises and falls over time. For example,

the Congressional Budget Office, the independent agency that conducts budget and economic analyses for Congress, believes that the U.S. natural rate of unemployment was 5.3% in 1950, rose to 6.3% by the end of the 1970s, but has fallen to 4.8% today. European countries have experienced even larger swings in their natural rates of unemployment.

What causes the natural rate of unemployment to change? The most important factors are changes in the characteristics of the labor force, changes in labor market institutions, and changes in government policies. Let's look briefly at each factor.

Changes in Labor Force Characteristics In January 2010 the overall rate of unemployment in the United States was 9.7%. Young workers, however, had much higher unemployment rates: 26.4% for teenagers and 15.8% for workers aged 20 to 24. Workers aged 25 to 54 had an unemployment rate of only 8.6%.

In general, unemployment rates tend to be lower for experienced than for inexperienced workers. Because experienced workers tend to stay in a given job longer than do inexperienced ones, they have lower frictional unemployment. Also, because older workers are more likely than young workers to be family breadwinners, they have a stronger incentive to find and keep jobs.

One reason the natural rate of unemployment rose during the 1970s was a large rise in the number of new workers—children of the post–World War II baby boom entered the labor force, as did a rising percentage of married women. As Figure 13.3 shows, both the percentage of the labor force less than 25 years old and the percentage of women in the labor force surged in the 1970s. By the end of the 1990s, however, the share of women in the labor force had leveled off and the percentage of workers under 25 had fallen sharply. As a result, the labor force as a whole is more experienced today than it was in the 1970s, one likely reason that the natural rate of unemployment is lower today than in the 1970s.

Changes in Labor Market Institutions As we pointed out earlier, unions that negotiate wages above the equilibrium level can be a source of structural unemployment. Some economists believe that strong labor unions are one reason for the high natural rate of unemployment in Europe. In the United States, a sharp fall in union membership after 1980 may have been one reason the natural rate of unemployment fell between the 1970s and the 1990s.

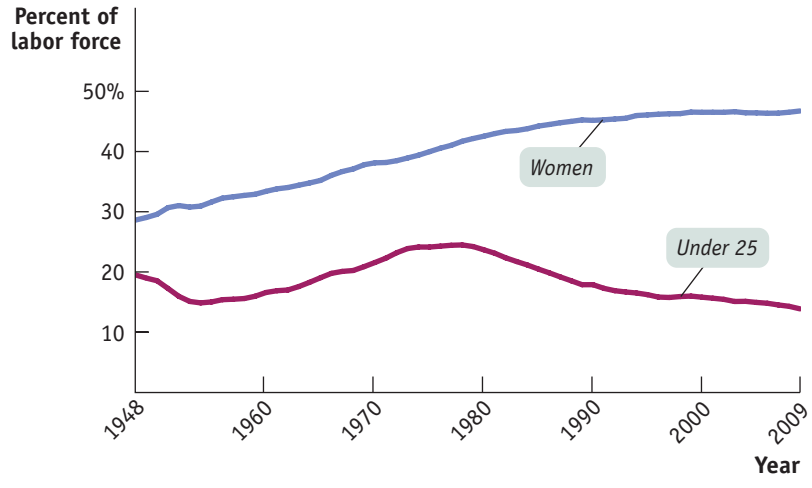
Other institutional changes may also have been at work. For example, some labor economists believe that temporary employment agencies, which have proliferated in recent years, have reduced frictional unemployment by helping match workers to jobs. Furthermore, Internet websites such as monster.com may have reduced frictional unemployment.

figure 13.3

The Changing Makeup of the U.S. Labor Force, 1948–2009

In the 1970s the percentage of the labor force consisting of women rose rapidly, as did the percentage under age 25. These changes reflected the entry of large numbers of women into the paid labor force for the first time and the fact that baby boomers were reaching working age. The natural rate of unemployment may have risen because many of these workers were relatively inexperienced. Today, the labor force is much more experienced, which is one possible reason the natural rate has fallen since the 1970s.

Source: Bureau of Labor Statistics.



Monster.com

Technological change, coupled with labor market institutions, can also affect the natural rate of unemployment.

Technological change probably leads to an increase in the demand for skilled workers who are familiar with the relevant technology and a reduction in the demand for unskilled workers. Economic theory predicts that wages should increase for skilled workers and decrease for unskilled workers. But if wages for unskilled workers cannot go down—say, due to a binding minimum wage—increased structural unemployment, and therefore a higher natural rate of unemployment, will result.

Changes in Government Policies A high minimum wage can cause structural unemployment. Generous unemployment benefits can increase both structural and frictional unemployment. So government policies intended to help workers can have the undesirable side effect of raising the natural rate of unemployment.

Some government policies, however, may reduce the natural rate. Two examples are job training and employment subsidies. Job-training programs are supposed to provide unemployed workers with skills that widen the range of jobs they can perform. Employment subsidies are payments either to workers or to employers that provide a financial incentive to accept or offer jobs.

fyi

Structural Unemployment in Eastern Germany

In one of the most dramatic events in world history, a spontaneous popular uprising in 1989 overthrew the communist dictatorship in East Germany. Citizens quickly tore down the wall that had divided Berlin, and in short order East and West Germany became a united, democratic nation.

Then the trouble started.

After reunification, employment in East Germany plunged and the unemployment rate soared. This high unemployment rate has persisted: despite receiving massive aid from the federal German government, the economy of the former East Germany has remained persistently depressed, with an unemployment rate of 12.1% in December 2009, compared to West Germany's unemployment rate of 6.7%. Other parts of formerly communist Eastern Europe have done much better. For example, the Czech Republic, which was often cited along with East Germany as a relatively successful communist economy, had a comparatively lower unemployment rate of only 9.2% in December 2009. What went wrong in East Germany?

The answer is that, through nobody's fault, East Germany found itself suffering from severe structural unemployment. When Germany was reunified, it became clear that workers in East Germany were much less productive than their cousins in the west. Yet unions initially demanded wage rates equal to those in West Germany, and these wage rates have been slow to come down because East German workers don't want to be treated as inferior to their West German counterparts. Meanwhile, productivity in the former East Germany has remained well below West German levels, in part because of decades of misguided investment. The result has been a persistently large mismatch between the number of workers demanded and the number of those seeking jobs.

Module 13 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. Explain the following.
   a. Frictional unemployment always exists.
   b. Frictional unemployment accounts for a larger share of total unemployment when the unemployment rate is low.
2. Why does collective bargaining have the same general effect on unemployment as a minimum wage? Illustrate your answer with a diagram.
3. Suppose the United States dramatically increases benefits for unemployed workers. Explain what will happen to the natural rate of unemployment.

Tackle the Test: Multiple-Choice Questions

1. A person who moved to a new state and took two months to find a new job experienced which type of unemployment?
   a. frictional
   b. structural
   c. cyclical
   d. natural
   e. none of the above
2. What type of unemployment is created by a recession?
   a. frictional
   b. structural
   c. cyclical
   d. natural
   e. none of the above
3. A person who is unemployed because of a mismatch between the quantity of labor supplied and the quantity of labor demanded is experiencing what type of unemployment?
   a. frictional
   b. structural
   c. cyclical
   d. natural
   e. none of the above
4. Which of the following is true of the natural rate of unemployment?
   I. It includes frictional unemployment.
   II. It includes structural unemployment.
   III. It is equal to 0%.
   a. I only
   b. II only
   c. III only
   d. I and II
   e. I, II, and III
5. Which of the following can affect the natural rate of unemployment in an economy over time?
   a. labor force characteristics such as age and work experience
   b. the existence of labor unions
   c. advances in technologies that help workers find jobs
   d. government job training programs
   e. all of the above

Tackle the Test: Free-Response Questions

1. a. Define the natural rate of unemployment.
   b. The natural rate of unemployment is made up of which of the types of unemployment?
   c. Explain how cyclical unemployment relates to the natural rate of unemployment.
   d. List three factors that can lead to a change in the natural rate of unemployment.

Answer (7 points)

1 point: The natural rate of unemployment is the normal unemployment rate around which the actual unemployment rate fluctuates.

1 point: The natural rate of unemployment is made up of frictional unemployment . . .

1 point: . . . plus structural unemployment.

1 point: Cyclical unemployment is the deviation of the actual rate of unemployment from the natural rate. *Or,* cyclical unemployment is the difference between the actual and natural rates of unemployment.

1 point: Changes in labor force characteristics

1 point: Changes in labor market institutions such as unions

1 point: Changes in government policies

2. In each of the following situations, what type of unemployment is Melanie facing? Explain.
   a. After completing a complex programming project, Melanie is laid off. Her prospects for a new job requiring similar skills are good, and she has signed up with a programmer placement service. She has passed up offers for low-paying jobs.
   b. When Melanie and her co-workers refused to accept pay cuts, her employer outsourced their programming tasks to workers in another country. This phenomenon is occurring throughout the programming industry.
   c. Due to the current slump in investment spending, Melanie has been laid off from her programming job. Her employer promises to rehire her when business picks up.

What you will learn in this **Module:**

- The economic costs of inflation
- How inflation creates winners and losers
- Why policy makers try to maintain a stable rate of inflation
- The difference between real and nominal values of income, wages, and interest rates
- The problems of deflation and disinflation

Module 14
Inflation: An Overview

Inflation and Deflation

In 1980 Americans were dismayed about the state of the economy for two reasons: the unemployment rate was high, and so was inflation. In fact, the high rate of inflation, not the high rate of unemployment, was the principal concern of policy makers at the time—so much so that Paul Volcker, the chairman of the Federal Reserve Board (which controls monetary policy), more or less deliberately created a deep recession in order to bring inflation under control. Only in 1982, after inflation had dropped sharply and the unemployment rate had risen to more than 10%, did fighting unemployment become the chief priority.

Why is inflation something to worry about? Why do policy makers even now get anxious when they see the inflation rate moving upward? The answer is that inflation can impose costs on the economy—but not in the way most people think.

The Level of Prices Doesn't Matter . . .

The most common complaint about inflation, an increase in the price level, is that it makes everyone poorer—after all, a given amount of money buys less. But inflation does *not* make everyone poorer. To see why, it's helpful to imagine what would happen if the United States did something other countries have done from time to time—replaced the dollar with a new currency.

A recent example of this kind of currency conversion happened in 2002, when France, like a number of other European countries, replaced its national currency, the franc, with the new Pan-European currency, the euro. People turned in their franc coins and notes, and received euro coins and notes in exchange, at a rate of precisely 6.55957 francs per euro. At the same time, all contracts were restated in euros at the same rate of exchange. For example, if a French citizen had a home mortgage debt of 500,000 francs, this became a debt of 500,000/6.55957 = 76,224.51 euros. If a worker's contract specified that he or she should be paid 100 francs per hour, it became a contract specifying a wage of 100/6.55957 = 15.2449 euros per hour, and so on.

You could imagine doing the same thing here, replacing the dollar with a "new dollar" at a rate of exchange of, say, 7 to 1. If you owed $140,000 on your home, that would become a debt of 20,000 new dollars. If you had a wage rate of $14 an hour, it

would become 2 new dollars an hour, and so on. This would bring the overall U.S. price level back to about what it was when John F. Kennedy was president.

So would everyone be richer as a result because prices would be only one-seventh as high? Of course not. Prices would be lower, but so would wages and incomes in general. If you cut a worker's wage to one-seventh of its previous value, but also cut all prices to one-seventh of their previous level, the worker's **real wage**—the wage rate divided by the price level—doesn't change. In fact, bringing the overall price level back to what it was during the Kennedy administration would have no effect on overall purchasing power, because doing so would reduce income exactly as much as it reduced prices. Conversely, the rise in prices that has actually taken place since the early 1960s hasn't made America poorer, because it has also raised incomes by the same amount: **real income**—income divided by the price level—hasn't been affected by the rise in overall prices.

The moral of this story is that the *level* of prices doesn't matter: the United States would be no richer than it is now if the overall level of prices was still as low as it was in 1961; conversely, the rise in prices over the past 45 years hasn't made us poorer.

The **real wage** is the wage rate divided by the price level.

Real income is income divided by the price level.

The **inflation rate** is the percent change per year in a price index—typically the consumer price index.

. . . But the Rate of Change of Prices Does

The conclusion that the level of prices doesn't matter might seem to imply that the inflation rate doesn't matter either. But that's not true.

To see why, it's crucial to distinguish between the *level of prices* and the *inflation rate*. In the next module, we will discuss precisely how the level of prices in the economy is measured using price indexes such as the consumer price index. For now, let's look at the **inflation rate,** the percent increase in the overall level of prices per year. The inflation rate is calculated as follows:

$$\text{Inflation rate} = \frac{\text{Price level in year 2} - \text{Price level in year 1}}{\text{Price level in year 1}} \times 100$$

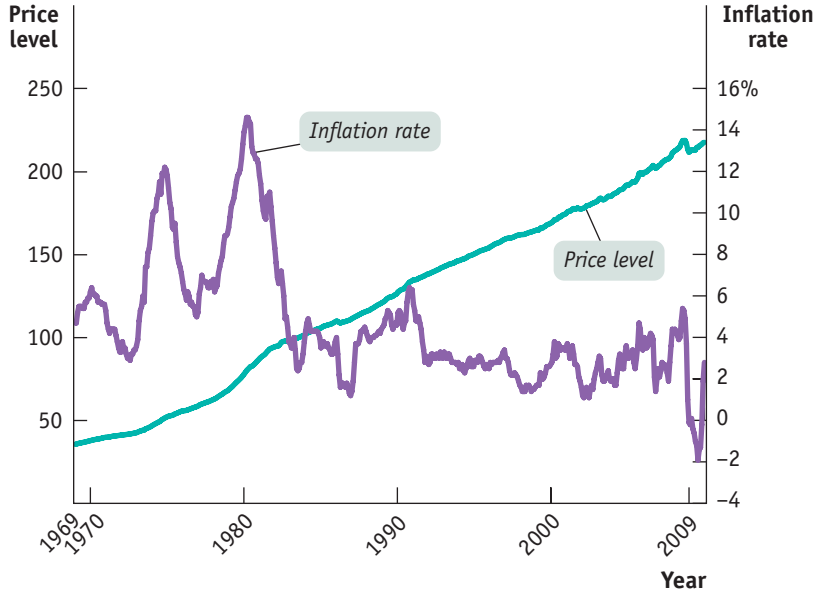
Figure 14.1 highlights the difference between the price level and the inflation rate in the United States since 1969, with the price level measured along the left vertical axis and the inflation rate measured along the right vertical axis. In the 2000s, the overall

figure 14.1

The Price Level versus the Inflation Rate, 1969–2009

Over the past 40 years, the price level has continuously gone up. But the *inflation rate*—the rate at which consumer prices are rising—has had both ups and downs.

Source: Bureau of Labor Statistics.



level of prices in the United States was much higher than it was in 1969—but that, as we've learned, didn't matter. The inflation rate in the 2000s, however, was much lower than in the 1970s—and that almost certainly made the economy richer than it would have been if high inflation had continued.

Economists believe that high rates of inflation impose significant economic costs. The most important of these costs are *shoe-leather costs, menu costs,* and *unit-of-account costs.* We'll discuss each in turn.

Shoe-Leather Costs People hold money—cash in their wallets and bank deposits on which they can write checks—for convenience in making transactions. A high inflation rate, however, discourages people from holding money, because the purchasing power of the cash in your wallet and the funds in your bank account steadily erodes as the overall level of prices rises. This leads people to search for ways to reduce the amount of money they hold, often at considerable economic cost.

Compassionate Eye Foundation/Siri Stafford/Digital Vision/Getty Images

During the most famous of all inflations, the German *hyperinflation* of 1921–1923, merchants employed runners to take their cash to the bank many times a day to convert it into something that would hold its value, such as a stable foreign currency. In an effort to avoid having the purchasing power of their money eroded, people used up valuable resources—the time and labor of the runners—that could have been used productively elsewhere. During the German hyperinflation, so many banking transactions were taking place that the number of employees at German banks nearly quadrupled—from around 100,000 in 1913 to 375,000 in 1923. More recently, Brazil experienced hyperinflation during the early 1990s; during that episode, the Brazilian banking sector grew so large that it accounted for 15% of GDP, more than twice the size of the financial sector in the United States measured as a share of GDP. The large increase in the Brazilian banking sector that was needed to cope with the consequences of inflation represented a loss of real resources to its society.

fyi

Israel's Experience with Inflation

It's hard to see the costs of inflation clearly because serious inflation is often associated with other problems that disrupt the economy and life in general, notably war or political instability (or both). In the mid-1980s, however, Israel experienced a "clean" inflation: there was no war, the government was stable, and there was order in the streets. Yet a series of policy errors led to very high inflation, with prices often rising more than 10% a month.

As it happens, one of the authors spent a month visiting Tel Aviv University at the height of the inflation, so we can give a first-hand account of the effects.

First, the shoe-leather costs of inflation were substantial. At the time, Israelis spent a lot of time in lines at the bank, moving money in and out of accounts that provided high enough interest rates to offset inflation. People walked around with very little cash in their wallets; they had to go to the bank whenever they needed to make even a moderately large cash payment.

Ricki Rosen/Corbis Saba

The shoe-leather costs of inflation in Israel: when the inflation rate hit 500% in 1985, people spent a lot of time in line at banks.

Banks responded by opening a lot of branches, a costly business expense.

Second, although menu costs weren't that visible to a visitor, what you could see were the efforts businesses made to minimize them. For example, restaurant menus often didn't list prices. Instead, they listed numbers that you had to multiply by another number, written on a chalkboard and changed every day, to figure out the price of a dish.

Finally, it was hard to make decisions because prices changed so much and so often. It was a common experience to walk out of a store because prices were 25% higher than at one's usual shopping destination, only to discover that prices had just been increased 25% there, too.

Increased costs of transactions caused by inflation are known as **shoe-leather costs,** an allusion to the wear and tear caused by the extra running around that takes place when people are trying to avoid holding money. Shoe-leather costs are substantial in economies with very high inflation rates, as anyone who has lived in such an economy—say, one suffering inflation of 100% or more per year—can attest. Most estimates suggest, however, that the shoe-leather costs of inflation at the rates seen in the United States—which in peacetime has never had inflation above 15%—are quite small.

Shoe-leather costs are the increased costs of transactions caused by inflation.

Menu costs are the real costs of changing listed prices.

Unit-of-account costs arise from the way inflation makes money a less reliable unit of measurement.

Menu Costs In a modern economy, most of the things we buy have a listed price. There's a price listed under each item on a supermarket shelf, a price printed on the front page of your newspaper, a price listed for each dish on a restaurant's menu. Changing a listed price has a real cost, called a **menu cost.** For example, to change a price in a supermarket may require a clerk to change the price listed under the item on the shelf and an office worker to change the price associated with the item's UPC code in the store's computer. In the face of inflation, of course, firms are forced to change prices more often than they would if the price level was more or less stable. This means higher costs for the economy as a whole.

In times of very high inflation rates, menu costs can be substantial. During the Brazilian inflation of the early 1990s, for instance, supermarket workers reportedly spent half of their time replacing old price stickers with new ones. When the inflation rate is high, merchants may decide to stop listing prices in terms of the local currency and use either an artificial unit—in effect, measuring prices relative to one another—or a more stable currency, such as the U.S. dollar. This is exactly what the Israeli real estate market began doing in the mid-1980s: prices were quoted in U.S. dollars, even though payment was made in Israeli shekels. And this is also what happened in Zimbabwe when, in May 2008, official estimates of the inflation rate reached 1,694,000%.

Menu costs are also present in low-inflation economies, but they are not severe. In low-inflation economies, businesses might update their prices only sporadically—not daily or even more frequently, as is the case in high-inflation or hyperinflation economies. Also, with technological advances, menu costs are becoming less and less important, since prices can be changed electronically and fewer merchants attach price stickers to merchandise.

Unit-of-Account Costs In the Middle Ages, contracts were often specified "in kind": a tenant might, for example, be obliged to provide his landlord with a certain number of cattle each year (the phrase *in kind* actually comes from an ancient word for *cattle).* This may have made sense at the time, but it would be an awkward way to conduct modern business. Instead, we state contracts in monetary terms: a renter owes a certain number of dollars per month, a company that issues a bond promises to pay the bondholder the dollar value of the bond when it comes due, and so on. We also tend to make our economic calculations in dollars: a family planning its budget, or a small business owner trying to figure out how well the business is doing, makes estimates of the amount of money coming in and going out.

This role of the dollar as a basis for contracts and calculation is called the *unit-of-account* role of money. It's an important aspect of the modern economy. Yet it's a role that can be degraded by inflation, which causes the purchasing power of a dollar to change over time—a dollar next year is worth less than a dollar this year. The effect, many economists argue, is to reduce the quality of economic decisions: the economy as a whole makes less efficient use of its resources because of the uncertainty caused by changes in the unit of account, the dollar. The **unit-of-account costs** of inflation are the costs arising from the way inflation makes money a less reliable unit of measurement.

Unit-of-account costs may be particularly important in the tax system, because inflation can distort the measures of income on which taxes are collected. Here's an example: Assume that the inflation rate is 10%, so that the overall level of prices rises 10% each year. Suppose that a business buys an asset, such as a piece of land, for $100,000 and then resells it a year later at a price of $110,000. In a fundamental sense, the business didn't make a profit on the deal: in real terms, it got no more for the land than it paid for it, because the $110,000 would purchase no more goods than the $100,000

The **nominal interest rate** is the interest rate actually paid for a loan.

The **real interest rate** is the nominal interest rate minus the rate of inflation.

would have a year earlier. But U.S. tax law would say that the business made a capital gain of $10,000, and it would have to pay taxes on that phantom gain.

During the 1970s, when the United States had a relatively high inflation rate, the distorting effects of inflation on the tax system were a serious problem. Some businesses were discouraged from productive investment spending because they found themselves paying taxes on phantom gains. Meanwhile, some unproductive investments became attractive because they led to phantom losses that reduced tax bills. When the inflation rate fell in the 1980s—and tax rates were reduced—these problems became much less important.

Winners and Losers from Inflation

As we've just learned, a high inflation rate imposes overall costs on the economy. In addition, inflation can produce winners and losers within the economy. The main reason inflation sometimes helps some people while hurting others is that economic transactions, such as loans, often involve contracts that extend over a period of time and these contracts are normally specified in nominal—that is, in dollar—terms. In the case of a loan, the borrower receives a certain amount of funds at the beginning, and the loan contract specifies how much he or she must repay at some future date. But what that dollar repayment is worth in real terms—that is, in terms of purchasing power—depends greatly on the rate of inflation over the intervening years of the loan.

The *interest rate* on a loan is the percentage of the loan amount that the borrower must pay to the lender, typically on an annual basis, in addition to the repayment of the loan amount itself. Economists summarize the effect of inflation on borrowers and lenders by distinguishing between *nominal* interest rates and *real* interest rates. The **nominal interest rate** is the interest rate that is actually paid for a loan, unadjusted for the effects of inflation. For example, the interest rates advertised on student loans and every interest rate you see listed by a bank is a nominal rate. The **real interest rate** is the nominal interest rate adjusted for inflation. This adjustment is achieved by simply subtracting the inflation rate from the nominal interest rate. For example, if a loan carries a nominal interest rate of 8%, but the inflation rate is 5%, the real interest rate is 8% – 5% = 3%.

When a borrower and a lender enter into a loan contract, the contract normally specifies a nominal interest rate. But each party has an expectation about the future rate of inflation and therefore an expectation about the real interest rate on the loan. If the actual inflation rate is *higher* than expected, borrowers gain at the expense of lenders: borrowers will repay their loans with funds that have a lower real value than had been expected—they can purchase fewer goods and service than expected due to the surprisingly high inflation rate. Conversely, if the inflation rate is *lower* than expected, lenders will gain at the expense of borrowers: borrowers must repay their loans with funds that have a higher real value than had been expected.

Historically, the fact that inflation creates winners and losers has sometimes been a major source of political controversy. In 1896 William Jennings Bryan electrified the Democratic presidential convention with a speech in which he declared, "You shall not crucify mankind on a cross of gold." What he was actually demanding was an inflationary policy. At the time, the U.S. dollar had a fixed value in terms of gold. Bryan wanted the U.S. government to abandon the gold standard and print more money, which would have raised the level of prices and, he believed, helped the nation's farmers who were deeply in debt.

In modern America, home mortgages (loans for the purchase of homes) are the most important source of gains and losses from inflation. Americans who took out mortgages in the early 1970s quickly found their real payments reduced by higher-than-expected inflation: by 1983, the purchasing power of a dollar was only 45% of what it had been in 1973. Those who took out mortgages in the early 1990s were not so lucky, because the inflation rate fell to lower-than-expected levels in the following years: in 2003 the purchasing power of a dollar was 78% of what it had been in 1993.

Because gains for some and losses for others result from inflation that is either higher or lower than expected, yet another problem arises: uncertainty about the future

inflation rate discourages people from entering into any form of long-term contract. This is an additional cost of high inflation, because high rates of inflation are usually unpredictable, too. In countries with high and uncertain inflation, long-term loans are rare. This, in turn, makes it difficult for people to commit to long-term investments.

One last point: unexpected deflation—a surprise fall in the price level—creates winners and losers, too. Between 1929 and 1933, as the U.S. economy plunged into the Great Depression, the price level fell by 35%. This meant that debtors, including many farmers and homeowners, saw a sharp rise in the real value of their debts, which led to widespread bankruptcy and helped create a banking crisis, as lenders found their customers unable to pay back their loans.

Disinflation is the process of bringing the inflation rate down.

Inflation Is Easy; Disinflation Is Hard

There is not much evidence that a rise in the inflation rate from, say, 2% to 5% would do a great deal of harm to the economy. Still, policy makers generally move forcefully to bring inflation back down when it creeps above 2% or 3%. Why? Because experience shows that bringing the inflation rate down—a process called **disinflation**—is very difficult and costly once a higher rate of inflation has become well established in the economy.

Figure 14.2 shows the inflation rate and the unemployment rate in the United States over a crucial decade, from 1978 to 1988. The decade began with an alarming rise in the inflation rate, but by the end of the period inflation averaged only about 4%. This was considered a major economic achievement—but it came at a high cost. Much of the fall in inflation probably resulted from the very severe recession of 1981–1982, which drove the unemployment rate to 10.8%—its highest level since the Great Depression.

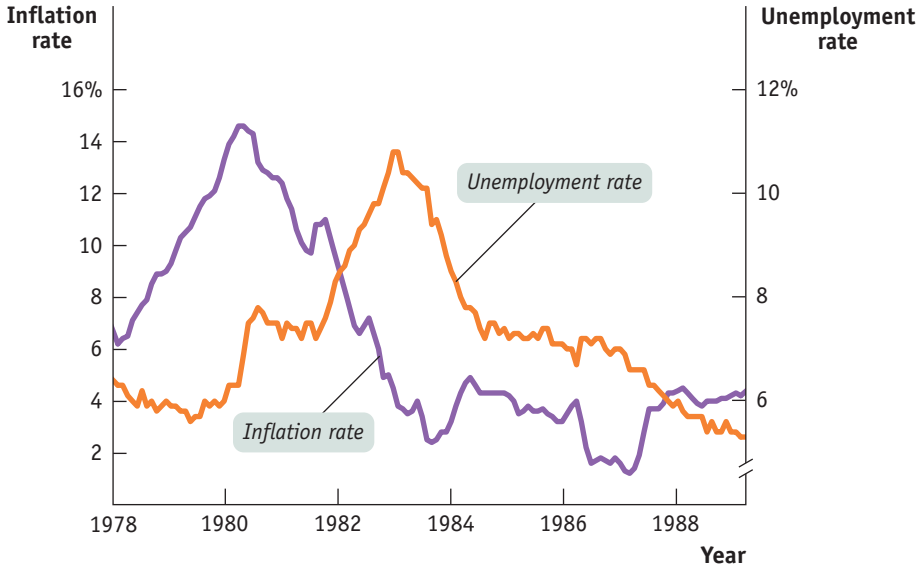
Many economists believe that this period of high unemployment was necessary, because they believe that the only way to reduce inflation that has become deeply embedded in the economy is through policies that temporarily depress the economy. The best way to avoid having to put the economy through a wringer to reduce inflation, however, is to avoid having a serious inflation problem in the first place. So, policy makers respond forcefully to signs that inflation may be accelerating as a form of preventive medicine for the economy.

figure 14.2

The Cost of Disinflation

The U.S. inflation rate peaked in 1980 and then fell sharply. Progress against inflation was, however, accompanied by a temporary but very large increase in the unemployment rate, demonstrating the high cost of disinflation.

Source: Bureau of Labor Statistics.



Module 14 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. The widespread use of technology has revolutionized the banking industry, making it much easier for customers to access and manage their assets. Does this mean that the shoe-leather costs of inflation are higher or lower than they used to be? Explain.
2. Most people in the United States have grown accustomed to a modest inflation rate of around 2-3%. Who would gain and who would lose if inflation came to a complete stop for several years? Explain.

Tackle the Test: Multiple-Choice Questions

1. Which of the following is true regarding prices in an economy?
   I. An increase in the price level is called inflation.
   II. The level of prices doesn't matter.
   III. The rate of change in prices matters.
   a. I only
   b. II only
   c. III only
   d. II and III only
   e. I, II, and III
2. If your nominal wage doubles at the same time as prices double, your real wage will
   a. increase.
   b. decrease
   c. not change.
   d. double.
   e. be impossible to determine.
3. If inflation causes people to frequently convert their dollars into other assets, the economy experiences what type of cost?
   a. price level
   b. shoe-leather
   c. menu
   d. unit-of-account
   e. monetary
4. Because dollars are used as the basis for contracts, inflation leads to which type of cost?
   a. price level
   b. shoe-leather
   c. menu
   d. unit-of-account
   e. monetary
5. Changing the listed price when inflation leads to a price increase is an example of which type of cost?
   a. price level
   b. shoe-leather
   c. menu
   d. unit-of-account
   e. monetary

Tackle the Test: Free-Response Questions

1. In the following examples, is inflation creating winners and losers at no net cost to the economy or is it imposing a net cost on the economy? Explain. If inflation is imposing a net cost on the economy, which type of cost is involved?
   a. When inflation is expected to be high, workers get paid more frequently and make more trips to the bank.
   b. Lanwei is reimbursed by her company for her work-related travel expenses. Sometimes, however, the company takes a long time to reimburse her. So when inflation is high, she is less willing to travel for her job.
   c. Hector Homeowner has a mortgage loan that he took out five years ago with a fixed 6% nominal interest rate. Over the years, the inflation rate has crept up unexpectedly to its present level of 7%.
   d. In response to unexpectedly high inflation, the manager of Cozy Cottages of Cape Cod must reprint and resend expensive color brochures correcting the price of rentals this season.

Answer (11 points)

1 point: There is a net cost to the economy.

1 point: This is an increase in the cost of financial transactions cost imposed by inflation.

1 point: This type of cost is called a shoe-leather cost.

1 point: There is a net cost to the economy.

1 point: Lanwei's forgone output is a cost to the economy.

1 point: This type of cost is called a unit-of-account cost.

1 point: There is no net cost to the economy.

1 point: Hector gains and the bank loses because the money Hector pays back is worth less than expected.

1 point: There is a net cost to the economy.

1 point: Cozy Cottages must reprint and resend the expensive brochure when inflation causes rental prices to rise.

1 point: This type of cost is called a menu cost.

2. You borrow $1,000 for one year at 5% interest to buy a couch. Although you did not anticipate any inflation, there is unexpected inflation of 5% over the life of your loan.
   a. What was the real interest rate on your loan?
   b. Explain how you gained from the inflation.
   c. Who lost as a result of the situation described? Explain.

What you will learn in this **Module:**

- How the inflation rate is measured
- What a price index is and how it is calculated
- The importance of the consumer price index and other price indexes

Module 15
The Measurement and Calculation of Inflation

The **aggregate price level** is a measure of the overall level of prices in the economy.

A **market basket** is a hypothetical set of consumer purchases of goods and services.

Price Indexes and the Aggregate Price Level

In the summer of 2008, Americans were facing sticker shock at the gas pump: the price of a gallon of regular gasoline had risen from about $3 in late 2007 to more than $4 in most places. Many other prices were also up. Some prices, though, were heading down: the prices of some foods, like eggs, were coming down from a run-up earlier in the year, and virtually anything involving electronics was also getting cheaper. Yet practically everyone felt that the overall cost of living seemed to be rising. But how fast?

Clearly there was a need for a single number summarizing what was happening to consumer prices. Just as macroeconomists find it useful to have a single number to represent the overall level of output, they also find it useful to have a single number to represent the overall level of prices: the **aggregate price level.** Yet a huge variety of goods and services are produced and consumed in the economy. How can we summarize the prices of all these goods and services with a single number? The answer lies in the concept of a *price index*—a concept best introduced with an example.

Market Baskets and Price Indexes

Suppose that a frost in Florida destroys most of the citrus harvest. As a result, the price of oranges rises from $0.20 each to $0.40 each, the price of grapefruit rises from $0.60 to $1.00, and the price of lemons rises from $0.25 to $0.45. How much has the price of citrus fruit increased?

One way to answer that question is to state three numbers—the changes in prices for oranges, grapefruit, and lemons. But this is a very cumbersome method. Rather than having to recite three numbers in an effort to track changes in the prices of citrus fruit, we would prefer to have some kind of overall measure of the *average* price change.

To measure average price changes for consumer goods and services, economists track changes in the cost of a typical consumer's *consumption bundle*—the typical basket of goods and services purchased before the price changes. A hypothetical consumption bundle, used to measure changes in the overall price level, is known as a **market basket.** For our market basket in this example we will suppose that, before the frost, a

typical consumer bought 200 oranges, 50 grapefruit, and 100 lemons over the course of a year.


© PhotoAlto/Alamy

Table 15.1 shows the pre-frost and post-frost costs of this market basket. Before the frost, it cost $95; after the frost, the same basket of goods cost $175. Since $175/$95 = 1.842, the post-frost basket costs 1.842 times the cost of the pre-frost basket, a cost increase of 84.2%. In this example, the average price of citrus fruit has increased 84.2% since the base year as a result of the frost, where the base year is the initial year used in the measurement of the price change.

table **15.1**

Calculating the Cost of a Market Basket

	Pre-frost	Post-frost
Price of orange	$0.20	$0.40
Price of grapefruit	0.60	1.00
Price of lemon	0.25	0.45
Cost of market basket (200 oranges, 50 grapefruit, 100 lemons)	(200 × $0.20) + (50 × $0.60) + (100 × $0.25) = $95.00	(200 × $0.40) + (50 × $1.00) + (100 × $0.45) = $175.00

Economists use the same method to measure changes in the overall price level: they track changes in the cost of buying a given market basket. Working with a market basket and a base year, we obtain what is known as a **price index,** a measure of the overall price level. It is always cited along with the year for which the aggregate price level is being measured and the base year. A price index can be calculated using the following formula:

$$\textbf{(15-1)}\quad \text{Price index in a given year} = \frac{\text{Cost of market basket in a given year}}{\text{Cost of market basket in base year}} \times 100$$

In our example, the citrus fruit market basket cost $95 in the base year, the year before the frost. So by applying Equation 15-1, we define the price index for citrus fruit as (cost of market basket in the current year/$95) × 100, yielding an index of 100 for the period before the frost and 184.2 after the frost. You should note that applying Equation 15-1 to calculate the price index for the base year always results in a price index of (cost of market basket in base year/cost of market basket in base year) × 100 = 100. Choosing a price index formula that always normalizes the index value to 100 in the base year avoids the need to keep track of the cost of the market basket, for example, $95, in such-and-such a year.

The price index makes it clear that the average price of citrus has risen 84.2% as a consequence of the frost. Because of its simplicity and intuitive appeal, the method we've just described is used to calculate a variety of price indexes to track average price changes among a variety of different groups of goods and services. Examples include the *consumer price index* and the *producer price index,* which we'll discuss shortly. Price indexes are also the basis for measuring inflation. The price level mentioned in the inflation rate formula in Module 14 is simply a price index value, and the inflation rate is determined as the annual percentage change in an official price index. The inflation rate from year 1 to year 2 is thus calculated using the following formula, with year 1 and year 2 being consecutive years.

$$\textbf{(15-2)}\quad \text{Inflation rate} = \frac{\text{Price index in year 2} - \text{Price index in year 1}}{\text{Price index in year 1}} \times 100$$

Typically, a news report that cites "the inflation rate" is referring to the annual percent change in the consumer price index.

A **price index** measures the cost of purchasing a given market basket in a given year. The index value is normalized so that it is equal to 100 in the selected base year.

The **consumer price index,** or **CPI,** measures the cost of the market basket of a typical urban American family.

The Consumer Price Index

The most widely used measure of the overall price level in the United States is the **consumer price index** (often referred to simply as the **CPI**), which is intended to show how the cost of all purchases by a typical urban family has changed over time. It is calculated by surveying market prices for a market basket that is constructed to represent the consumption of a typical family of four living in a typical American city. Rather than having a single base year, the CPI currently has a base period of 1982–1984.

Denise Bober

The market basket used to calculate the CPI is far more complex than the three-fruit market basket we described above. In fact, to calculate the CPI, the Bureau of Labor Statistics sends its employees out to survey supermarkets, gas stations, hardware stores, and so on—some 23,000 retail outlets in 87 cities. Every month it tabulates about 80,000 prices, on everything from romaine lettuce to video rentals. Figure 15.1 shows the weight of major categories in the consumer price index as of December 2008. For example, motor fuel, mainly gasoline, accounted for 3% of the CPI in December 2008.

Figure 15.2 shows how the CPI has changed since measurement began in 1913. Since 1940, the CPI has risen steadily, although its annual percent increases in recent years have been much smaller than those of the 1970s and early 1980s. A logarithmic scale is used so that equal percent changes in the CPI appear the same.

Some economists believe that the consumer price index systematically overstates the actual rate of inflation. Why? Consider two families: one in 1985, with an after-tax income of $20,000, and another in 2010, with an after-tax income of $40,000. According to the CPI, prices in 2010 were about twice as high as in 1985, so those two families should have about the same standard of living. However, the 2010 family might have a higher standard of living for two reasons.

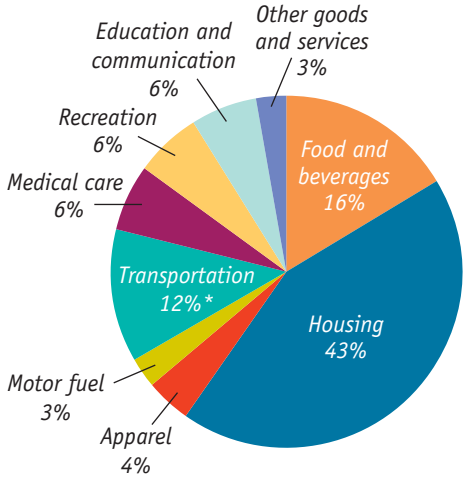
First, the CPI measures the cost of buying a given market basket. Yet, consumers typically alter the mix of goods and services they buy, reducing purchases of products

figure 15.1

The Makeup of the Consumer Price Index in 2008

This chart shows the percentage shares of major types of spending in the CPI as of December 2008. Housing, food, transportation, and motor fuel made up about 76% of the CPI market basket.

Source: Bureau of Labor Statistics.



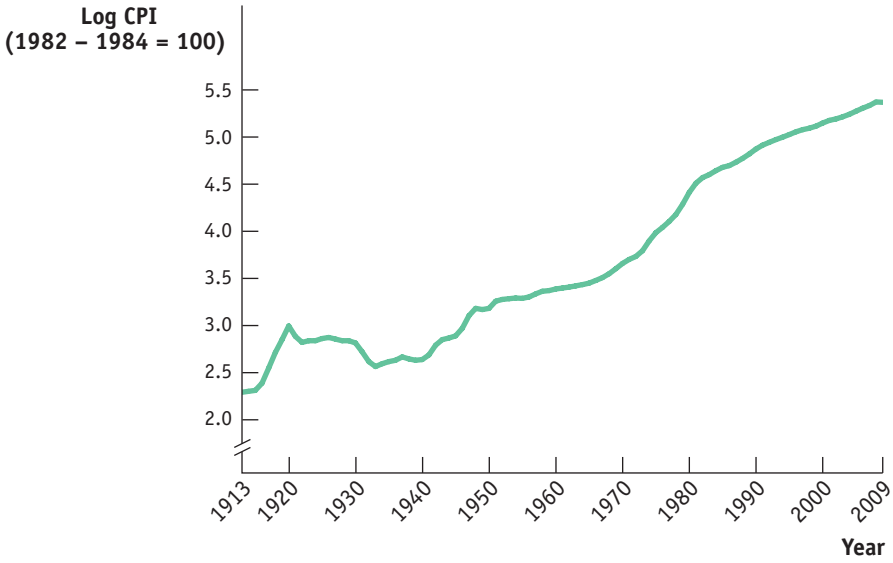
*Excludes motor fuel.

figure 15.2

The CPI, 1913–2009

Since 1940, the CPI has risen steadily. But the annual percentage increases in recent years have been much smaller than those of the 1970s and early 1980s. (The vertical axis is measured on a logarithmic scale so that equal percent changes in the CPI appear the same.)

Source: Bureau of Labor Statistics.



that have become relatively more expensive and increasing purchases of products that have become relatively cheaper. For example, suppose that the price of hamburgers suddenly doubled. Americans currently eat a lot of hamburgers, but in the face of such a price rise many of them would switch to cheaper foods. A price index based on a market basket with a lot of hamburgers in it would overstate the true rise in the cost of living.

The second reason arises from innovation. In 1985 many of the goods we now take for granted, especially those using information technology, didn't exist: there was no Internet and there were no iPhones. By widening the range of consumer choice, innovation makes a given amount of money worth more. That is, innovation is like a fall in consumer prices. For both of these reasons, many economists believe that the CPI somewhat overstates inflation when we think of inflation as measuring the actual change in the cost of living of a typical urban American family. But there is no consensus on how large the overstatement is, and for the time being, the official CPI remains the basis for most estimates of inflation.

The United States is not the only country that calculates a consumer price index. In fact, nearly every country calculates one. As you might expect, the market baskets that make up these indexes differ quite a lot from country to country. In poor countries, where people must spend a high proportion of their income just to feed themselves, food makes up a large share of the price index. Among high-income countries, differences in consumption patterns lead to differences in the price indexes: the Japanese price index puts a larger weight on raw fish and a smaller weight on beef than ours does, and the French price index puts a larger weight on wine.

Other Price Measures

There are two other price measures that are also widely used to track economy-wide price changes. One is the **producer price index** (or **PPI,** which used to be known as the *wholesale price index*). As its name suggests, the producer price index measures the cost of a typical basket of goods and services—containing raw commodities such as steel, electricity, coal, and so on—purchased by producers. Because commodity producers are relatively quick to raise prices when they perceive a change in overall demand for their

The **producer price index,** or **PPI,** measures changes in the prices of goods and services purchased by producers.

The **GDP deflator** for a given year is 100 times the ratio of nominal GDP to real GDP in that year.

goods, the PPI often responds to inflationary or deflationary pressures more quickly than the CPI. As a result, the PPI is often regarded as an "early warning signal" of changes in the inflation rate.

The other widely used price measure is the *GDP deflator;* it isn't exactly a price index, although it serves the same purpose. Recall how we distinguished between nominal GDP (GDP in current prices) and real GDP (GDP calculated using the prices of a base year). The **GDP deflator** for a given year is equal to 100 times the ratio of nominal GDP for that year to real GDP for that year expressed in prices of a selected base year. Since real GDP is currently expressed in 2005 dollars, the GDP deflator for 2005 is equal to 100. If nominal GDP doubles but real GDP does not change, the GDP deflator indicates that the aggregate price level doubled.

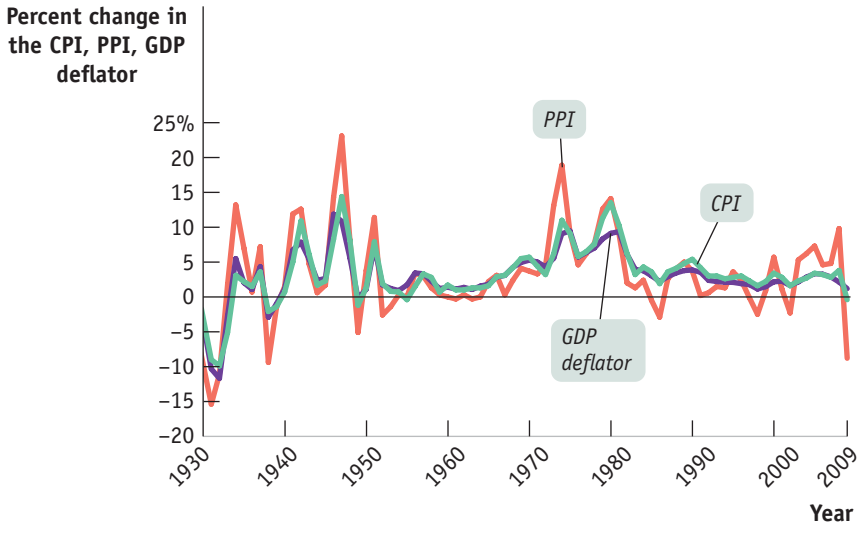
Perhaps the most important point about the different inflation rates generated by these three measures of prices is that they usually move closely together (although the producer price index tends to fluctuate more than either of the other two measures). Figure 15.3 shows the annual percent changes in the three indexes since 1930. By all three measures, the U.S. economy experienced deflation during the early years of the Great Depression, inflation during World War II, accelerating inflation during the 1970s, and a return to relative price stability in the 1990s. Notice, by the way, the large surge and subsequent drop in producer prices at the very end of the graph; this reflects a sharp rise in energy and food prices, during the second half of the 2000s, and the subsequent large drop in those prices as energy prices fell during the recession that began in 2007. And you can see these large changes in energy and food prices reflected most in the producer price index since they play a much bigger role in the PPI than they do in either the CPI or the GDP deflator.

figure 15.3

The CPI, the PPI, and the GDP Deflator

As the figure shows, these three different measures of inflation usually move closely together. Each reveals a drastic acceleration of inflation during the 1970s and a return to relative price stability in the 1990s.

Source: Bureau of Labor Statistics; Bureau of Economic Analysis.



fyi

Indexing to the CPI

Although GDP is a very important number for shaping economic policy, official statistics on GDP don't have a direct effect on people's lives. The CPI, by contrast, has a direct and immediate impact on millions of Americans. The reason is that many payments are tied, or "indexed," to the CPI—the amount paid rises or falls when the CPI rises or falls.

The practice of indexing payments to consumer prices goes back to the dawn of the United States as a nation. In 1780 the Massachusetts State Legislature recognized that the pay of its soldiers fighting the British needed to be increased because of inflation that occurred during the Revolutionary War. The legislature adopted a formula that made a soldier's pay proportional to the cost of a market basket consisting of 5 bushels of corn, 68⅐ pounds of beef, 10 pounds of sheep's wool, and 16 pounds of sole leather.

Today, 48 million people, most of them old or disabled, receive checks from Social Security, a national retirement program that accounts for almost a quarter of current total federal spending—more than the defense budget. The amount of an individual's check is determined by a formula that reflects his or her previous payments into the system as well as other factors. In addition, all Social Security payments are adjusted each year to offset any increase in consumer prices over the previous year. The CPI is used to calculate the official estimate of the inflation rate used to adjust these payments yearly. So every percentage point added to the official estimate of the rate of inflation adds 1% to the checks received by tens of millions of individuals.

Donald A. Higgs Photography

A small change in the CPI has large consequences for those dependent on Social Security payments.

Other government payments are also indexed to the CPI. In addition, income tax brackets, the bands of income levels that determine a taxpayer's income tax rate, are indexed to the CPI. (An individual in a higher income bracket pays a higher income tax rate in a progressive tax system like ours.) Indexing also extends to the private sector, where many private contracts, including some wage settlements, contain cost-of-living allowances (called COLAs) that adjust payments in proportion to changes in the CPI.

Because the CPI plays such an important and direct role in people's lives, it's a politically sensitive number. The Bureau of Labor Statistics, which calculates the CPI, takes great care in collecting and interpreting price and consumption data. It uses a complex method in which households are surveyed to determine what they buy and where they shop, and a carefully selected sample of stores are surveyed to get representative prices. As explained in the preceding FYI, however, there is still considerable controversy about whether the CPI accurately measures inflation.

Module 15 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. Consider Table 15.1 but suppose that the market basket is composed of 100 oranges, 50 grapefruit, and 200 lemons. How does this change the pre-frost and post-frost consumer price indexes? Explain. Generalize your answer to explain how the construction of the market basket affects the CPI.
2. For each of the following events, explain how the use of a 10-year-old market basket would bias measurements of price changes over the past decade.
   a. A typical family owns more cars than it would have a decade ago. Over that time, the average price of a car has increased more than the average prices of other goods.
   b. Virtually no households had broadband Internet access a decade ago. Now many households have it, and the price has been falling.
3. The consumer price index in the United States (base period 1982–1984) was 201.6 in 2006 and 207.3 in 2007. Calculate the inflation rate from 2006 to 2007.

Tackle the Test: Multiple-Choice Questions

1. If the cost of a market basket of goods increases from $100 in year 1 to $108 in year 2, the consumer price index in year 2 equals _____ if year 1 is the base year.
   a. 8
   b. 10
   c. 100
   d. 108
   e. 110
2. If the consumer price index increases from 80 to 120 from one year to the next, the inflation rate over that time period was
   a. 20%
   b. 40%
   c. 50%
   d. 80%
   e. 120%
3. Which of the following is true of the CPI?
   I. It is the most common measure of the price level.
   II. It measures the price of a typical market basket of goods.
   III. It currently uses a base period of 1982–1984.
   a. I only
   b. II only
   c. III only
   d. I and II only
   e. I, II, and III
4. The value of a price index in the base year is
   a. 0.
   b. 100.
   c. 200.
   d. the inflation rate.
   e. the average cost of a market basket of goods.
5. If your wage doubles at the same time as the consumer price index goes from 100 to 300, your real wage
   a. doubles.
   b. falls.
   c. increases.
   d. stays the same.
   e. cannot be determined.

Tackle the Test: Free-Response Questions

1. Suppose the year 2000 is the base year for a price index. Between 2000 and 2020 prices double and at the same time your nominal income increases from $40,000 to $80,000.
   a. What is the value of the price index in 2000?
   b. What is the value of the price index in 2020?
   c. What is the percentage increase in your nominal income between 2000 and 2020?
   d. What has happened to your real income between 2000 and 2020? Explain.

Answer (5 points)

1 point: 100

1 point: 200

1 point: 100%

1 point: It stayed the same.

1 point: Real income is a measure of the purchasing power of my income, and because my income and the price level both doubled, the purchasing power of my income has not been affected: $40,000/100 = $80,000/200.

2. The accompanying table contains the values of two price indexes for the years 2004, 2005, and 2006: the GDP deflator and the CPI. For each price index, calculate the inflation rate from 2004 to 2005 and from 2005 to 2006.

Year	GDP deflator	CPI
2004	96.8	188.9
2005	100.0	195.3
2006	103.3	201.6

Section 3 Review

Summary

1. Economists keep track of the flows of money between sectors with the **national income and product accounts,** or **national accounts. Households** earn income via the **factor markets** from wages, interest on **bonds,** profit accruing to owners of **stocks,** and rent on land. In addition, they receive **government transfers.**

Disposable income, total household income minus taxes plus government transfers, is allocated to **consumer spending** (*C*) in the **product markets** and **private savings.** Via the **financial markets,** private savings and foreign lending are channeled to **investment spending** (*I*), government borrowing, and foreign borrowing. **Government purchases of goods and services** (*G*) are paid for by tax revenues and **government borrowing. Exports** (*X*) generate an inflow of funds into the country from the rest of the world, but **imports** (*IM*) lead to an outflow of funds to the rest of the world. Foreigners can also buy stocks and bonds in the U.S. financial markets.

2. **Gross domestic product,** or **GDP,** measures the value of all **final goods and services** produced in the economy. It does not include the value of **intermediate goods and services,** but it does include **inventories** and **net exports** ($X - IM$). It can be calculated in three ways: add up the **value added** by all producers; add up all spending on domestically produced final goods and services, leading to the equation $GDP = C + I + G + X - IM$, also known as **aggregate spending;** or add up all the income paid by domestic **firms** to factors of production. These three methods are equivalent because in the economy as a whole, total income paid by domestic firms to factors of production must equal total spending on domestically produced final goods and services.
3. **Real GDP** is the value of the final goods and services produced calculated using the prices of a selected base year. Except in the base year, real GDP is not the same as **nominal GDP,** the value of **aggregate output** calculated using current prices. Analysis of the growth rate of aggregate output must use real GDP because doing so eliminates any change in the value of aggregate output due solely to price changes. Real **GDP per capita** is a measure of average aggregate output per person but is not in itself an appropriate policy goal. U.S. statistics on real GDP are always expressed in "chained dollars," which means they are calculated with the **chain-linking** method of averaging the GDP growth rate found using an early base year and the GDP growth rate found using a late base year.
4. **Employed** people currently hold a part-time or full-time job; **unemployed** people do not hold a job but are actively looking for work. Their sum is equal to the **labor force,** and the **labor force participation rate** is the percentage of the population age 16 or older that is in the labor force.
5. The **unemployment rate,** the percentage of the labor force that is unemployed and actively looking for work, can overstate or understate the true level of unemployment. It can overstate because it counts as unemployed those who are continuing to search for a job despite having been offered one (that is, workers who are frictionally unemployed). It can understate because it ignores frustrated workers, such as **discouraged workers, marginally attached workers,** and the **underemployed.** In addition, the unemployment rate varies greatly among different groups in the population; it is typically higher for younger workers and for workers near retirement age than for workers in their prime working years.
6. The unemployment rate is affected by the business cycle. The unemployment rate generally falls when the growth rate of real GDP is above average and generally rises when the growth rate of real GDP is below average.
7. Job creation and destruction, as well as voluntary job separations, lead to **job search** and **frictional unemployment.** In addition, a variety of factors such as minimum wages, unions, **efficiency wages,** and government policies designed to help laid-off workers result in a situation in which there is a surplus of labor at the market wage rate, creating **structural unemployment.** As a result, the **natural rate of unemployment,** the sum of frictional and structural unemployment, is well above zero, even when jobs are plentiful.
8. The actual unemployment rate is equal to the natural rate of unemployment, the share of unemployment that is independent of the business cycle, plus **cyclical unemployment,** the share of unemployment that depends on fluctuations in the business cycle.
9. The natural rate of unemployment changes over time, largely in response to changes in labor force characteristics, labor market institutions, and government policies.
10. Inflation does not, as many assume, make everyone poorer by raising the level of prices. That's because if wages and incomes are adjusted to take into account a rising price level, **real wages** and **real income** remain unchanged. However, a high inflation rate imposes overall costs on the economy: **shoe-leather costs, menu costs,** and **unit-of-account costs.**
11. Inflation can produce winners and losers within the economy, because long-term contracts are generally written in dollar terms. Loans typically specify a **nominal interest rate,** which differs from the **real interest rate** due to inflation. A higher-than-expected inflation rate is good for borrowers and bad for lenders. A lower-than-expected inflation rate is good for lenders and bad for borrowers.
12. It is very costly to create **disinflation,** so policy makers try to prevent inflation from becoming excessive in the first place.
13. To measure the **aggregate price level,** economists calculate the cost of purchasing a **market basket.** A **price index** is the ratio of the current cost of that market basket to the cost in a selected base year, multiplied by 100.
14. The **inflation rate** is the yearly percent change in a price index, typically based on the **consumer price index,** or **CPI,** the most common measure of the aggregate price level. A similar index for goods and services purchased by firms is the **producer price index,** or **PPI.** Finally, economists also use the **GDP deflator,** which measures the price level by calculating the ratio of nominal to real GDP times 100.

Key Terms

National income and product accounts, p. 102
National accounts, p. 102
Household, p. 103
Firm, p. 103
Product markets, p. 103
Factor markets, p. 103
Consumer spending, p. 103
Stock, p. 104
Bond, p. 104
Government transfers, p. 105
Disposable income, p. 105
Private savings, p. 105
Financial markets, p. 105
Government borrowing, p. 105
Government purchases of goods and services, p. 105
Exports, p. 105
Imports, p. 105
Inventories, p. 105
Investment spending, p. 106
Final goods and services, p. 106
Intermediate goods and services, p. 106
Gross domestic product (GDP), p. 106
Aggregate spending, p. 106
Value added, p. 107
Net exports, p. 108
Aggregate output, p. 113
Real GDP, p. 114
Nominal GDP, p. 114
Chain-linking, p. 115
GDP per capita, p. 115
Employed, p. 119
Unemployed, p. 119
Labor force, p. 119
Labor force participation rate, p. 119
Unemployment rate, p. 119
Discouraged workers, p. 120
Marginally attached workers, p. 120
Underemployed, p. 120
Job search, p. 127
Frictional unemployment, p. 127
Structural unemployment, p. 128
Efficiency wages, p. 130
Natural rate of unemployment, p. 130
Cyclical unemployment, p. 130
Real wage, p. 135
Real income, p. 135
Inflation rate, p. 135
Shoe-leather costs, p. 137
Menu costs, p. 137
Unit-of-account costs, p. 137
Nominal interest rate, p. 138
Real interest rate, p. 138
Disinflation, p. 139
Aggregate price level, p. 142
Market basket, p. 142
Price index, p. 143
Consumer price index (CPI), p. 144
Producer price index (PPI), p. 145
GDP deflator, p. 146

Problems

1. At right is a simplified circular-flow diagram for the economy of Micronia.

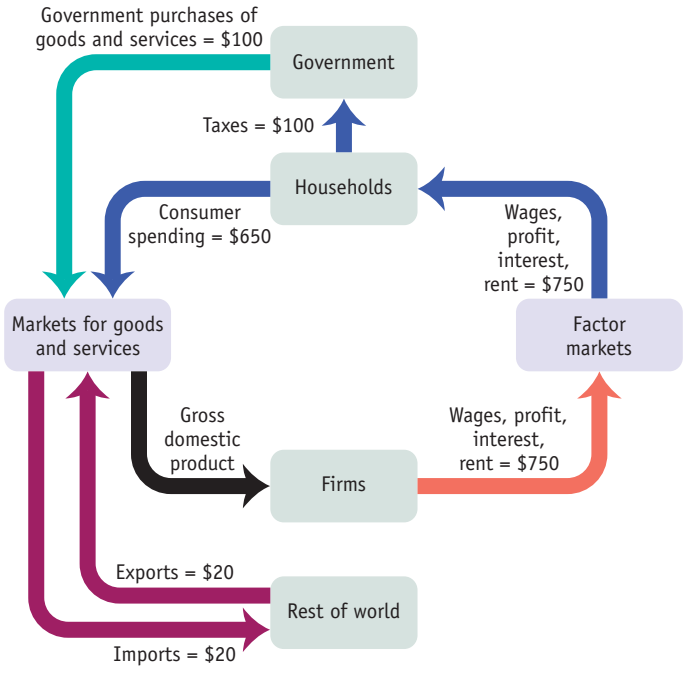
a. What is the value of GDP in Micronia?

b. What is the value of net exports?

c. What is the value of disposable income?

d. Does the total flow of money out of households—the sum of taxes paid and consumer spending—equal the total flow of money into households?

e. How does the government of Micronia finance its purchases of goods and services?



2. A more complex circular-flow diagram for the economy of Macronia is shown at right.

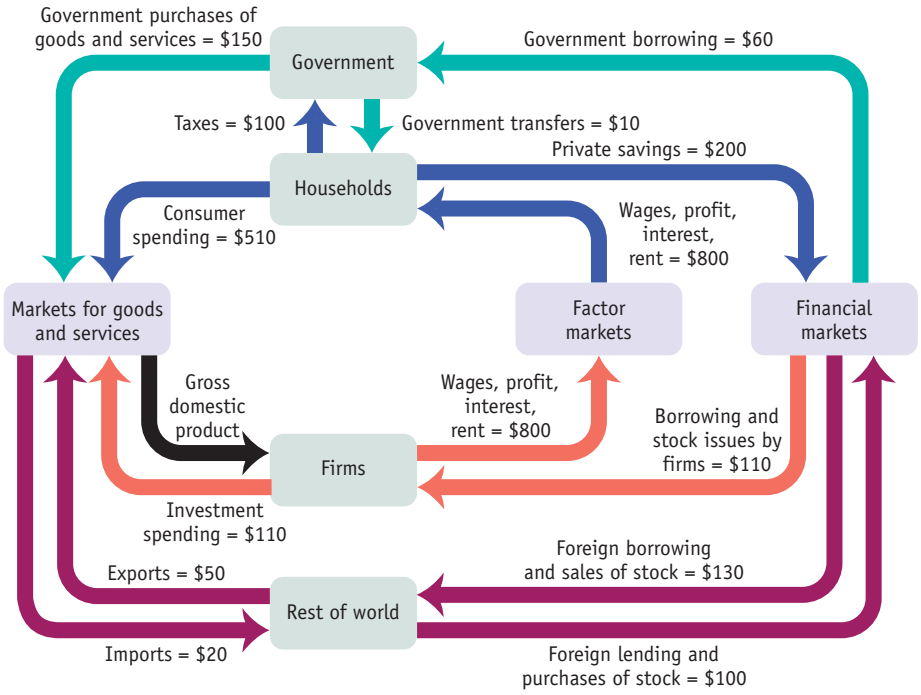
a. What is the value of GDP in Macronia?

b. What is the value of net exports?

c. What is the value of disposable income?

d. Does the total flow of money out of households—the sum of taxes paid, consumer spending, and private savings—equal the total flow of money into households?

e. How does the government finance its spending?



3. The components of GDP in the accompanying table were produced by the Bureau of Economic Analysis.

Category	Components of GDP in 2009 (billions of dollars)
Consumer spending	
Durable goods	$1,034.4
Nondurable goods	2,223.3
Services	6,835.0
Private investment spending	
Fixed investment spending	1,747.9
Nonresidential	1,386.6
Structures	480.7
Equipment and software	906
Residential	361.3
Change in private inventories	–125.0
Net exports	
Exports	1,560.0
Imports	1,950.1
Government purchases of goods and services and investment spending	
Federal	1,444.9
National defense	779.1
Nondefense	365.8
State and local	1,788.4

a. Calculate consumer spending.

b. Calculate private investment spending.

c. Calculate net exports.

d. Calculate government purchases of goods and services and investment spending.

e. Calculate gross domestic product.

f. Calculate consumer spending on services as a percentage of total consumer spending.

g. Calculate exports as a percentage of imports.

h. Calculate government purchases on national defense as a percentage of federal government purchases of goods and services.

4. The small economy of Pizzania produces three goods (bread, cheese, and pizza), each produced by a separate company. The bread and cheese companies produce all the inputs they need to make bread and cheese, respectively. The pizza company uses the bread and cheese from the other companies to make its pizzas. All three companies employ labor to help produce their goods, and the difference between the value of goods sold and the sum of labor and input costs is the firm's profit. The accompanying table summarizes the activities of the three companies when all the bread and cheese produced are sold to the pizza company as inputs in the production of pizzas.

	Bread company	Cheese company	Pizza company
Cost of inputs	$0	$0	$50 (Bread) 35 (Cheese)
Wages	15	20	75
Value of output	50	35	200

a. Calculate GDP as the value added in production.

b. Calculate GDP as spending on final goods and services.

c. Calculate GDP as factor income.

5. The economy of Pizzanistan resembles Pizzania (from Problem 4) except that bread and cheese are sold both to a pizza company as inputs in the production of pizzas and to consumers as final goods. The accompanying table summarizes the activities of the three companies.

	Bread company	Cheese company	Pizza company
Cost of inputs	$0	$0	$50 (Bread) 35 (Cheese)
Wages	25	30	75
Value of output	100	60	200

a. Calculate GDP as the value added in production.

b. Calculate GDP as spending on final goods and services.

c. Calculate GDP as factor income.

6. The accompanying table shows data on nominal GDP (in billions of dollars), real GDP (in billions of year 2000 dollars), and population (in thousands) of the United States in 1960, 1970, 1980, 1990, 2000, and 2007, years in which the U.S. price level consistently rose.

Year	Nominal GDP (billions of dollars)	Real GDP (billions of 2000 dollars)	Population (thousands)
1960	$526.4	$2,501.8	180,671
1970	1,038.5	3,771.9	205,052
1980	2,789.5	5,161.7	227,726
1990	5,803.1	7,112.5	250,132
2000	9,817.0	9,817.0	282,388
2007	13,841.3	11,566.8	301,140

a. Why is real GDP greater than nominal GDP for all years before 2000 and lower for 2007? Does nominal GDP have to equal real GDP in 2000?

b. Calculate the percent change in real GDP from 1960 to 1970, 1970 to 1980, 1980 to 1990, and 1990 to 2000. Which period had the highest growth rate?

c. Calculate real GDP per capita for each of the years in the table.

d. Calculate the percent change in real GDP per capita from 1960 to 1970, 1970 to 1980, 1980 to 1990, and 1990 to 2000. Which period had the highest growth rate?

e. How do the percent change in real GDP and the percent change in real GDP per capita compare? Which is larger? Do we expect them to have this relationship?

7. Eastland College is concerned about the rising price of textbooks that students must purchase. To better identify the increase in the price of textbooks, the dean asks you, the Economics Department's star student, to create an index of textbook prices. The average student purchases three English, two math, and four economics textbooks. The prices of these books are given in the accompanying table.

	2008	2009	2010
English textbook	$50	$55	$57
Math textbook	70	72	74
Economics textbook	80	90	100

a. What is the percent change in the price of an English textbook from 2008 to 2010?

b. What is the percent change in the price of a math textbook from 2008 to 2010?

c. What is the percent change in the price of an economics textbook from 2008 to 2010?

d. Using 2008 as a base year, create a price index for these books for all years.

e. What is the percent change in the price index from 2008 to 2010?

8. The consumer price index, or CPI, measures the cost of living for a typical urban household by multiplying the price for each category of expenditure (housing, food, and so on) times a measure of the importance of that expenditure in the average consumer's market basket and summing over all categories. However, using data from the consumer price index, we can see that changes in the cost of living for different types of consumers can vary a great deal. Let's compare the cost of living for a hypothetical retired person and a hypothetical college student. Let's assume that the market basket of a retired person is allocated in the following way: 10% on housing, 15% on food, 5% on transportation, 60% on medical care, 0% on education, and 10% on recreation. The college student's market basket is allocated as follows: 5% on housing, 15% on food, 20% on transportation, 0% on medical care, 40% on education, and 20% on recreation. The accompanying table shows the December 2009 CPI for each of the relevant categories.

	CPI December 2009
Housing	215.5
Food	218.0
Transportation	188.3
Medical care	379.5
Education	128.9
Recreation	113.2

Calculate the overall CPI for the retired person and for the college student by multiplying the CPI for each of the categories by the relative importance of that category to the individual and then summing each of the categories. The CPI for all items in December 2009 was 215. How do your calculations for a CPI for the retired person and the college student compare to the overall CPI?

9. Each month the Bureau of Labor Statistics releases the Consumer Price Index Summary for the previous month. Go to www.bls.gov and find the latest report. (On the Bureau of Labor Statistics home page, click on "News Release" under "Latest Numbers—Consumer Price Index" and then choose "Consumer Price Index Summary.") What was the CPI for the previous month? How did it change from the month before? How did it change over the last year?

10. The accompanying table provides the annual real GDP (in billions of 2000 dollars) and nominal GDP (in billions of dollars) for the United States.

	2002	2003	2004	2005	2006
Real GDP (billions of 2000 dollars)	$10,048.8	10,301.0	10,675.8	11,003.4	11,319.4
Nominal GDP (billions of dollars)	$10,469.6	10,960.8	11,685.9	12,433.9	13,194.7

a. Calculate the GDP deflator for each year.

b. Use the GDP deflator to calculate the inflation rate for all years except 2002.

11. The cost of a college education in the United States is rising at a rate faster than inflation. The table below shows the average cost of a college education in the United States in 2006 and 2007 for public and private colleges. Assume the costs listed in the table are the only costs experienced by the various college students in a single year.

a. Calculate the cost of living for an average college student in each category for 2006 and 2007.

b. Assume the quantity of goods purchased in each category, that is, the market basket, is identical for 2006 and 2007. Calculate an inflation rate for each type of college student between 2006 and 2007.

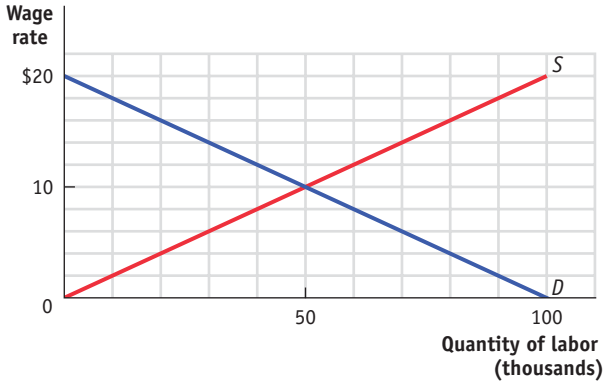
	Cost of college education (averages in 2006 dollars)				
	Tuition and fees	Books and supplies	Room and board	Transportation	Other expenses
Two-year public college: commuter	$2,272	$850	$6,299	$1,197	$1,676
Four-year public college: resident	5,836	942	6,690	880	1,739
Four-year public college: commuter	5,836	942	6,917	1,224	2,048
Four-year public college: out-of-state	15,783	942	6,960	880	1,739
Four-year private college: resident	22,218	935	8,149	722	1,277
Four-year private college: commuter	22,218	935	7,211	1,091	1,630
	Cost of college education (averages in 2007 dollars)				
	Tuition and fees	Books and supplies	Room and board	Transportation	Other expenses
Two-year public college: commuter	$2,361	$921	$6,875	$1,270	$1,699
Four-year public college: resident	6,185	988	7,404	911	1,848
Four-year public college: commuter	6,185	988	7,419	1,284	2,138
Four-year public college: out-of-state	16,640	988	7,404	911	1,848
Four-year private college: resident	23,712	988	8,595	768	1,311
Four-year private college: commuter	23,712	988	7,499	1,138	1,664

12. Each month, usually on the first Friday of the month, the Bureau of Labor Statistics releases the Employment Situation Summary for the previous month. Go to www.bls.gov and find the latest report. (On the Bureau of Labor Statistics home page, on the left side of the page, find "Unemployment" and select "National Unemployment Rate. " You will find the Employment Situation Summary under "News Releases.") How does the unemployment rate compare to the rate one month earlier? How does the unemployment rate compare to the rate one year earlier?

13. In general, how do changes in the unemployment rate vary with changes in real GDP? After several quarters of a severe recession, explain why we might observe a decrease in the official unemployment rate. Could we see an increase in the official unemployment rate after several quarters of a strong expansion?

14. There is only one labor market in Profunctia. All workers have the same skills, and all firms hire workers with these skills. Use the accompanying diagram, which shows the supply of

and demand for labor, to answer the following questions. Illustrate each answer with a diagram.



a. What is the equilibrium wage rate in Profunctia? At this wage rate, what are the level of employment, the size of the labor force, and the unemployment rate?

b. If the government of Profunctia sets a minimum wage equal to $12 per hour, what will be the level of employment, the size of the labor force, and the unemployment rate?

c. If unions bargain with the firms in Profunctia and set a wage rate equal to $14, what will be the level of employment, the size of the labor force, and the unemployment rate?

d. If the concern for retaining workers and encouraging high-quality work leads firms to set a wage rate equal to $16, what will be the level of employment, the size of the labor force, and the unemployment rate?

15. A country's labor force is the sum of the number of employed and unemployed workers. The accompanying table provides data on the size of the labor force and the number of unemployed workers for different regions of the United States.

	Labor force (thousands)		Unemployed (thousands)	
Region	March 2007	March 2008	March 2007	March 2008
Northeast	27,863.5	28,035.6	1,197.8	1,350.3
South	54,203.8	54,873.9	2,300.9	2,573.8
Midwest	34,824.3	35,048.6	1,718.2	1,870.8
West	35,231.8	35,903.3	1,588.0	1,914.4

a. Calculate the number of workers employed in each of the regions in March 2007 and March 2008. Use your answers to calculate the change in the total number of workers employed between March 2007 and March 2008.

b. For each region, calculate the growth in the labor force from March 2007 to March 2008.

c. Compute unemployment rates in the different regions of the country in March 2007 and March 2008.

d. What can you infer about the rise in unemployment rates over this period? Was it caused by a net loss in the number of jobs or by a large increase in the number of people seeking jobs?

16. In which of the following cases is it likely for efficiency wages to exist? Why?

a. Jane and her boss work as a team selling ice cream.

b. Jane sells ice cream without any direct supervision by her boss.

c. Jane speaks Korean and sells ice cream in a neighborhood in which Korean is the primary language. It is difficult to find another worker who speaks Korean.

17. How will the following changes affect the natural rate of unemployment?

a. The government reduces the time during which an unemployed worker can receive benefits.

b. More teenagers focus on their studies and do not look for jobs until after college.

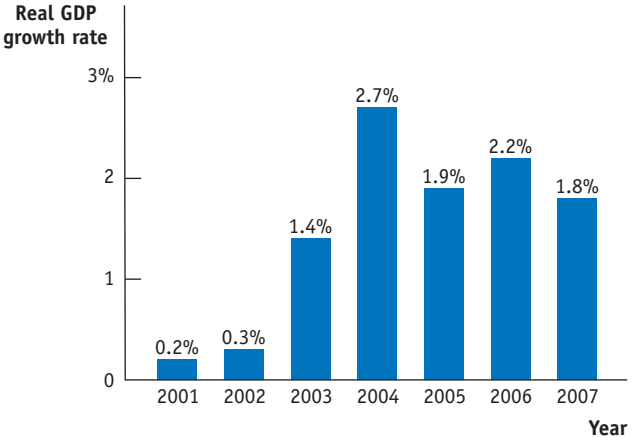
c. Greater access to the Internet leads both potential employers and potential employees to use the Internet to list and find jobs.

d. Union membership declines.

18. With its tradition of a job for life for most citizens, Japan once had a much lower unemployment rate than that of the United States; from 1960 to 1995, the unemployment rate in Japan exceeded 3% only once. However, since the crash of its stock market in 1989 and slow economic growth in the 1990s, the job-for-life system has broken down and unemployment rose to more than 5% in 2003.

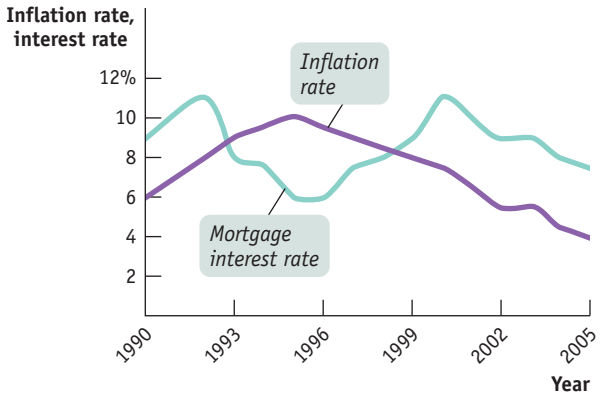
a. Explain the likely effect of the breakdown of the job-for-life system in Japan on the Japanese natural rate of unemployment.

b. As the accompanying diagram shows, the rate of growth of real GDP has picked up in Japan since 2001. Explain the likely effect of this increase in GDP growth on the unemployment rate. Is the likely cause of the change in the unemployment rate during this period a change in the natural rate of unemployment or a change in the cyclical unemployment rate?



Source: OECD.

19. The accompanying diagram shows mortgage interest rates and inflation during 1990–2005 in the economy of Albernia. When would home mortgages have been especially attractive and why?



20. The accompanying table provides the inflation rate in the year 2000 and the average inflation rate over the period 2000–2007 for eight different countries.

a. Given the expected relationship between average inflation and menu costs, rank the countries in descending order of menu costs using average inflation over the period 2000–2007.

b. Rank the countries in order of inflation rates that most favored borrowers with seven-year loans that were taken out in 2000. Assume that the expected inflation rate was the inflation rate in 2000.

c. Did borrowers who took out seven-year loans in Japan gain or lose overall versus lenders? Explain.

Country	Inflation rate in 2000	Average inflation rate, 2000–2007
Brazil	7.1%	7.3%
China	0.3	1.6
France	1.7	1.8
Indonesia	3.8	8.8
Japan	–0.7	–0.3
Turkey	56.4	27.8
United States	3.4	2.8
Zimbabwe	55.7	904.1

Source: IMF.