The following events occurred in January 2004.

January 9, 2004, 8:30 A.M.
The U.S. Department of Labor, Bureau of Labor Statistics (BLS) releases this statement: Employment was virtually unchanged in December, while the unemployment rate, at 5.7 percent, continued to trend down.

January 15, 2004, 7:42 A.M.
It’s Thursday, and Franklin Smithies has just gotten off the subway at Park Place, in the heart of the Financial District in Lower Manhattan. He sips his morning cup of coffee as he walks toward his office. As he walks, he thinks about what awaits him. Franklin manages the stock portfolio of one of the largest pension funds in the country, and in a little less than an hour, the BLS will issue a summary report on prices. What that report says will have much to do with how he spends the rest of his day.

January 15, 2004, 8:30 A.M.
The BLS releases this statement: The Consumer Price Index for All Urban Consumers (CPI-U) decreased 0.1 percent in December, before seasonal adjustment. The December level of 184.3 (1982–84 = 100) was 1.9 percent higher than in December 2002.

January 17, 2004, 8:00 P.M.
Todd and Ellen are in their seats in the dark movie theater as the trailers play. They’re waiting for the start of the *The Lord of the Rings: The Return of the King.* Although the release date for the movie was a month ago (December 17, 2003), the third in the *Lord of the Rings* trilogy is still playing to large crowds. Todd turns to Ellen and whispers, “I heard that this movie might be the biggest box office hit of all time—even bigger than *Titanic.*”

January 23, 3:18 P.M.
Catherine Lincoln picks up the phone to call her parents, both of whom are retired. When her father answers the phone, Catherine blurts out, “I got the job. And I got the salary I asked for—$50,000 a year.” Her father replies, “That’s a great salary—you’re rich. You can easily live on that salary. After all, your mother and I lived comfortably on my first salary of $8,000 a year.”

January 25, 10.07 A.M.
George Krenshaw, who has worked at T.R. Electronics for 10 years, is called into his boss’s office. George learns that the company has terminated his employment. “We have to cut back,” his boss says. “We just don’t have the business we once had.”

How would an economist look at these events? Later in the chapter, discussions based on the following questions will help you analyze the scene the way an economist would.

- How does the BLS compute the unemployment rate, and does it matter whether the unemployment rate is trending down or up?
- What does a report on prices have to do with what Franklin Smithies will do at work?
- How does the BLS compute the consumer price index, and what does it matter whether prices are rising or falling?
- What’s the best way to compare the gross receipts of two movies?
- Will Catherine be rich? How does her salary of $50,000 compare to her father’s first salary of $8,000?
- How long will George Krenshaw stay unemployed?
MACROECONOMIC MEASUREMENTS

A doctor often takes your temperature and blood pressure and, in some cases, may order a few tests. The doctor uses these measurements to learn about the condition of your body.

In a way, economists are the physicians of the economy. They often want to take the “temperature” or “blood pressure” of the economy. Their objective in taking such measurements is to find out how the economy is doing. Is it well and healthy? Is it getting sick? If it is getting sick, is there any “medicine” that can be prescribed?

Some of the things that economists measure are prices (Are prices rising or falling?), the unemployment rate (Is the unemployment rate rising or falling?), and the total market value of all final goods and services produced in the economy (Is the economy producing more goods or fewer goods?).

This chapter explains how economists measure prices and the unemployment rate. The next chapter shows how economists measure the market value of the goods and services the economy produces.

MEASURING PRICES

Before we can measure prices, we need to know what “price” means in macroeconomics. Price in macroeconomics does not usually refer to a single price, such as the price of cars or the price of computers. Price in macroeconomics usually refers to an aggregate price, a price level, a price index, or an average price.

For example, suppose books and pens are the only two goods in an economy. Books are priced at $10 each and pens at $1 each. Without considering the quantity of each good, the average price in this tiny economy is $5.50. When economists talk about price stability, they are referring to the average price, price level, or price index remaining constant.

Measuring Prices Using the CPI

The price level is a weighted average of the prices of all goods and services. Economists measure the price level by constructing a price index. One major price index is the consumer price index (CPI).

Computing the CPI

The CPI is calculated by the Bureau of Labor Statistics (BLS) through its sampling of thousands of households and businesses. When a news report says that the “cost of living” increased by, say, 7 percent, it is usually referring to the CPI.¹

The CPI is based on a representative group of goods and services purchased by a typical household. This representative group of goods is called the market basket. The market basket includes eight major categories of goods and services: food and beverages, housing, apparel, transportation, medical care, recreation, education and communication, and other goods and services. Some examples of these goods and services are breakfast cereal, milk, coffee, bedroom furniture, men’s shirts, women’s dresses, jewelry, new vehicles, airline fares, gasoline, prescription drugs, cable television, sports equipment, college tuition, postage, and haircuts.

To simplify our discussion, we assume the market basket includes only three goods instead of the many goods it actually contains. Our market basket consists of 10 pens, 5 shirts, and 3 pairs of shoes.

¹. Although changes in the CPI are often used to compute the change in the “cost of living,” one’s cost of living usually involves more than is measured by the CPI. For example, the CPI does not include income taxes, yet income taxes are a part of the cost of living for most people.
To calculate the CPI, we must first calculate the total dollar expenditure on the market basket in two years: the current year and the base year. The base year is a benchmark year that serves as a basis of comparison for prices in other years.

In Exhibit 1, we multiply the quantity of each good in the market basket (column 1) times its current-year price (column 2) to compute the current-year expenditure on each good (column 3). By adding the dollar amounts in column 3, we obtain the total dollar expenditure on the market basket in the current year. This amount is $167.

To find the total expenditure on the market basket in the base year, we multiply the quantity of each good in the market basket (column 1A) times its base-year price (column 2A) and then add these products (column 3A). This gives us $67.

To find the CPI, we use the formula:

$$\text{CPI} = \frac{\text{Total dollar expenditure on market basket in current year}}{\text{Total dollar expenditure on market basket in base year}} \times 100$$

As shown in Exhibit 1, the CPI for our tiny economy is 249.

The consumer price index for the United States for the years 1959 to 2003 is shown in Exhibit 2.

**More About the Base Year**

Recall that the base year is a benchmark year that serves as a basis of comparison for prices in other years. The CPI in the base year is 100. How do we know this? Well, look again at the formula for calculating the CPI. The numerator is the “total dollar expenditure on market basket in current year” and the denominator is the “total dollar expenditure on market basket in base year.” In the base year, the current year is the base year so the numerator and denominator are the same. The ratio is 1, and $1 \times 100 = 100$.

But if you look at Exhibit 2, you will notice that there is no year where the CPI is 100. Does this mean that there is no base year? Not at all. The base year has been defined by the government to be the period 1982–84. Look at the CPI in each of the years 1982, 1983, and 1984. If we add the CPIs for the three years and divide by 3, we get 100: $(96.5 + 99.6 + 103.9) ÷ 3 = 100$.

<table>
<thead>
<tr>
<th>(1) Market Basket</th>
<th>(2) Current-Year Prices (per item)</th>
<th>(3) Current-Year Expenditures</th>
<th>(1A) Market Basket</th>
<th>(2A) Base-Year Prices (per item)</th>
<th>(3A) Base-Year Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 pens</td>
<td>×</td>
<td>$ .70</td>
<td>$ 7.00</td>
<td>10 pens</td>
<td>×</td>
</tr>
<tr>
<td>5 shirts</td>
<td>×</td>
<td>14.00</td>
<td>70.00</td>
<td>5 shirts</td>
<td>×</td>
</tr>
<tr>
<td>3 pairs of shoes</td>
<td>×</td>
<td>30.00</td>
<td>90.00</td>
<td>3 pairs of shoes</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>$167.00</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total dollar expenditure on market basket in current year

Total dollar expenditure on market basket in base year

CPI = \left( \frac{\text{Total dollar expenditure on market basket in current year}}{\text{Total dollar expenditure on market basket in base year}} \right) \times 100

= \left( \frac{\$167}{\$67} \right) \times 100

= 249
When We Know the CPI for Various Years, We Can Compute the Percentage Change in Prices

To find the percentage change in prices between any two years, we use the following formula:

\[
\text{Percentage change in prices} = \left( \frac{\text{CPI}_{\text{later year}} - \text{CPI}_{\text{earlier year}}}{\text{CPI}_{\text{earlier year}}} \right) \times 100
\]

For example, Exhibit 2 shows that the CPI in 1990 was 130.7 and the CPI in 2003 was 184.0. What was the percentage change in prices over this period of time? It was 40.78 percent: \[
\left( \frac{184.0 - 130.7}{130.7} \right) \times 100 = 40.78.
\]

This means that from 1990 to 2003, prices increased 40.78 percent. You can think of the percentage change in prices this way: What cost $1 in 1990 cost approximately $1.41 in 2003.

Consider another time period. Between 1980 and 2000, prices in the United States increased more than 108 percent: \[
\left( \frac{172.2 - 82.4}{82.4} \right) \times 100 = 108.98.
\]

Does this mean that the price of every good increased by this percentage? No. Some increased by more and some increased by less. For example, food and beverage prices increased 94 percent, housing prices increased 109 percent, telephone service prices increased 26 percent, and motor fuel prices increased 32 percent. Two of the bigger price increases during this period were in medical care and college tuition. Medical care costs increased 248 percent, and college tuition increased 368 percent.

**Inflation and the CPI**

**Inflation** is an increase in the price level and is usually measured on an annual basis. The **inflation rate** is the positive percentage change in the price level on an annual basis. For example, the inflation rate for 2000 is the percentage change in prices from the end of December 1999 through the end of December 2000. Although we do not show these data in a table, the CPI in December 1999 was 168.9 and the CPI in December 2000 was 174.6. This means the inflation rate in 2000 was approximately 3.4 percent.

When you know the inflation rate, you can find out whether your income is (1) keeping up with, (2) not keeping up with, or (3) more than keeping up with inflation. How you are doing depends on whether your income is rising by (1) the same percentage as, (2) a lesser percentage than, or (3) a greater percentage than the inflation rate, respectively.

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**ANALYZING THE SCENE**

**Questions from Setting the Scene:** How does the BLS compute the consumer price index, and what does it matter whether prices are rising or falling? What does a report on prices have to do with what Franklin Smithies will do at work?

This section shows how to compute the CPI: define the market basket of goods, collect prices in the base year and current year, and carry out some simple arithmetic operations. Does it matter whether prices rise or fall? As you will find out in later chapters, it does. For now, though, let’s consider what a report on prices (and whether prices are rising or falling) has to do with what Franklin Smithies will do at work.

Franklin manages the stock portfolio of one of the largest pension funds in the country. Often stock portfolio managers use price reports to get a hint of what the Federal Reserve will do in the near future. (The Federal Reserve is the monetary authority of the United States, capable of increasing and decreasing the money supply, influencing interest rates, and so on.)

For example, Franklin might reason: If prices have recently risen sharply, the Federal Reserve may try to slow down price rises by raising interest rates. Higher interest rates may adversely affect the stocks I recently purchased, so the best thing for me to do is to sell some stocks.
Another way to look at this is to compute and compare your real income for different years. **Real income** is a person’s **nominal income** (or money income) adjusted for any change in prices. Real income is computed as follows:

\[
\text{Real income} = \left( \frac{\text{Nominal income}}{\text{CPI}} \right) \times 100
\]

**Case 1. Keeping Up With Inflation: Real Income Stays Constant**
Jim earns $50,000 in year 1 and $55,000 in year 2. The CPI is 100 in year 1 and 110 in year 2. Jim’s income has risen by 10 percent \(((55,000 - 50,000)/50,000) \times 100 = 10\), and the inflation rate is 10 percent \(((110 - 100)/100) \times 100 = 10\). Jim’s income has risen by the same percentage as the inflation rate, so he has kept up with inflation. This is evident when we see that Jim’s real income is the same in the two years. In year 1, it is $50,000, and in year 2, it is $50,000 too.

\[
\begin{align*}
\text{Real income year 1} &= \frac{50,000}{100} \times 100 = 50,000 \\
\text{Real income year 2} &= \frac{55,000}{110} \times 100 = 50,000 
\end{align*}
\]

**Case 2. Not Keeping Up With Inflation: Real Income Falls**
Karen earns $50,000 in year 1 and $52,000 in year 2. The CPI is 100 in year 1 and 110 in year 2. Karen’s income has risen by 4 percent, and the inflation rate is 10 percent. Her income has risen by a lesser percentage than the inflation rate, so she has not kept up with inflation. Karen’s real income has fallen from $50,000 in year 1 to $47,273 in year 2.

\[
\begin{align*}
\text{Real income year 1} &= \frac{50,000}{100} \times 100 = 50,000 \\
\text{Real income year 2} &= \frac{52,000}{110} \times 100 = 47,273 
\end{align*}
\]

**Case 3. More Than Keeping Up With Inflation: Real Income Rises**
Carl earns $50,000 in year 1 and $60,000 in year 2. The CPI is 100 in year 1 and 110 in year 2. Carl’s income has risen by 20 percent, and the inflation rate is 10 percent. His income has risen by a greater percentage than the inflation rate, so he has more than kept up with inflation. Carl’s real income has risen from $50,000 in year 1 to $54,545 in year 2.

\[
\begin{align*}
\text{Real income year 1} &= \frac{50,000}{100} \times 100 = 50,000 \\
\text{Real income year 2} &= \frac{60,000}{110} \times 100 = 54,545 
\end{align*}
\]

**How Is the CPI Used?**
The CPI is used (1) as an economic indicator, (2) to find the real value of an economic variable, and (3) to adjust certain income payments.

We have already seen how the CPI is used as an economic indicator. Essentially, it is used to measure the inflation rate. The inflation rate, in turn, is often used by policymakers to determine the success of government economic policy. For example, suppose the government wants to lower the nation’s inflation rate. With this in mind, it undertakes policies X and Y. Two years later, it uses the CPI to measure the inflation rate over the past two years. If the inflation rate has not fallen, the government knows that its policies to lower the inflation rate have been unsuccessful.

We have also seen how the CPI can be used to find the real value of an economic variable. We used the CPI to turn nominal income into real income. The CPI can also be used

**Thinking Like an Economist**
Comparing one thing with something else can be extremely useful. For example, in each of these three cases, we compared the percentage change in a person’s nominal income with the inflation rate. Through this comparison, we learned something that we could not have learned by looking at either factor alone: how a person fared under inflation. Making comparisons is part of the economic way of thinking.
Getting the Numbers Wrong

Government statisticians compute various price indices, such as the consumer price index. By comparing a price index for one month or year to the same index for another month or year, we can find out whether prices (in general) have been rising, falling, or remaining stable.

Often, a price index is used by government officials to determine whether or not their economic policies are working. For example, suppose the government undertakes various economic policies in order to bring down the rate of increase in prices. Specifically, suppose prices have been rising 8 percent a year and the government wants to bring the rate down to an annual increase of 1 percent a year. Looking at changes in a price index will tell the government whether or not its policies are working.

Price indices are also used by certain businesses. For example, a business might determine its wage increases based on what is happening to prices. Specifically, management might have agreed to raise employees’ wages each year by the rate of increase in the CPI. If the CPI rises by 3 percent, then employees get a 3 percent raise; if the CPI rises by 7 percent, then employees get a 7 percent raise.

Most people assume the government agencies that compute price indices do their jobs correctly. If a government agency reports that prices have risen 4.5 percent over the last year, then this is how much prices have risen. But government agencies are made up of people, and people are not infallible. What would happen if a government agency made a mistake?

South Africa found out what would happen in 2003 when Statistics South Africa, the government agency responsible for collecting price data and computing various price indices, miscalculated various price indices. Specifically, it made a mistake in calculating rents. The problem compounded over time, and by March 2003, one major price index was reported as 1.9 points higher than it really was. In other words, instead of stating that prices had risen, say, by 8.2 percent, Statistics South Africa reported that prices had risen by 10.1 percent.

How important was a 1.9 point error? Well, the central bank of South Africa looked at the data and thought that it was failing to bring prices down, and so it began to institute a tighter monetary policy. Also, wages tied to the price index went up higher than warranted, and many state-run companies, such as the Post Office, raised the price of stamps by more than was warranted.

In other words, because one mistake was made (the price index was not computed correctly), many other mistakes followed. When it comes to computing prices, a little mistake has far-reaching effects.

The Substitution Bias in Fixed-Weighted Measures

Look at Exhibit 1 where the CPI was first calculated. Notice that the market basket in both the current year and the base year is the same: 10 pens, 5 shirts, and 3 pairs of shoes. In the base year, the person bought 10 pens, 5 shirts, and 3 pairs of shoes, and even though the prices of all three of these items increased, she continued to buy the same
quantity of each. This is like saying that Michael purchased two pounds of beef a week in 2002, and even though the price of beef increased between, say, 2002 and 2003, he continued to buy two pounds of beef a week. In reality, what Michael is likely to have done is substitute, say, chicken for beef if the price of beef increased relatively more than the price of chicken during the time period in question. In other words, Michael’s buying behavior is likely to have responded to changes in relative prices.

Any price index that uses fixed quantities of goods, and therefore does not reflect the fact that people might substitute one good for another as the price of one good rises relative to another, is called a fixed-weighted price index. All fixed-weighted price measures have a substitution bias—they do not regularly account for the substitutions that individuals are likely to make. As a result of the substitution bias, a fixed-weighted price index can “overstate the cost of living.” We explain how a fixed-weighted price index “overstates the cost of living,” in the following paragraphs.

Suppose a fixed-weighted price index—such as the CPI—is 100 in year 1 and 110 in year 2. Some people would loosely say that there has been a rise in the cost of living. In this context, a rise in the cost of living means that it takes more money in year 2 to purchase the same bundle of goods that was purchased in year 1. But this implicitly assumes that one’s standard of living is obtained in only one way: by purchasing a constant, or fixed, bundle of goods. In reality this probably isn’t true. Different bundles of goods may represent equivalent standards of living.

For example, assume bundle A, consists of two pounds of beef, one loaf of bread, and three boxes of Frosted Flakes cereal and bundle B consists of two pounds of chicken, one loaf of bread, and three boxes of Honey Nut Cheerios. Furthermore, assume (1) bundles A and B represent equivalent standards of living; (2) a buyer is currently purchasing bundle A, which costs $100 over some time period; (3) the cost of purchasing bundle A rises to $110, prompting the buyer to substitute bundle B for bundle A; and (4) bundle B costs $100.

Has the cost of living increased for this person? If we base our answer on purchasing a fixed bundle of goods—bundle A—the answer is yes because the price of purchasing bundle A has risen from $100 to $110. But if we allow for substitutions (of bundles) and bundles A and B represent equivalent standards of living, then the answer is no because the cost of buying an equivalent bundle remains constant at $100. Many economists believe that allowing for substitutions is the only justifiable way of measuring the cost of living. Any method that does not allow for substitutions can result in overstating the change in the cost of living.

For many years, economists criticized the use of the CPI (a fixed-weighted price index), largely because the expenditure weights of the various goods and services in the market basket were changed only once a decade. This meant that the market basket used to measure the CPI was the same for a decade or longer even though substitutions were taking place during this time. Recently, the BLS decided to update the expenditure weights of the market basket (used to compute the CPI) every two years.

**GDP Implicit Price Deflator**

Besides the CPI, there is another price index that is often cited—the GDP deflator or the GDP implicit price deflator. As you know, the CPI is based on a representative group of goods and services (the market basket) purchased by a typical household. Obviously, there are more goods and services produced in an economy than find their way into the market

3. The “expenditure weights” refer to the quantities of each good in the market basket. For example, the expenditure weight for pens in our market basket in Exhibit 1 is 10.
basket. The GDP implicit price deflator, unlike the CPI, is based on all goods and services produced in an economy.

**Converting Dollars From One Year to Another**

Suppose someone says to you, “Back in 1960, I had an annual salary of $10,000 a year. That sure isn’t much these days.” Of course, the person is right in one sense: an annual salary of $10,000 doesn’t buy much these days. But was $10,000 a good salary back in 1960? It certainly could have been because prices in 1960 weren’t as high as they are today. For example, the CPI was 29.6 in 1960 and it was 184.0 in 2003. In other words, one of the things that make a salary “good” or “not so good” is what the salary can buy.

Now suppose someone tells you that a $10,000 salary in 1960 is the same as a $62,162 salary today. Would you then better understand the 1960 $10,000 salary? Of course you would because you understand what it means to earn $62,162 today.

Economists convert a past salary into a salary today by using this formula:

\[
\text{Salary in today's (current) dollars} = \frac{\text{Salary}_{\text{earlier year}} \times \left( \frac{\text{CPI}_{\text{current year}}}{\text{CPI}_{\text{earlier year}}} \right)}{1}.
\]

Assume the CPI today is the same as the most recent CPI in Exhibit 2 (which is the CPI for 2003). Using the formula, we get:

\[
\text{Salary in 2003 dollars} = \frac{\text{Salary}_{\text{1960}}} {\frac{\text{CPI}_{\text{2003}}}{\text{CPI}_{\text{1960}}}} = \frac{10,000 \times 184.0}{29.6} = 62,162.
\]

#### ANALYZING THE SCENE

**Questions from Setting the Scene: What's the best way to compare the gross receipts of two movies?**

Will Catherine be rich? How does her salary of $50,000 compare to her father's first salary of $8,000?

Todd says that he had heard *The Lord of the Rings: The Return of the King* might be the biggest box office hit of all times—even bigger than *Titanic*. But *Titanic* was released in 1997 and *The Lord of the Rings: The Return of the King* was released in 2003. The CPI was 160.5 in 1997 and 184 in 2003, so prices had risen 14.64 percent during this time period. The best way to compare the gross receipts of the two movies is to convert *Titanic* receipts into 2003 dollars. Then the receipts for both movies will be expressed in terms of the same year.

The questions about Catherine's salary and her father's salary are also related to comparing dollars in one year to dollars in a different year. Catherine's father is quite happy about Catherine's salary of $50,000. He thinks Catherine is rich because her salary is a lot larger than his first starting salary of $8,000. But when Catherine's father earned $8,000, prices were lower than prices were in January 2004. Suppose Catherine's father earned the $8,000 in, say, 1960. By converting 1960 dollars into 2004 dollars (CPI in January 2004 was 185.2), we find that earning $8,000 in 1960 is equivalent to earning $50,054 today. So, Catherine's salary is $54 less than her father earned in 1960.

#### SELF-TEST

(Answers to Self-Test questions are in the Self-Test Appendix.)

1. Explain how the CPI is calculated.
2. If the CPI at the end of December in year 1 is 132.5 and the CPI at the end of December in year 2 is 143.2, what is the inflation rate?
3. In year 1, your annual income is $45,000 and the CPI is 143.6; in year 2, your annual income is $51,232 and the CPI is 150.7. Has your real income risen, fallen, or remained constant? Explain your answer.
Who Earned More as President: John F. Kennedy or George W. Bush?

You know how to compute the CPI and how to use it to find the percentage change in prices between years. We can do something else with the CPI. We can use it to find out who earned more as President—John F. Kennedy or George W. Bush.

John F. Kennedy was President in 1961; his annual salary that year was $100,000. George W. Bush was President in 2003; his annual salary that year was $400,000. It seems clear that Bush earned more as President than Kennedy did.

But wait; have we considered everything? No. The dollars Kennedy was paid as President had greater purchasing power than the dollars Bush was paid as President. One dollar in 1961 bought more goods and services than one dollar in 2003 did. To accurately compare their salaries, we need to convert Kennedy’s 1961 salary of $100,000 into 2003 dollars.

\[
\text{Kennedy’s salary in 2003 dollars} = 100,000 \times \left( \frac{184.0}{29.9} \right) = 615,385
\]

So, in 2003 dollars, Kennedy earned $615,385; Bush, of course, earned $400,000 in 2003.

MEASURING UNEMPLOYMENT

Every month, the government surveys thousands of households to gather information about labor market activities. It uses the information from the survey to derive the number of Americans unemployed.

Who Are the Unemployed?
The total population of the United States can be divided into two broad groups (Exhibit 3). One group consists of persons who are (1) under 16 years of age, (2) in the armed forces, or (3) institutionalized—that is, they are in a prison, mental institution, or home for the aged. The second group, which consists of all others in the total population, is called the civilian noninstitutional population.

The civilian noninstitutional population, in turn, can be divided into two groups: persons not in the labor force and persons in the civilian labor force. (Economists often refer to the “labor force” instead of the “civilian labor force.”)

Civilian noninstitutional population = Persons not in the labor force + Persons in the labor force

Those persons not in the labor force are neither working nor looking for work. For example, people who are retired, who are engaged in own-home housework, or who choose not to work fall into this category.

Persons in the civilian labor force fall into one of two categories: employed or unemployed.

Civilian labor force = Employed persons + Unemployed persons
Economics at the Movies

Some movies do better at the box office than other movies. For example, Finding Nemo, a movie released in 2003, earned higher gross receipts than Pirates of the Caribbean, another movie released in 2003. Finding Nemo had domestic gross receipts of $339 million and Pirates of the Caribbean had domestic gross receipts of $305 million.

As of January 2004, the following list ranks the all-time top 10 movies in the United States in terms of gross receipts:

1. Titanic (1997)
2. Star Wars (1977)

Titanic, first on this list, earned gross receipts in the United States of $600 million, and Star Wars, in second place, earned $461 million. Comparing these two dollar amounts, it is easy to conclude that Titanic did better at the box office than Star Wars did.

But notice that Titanic was released in 1997 and Star Wars was released 20 years earlier in 1977. In other words, the receipts for Titanic are in 1997 dollars and those for Star Wars are in 1977 dollars. To accurately compare the receipts of the two movies, we need to put them on an even footing. To do this, we need to change each movie’s receipts into today’s dollars.

In today’s dollars, Titanic earned $672 million and Star Wars earned $1.3 billion. Thus, when we convert the gross receipts to today’s dollars, we find that Star Wars did better at the box office than Titanic did.

In today’s dollars, here are the top 10 movies of all times in terms of domestic gross receipts:

1. Gone with the Wind (1939)
2. Star Wars (1977)
3. The Sound of Music (1965)
5. Titanic (1997)
6. The Ten Commandments (1956)
7. Jaws (1975)
8. Doctor Zhivago (1965)
9. The Exorcist (1973)
10. Snow White and the Seven Dwarfs (1937)

exhibit 3

Breakdown of the U.S. Population and the Labor Force
According to the BLS, employed persons consist of:

- All persons who did any work for pay or profit during the survey reference week.
- All persons who did at least 15 hours of unpaid work in a family-operated enterprise.
- All persons who were temporarily absent from their regular jobs because of illness, vacation, bad weather, industrial dispute, or various personal reasons.

According to the BLS, unemployed persons consist of:

- All persons who did not have jobs, made specific active efforts to find a job during the prior four weeks, and were available for work.
- All persons who were not working and were waiting to be called back to a job from which they had been temporarily laid off.

**The Unemployment and Employment Rates**

The unemployment rate is the percentage of the civilian labor force that is unemployed. It is equal to the number of unemployed persons divided by the civilian labor force.

\[
\text{Unemployment rate (U)} = \frac{\text{Number of unemployed persons}}{\text{Civilian labor force}}
\]

In December 2003, the civilian labor force consisted of 146.8 million people. The number of unemployed persons totaled 8.4 million, so the unemployment rate was 5.72 percent.

The employment rate (sometimes referred to as the employment/population ratio) is the percentage of the civilian noninstitutional population that is employed. It is equal to the number of employed persons divided by the civilian noninstitutional population:

\[
\text{Employment rate (E)} = \frac{\text{Number of employed persons}}{\text{Civilian noninstitutional population}}
\]

In recent years, the employment rate has ranged between 61 and 64 percent. In other words, between 61 and 64 percent of the civilian noninstitutional population is employed.

Notice that the sum of the unemployment rate and the employment rate is not 100 percent. In other words if the unemployment rate is 6 percent, it does not follow that the employment rate is 94 percent. The denominator of the unemployment rate and the employment rate are not the same, so the two rates are percentages of different totals. The unemployment rate is a percentage of the civilian labor force. The employment rate is a percentage of the civilian noninstitutional population, which is a larger number than the civilian labor force.

Finally, the labor force participation rate (LFPR) is the percentage of the civilian noninstitutional population that is in the civilian labor force.

\[
\text{Labor force participation rate (LFPR)} = \frac{\text{Civilian labor force}}{\text{Civilian noninstitutional population}}
\]

In recent years the labor force participation rate has been about 67 percent.

The LFPR may sound like the employment rate, but it is different. Although the denominator in both is the same, the numerator in the employment rate is the number of employed persons and the numerator in the LFPR is the civilian labor force (which consists of both employed persons and unemployed persons). For this reason, some econo-
omists say that while the employment rate gives us the percentage of the population that is working, the LFPR gives us the percentage of the population that is willing to work.

**Reasons for Unemployment**

Usually, we think of an unemployed person as someone who has been fired or laid off from his or her job. Certainly some unemployed persons fit this description, but not all of them do. According to the BLS, an unemployed person may fall into one of four categories.

1. **Job loser.** This is a person who was employed in the civilian labor force and was either fired or laid off. Most unemployed persons fall into this category. In December 2003, 55 percent of all unemployed persons fell into this category.
2. **Job leaver.** This is a person employed in the civilian labor force who quits his or her job. For example, if Jim quit his job with company $X$ and is looking for a better job, then he is a job leaver. In December 2003, 9 percent of all unemployed persons fell into this category.
3. **Reentrant.** This is a person who was previously employed, hasn't worked for some time, and is currently reentering the labor force. In December 2003, 29 percent of all unemployed persons fell into this category.
4. **New entrant.** This is a person who has never held a full-time job for two weeks or longer and is now in the civilian labor force looking for a job. In December 2003, 7 percent of all unemployed persons fell into this category.

$$\text{Unemployed persons} = \text{Job losers} + \text{Job leavers} + \text{Reentrants} + \text{New entrants}$$

**Discouraged Workers**

Suppose Adam is fired from his job at company $A$ in September. He looks for a job for about six months. During this time, he is considered an unemployed person and is counted in the unemployment rate. At the end of the sixth month, Adam is very discouraged; he doesn’t think he will ever find a job, and so he stops looking. A month passes and he continues not to look for a job. Is Adam still considered an unemployed person? The answer is no. Remember, to be an unemployed person you have to meet certain conditions, one of which is that you have to be actively looking for work. But Adam isn’t actively looking for work, and he isn’t waiting to be called back to a job or to report to a job. So Adam isn’t unemployed. Because Adam is not unemployed, he does not get counted in the unemployment rate.
The BLS considers Adam a *discouraged worker*. You may think that for all practical purposes, a discouraged worker is the same as an unemployed person (because neither has a job). But they aren’t the same for calculating the unemployment rate. The unemployed person gets counted and the discouraged worker does not.

Some economists think that because discouraged workers are not considered unemployed, the unemployment rate is biased downward. Consequently, it doesn’t really give us a good fix on the “real unemployment problem” in society.

**Types of Unemployment**

This section describes a few types of unemployment.

**Frictional Unemployment**

Every day, demand conditions change in some markets, causing qualified individuals with transferable skills to leave some jobs and move to others. To illustrate, suppose there are two computer firms, A and B. For some reason, the demand falls for firm A’s computers and the demand rises for firm B’s computers. Consequently, firm A produces fewer computers. With fewer computers being produced, firm A doesn’t need as many employees, so it fires some employees. On the other hand, firm B produces more computers. With more computers being produced, firm B hires additional employees. The employees fired from firm A have skills that they can transfer to firm B—after all, both firms produce computers. However, it takes time for people to transfer from one firm to another. During this time, they are said to be frictionally unemployed.

The unemployment owing to the natural “frictions” of the economy, which is caused by changing market conditions and is represented by qualified individuals with transferable skills who change jobs, is called **frictional unemployment**. We use the symbol $U_f$ to designate the frictional unemployment rate, which is the percentage of the labor force that is frictionally unemployed.

In a dynamic, changing economy like ours, there will always be frictional unemployment. Many economists believe that the basic cause of frictional unemployment is imperfect or incomplete information, which prevents individuals from leaving one job and finding another instantly.

Consider the situation where there are 1,000 job vacancies and 1,000 persons with the qualifications to fill the jobs. Will there be some unemployment? It is likely that there will be because not every one of the 1,000 job seekers will know where an available job is, nor will all employers give the job to the first applicant who knocks on the door (employers don’t know if “better” applicants are around the corner). Matching qualified workers with jobs takes time.

**Structural Unemployment**

**Structural unemployment** is unemployment due to structural changes in the economy that eliminate some jobs and create others for which the unemployed are unqualified. Most economists argue that structural unemployment is largely the consequence of automation (laborsaving devices) and long-lasting shifts in demand. The major difference between the frictionally unemployed and the structurally unemployed is that the latter do not have transferable skills. Their choice is between prolonged unemployment and retraining. For example, suppose there is a pool of unemployed automobile workers and a rising demand for computer analysts. If the automobile workers do not currently have the skills necessary to become computer analysts, they are structurally unemployed. We use the symbol $U_s$ to designate the structural unemployment rate, which is the percentage of the labor force that is structurally unemployed.

**Frictional Unemployment**

Unemployment due to the natural “frictions” of the economy, which is caused by changing market conditions and is represented by qualified individuals with transferable skills who change jobs.

**Structural Unemployment**

Unemployment due to structural changes in the economy that eliminate some jobs and create others for which the unemployed are unqualified.
Natural Unemployment

Unemployment caused by frictional and structural factors in the economy.
Natural unemployment rate = Frictional unemployment rate + Structural unemployment rate

Natural Unemployment
Adding the frictional unemployment rate and the structural unemployment rate gives the natural unemployment rate (or natural rate of unemployment). We use the symbol $U_N$ to designate the natural unemployment rate. Currently, most economists estimate the natural unemployment rate at between 4 and 6.5 percent.

\[
\text{Natural unemployment rate (} U_N \text{)} = \text{Frictional unemployment rate (} U_F \text{)} + \text{Structural unemployment rate (} U_S \text{)}
\]

Analyzing the Scene

Question from Setting the Scene: How long will George Krenshaw stay unemployed?
This is a hard question to answer. We cannot say for sure if George Krenshaw will remain unemployed for two weeks, two months, or two years. How long he stays unemployed depends on the current and future state of the economy, how much time and effort he devotes to searching for another job, and other such things. We can make some general statements about the duration of his unemployment, though. For example, whether George Krenshaw is frictionally or structurally unemployed matters to how long he stays unemployed. All other things being equal, George will stay unemployed longer if he is structurally unemployed than if he is frictionally unemployed. Recall that a person who is structurally unemployed does not have transferable skills whereas a person who is frictionally unemployed does. The structurally unemployed person has to spend time retraining whereas the frictionally unemployed person does not.

Cyclical Unemployment

The unemployment rate that exists in the economy is not always the natural rate. The difference between the existing unemployment rate and the natural unemployment rate is the cyclical unemployment rate ($U_C$).

\[
\text{Cyclical unemployment rate (): } U_C = \text{Unemployment rate (} U \text{)} - \text{Natural unemployment rate (} U_N \text{)}
\]

When the unemployment rate ($U$) that exists in the economy is greater than the natural unemployment rate ($U_N$), the cyclical unemployment rate ($U_C$) is positive. For example, if $U = 8$ percent and $U_N = 5$ percent, then $U_C = 3$ percent. When the unemployment rate that exists in the economy is less than the natural unemployment rate, the cyclical unemployment rate is negative. For example, if $U = 4$ percent and $U_N = 5$ percent, then $U_C = -1$ percent.

Full Employment
The condition that exists when the unemployment rate is equal to the natural unemployment rate.

Cyclical Unemployment Rate
The difference between the unemployment rate and the natural unemployment rate.

What Is Full Employment?
What do you think of when you hear the term full employment? Most people think full employment means that the actual or reported unemployment rate is zero. But a dynamic, changing economy can never have full employment of this type due to the frictional and structural changes that continually occur. In fact, it is natural for some unemployment to exist—some natural unemployment, that is. For this reason, economists do not equate full employment with a zero unemployment rate. Instead, for economists, full employment exists when the economy is operating at its natural unemployment rate. For example, if the natural unemployment rate is 5 percent, then full employment exists when the unemployment rate (in the economy) is 5 percent. In other words, the economy can be operating at full employment and some people will be unemployed.
What Explains the Increasing Percentage of Women in the Labor Force?

The BLS reports that in 1948 in the United States, 31 percent of all women 20 years old and older were working in the labor force. In 2003, that percentage had risen to 57.2 percent. In fact, in the years from 1948 to 2003, the percentage of women in the labor force has increased almost every year.

The same trend is visible in many other countries. In 1984, 52.8 percent of the adult female population in Australia worked in the labor force, and in 1994, the percentage had increased to 63.4 percent. During the same time period, the percentage rose from 62.7 percent to 80.0 percent in Iceland, from 33.2 percent to 44.1 percent in Spain, and from 57.2 to 62.1 percent in Japan.

What explains the percentage increase of women in the work force over the last half of the twentieth century? One explanation is that the “work culture” has changed during this time period. Whereas once it was widely accepted that a woman’s place was primarily in the home, this view has changed over time. Often, in the United States in particular, the women’s movement and feminism are given credit for this change in attitude.

There is, however, another explanation—one that has nothing to do with a changing culture but is purely economic in nature. Women have joined the work force in record numbers at the same time that it has become monetarily more advantageous to join the work force.

To illustrate, let’s consider life at the end of the nineteenth century. In 1895, the average worker had to work 260 hours to earn enough money to buy a one-speed bicycle, 24 hours to earn enough to buy a cushioned chair, and 44 hours to earn enough to buy a 100-piece dinner set. More than 100 years later, in 2000, the average worker had to work only 7.2 hours to earn enough money to buy a one-speed bicycle, only 2.0 hours to earn enough to buy a cushioned chair, and only 3.6 hours to earn enough to buy a 100-piece dinner set. In other words, the average worker did not have to work as many hours in 2000 as in 1895 to buy the same goods.

This conclusion also holds for goods other than bicycles, cushioned chairs, and dinner sets. In fact, it holds for many if not most goods. Here are a few:

<table>
<thead>
<tr>
<th>Time Needed for the Average Worker to Earn the Purchase Price of Various Goods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Earn in 1895 (hours)</td>
</tr>
<tr>
<td>One-speed bicycle</td>
</tr>
<tr>
<td>Cushioned office chair</td>
</tr>
<tr>
<td>100-piece dinner set</td>
</tr>
<tr>
<td>Hairbrush</td>
</tr>
<tr>
<td>Cane rocking chair</td>
</tr>
<tr>
<td>Solid gold locket</td>
</tr>
<tr>
<td>Encyclopedia Britannica</td>
</tr>
<tr>
<td>Steinway piano</td>
</tr>
</tbody>
</table>

When the average worker has to work only 7.2 hours to earn enough money to buy a bicycle, as compared to 260 hours, it follows that it is much more advantageous to work. Stated differently, using bicycles as our good, one hour of work in 1895 got the average worker 1/260 of a bicycle; but in 2000, it got the average worker about 1/7 of a bicycle. In other words, the hourly pay (in terms of bicycles) was much higher in 2000 than in 1895.

Economists would predict that more people would want to work the higher the wage rate for working (in terms of goods). In other words, the greater the benefits from working, the more people would choose to work. And this is exactly what we see. As the wage rate for working (in terms of bicycles, office chairs, dinner sets) has increased, women have joined the labor force in record numbers.

4. The data here are from Brad DeLong, an economist at the University of California, Berkeley, in his work-in-progress The Economic History of the Twentieth Century: Slouching Towards Utopia. The work can be found at http://www.j-bradford-delong.net/TCEH/2000/TCEH_title.html.

SELF-TEST

1. What is the major difference between a person who is frictionally unemployed and one who is structurally unemployed?

2. If the cyclical unemployment rate is positive, what does this imply?

According to the Handbook, mathematicians usually work as part of a team that includes economists, engineers, computer scientists, physicists, and others. In 2000, mathematicians held about 3,600 jobs. In addition, about 20,000 persons held faculty positions in mathematics at colleges and universities.

Many nonfaculty mathematicians work for the federal and state governments. The biggest employer of mathematicians in the federal government is the Department of Defense. In the private sector, major employers include research and testing services, educational services, security and commodity exchanges, and management and public relations services. In manufacturing, the pharmaceutical industry is the primary employer. Some mathematicians also work for banks, insurance companies, and public utilities.

Median annual earnings of mathematicians were $68,640 in 1998. The middle 50 percent earned between $50,740 and $85,520. The lowest 10 percent had earnings of less than $35,390, while the top 10 percent earned more than $101,900.

According to the Handbook, “employment of mathematicians is expected to decline through 2010, because very few jobs with the title mathematician are available. However, master’s and Ph.D. degree holders with a strong background in mathematics and a related discipline, such as engineering or computer science, should have good job opportunities. However, many of these workers have job titles that reflect their occupation, rather than the title mathematician.”

Finally, according to a 2001 survey by the National Association of Colleges and Employers, starting salary offers averaged about $46,466 a year for mathematics graduates with a bachelor’s degree and $53,440 for those with a master’s degree. Doctoral degree candidates averaged $55,938. The average annual salary in 1999 for mathematicians employed by the federal government in supervisory, nonsupervisory, and managerial positions was $76,460, for mathematics statisticians it was $76,530, and for cryptoanalysts it was $70,840.
Structural unemployment is due to structural changes in the economy that eliminate some jobs and create others for which the unemployed are unqualified.

Natural unemployment is caused by frictional and structural factors in the economy. The natural unemployment rate equals the sum of the frictional unemployment rate and the structural unemployment rate.

Full employment is the condition that exists when the unemployment rate is equal to the natural unemployment rate.

The cyclical unemployment rate is the difference between the existing unemployment rate and the natural unemployment rate.

Questions and Problems

1. What does the CPI in the base year equal? Explain your answer.
2. Show that if the percentage rise in prices is equal to the percentage rise in nominal income, then one’s real income does not change.
3. What does it mean if the expenditure weights of the market basket used to compute the CPI are changed?
4. How does structural unemployment differ from frictional unemployment?
5. What does it mean to say that the country is operating at full employment?
6. What is “natural” about natural unemployment?
7. What is the difference between the employment rate and the labor force participation rate?
8. If the unemployment rate is 4 percent, it does not follow that the employment rate is 96 percent. Explain why.
9. What criteria must be met in order for a person to be characterized as unemployed?
10. What is the difference between a job leaver and a reentrant?
11. How is a discouraged worker different from an unemployed worker?

Working With Numbers and Graphs

1. Suppose there are 60 million people employed, 10 million unemployed, and 30 million not in the labor force. What does the civilian noninstitutional population equal?
2. Suppose there are 100 million people in the civilian labor force and 90 million people employed. How many people are unemployed? What is the unemployment rate?
3. Change the current-year prices in Exhibit 1 to $1 for pens, $28 for shirts, and $32 for a pair of shoes. What is the CPI for the current year based on these prices?
4. Jim earned an annual salary of $15,000 in 1965. What is this equivalent to in 2002 dollars? (Use Exhibit 2 to find the CPI in the years mentioned.)
5. A house cost $10,000 in 1976. What is this equivalent to in 2001 dollars? (Use Exhibit 2 to find the CPI in the years mentioned.)
6. Using the following data, compute (a) the unemployment rate, (b) the employment rate, and (c) the labor force participation rate.
   - Civilian noninstitutional population = 200 million
   - Number of employed persons = 126 million
   - Number of unemployed persons = 8 million
7. Based on the following data, compute (a) the unemployment rate, (b) the structural unemployment rate, and (c) the cyclical unemployment rate.
   - Frictional unemployment rate = 2 percent
   - Natural unemployment rate = 5 percent
   - Civilian labor force = 100 million
   - Number of employed persons = 82 million
8. Using Exhibit 2, compute the percentage change in prices between (a) 1966 and 1969, (b) 1976 and 1986, and (c) 1990 and 1999.

9. Assume the market basket contains $10X, 20Y,$ and $45Z.$ The current-year prices for goods $X,$ $Y,$ and $Z$ are $1, \$4,$ and $6,$ respectively. The base-year prices are $1, \$3,$ and $5,$ respectively. What is the CPI in the current year?

10. If the CPI is 150 and nominal income is $100,000, what does real income equal?

### Internet Activities

   - a. What is the inflation rate in the United States? What is the unemployment rate in the United States?
   - b. Select a country in Africa and one in South America. How do the inflation rates and unemployment rates compare in the two countries? How do the inflation and unemployment rates in the two countries compare to the rates in the United States?
   - c. Is there any relationship between inflation rates and unemployment rates?


   - a. Has inflation always been present in the United States?
   - b. Do you think that inflation has ever been high enough in the United States to be considered a major economic problem? How high do you think the inflation rate has to rise before it becomes a major national problem?
   - c. Do you consider the 1990s to be a period of high inflation, low inflation, or price stability?

3. Go back to [http://www.bls.gov/cps/home.htm](http://www.bls.gov/cps/home.htm), and select “Tables Created by BLS.” Under “EMPLOYMENT STATUS,” select “Employment status of the civilian noninstitutional population by age, sex, and race (TXT),”
   - a. How many people are in the labor force? How many people are unemployed?
   - b. What is the unemployment rate?
   - c. Would you say that age, sex, and race are factors in a person being unemployed?
   - d. Is educational attainment a factor as well?

4. Again, go back to [http://www.bls.gov/cpi/home.htm](http://www.bls.gov/cpi/home.htm). Under “Get Detailed CPI Statistics,” select “Inflation Calculator.” If the price of breakfast in 1914 was $0.25, how much is this in today’s dollars?