Chapter 12 (24)

Aggregate Demand and Aggregate Supply Analysis

Chapter Summary

During most years, prices rise (we have inflation) and real GDP increases (we have economic growth). The equilibrium level of real GDP and the price level are determined by aggregate demand and aggregate supply. Aggregate demand shows the relationship between the price level and the quantity of real GDP demanded by households, firms, and the government. Aggregate supply shows the relationship between the price level and the quantity of real GDP that firms are willing to produce. This chapter looks at how aggregate demand and aggregate supply determine the equilibrium level of real GDP and the price level, and how changes in aggregate demand and aggregate supply change the price level and the level of real GDP. The aggregate demand and aggregate supply model enables us to explain short-run fluctuations in real GDP and price level.

The aggregate demand curve shows the relationship between the price level and the level of planned aggregate expenditure by households, firms, and the government. The short-run aggregate supply curve shows the relationship in the short run between the price level and the quantity of real GDP supplied by firms. The long-run aggregate supply curve shows the relationship in the long run between the price level and the quantity of real GDP supplied. The four components of aggregate demand are consumption (C), investment (I), government purchases (G), and net exports (NX). Monetary policy involves the actions the Federal Reserve takes to manage the money supply and interest rates to pursue macroeconomic policy objectives. When the Federal Reserve takes actions to change interest rates, consumption and investment spending will change, shifting the aggregate demand curve. Fiscal policy involves changes in federal taxes and purchases that are intended to achieve macroeconomic policy objectives. Changes in federal taxes and purchases shift the aggregate demand curve.

The long-run aggregate supply curve is a vertical line because in the long run, real GDP is always at its potential level and is unaffected by the price level. The short-run aggregate supply curve slopes upward because workers and firms fail to predict accurately the future price level. A supply shock is an unexpected event that causes the short-run aggregate supply curve to shift. Stagflation is a combination of inflation and recession, usually resulting from a supply shock.

Learning Objectives

When you finish this chapter, you should be able to:

1. Identify the determinants of aggregate demand and distinguish between a movement along the aggregate demand curve and a shift of the curve. The aggregate demand and aggregate supply model enables us to explain short-run fluctuations in real GDP and the price level. The aggregate
Aggregate demand curve (AD) shows the relationship between the price level and the quantity of real GDP demanded by households, firms, and the government. The short-run aggregate supply curve (SRAS) shows the relationship in the short run between the price level and the quantity of real GDP supplied by firms. The long-run aggregate supply curve shows the relationship in the long run between the price level and the quantity of real GDP supplied. The four components of aggregate demand are consumption (C), investment (I), government purchases (G), and net exports (NX). The aggregate demand curve is downward sloping because a decline in the price level causes real consumption, investment, and net exports to increase. If the price level changes but all else remains constant, the economy will move up or down a stationary aggregate demand curve. If any variable other than the price level changes, the aggregate demand curve will shift. The variables that cause the aggregate demand curve to shift fall into three categories: changes in government policies, changes in the expectations of households and firms, and changes in foreign variables.

2. Identify the determinants of aggregate supply and distinguish between a movement along the short-run aggregate supply curve and a shift of the curve. The long-run aggregate supply curve is a vertical line at full-employment GDP, because in the long run, real GDP is always at its full-employment level and is unaffected by the price level. The short-run aggregate supply curve slopes upward because workers and firms fail to predict accurately the future price level. The three main explanations why this failure results in an upward-sloping aggregate supply curve are contracts make wages and prices “sticky,” businesses often adjust wages slowly, and menu costs make some prices sticky. If the price level changes but all else remains constant, the economy will move up or down a stationary aggregate supply curve. If any factor other than the price level changes, the aggregate supply curve will shift. The aggregate supply curve shifts as a result of increases in the labor force, increases in the capital stock, technological change, expected increases or decreases in the future price level, adjustments of workers and firms to errors in past expectations about the price level, and unexpected increases or decreases in the price of an important raw material.

3. Use the aggregate demand and aggregate supply model to illustrate the difference between short-run and long-run macroeconomic equilibrium. In long-run macroeconomic equilibrium, the aggregate demand and short-run aggregate supply curves intersect at a point on the long-run aggregate supply curve. In short-run macroeconomic equilibrium, the aggregate demand and short-run aggregate supply curves often intersect at a point off the long-run aggregate supply curve. An automatic mechanism drives the economy to long-run equilibrium. If short-run equilibrium occurs at a point below full-employment real GDP, wages and prices will fall and the short-run aggregate supply curve will shift to the right until full employment is restored. If short-run equilibrium occurs at a point above full-employment real GDP, wages and prices will rise and the short-run aggregate supply curve will shift to the left until full employment is restored. Real GDP can be temporarily above or below its full-employment level, either because of shifts in the aggregate demand curve or because supply shocks lead to shifts in the aggregate supply curve.

4. Use the dynamic aggregate demand and aggregate supply model to analyze macroeconomic conditions. To make the aggregate demand and aggregate supply model more realistic, we must make it dynamic by incorporating three facts that were left out of the basic model:
   a. Potential real GDP increases continually, shifting the long-run aggregate supply curve to the right.
   b. During most years, aggregate demand will be shifting to the right.
   c. Except during periods when workers and firms expect high rates of inflation, the aggregate supply curve will be shifting to the right. The dynamic aggregate demand and aggregate supply model allows us to analyze macroeconomic conditions, including the recovery from the 2001 recession.
Appendix: Understand macroeconomic schools of thought. There are three major alternative models to the aggregate demand and aggregate supply model. Monetarism emphasizes that the quantity of money should be increased at a constant rate. New classical macroeconomics emphasizes that workers and firms have rational expectations. The real business cycle model focuses on real, rather than monetary, causes of the business cycle.

Chapter Review

Chapter Opener: The Fortunes of FedEx Follow the Business Cycle (pages 390-391)

Many economists, such as former Chairman of the Federal Reserve Alan Greenspan, believe that changes in the quantity of packages shipped by FedEx are a good indicator of the overall state of the economy. FedEx was founded by Fred Smith, who in the 1960s proposed a new method of sending packages that moved away from using passenger airlines. FedEx’s profits rise and fall with the quantity of packages they ship, and that quantity changes with the level of economic activity, referred to as the business cycle.

Helpful Study Hint

Read An Inside Look at the end of the chapter to learn how a decline in the growth rate of real GDP affected freight-transportation giant United Parcel Service, Inc. (UPS).

Freight-transportation companies’ earnings are dependent on the volume of shipments to retailers; in a slowing economy, retailers typically reduce their orders from manufacturers as they carry smaller planned inventories than usual.

If the economy falls into recession, will your employer cut your pay – or cut your job? Economics in YOUR Life! at the start of this chapter poses these questions. Keep the questions in mind as you read the chapter. The authors will answer the questions at the end of the chapter.

12.1 LEARNING OBJECTIVE

12.1 Aggregate Demand (pages 392-398)

Learning Objective 1 Identify the determinants of aggregate demand and distinguish between a movement along the aggregate demand curve and a shift of the curve.

This chapter uses the aggregate demand and aggregate supply model to explain fluctuations in real GDP and the price level. Real GDP and the price level are determined in the short run by the intersections of the aggregate demand curve and the aggregate supply curve. This is seen in Figure 12-1 below. Changes in real GDP and changes in the price level are caused by shifts in these two curves.
The aggregate demand curve \((AD)\) shows the relationship between the price level and the level of real GDP demanded by households, firms and the government. The four components of real GDP are:

- Consumption \((C)\)
- Investment \((I)\)
- Government purchases \((G)\)
- Net exports \((NX)\)

Using \(Y\) for real GDP, then we can write the following:

\[
Y = C + I + G + NX.
\]

The aggregate demand curve is downward sloping because a decrease in the price level increases the quantity of real GDP demanded. We assume that government purchases do not change as the price level changes. There are three reasons why the other components of real GDP change as the price level changes:

- **The wealth effect.** As the price level increases, the real value of household wealth falls, and so will consumption. In contrast, if the price level declines, real household wealth rises and so does consumption.

- **The interest rate effect.** A higher price level will tend to increase interest rates. Higher interest rates will reduce investment spending by firms as borrowing costs rise. Additionally, higher interest rates will also reduce consumption spending.
The international effect. A higher price level will make U.S. goods relatively more expensive compared to other countries’ goods. This will reduce exports, increase imports, and, therefore, reduce net exports.

Price level changes cause movements along the $AD$ curve. A change in any other variable that affects the willingness of households, firms, and the government to spend will cause a shift in the $AD$ curve. The variables that cause $AD$ to shift fall into three categories:

- **Changes in government policies.** Monetary policy refers to the actions the Federal Reserve takes to manage the money supply and interest rates to pursue macroeconomic policy objectives. Fiscal policy refers to changes in federal taxes and purchases that are intended to achieve macroeconomic policy objectives, such as high unemployment, price stability, and high rates of economic growth.
- **Changes in expectations of households and firms.** If consumers or firms are more optimistic about the future, they may purchase more goods and services, increasing consumption and investment expenditures.
- **Changes in foreign variables.** As income changes in other countries, consumers in those countries may buy more U.S. goods, causing exports to increase. Changes in exchange rates can also shift the $AD$ curve; for example, if the U.S. dollar appreciates relative to other currencies, it makes imported goods less expensive and exports more expensive to foreign consumers, shifting the $AD$ curve to the left.
The variables that shift the $AD$ curve are summarized in textbook Table 12-1 reproduced below:

<table>
<thead>
<tr>
<th>An increase in ...</th>
<th>Shifts the aggregate demand curve ...</th>
<th>Because ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>interest rates</td>
<td>$AD_2$ shift to the left of $AD_1$</td>
<td>higher interest rates raise the cost to firms and households of borrowing, reducing consumption and investment spending.</td>
</tr>
<tr>
<td>government purchases</td>
<td>$AD_2$ shift to the right of $AD_1$</td>
<td>government purchases are a component of aggregate demand.</td>
</tr>
<tr>
<td>personal income taxes or business taxes</td>
<td>$AD_2$ shift to the left of $AD_1$</td>
<td>consumption spending falls when personal taxes rise, and investment falls when business taxes rise.</td>
</tr>
<tr>
<td>households’ expectations of their future incomes</td>
<td>$AD_2$ shift to the right of $AD_1$</td>
<td>consumption spending increases.</td>
</tr>
<tr>
<td>firms’ expectations of the future profitability of investment spending</td>
<td>$AD_2$ shift to the right of $AD_1$</td>
<td>investment spending increases.</td>
</tr>
<tr>
<td>the growth rate of domestic GDP relative to the growth rate of foreign GDP</td>
<td>$AD_2$ shift to the left of $AD_1$</td>
<td>exports will fall, reducing net exports.</td>
</tr>
<tr>
<td>the exchange rate (the value of the dollar) relative to foreign currencies</td>
<td>$AD_2$ shift to the left of $AD_1$</td>
<td>imports will rise and exports will fall, reducing net exports.</td>
</tr>
</tbody>
</table>
If you own a car, do you know where the parts come from and where the car was built? Although you may own a “Japanese” car or an “American” car, you may be surprised to learn that its parts come from various countries. Read Making the Connection: In a Global Economy, How Can You Tell the Imports from the Domestic Goods? The level of imports and exports influence the level of aggregate demand in the United States. Some products that are produced by U.S. firms, such as the Ford Mustang, have about 35 percent of their parts from countries other than the United States or Canada. Contrast that with the Toyota Sienna, which is built in Princeton, Indiana and has about 90 percent of its contents from the United States or Canada.

It is important to understand why the AD curve slopes downward. Read Don’t Let This Happen to YOU! Unlike the demand curve for an individual good where the prices of other goods are held constant, on the aggregate demand curve as the price level increases, all prices in the economy are increasing. The aggregate demand curve has a downward slope because of the wealth effect, the interest rate effect, and the international trade effect.

### 12.2 LEARNING OBJECTIVE

#### 12.2 Aggregate Supply (pages 399-403)

**Learning Objective 2** Identify the determinants of aggregate supply and distinguish between a movement along the short-run aggregate supply curve and a shift of the curve.

The aggregate supply curve shows the effects of price level changes on the quantity of goods and services firms are willing to supply. Because price level changes have different effects in the short run and in the long run, there is an aggregate supply curve for the long run and an aggregate supply curve for the short run.

The **long-run aggregate supply curve (LRAS)** is a curve showing the relationship in the long run between the price level and the level of real GDP supplied. As we saw in Chapter 10, in the long run the level of real GDP is determined by:

- the number of workers
- the capital stock
- the available technology

Because price level changes do not affect these factors, price level changes do not affect the level of real GDP in the long run. The long-run aggregate supply curve is therefore a vertical line. Increases in the number of workers, the capital stock, and the available technology will increase real GDP and shift the LRAS to the right. This is seen in textbook Figure 12-2:
Although the \( LRAS \) curve is vertical, the short-run aggregate supply curve (\( SRAS \)) is upward sloping. In the short run, as the price level increases, the quantity of goods and services that firms are willing to supply increases. This short-run relationship between the price level and the quantity of goods and services supplied occurs because as prices of final goods and services rise, the prices of inputs, such as wages and natural resource, rise more slowly, and may even remain constant. A consequence of this is that as the prices of final goods and services rise, profits increase and firms are willing to supply more goods and services in the short run. Additionally, as the overall price level rises, some firms are slower to adjust their prices. These firms may find their sales increasing and produce more output. Economists believe that some firms adjust prices more slowly than others and wages adjust more slowly than the price level because firms and workers fail to perfectly forecast changes in the price level. If firms and workers could accurately forecast prices, the short-run and long-run aggregate supply curves would both be vertical.

The three most common explanations for the upward-sloping short run supply curve are:

- Contracts make some wages and prices sticky. For example, the labor contract between General Motors and the United Automobile Workers fixes wages by contract.
- Firms are often slow to adjust wages. Firms tend to adjust wages once or twice a year, making wages slow to change. In addition, firms are often also reluctant to cut wages.
- Menu costs make some prices sticky. Some firms are slow to change prices because of expenses associated with the price changes. These are called menu costs.

The short-run aggregate supply curve will shift to the right when something happens that makes firms willing to supply more goods and services at the same prices. The short-run aggregate supply curve will shift with:

- Changes in the labor force or capital stock.
- Technological change.
- Expected changes in the future price level.
- Adjustment of workers and firms to errors in past expectations about the price level.
- Unexpected changes in the price of natural resources that are important inputs to many industries (this is often referred to as a supply shock).

Helpful Study Hint

Natural resource prices can rise or fall. An adverse supply shock usually refers to an increase in resource prices.
Oil is a natural resource. When hurricane Katrina hit New Orleans in 2005, it disrupted one-quarter of U.S. oil and natural gas output. This unexpected fall in oil production caused oil prices to soar. This made it more costly for firms to operate and produce and transport their goods.

The factors that shift the $SRAS$ curve are summarized in textbook Table 12-2 reproduced below:

<table>
<thead>
<tr>
<th>An increase in ...</th>
<th>Shifts the short-run aggregate supply curve ...</th>
<th>Because ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>the labor force or the capital stock</td>
<td>$SRAS_1$ to $SRAS_2$</td>
<td>more output can be produced at every price level.</td>
</tr>
<tr>
<td>productivity</td>
<td>$SRAS_1$ to $SRAS_2$</td>
<td>costs of producing output fall.</td>
</tr>
<tr>
<td>the expected future price level</td>
<td>$SRAS_2$ to $SRAS_1$</td>
<td>workers and firms increase wages and prices.</td>
</tr>
<tr>
<td>workers and firms adjusting to having previously underestimated the price level</td>
<td>$SRAS_2$ to $SRAS_1$</td>
<td>workers and firms increase wages and prices.</td>
</tr>
<tr>
<td>the expected price of an important natural resource</td>
<td>$SRAS_2$ to $SRAS_1$</td>
<td>costs of producing output rise.</td>
</tr>
</tbody>
</table>
Extra Solved Problem 12-2

Chapter 12 in the textbook includes two Solved Problems. Here is an extra Solved Problem to help you build your skills solving economic problems:

**Shifts and Movements Along the Short-Run Aggregate Supply Curve**

Supports Learning Objective 2: Identify the determinants of aggregate supply and distinguish between a movement along the short-run aggregate supply curve and a shift of the curve.

Show how an increase in wages has a different effect on the SRAS curve than does an increase in prices.

**SOLVING THE PROBLEM**

**Step 1: Review the chapter material.**
This question is about the difference in shifts and movements along the SRAS curve, so you may want to review the section “The Short-Run Aggregate Supply Curve,” which begins on page 400 of the textbook.

**Step 2: Use a graph to show the effect on the SRAS curve of a change in the price level.**
Changes in the price level cause movements along the SRAS curve. This is shown in the movement from point A to point B in the graph below. The higher price level leads firms to produce more goods and services, resulting in a higher level of real GDP in the short run.

**Step 3: Use a second graph to show the effect on the SRAS curve of a change in wages.**
Wages are one of the economic variables that are held constant along a given SRAS curve. An increase in the overall wage rate will shift the SRAS curve to the left. This is seen in the movement from point A to point B in the graph below. If wages rise, the production costs of firms increase, and, in the short run, at any given price level firms are willing to supply a lower level of real GDP.
12.3 Macroeconomic Equilibrium in the Long Run and the Short Run (pages 404-407)

Learning Objective 3: Use the aggregate demand and aggregate supply model to illustrate the difference between short-run and long-run macroeconomic equilibrium.

In long-run macroeconomic equilibrium, the $AD$ curve and the $SRAS$ curve intersect at a point on the $LRAS$ curve. This is shown in textbook Figure 12-4 below:

Because this point—price level of 100 and real GDP of $10.0$ trillion—is on the $LRAS$ curve, firms will be operating at normal levels of capacity and everyone that wants a job at the prevailing wage rate will have one (although there will still be frictional and structural unemployment).
Helpful Study Hint

Remember that although in long-run macroeconomic equilibrium there is no cyclical unemployment, there will still be frictional and structural unemployment. The LRAS curve represents the level of real GDP that will be produced when firms are operating at their normal capacity; it does not represent the level of real GDP that could be produced if firms operated at their maximum capacity.

The aggregate demand and aggregate supply model can be used to examine events that move the economy away from long-run equilibrium. As a starting point, assume:

- The economy has not been experiencing inflation.
- The economy has not been experiencing long-run growth.

Recession

A decline in $AD$ will cause a short-run decline in real GDP. As the $AD$ curve shifts to the left, the economy will move to a new short-run equilibrium where $AD$ intersects the $SRAS$ curve at a level of real GDP below potential GDP. The economy will be in a recession. Because firms need fewer workers to produce the lower level of output, wages will begin to fall. As wages fall, firms’ costs will decline. Over time, as costs fall, the $SRAS$ curve will shift to the right and the economy will move back to long-run equilibrium at potential GDP. This is shown in textbook Figure 12-5 below:

This adjustment back to long-run equilibrium will occur automatically without any form of government intervention. But it may take several years to complete this adjustment. This is usually referred to as an automatic mechanism.
Expansion

An increase in $AD$ will cause a short-run expansion in the economy. An increase in $AD$ will shift the $AD$ curve to the right as spending by households, firms, or government increases. This increased spending will cause a short-run expansion as firms meet increased demand by increasing production. In expanding production, firms may hire workers who would normally be structurally or frictionally unemployed. The lower level of unemployment will eventually result in higher wages, which will raise costs to firms. These higher costs will shift the $SRAS$ curve to the left and eventually return output to potential GDP. This is shown in Figure 12-6 below:

As with a recession, the return to long-run equilibrium is an automatic adjustment in the long run. The inflation caused by an expansion beyond potential GDP usually occurs fairly quickly.

Supply Shock

An adverse supply shock (such as an oil price increase) is a shift to the left of the $SRAS$ curve not caused by the automatic adjustment mechanism of the economy. In the short run, this adverse supply shock will reduce real GDP and increase the price level. The higher price level and recession is often referred to as stagflation. The recession caused by the supply shock will result in lower wages, which will shift the $SRAS$ curve to the right, returning the economy to the initial long-run equilibrium. This is shown in textbook Figure 12-7 below:
**Extra Solved Problem 12-3**

Chapter 12 in the textbook includes two Solved Problems. Here is an extra Solved Problem to help you build your skills solving economic problems:

**Determining Growth and Inflation Rates**

Supports Learning Objective 3: Use the aggregate demand and aggregate supply model to illustrate the difference between short-run and long-run macroeconomic equilibrium.

Draw graphs showing how, as the $AD$ and $LRAS$ curves shift over time, real GDP and the price level are affected.

**SOLVING THE PROBLEM**

**Step 1:** **Review the chapter material.**

This problem is about analyzing the effects of shifts in aggregate demand and aggregate supply on the price level and real GDP, so you may want to review the section “Recessions, Expansions, and Supply Shocks,” which begins on page 404 of the textbook.

**Step 2:** **Discuss how the price level and level of real GDP are determined in the long run.**

The price level and the level of real GDP are determined in the long run by the levels of aggregate demand and $LRAS$. Over time, $LRAS$ changes due to growth in the capital stock, growth in the number of workers, and technological change. These cause the $LRAS$ curve to shift to the right from $LRAS_0$ to $LRAS_1$ in the graph:
At the same time, the $AD$ curve will also shift to the right as consumption, investment, and government purchases all increase. Combining the shifts of the $LRAS$ and $AD$ curves on one graph gives the following:

**Step 3:** Determine the amount of real GDP growth.

The amount of real GDP growth depends on the change in $LRAS$. In the case above, real GDP will grow from $Y_0$ to $Y_1$. The shift in $AD$ will not affect that long run result. How much the price level rises—in other words, how high the inflation rate is—will be affected by the shift in $AD$. The larger the change in $AD$, the higher the inflation rate. In the long run, output growth is determined by shifts in the $LRAS$ curve, and inflation is determined by shifts in the $AD$ curve.
12.4 A Dynamic Aggregate Demand and Aggregate Supply Model (pages 408-417)

Learning Objective 4 Use the dynamic aggregate demand and aggregate supply model to analyze macroeconomic conditions.

The dynamic model of aggregate demand and aggregate supply builds on the basic aggregate demand and aggregate supply model to account for two key macroeconomic facts: the economy experiences long-term growth as potential real GDP increases every year, and the economy experiences at least some inflation every year. Three changes are made to the basic model:

- Potential real GDP increases continually, shifting the LRAS curve to the right.
- During most years, the AD curve will also shift to the right.
- Except during periods when workers expect very high rates of inflation, the SRAS curve will also shift to the right.

Helpful Study Hint

Spend time reviewing the acetate of Figure 12-8 on page 408 of the main text. This acetate builds the dynamic aggregate demand and aggregate supply model step by step.

An example of including these changes is shown in textbook Figure 12-9 reproduced below:
Helpful Study Hint

The dynamic aggregate demand and aggregate supply model assumes that the \( LRAS \) curve shifts to the right each year, which represents normal long-run growth in the economy. The \( AD \) curve also typically shifts to the right each year as the components of \( AD \) change.

If we start at point \( A \), the increase in \( LRAS \) and \( SRAS \) along with the shift in the \( AD \) curve will move the equilibrium to point \( B \) where the price level and the level of real GDP are both higher. If the \( AD \) curve shifts to the right more than the \( LRAS \) curve, the economy will experience both growth and inflation. If the \( AD \) and \( LRAS \) curves had shifted to the right by the same amount, the economy would have experienced growth without inflation. If the economy had suffered an adverse supply shock during the same period (with the \( SRAS \) curve shifting to the left), the price level would have increased more and real GDP would have increased less.

The dynamic aggregate demand and supply model suggests that inflation is caused by increases in total spending that are larger than increases in real GDP and by the \( SRAS \) curve shifting to the left due to higher costs. The model can shed light on the slow recovery from the recession of 2001. This recession was due to the end of the stock market bubble. The fall in stock prices reduced consumer wealth, and reduced the increases in consumption and investment spending below what they would otherwise have been. Firms that invested to create an internet presence cut back on their investment spending due to low levels of internet sales. The terror attacks of September 11, 2001 increased the level of uncertainty in the economy. Corporate accounting scandals created more uncertainty. These changes are shown in Figure 12-10 below, which shows the recession and the growth of the economy in 2002.
Low interest rates, tax cuts, and a rising stock market contributed to the increase in the economy in 2003-2004. This is shown in Figure 12-11 below.

The economy in 2008 is experiencing several events that could push it into a recession. Higher oil prices, the collapse of the housing “bubble,” and problems in financial markets may push the economy into a recession.

Helpful Study Hint

Read *Making the Connection: Does Rising Productivity Growth Reduce Employment?* Growth in labor productivity (output per worker) is a key requirement for a rising standard of living. But if firms can produce more output per worker, they are less likely to hire extra workers. This may be the cause of the slow employment growth immediately after the end of the 2001 recession. Rising productivity may have made it possible for some firms to expand production without increasing employment. This was a short-run effect, however. In the long run, employment is determined by population growth and by the fraction of the population in the labor force rather than by the rate of productivity growth.

Read *Making the Connection: Do Oil Shocks Still Cause Recessions?* An increase in oil prices will cause FedEx to increase the price of delivering packages, which will cause a reduction in the number of packages delivered. If significant cost increases resulting from higher oil prices affect enough firms, the SRAS curve will shift to the left, potentially moving the economy toward a recession. This happened in the recession of 1974-1975, where oil prices rose sharply from $3 per barrel to $10 per barrel. This sharp rise in the price of oil was labeled an oil price shock. Oil prices have been rising from 2004–2007, and the economy has continued to expand. This is because the economy is less vulnerable to oil price increases and because of the more gradual
increase in prices. Economist Keith Sill estimates that a 10 percent increase in oil prices will result in a reduction in the annual growth rate of real GDP of about 0.5 percent.

Helpful Study Hint

Economics in YOUR Life! at the start of this chapter asked if you should expect a pay cut if the economy falls into recession. Firms are not likely to cut wages because of the effect on morale and productivity and the fear that workers may leave for a competitor. Firms are very reluctant to lay off skilled workers, because they may not be able to rehire them when the recession is over.

Key Terms

**Aggregate demand and aggregate supply model.** A model that explains short-run fluctuations in real GDP and the price level.

**Aggregate demand curve (AD).** A curve showing the relationship between the price level and the quantity of real GDP demanded by households, firms, and the government.

**Fiscal policy.** These are changes in federal taxes and purchases intended to attain macroeconomic policy goals.

**Long-run aggregate supply curve (LRAS).** A curve showing the relationship in the long run between the price level and the quantity of real GDP supplied.

**Menu costs.** The costs to firms of changing prices.

**Monetary policy.** These are actions by the Federal Reserve to change the money supply and interest rates in order to achieve macroeconomic policy objectives.

**Short-run aggregate supply curve (SRAS).** A curve showing the relationship in the short run between the price level and the quantity of real GDP supplied by firms.

**Stagflation.** A combination of inflation and recession, usually resulting from a supply shock.

**Supply shock.** An unexpected event that causes the short-run aggregate supply curve to shift.
Appendix

Macroeconomic Schools of Thought (pages 426-428)

LEARNING OBJECTIVE: Understand macroeconomic schools of thought.

There are three major alternative models to the aggregate demand and aggregate supply model. Monetarism emphasizes that the quantity of money should be increased at a constant rate. *New classical macroeconomics* emphasizes that workers and firms have rational expectations. The *real business cycle model* focuses on real, rather than monetary, causes of the business cycle.

**Key Terms – Appendix**

**Keynesian revolution.** The name given to the widespread acceptance during the 1930s and 1940s of John Maynard Keynes’s macroeconomic model.

**Monetarism.** The macroeconomic theories of Milton Friedman and his followers, particularly the idea that the quantity of money should be increased at a constant rate.

**Monetary growth rule.** A plan for increasing the quantity of money at a fixed rate that does not respond to changes in economic conditions.

**New classical macroeconomics.** The macroeconomic theories of Robert Lucas and others, particularly the idea that workers and firms have rational expectations.

**Real business cycle model.** A macroeconomic model that focuses on real, rather than monetary, causes of the business cycle.

**Self-Test**

(Answers are provided at the end of the Self-Test.)

**Multiple-Choice Questions**

1. The aggregate demand and aggregate supply model explains
   a. the effect of changes in the inflation rate on the nominal interest rate.
   b. short-run fluctuations in real GDP and the price level.
   c. the effect of long-run economic growth on the standard of living.
   d. the effect of changes in the interest rate on investment spending.
2. The aggregate demand curve shows the relationship between the price level and the quantity of real GDP demanded by
   a. households.
   b. firms.
   c. the government.
   d. all of the above

3. The *wealth effect* refers to the fact that
   a. when the price level falls, the real value of household wealth rises, and so will consumption.
   b. when income rises, consumption rises.
   c. when the price level falls, the nominal value of assets rises, while the real value of assets remains the same.
   d. all of the above

4. The *interest rate effect* refers to the fact that a higher price level results in
   a. higher interest rates and higher investment.
   b. higher interest rates and lower investment.
   c. lower interest rates and lower investment.
   d. lower interest rates and higher investment.

5. The *international-trade effect* refers to the fact that an increase in the price level will result in
   a. an increase in exports and a decrease in imports.
   b. a decrease in exports and an increase in imports.
   c. an increase in exports and an increase in imports.
   d. a decrease in exports and a decrease in imports.

6. If the price level increases, then
   a. the economy will move up and to the left along a stationary aggregate demand curve.
   b. the aggregate demand curve will shift to the right.
   c. the aggregate demand curve will shift to the left.
   d. none of the above

7. Which of the following factors does not cause the aggregate demand curve to shift?
   a. a change in the price level
   b. a change in government policies
   c. a change in the expectations of households and firms
   d. a change in foreign variables

8. Which of the following will not shift the aggregate demand curve to the right?
   a. a fall in the price level
   b. a decrease in taxes
   c. households expecting higher future income
   d. exports rising

9. Which of the following government policies affects the economy through intended changes in the money supply and interest rates?
   a. fiscal policy
   b. monetary policy
   c. both fiscal and monetary policies
   d. neither fiscal nor monetary policies
10. How can government policies shift the aggregate demand curve to the right?
   a. by increasing personal income taxes
   b. by increasing business taxes
   c. by increasing government purchases
   d. all of the above

11. Which of the following statements is correct?
   a. If households become more optimistic about their future incomes, the aggregate demand curve
      will shift to the right.
   b. If firms become more optimistic about the future profitability of investment spending, the
      aggregate demand curve will shift to the right.
   c. Both a. and b.
   d. Neither a. nor b. Optimism or pessimism do not have anything to do with shifts in the aggregate
      demand curve.

12. If real GDP in the United States increases faster than real GDP in other countries, U.S. imports will
    __________ faster than U.S. exports, and net exports will __________.
    a. increase; rise
    b. increase; fall
    c. decrease; rise
    d. decrease; fall

13. If the exchange rate between the dollar and foreign currencies rises (the dollar rises in value versus
    foreign currencies), the price in foreign currency of U.S. products will _________ and the U.S.
    aggregate demand curve will shift to the ________.
    a. rise; right
    b. rise; left
    c. fall; right
    d. fall; left

14. An increase in net exports that results from a change in the price level in the United States
    a. will shift the aggregate demand curve to the right.
    b. will shift the aggregate demand curve to the left.
    c. will not cause the aggregate demand curve to shift.
    d. will have an indeterminate effect on aggregate demand.

15. Which of the following statements is true?
    a. In the long run, increases in the price level result in an increase in real GDP.
    b. In the long run, increases in the price level result in a decrease in real GDP.
    c. In the long run, changes in the price level do not affect the level of real GDP.
    d. In the long run, changes in the price level may either increase or decrease real GDP.

16. The long-run aggregate supply curve
    a. is positively sloped.
    b. shifts to the right as technological change occurs.
    c. is negatively sloped.
    d. shifts to the left as the capital stock of the country grows.
17. Which of the following factors will cause the long-run aggregate supply curve to shift to the right?
   a. an increase in the number of workers in the economy
   b. the accumulation of more machinery and equipment
   c. technological change
   d. all of the above

18. Which of the following factors will shift the short-run aggregate supply to the right?
   a. an increase in the price level
   b. an increase in the wage rate
   c. an increase in the cost of producing output
   d. the labor force increases

19. Why does the short-run aggregate supply curve slope upward?
   a. because profits rise when the prices of the goods and services firms sell rise more rapidly than the prices they pay for inputs
   b. because an increase in market price results in an increase in quantity supplied, as stated by the law of supply
   c. because, as the number of workers, machinery, equipment, and technological changes increase, quantity supplied increases
   d. all of the above

20. If firms and workers could predict the future price level exactly, the short-run aggregate supply curve would be
   a. downward sloping.
   b. upward sloping.
   c. horizontal.
   d. the same as the long-run aggregate supply curve.

21. Why does the failure of workers and firms to accurately predict the price level result in an upward-sloping aggregate supply curve?
   a. because contracts make some wages and prices “sticky”
   b. because firms are often slow to adjust wages
   c. because menu costs make some prices “sticky”
   d. all of the above

22. Assume that steel is the only good produced in the economy. Which of the following would explain why the short-run aggregate supply curve for steel would be upward sloping?
   a. Steel demand and steel prices begin to rise rapidly, and the wages of steel workers rise as the demand for workers increases.
   b. Steel demand and steel prices begin to rise rapidly, but the price of coal—an input into the production of steel—remains fixed by contract.
   c. Steel demand and steel prices begin to rise rapidly, but foreign producers increase production faster than domestic producers increase production.
   d. all of the above

23. What are menu costs?
   a. the costs of searching for profitable opportunities
   b. the costs associated with guarding against the effects of inflation
   c. the costs to firms of changing prices
   d. the costs of a fixed list of inputs
24. What is the impact of an increase in the price level on the short-run aggregate supply curve?
   a. a shift of the curve to the right
   b. a shift of the curve to the left
   c. a movement up and to the right along a stationary curve
   d. a combination of a movement along the curve and a shift of the curve

25. Which of the following will cause the short-run aggregate supply curve to shift to the right?
   a. a higher expected future price level
   b. an increase in the actual (or current) price level
   c. a technological change
   d. all of the above

26. If workers and firms across the economy adjust to the fact that the price level is higher than they had expected it to be,
   a. there will be a movement up and to the right along a stationary aggregate supply curve.
   b. there will be a movement down and to the left along a stationary aggregate supply curve.
   c. the short-run aggregate supply curve will shift to the left.
   d. the short-run aggregate supply curve will shift to the right.

27. If oil prices rise unexpectedly,
   a. there will be a movement up and to the right along a stationary aggregate supply curve.
   b. there will be a movement down and to the left along a stationary aggregate supply curve.
   c. the short-run aggregate supply curve will shift to the left.
   d. the short-run aggregate supply curve will shift to the right.

28. An unexpected increase in the price of oil would be called _________ by economists.
   a. a demand shock
   b. an adverse supply shock
   c. disinflation
   d. an increase in menu costs

29. A supply shock will
   a. increase the real GDP in the short-run.
   b. not change real GDP in the long-run.
   c. shift the long-run aggregate supply curve to the right.
   d. decrease both the price level and real GDP in the short-run.

30. If firms reduce investment spending and the economy slumps into a recession, which of the following contributes to the adjustment that causes the economy to return to its long-run equilibrium?
   a. the eventual agreement by workers to accept lower wages
   b. the decision by firms to charge higher prices
   c. both of the above
   d. none of the above

31. If the economy adjusts through the automatic mechanism, then a decline in aggregate demand causes
   a. a recession in the short run, and an increase in the price level in the long run.
   b. a recession in the short run, and a decline in the price level in the long run.
   c. an expansion in the short run, and a decline in the price level in the long run.
   d. an expansion in the short run, and an increase in the price level in the long run.
32. If the economy is initially at full employment equilibrium, in the short run, an increase in aggregate demand causes _____________ in real GDP, and in the long run, it causes___________ in the price level.
   a. an increase; an increase
   b. a decrease; a decrease
   c. an increase; a decrease
   d. a decrease; an increase

33. Stagflation is
   a. a combination of inflation and recession.
   b. a combination of stagnation and deflation.
   c. a situation of low inflation and low unemployment.
   d. stagnant employment during periods of expansion.

34. Which of the following is usually the cause of stagflation?
   a. reductions in government spending
   b. increases in investment
   c. a decline in net exports
   d. an adverse supply shock

35. After an adverse supply shock, what causes the short-run aggregate supply to shift to the right until the long-run level of equilibrium output is reached once again?
   a. an increase in the wages that workers earn and the prices that firms charge
   b. workers’ willingness to accept lower wages and firms’ willingness to accept lower prices
   c. an increase in government spending
   d. a decrease in government spending

36. How accurate is the prediction that a recession in the U.S. caused by the aggregate demand curve shifting to the left will cause the price level to fall?
   a. Very accurate. In fact, since the 1930s, this has happened every time there has been a recession in the economy.
   b. Inaccurate. This has not happened for an entire year since the 1930s.
   c. The results have been mixed. Sometimes since the 1930s this has happened, and other times it has not.
   d. Unfortunately, there is not enough data to substantiate the predictions of the model.

37. To turn the basic model of aggregate demand and aggregate supply into a dynamic model, which of the following assumptions must be made?
   a. Potential real GDP increases continually, shifting the long-run aggregate supply (LRAS) curve to the right.
   b. During most years, the aggregate demand (AD) curve will be shifting to the right.
   c. Except during periods when workers and firms expect high rates of inflation, the short-run aggregate supply (SRAS) curve will be shifting to the right.
   d. all of the above
38. If no other factors that affect the SRAS curve have changed, what impact will increases in the labor force, increases in the capital stock, and technological change have on both the short-run and the long-run aggregate supply?
   a. Over time, both the long-run aggregate supply and the short-run aggregate supply will shift to the right by the same amount.
   b. Over time, the long-run aggregate supply will shift to the right, and the short-run aggregate supply will remain stationary.
   c. Over time, the long-run aggregate supply will remain stationary, and the short-run aggregate supply will shift to the right.
   d. Both the long-run aggregate supply and the short-run aggregate supply will shift to the left by the same amount.

39. How does the dynamic model of aggregate supply and aggregate demand explain inflation?
   a. by showing that if total production in the economy grows faster than total spending, prices will rise
   b. by showing that increases in labor productivity usually lead to increases in prices
   c. by showing that if total spending in the economy grows faster than total production, prices will rise
   d. none of the above

40. In the dynamic aggregate demand and supply model, which of the following is correct?
   a. If aggregate demand increases more than aggregate supply increases, the price level will rise.
   b. If aggregate demand and aggregate supply both increase the same amount, the price level will rise.
   c. If aggregate supply increases more than aggregate demand increases, the price level will rise.
   d. If aggregate supply increases more than aggregate demand increases, the price level will not change.

41. The long economic expansion that began in March 1991 and ended in March 2001 gave way to a recession. The recession was caused by a decline in aggregate demand. Which factors contributed to this decline?
   a. the end of the stock market “bubble” and excessive investment in information technology
   b. the terrorist attacks of September 11, 2001
   c. the corporate accounting scandals
   d. all of the above

42. As productivity and real GDP rose during 2002 and 2003, economists noticed that if firms can produce more output with the same number of workers
   a. firms will be inclined to hire additional workers in the short run.
   b. firms might be less likely to hire additional workers in the short run.
   c. labor productivity will be the main determinant of output in the long run.
   d. firms will produce output using more workers and less capital.

43. The effect of productivity growth on the level of employment is as follows:
   a. Productivity growth affects the level of employment, but only in the short run.
   b. Productivity growth affects the level of employment in both the short run and the long run.
   c. There is no relationship between productivity growth and the level of employment in either the short run or the long run.
   d. Productivity growth affects the level of employment, but only in the long run.
44. The 1974-1975 recession was a clear example of
   a. the impact that a decrease in aggregate demand can have on the economy.
   b. the impact of a shift to the left in the long run aggregate supply on the economy.
   c. the impact of an adverse supply shock on the economy.
   d. none of the above

45. Which of the following are the main objectives of this chapter?
   a. to discuss the determinants of aggregate demand and aggregate supply, and distinguish between a
      movement along the short-run aggregate supply curve and a shift of the curve
   b. to use the aggregate demand and aggregate supply model to illustrate the difference between
      short-run macroeconomic equilibrium and long-run macroeconomic equilibrium
   c. to use the dynamic aggregate demand and aggregate supply model to analyze macroeconomic
      conditions
   d. all of the above

Short Answer Questions

1. Explain the difference between the aggregate demand curve and the demand curve for an
   individual product.

   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

2. Explain the difference between a shift of the $AD$ curve and a movement along the $AD$ curve.

   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________

3. Over time, as the capital stock increases, the number of workers increases, and technology change
   occurs, what happens to the $LRAS$ and $SRAS$ curves?

   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
   ________________________________________________________________________________
4. Suppose the $AD$ and $SRAS$ curves intersect at a level of real GDP to the right of the $LRAS$ curve. Show this graphically. Explain how real GDP will adjust toward potential real GDP. Show the resulting long-run equilibrium graphically.

5. Over time, the $AD$ and $LRAS$ curves both shift to the right. Show that this can have three results: inflation, no price change, or deflation. Because we generally observe inflation in the U.S. economy, what does this tell us about the shifts in the $AD$ and $LRAS$ curves over time?

6. Starting at potential real GDP, explain why the short-run impact of an increase in aggregate demand on output is different from the long-run impact of a change in aggregate demand on output.

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True/False Questions

1. The wealth effect suggests that a fall in the price level will increase consumption spending by households.  
T F
2. As the price level in the United States increases, exports from the United States will also increase.  
T F
3. An increase in taxes will reduce consumption and shift the $AD$ curve to the right.  
T F
4. Because prices do not influence the level of the capital stock, the number of workers, or the level of technology in the long run, changes in the price level will not change the level of real GDP in the long run.  
T F
5. Growth in the capital stock will shift the $LRAS$ curve to the left.  
T F
6. When real GDP is equal to potential real GDP, there is no unemployment.  
T F
7. Generally, as prices of finished goods rise, the prices of inputs, such as labor, rise at the same pace.  
T F
8. If workers expect prices to rise, the $SRAS$ curve will shift to the left.  
T F
9. An unexpected increase in the price of an important natural resource is called a supply shock and will shift the $SRAS$ curve to the right.  
T F
10. Long-run macroeconomic equilibrium occurs where the $AD$ and $SRAS$ curves intersect at a point on the $LRAS$ curve.  
T F
11. A decrease in $AD$ will reduce real GDP in the short run and in the long-run.  
T F
T F 12. If real GDP is to the left of the LRAS curve, there will be no cyclical unemployment.
T F 13. The adjustment from short-run to long-run equilibrium is due to government policy actions.
T F 14. A supply shock will temporarily reduce the level of real GDP.
T F 15. If AD grows faster than LRAS, prices will not change.

Answers to the Self-Test

Multiple-Choice Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b</td>
<td>The aggregate demand and aggregate supply model explains short-run fluctuations in real GDP and the price level. As Figure 12-1 shows, in this model real GDP and the price level are determined in the short run by the intersection of the aggregate demand curve and the aggregate supply curve. Fluctuations in real GDP and the price level are caused by shifts in the aggregate demand curve or in the aggregate supply curve.</td>
</tr>
<tr>
<td>2</td>
<td>d</td>
<td>The aggregate demand and aggregate supply model explains short-run fluctuations in real GDP and the price level. As Figure 12-1 shows, in this model real GDP and the price level are determined in the short run by the intersection of the aggregate demand curve and the aggregate supply curve. Fluctuations in real GDP and the price level are caused by shifts in the aggregate demand curve or in the aggregate supply curve. The aggregate demand curve shows the relationship between the price level and the quantity of real GDP demanded by households, firms, and the government.</td>
</tr>
<tr>
<td>3</td>
<td>a</td>
<td>When the price level falls, the real value of household wealth rises, and so will consumption. Economists refer to this impact of the price level on consumption as the <em>wealth effect</em>.</td>
</tr>
<tr>
<td>4</td>
<td>b</td>
<td>When prices rise, businesses and households need more money to finance buying and selling. A higher interest rate raises the cost of borrowing to business firms and households. As a result, firms will borrow less to build new factories or to install new machinery and equipment, and households will borrow less to buy new houses. A lower price level will have the reverse effect, leading to an increase in investment.</td>
</tr>
<tr>
<td>5</td>
<td>b</td>
<td>If the price level in the United States rises relative to the price levels in other countries, U.S. exports will become relatively more expensive and foreign imports will become relatively less expensive. Some consumers in foreign countries will shift from buying U.S. products to buying domestic products, and some U.S. consumers will also shift from buying U.S. products to buying imported products. U.S. exports will fall and U.S. imports will rise, causing net exports to fall. A lower price level in the United States has the reverse effect, causing net exports to rise.</td>
</tr>
<tr>
<td>6</td>
<td>a</td>
<td>If the price level rises but other factors that affect the willingness of households, firms, and the government to spend are unchanged, then the economy will move up a stationary aggregate demand curve.</td>
</tr>
<tr>
<td>7</td>
<td>a</td>
<td>The factors that cause the aggregate demand curve to shift fall into three categories: changes in government policies, changes in the expectations of households and firms, and changes in foreign factors. Changes in the price level causes a movement along the aggregate demand curve, not a shift.</td>
</tr>
</tbody>
</table>
A price level change causes a movement along the AD curve rather than a shift in the curve.

The federal government uses monetary policy and fiscal policy to shift the aggregate demand curve. Monetary policy involves changes in interest rates, and fiscal policy involves changes in government purchases and taxes.

Because government purchases are one component of aggregate demand, an increase in government purchases shifts the aggregate demand curve to the right. An increase in personal income taxes reduces disposable income available to households. This reduces consumption spending and shifts the aggregate demand curve to the left. Lower personal income taxes shift the aggregate demand curve to the right. Increases in business taxes reduce the profitability of investment spending and shift the aggregate demand curve to the left. Decreases in business taxes shift the aggregate demand curve to the right.

If households become more optimistic about their future incomes, they are likely to increase their current consumption. This will shift the aggregate demand curve to the right. Similarly, if firms become more optimistic about the future profitability of investment spending, the aggregate demand curve will shift to the right.

When real GDP increases, so does the income available for consumers and businesses to spend. If real GDP in the United States increases faster than real GDP in other countries, U.S. imports will increase faster than U.S. exports, and net exports will fall. This happened in the late 1990s and early 2000s.

Net exports will fall if the exchange rate between the dollar and foreign currencies rises, because the price in foreign currency of U.S. products sold in other countries will rise, thereby lowering exports, and the dollar price of foreign products sold in the United States will fall, which increases U.S. imports. Consequently, net exports will fall. A decrease in net exports at every price level will shift the AD curve to the left.

A change in the U.S. domestic price level causes a movement along the U.S. aggregate demand curve, not a shift. Therefore, a change in net exports caused by a change in the price level in the United States will not cause the aggregate demand curve to shift.

In the long run, changes in the price level do not affect the level of real GDP. Figure 12-2 illustrates the fact that in the long run, changes in the price level do not affect real GDP by showing the long-run aggregate supply curve (LRAS) as a vertical line.

The long-run aggregate supply curve is vertical and shifts to the right with increases in capital, labor, and technology.

The long-run aggregate supply curve and potential real GDP increase each year as the number of workers in the economy increases, the economy accumulates more machinery and equipment, and technological improvement occurs.

A price level change will cause a movement along the short-run aggregate supply curve, while increasing costs of production and higher wages will cause the curve to shift to the left. Increases in labor force will cause the curve to shift to the right.
The short-run aggregate supply curve (SRAS) slopes upward because, as prices of final goods and services rise, prices of inputs—such as the wages of workers—rise more slowly. Profits rise when the prices of the goods and services firms sell rise more rapidly than the prices they pay for inputs. Therefore, a higher price level leads firms to supply more goods and services.

A secondary reason the SRAS curve slopes upward is that as the price level rises or falls, some firms are slow to adjust their prices. A firm that is slow to raise its prices when the price level is increasing may find its sales increasing and will increase production.

It is impossible for each firm and every individual to correctly predict the future price level. If they could, the short-run aggregate supply curve would be the same as the long-run aggregate supply curve. Most economists agree that the short-run aggregate supply curve slopes upward because workers and firms cannot accurately predict the future price level.

Most economists agree that the short-run aggregate supply curve slopes upward because workers and firms fail to accurately predict the future price level. Economists are not in complete agreement on why this is true, but the three most common explanations are: contracts make some wages and prices “sticky,” businesses are often slow to adjust wages, and menu costs make some prices sticky.

If steel demand and steel prices begin to rise rapidly, producing additional steel will be profitable, because coal prices will remain fixed by contract. In both of these cases, rising prices lead to higher output. If these examples are representative of enough firms in the economy, then a rising price level should lead to a greater quantity of goods and services supplied. If the workers of the coal companies had accurately predicted what would happen to prices, this would have been reflected in the contracts, and the steel mill would not have earned greater profits when prices rose. In that case, rising prices would not have led to higher output.

If demand for their products is higher or lower than they had expected, firms may want to charge prices different from the ones printed in their menus or catalogs. Changing prices would be costly, however, because it would involve printing new menus or catalogs. The costs to firms of changing prices are called menu costs.

If the price level changes, but other factors are unchanged, then the economy will move up or down a stationary aggregate supply curve. If any factor other than the price level changes, the aggregate supply curve will shift.

As technology improves, the productivity of workers and machinery increases, which means that firms can produce more goods and services with the same quantities of labor and capital. This reduces their costs of production and allows them to produce more output at every price level. As a result, the short-run aggregate supply curve shifts to the right.

If workers and firms across the economy are adjusting to the price level being higher than expected, the short-run aggregate supply curve will shift to the left. If they are adjusting to the price level being lower than expected, the short-run aggregate supply curve will shift to the right.
If oil prices rise unexpectedly, the costs of production will rise for many firms. Some utilities also burn oil to generate electricity, so electricity prices will rise. Rising oil prices lead to rising gasoline prices, which raise transportation costs for many firms. Oil is a key input to manufacturing plastics and artificial fibers, so costs will rise for many other products. Because many firms face rising marginal production costs, they will supply the same level of output only at higher prices, and the short-run aggregate supply curve will shift to the left.

Economists refer to an unexpected increase in the price of an important raw material as an adverse supply shock.

In the long run, real GDP is determined by the position of the long-run aggregate supply curve.

The decrease in aggregate demand initially leads to a short-run equilibrium with a lower price level. Workers and firms will begin to adjust to the price level being lower than they had expected it to be. Workers will be willing to accept lower wages—because each dollar of wages is able to buy more goods and services—and firms will be willing to accept lower prices. In addition, the unemployment resulting from the recession will make workers more willing to accept lower wages, and the decline in demand will make firms more willing to accept lower prices.

An important point to notice is that a decline in aggregate demand causes a recession in the short run, but in the long run it causes only a decline in the price level. Economists refer to the process of adjustment back to full employment just described as an automatic mechanism because it occurs without any actions by the government.

In the short run, the increase in aggregate demand causes an increase in real GDP. In the long run, it causes only an increase in the price level.

Stagflation is a combination of inflation and recession.

The recession caused by the supply shock increases unemployment and reduces output. This eventually results in workers being forced to accept lower wages and firms being forced to accept lower prices. Lower wages cause the short-run aggregate supply curve to shift back to the long-run equilibrium output at full employment.

The basic aggregate demand and aggregate supply model gives us important insights into how short-run macroeconomic equilibrium is determined. Unfortunately, the model also gives us some misleading results: For instance, it incorrectly predicts that a recession caused by the aggregate demand curve shifting to the left will cause the price level to fall, which has not happened for an entire year since the 1930s.

The economy is not static, with an unchanging level of full-employment real GDP and no continuing inflation. Real economies are dynamic, with growing potential GDP and ongoing inflation. We can create a dynamic aggregate demand and aggregate supply model by making three changes to the basic model: 1) The full-employment level of real GDP increases continually, shifting the long-run aggregate supply (LRAS) curve to the right; 2) During most years the aggregate demand (AD) curve will be shifting to the right, and 3) Except during periods when workers and firms expect high rates of inflation, the short-run aggregate supply (SRAS) curve will be shifting to the right.
Increases in the labor force and the capital stock and technological change cause both the long-run aggregate supply curve and the short-run aggregate supply curve to shift. If no other factors that affect the $SRAS$ curve have changed, the $LRAS$ and $SRAS$ curves will shift to the right by the same amount.

The dynamic aggregate demand and aggregate supply model provides a more accurate explanation than the basic model of the source of most inflation. Figure 12-9 shows that if total spending in the economy grows faster than total production, prices rise. If the $AD$ curve shifts to the right by more than the $LRAS$ curve, inflation will result because equilibrium will occur at a higher price level.

In a growing economy, prices rise when aggregate demand grows more than aggregate supply.

All of the factors above caused a decline in aggregate demand that ended the long expansion of the 1990s.

If firms can produce more output with the same number of workers, are they less likely to hire additional workers? Some observers argued that this was happening during 2002 and 2003 as productivity and real GDP rose, but employment grew very little.

We know that over the long run, the level of employment is determined by population growth and by factors—such as the level of retirement benefits and unemployment payments—that affect the fraction of the population in the labor force. The level of employment is not determined in the long run by the rate of productivity growth. In fact, a report from the Federal Reserve Bank of Dallas noted that between 1979 and 2003, the level of productivity in the U.S. economy increased by 67 percent, while during the same period 40 million new jobs were created. That the effect of productivity growth on employment is only temporary was demonstrated in 2004, as productivity growth remained high, but employment began to increase rapidly.

The 1974-1975 recession provides a clear example of the impact of an adverse supply shock on the economy. Following the Arab-Israeli War of 1973, the Organization of Petroleum Exporting Countries (OPEC) increased the price of a barrel of oil from less than $3 to more than $10.

We saw in Chapter 3 how powerful the microeconomic model of supply and demand is in explaining many facts about business and economics. In this chapter we have seen that the macroeconomic model of aggregate demand and aggregate supply is also very useful in explaining fluctuations in real GDP and the price level.

**Short Answer Responses**

1. Though the demand curve for an individual product and the $AD$ curve look alike, they are very different. On the individual product demand curve, as the price changes, all other prices are held constant. On the $AD$ curve, all prices are changing together.

2. A change in the price level (the GDP deflator) will cause a movement along the $AD$ curve. As the price level increases, the quantity demand of real GDP falls because of the wealth effect, the interest-rate effect, and the international-trade effect. The $AD$ curve shifts when something happens that changes demand for real GDP at each price level, such as a change in government purchases, investment spending, or net exports.
3. Over time as the capital stock increases, the number of workers increases, and technology change occurs, firms can produce more output. This is seen as a shift in the $LRAS$ curve to the right. As this happens the $SRAS$ curve also shifts out, reflecting the notion that firms can produce more with more resources. This is shown in the graph below.

As this growth occurs, other economic variables may also change, so the shift in the $SRAS$ curve could be larger or smaller than that shown above. For instance, if a supply shock occurred the new $SRAS$ curve would not shift as far to the right as shown above.

4. The initial equilibrium, with the $AD$ and $SRAS$ curves together at an output level to the right of the $LRAS$ curve, would look like:
With the SRAS and AD curves above, the short-run equilibrium would be at $P_1$ and $Y_1$. Because this level of real GDP is above potential real GDP, eventually wages will start to rise. This increase in wages will shift the SRAS curve to the left. The SRAS curve will continue to shift to the left until real GDP returns to the level of potential real GDP, $Y_0$. This is the automatic adjustment mechanism. The final equilibrium is shown in the graph below.

5. Over time, both the $AD$ curve and the LRAS curve will shift to the right. What happens to the price level depends on the increase in demand relative to the increase in supply. Shown below are three possibilities. If the $AD$ curve shifts to the right more than the LRAS curve ($AD_0 \rightarrow AD_1$), the price level will rise from $P_0$ to $P_1$, so there will be inflation. If the $AD$ curve shifts the same as the LRAS curve ($AD_0 \rightarrow AD_2$), prices will not change. If the $AD$ curve shifts to the right less than the LRAS curve ($AD_0 \rightarrow AD_3$), then the price level will fall from $P_0$ to $P_2$, so there will be deflation.

Because we observe over time that both the price level and real GDP generally increase, we can conclude that $AD$ usually increases more than LRAS.
6. In the short run, the increase in $AD$ will result in a higher price level and a higher level of output. This extra production pushes the economy above potential real GDP. At this higher level of production above potential, costs of producing will begin to rise. These higher costs will in the long run cause the $SRAS$ curve to shift to the left, eventually returning the economy to potential real GDP. In the short run with costs fixed, output can rise from an increase in aggregate demand. In the long run, as costs adjust upward, the level of real GDP returns to potential GDP.

**True/False Answers**

1. T
2. F  As U.S. prices rise, other things (prices in other countries) equal, U.S. goods get more expensive, causing exports to fall.
3. F  Higher taxes will reduce consumption, but shift $AD$ to the left.
4. T
5. F  Capital growth will increase potential real GDP and shift the $LRAS$ curve to the right.
6. F  At potential real GDP there is both structural and frictional unemployment.
7. F  The price of labor, the wage rate, rises slower than output prices. This is one of the reasons for the positively-sloped $SRAS$ curve.
8. T
9. F  A supply shock will shift the $SRAS$ curve to the left.
10. T
11. F  A change in $AD$ will only change real GDP in the short run.
12. F  At output to the left of the $LRAS$ curve, there will be cyclical unemployment.
13. F  The automatic adjustment from short-run to long-run equilibrium is due to the adjustment of input prices.
14. T
15. F  If $AD$ grows faster than $LRAS$, prices will rise.