Learning Objectives

1. Describe the Phillips curve and the nature of the short-run trade-off between unemployment and inflation.
2. Explain the relationship between the short-run and long-run Phillips curves.
3. Discuss how expectations of the inflation rate affect monetary policy.
4. Use a Phillips curve graph to show how the Federal Reserve can permanently lower the inflation rate.
Discovery of the SR Tradeoff Between Unemployment and Inflation

- The top two MP goals can sometimes be in conflict:
  - price stability
  - higher employment

- In the SR, there can be a trade-off between unemployment and inflation: Lower UE can result in higher inflation rate. However, in the LR, the UE is independent of the inflation rate.

- We can use the AD-AS model to explain the short-run trade-off.
The Discovery of the Short-Run Trade-off between Unemployment and Inflation

**Phillips curve** A curve showing the short-run relationship between the unemployment rate and the inflation rate.

**Figure 16-1**

**The Phillips Curve**

A.W. Phillips was the first economist to show that there is usually an inverse relationship between unemployment and inflation. Here we can see this relationship at work:

In the year represented by point A, the inflation rate is 4 percent and the unemployment rate is 5 percent.

In the year represented by point B, the inflation rate is 2 percent and the unemployment rate is 6 percent.

16.1 LEARNING OBJECTIVE

Describe the Phillips curve and the nature of the short-run trade-off between unemployment and inflation.
Explaining the Phillips Curve with Aggregate Demand and Aggregate Supply Curves

The economy in 2011 is at point A, with real GDP of $14.0 trillion and a price level of 100.

If there is weak growth in aggregate demand, in 2012, the economy moves to point B, with real GDP of $14.3 trillion and a price level of 102. The inflation rate is 2 percent and the unemployment rate is 6 percent, which corresponds to point B on the Phillips curve in panel (b).

If there is strong growth in aggregate demand, in 2012, the economy moves to point C, with real GDP of $14.6 trillion and a price level of 104. Strong aggregate demand growth results in a higher inflation rate of 4 percent but a lower unemployment rate of 5 percent. This combination of higher inflation and lower unemployment is shown as point C on the Phillips curve in panel (b).
Is the Phillips Curve a Policy Menu?

- **Structural relationship (S-R):** A relationship that depends on the basic behavior of consumers and firms and remains *unchanged* over long periods.

- S-R are useful in formulating macro policy because policymakers (PM) can anticipate that these relationships are constant, i.e., the relationships will *not* change as a result of changes in policy.

- If the PC were a S-R, it would provide policymakers with a *reliable menu* of combinations of UE and inflation: They could either
  1. use expansionary MP or FP to choose a point on the curve that had lower UE and higher inflation or
  2. use contractionary MP or FP to choose a point of higher UE and lower inflation.

- In the 1960s, economists and PMs viewed the PC as a S-R (a *permanent trade-off* bw UE and Inflation). However, it turned out the PC is *not* a S-R.
During the 1960s, the basic Phillips curve relationship seemed to hold because a stable trade-off appeared to exist between unemployment and inflation.

Then in 1968, in his presidential address to the AEA, Milton Friedman argued that the Phillips curve did not represent a permanent trade-off between unemployment and inflation.

The reason is that if the LR-AS curve is vertical at potential real GDP (economists had come to agree this then), the PC could not be downward sloping in the LR. In other words, there is no trade-off between UE and inflation in the LR.
The Long-Run Phillips Curve

- The level of real GDP in the LR is referred to as potential GDP, at which firms operate at their capacity and everyone wants a job will have one, except the structurally and frictionally unemployed.
- *Natural rate of unemployment* The UER that exists when the economy is at potential GDP.
- In the SR, the actual UER and actual real GDP fluctuate around the NRU and potential real GDP, respectively.
- In the LR, the PL has no impact on potential real GDP and the inflation rate has no impact on the NRU.
The Discovery of the Short-Run Trade-off between Unemployment and Inflation

The Long-Run Phillips Curve

Milton Friedman and Edmund Phelps argued that there is no trade-off between unemployment and inflation in the long run. If real GDP automatically returns to its potential level in the long run, the unemployment rate must return to the natural rate of unemployment in the long run. In this figure, we assume that potential real GDP is $14 trillion and the natural rate of unemployment is 5 percent.
The Discovery of the Short-Run Trade-off between Unemployment and Inflation

The Role of Expectations of Future Inflation

Real wage = \( \frac{\text{Nominal wage}}{\text{Price level}} \times 100 = \frac{31.50}{105} \times 100 = 30 \)

Table 16-1

<table>
<thead>
<tr>
<th>NOMINAL WAGE</th>
<th>EXPECTED REAL WAGE</th>
<th>ACTUAL REAL WAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected ( P_{2015} = 105 )</td>
<td>Actual ( P_{2015} = 102 )</td>
<td>Actual ( P_{2015} = 108 )</td>
</tr>
<tr>
<td>Expected Inflation = 5%</td>
<td>Actual Inflation = 2%</td>
<td>Actual Inflation = 8%</td>
</tr>
</tbody>
</table>
| $31.50 \times \frac{100}{105} = 30 \) | $31.50 \times \frac{100}{102} = 30.88 \) | $31.50 \times \frac{100}{108} = 29.17 \)

16.1 LEARNING OBJECTIVE
Describe the Phillips curve and the nature of the short-run trade-off between unemployment and inflation.
The Discovery of the Short-Run Trade-off between Unemployment and Inflation

The Role of Expectations of Future Inflation

Table 16-2

<table>
<thead>
<tr>
<th>IF . . .</th>
<th>THEN . . .</th>
<th>AND . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>actual inflation is greater than expected inflation,</td>
<td>the actual real wage is less than the expected real wage,</td>
<td>the unemployment rate falls.</td>
</tr>
<tr>
<td>actual inflation is less than expected inflation,</td>
<td>the actual real wage is greater than the expected real wage,</td>
<td>the unemployment rate rises.</td>
</tr>
</tbody>
</table>
Making the Connection

Do Workers Understand Inflation?

Although most economists believe an increase in inflation will lead quickly to an increase in wages, a majority of the general public thinks otherwise.

16.1 LEARNING OBJECTIVE
Describe the Phillips curve and the nature of the short-run trade-off between unemployment and inflation.
Friedman and Phelps: An increase in the inflation rate increases employment (and decreases unemployment) *only if* the increase in the inflation rate is *unexpected*.

A higher inflation rate can induce lower unemployment if both firms and workers under-estimate the inflation rate. In reality, firms can forecast more accurately than workers do or firms can better understand inflation.

*Nonaccelerating inflation rate of unemployment (NAIRU)* The unemployment rate at which the inflation rate has no tendency to increase or decrease.
The Short-Run and Long-Run Phillips Curves

16.2 LEARNING OBJECTIVE

Explain the relationship between the short-run and long-run Phillips curves.

Figure 16-4

The Short-Run Phillips Curve of the 1960s and the Long-Run Phillips Curve

In the late 1960s, U.S. workers and firms were expecting the 1.5 percent inflation rates of the recent past to continue.

However, expansionary monetary and fiscal policies moved the short-run equilibrium up the short-run Phillips curve to an inflation rate of 4.5 percent and an unemployment rate of 3.5 percent.

1. As the U.S. economy’s equilibrium moved up the short-run Phillips curve during the 1960s...

2. ...workers and firms expected an inflation rate of 1.5 percent...

3. ...but actually experienced an inflation rate of 4.5 percent.
The Short-Run and Long-Run Phillips Curves

Shifts in the Short-Run Phillips Curve

Figure 16-5

Expectations and the Short-Run Phillips Curve

By the end of the 1960s, workers and firms had revised their expectations of inflation from 1.5 percent to 4.5 percent. As a result, the short-run Phillips curve shifted up, which made the short-run trade-off between employment and inflation worse.

16.2 LEARNING OBJECTIVE

Explain the relationship between the short-run and long-run Phillips curves.
The Short-Run and Long-Run Phillips Curves

Shifts in the Short-Run Phillips Curve

Figure 16-6

A Short-Run Phillips Curve for Every Expected Inflation Rate

There is a different short-run Phillips curve for every expected inflation rate. Each short-run Phillips curve intersects the long-run Phillips curve at the expected inflation rate.

16.2 LEARNING OBJECTIVE

Explain the relationship between the short-run and long-run Phillips curves.
The Short-Run and Long-Run Phillips Curves

How Does a Vertical Long-Run Phillips Curve Affect Monetary Policy?

Figure 16-7

The Inflation Rate and the Natural Rate of Unemployment in the Long Run

The inflation rate is stable only if the unemployment rate equals the natural rate of unemployment (point C).

If the unemployment rate is below the natural rate (point A), the inflation rate increases, and, eventually, the short-run Phillips curve shifts up.

If the unemployment rate is above the natural rate (point B), the inflation rate decreases, and, eventually, the short-run Phillips curve shifts down.

16.2 LEARNING OBJECTIVE

Explain the relationship between the short-run and long-run Phillips curves.
Does the Natural Rate of Unemployment Ever Change?

Frictional or structural unemployment can change—thereby changing the natural rate—for several reasons:

- **Demographic changes.**
- **Labor market institutions.**
- **Past high rates of unemployment.**

What makes the natural rate of unemployment increase or decrease?
Expectations of the Inflation Rate

- How long the economy can remain on the SR-PC depends on how quickly workers and firms adjust their expectations of future inflation to changes in current inflation.
- The experience in the U.S. over the past 50 years indicates that how workers and firms adjust their expectations of inflation depends on how high the inflation rate is. There are 3 possibilities:
  1. *Low inflation* When inflation is low, workers and firms tend to ignore it.
2. (Cont.) *Moderate, but stable inflation* From 1968 to 1971, the inflation rate ranged between 4% to 5%. This rate is high enough that workers and firms can’t ignore it.

- It is also likely that the next year’s inflation rate would be close to the current rate. They acted as if they expected changes in inflation during one year to continue into the following year.
- *Adaptive expectations* people assume that future inflation rates will follow the pattern of rates of inflation in the recent past.
3. *High and unstable inflation.* The inflation rate was above 5% every year from 1973 to 1982. In addition, the inflation rate was also unstable during this period.

- Lucas and Sargent in the mid-1970s argued that the gains to forecasting inflation accurately had increased significantly. Otherwise, they could experience substantial declines in real wages and profits.
- They argued that workers and firms should use *all available information* when forming their expectations of future inflation.
- *Rational expectations (RE):* Expectations formed by *using all available information* about an economic variable.
Expectations of the Inflation Rate and Monetary Policy

The Effect of Rational Expectations on Monetary Policy

Figure 16-8
Rational Expectations and the Phillips Curve

If workers and firms ignore inflation, or if they have adaptive expectations, an expansionary monetary policy will cause the short-run equilibrium to move from point A on the short-run Phillips curve to point B; inflation will rise, and unemployment will fall.

If workers and firms have rational expectations, an expansionary monetary policy will cause the short-run equilibrium to move up the long-run Phillips curve from point A to point C. Inflation will still rise, but there will be no change in unemployment.
L&S pointed out an important consequence of RE: An expansionary MP would NOT work, i.e., there might not be a trade-off bw UE and inflation, even in the SR.

Most economists then had accepted that the expansionary MP could cause the actual inflation rate to be higher than the expected one. The gap bw these rates would then cause the actual real wage to fall below the expected one, and the UER would be pushed below the NRU. The economy would move up the SR-PC.
(Cont.) L&S argued that this explanation assumed that workers and firms either ignore inflation or use AE.

If they used RE, they would use all available information, including knowledge of the MP used by the Fed. *If they know that an expansionary MP would raise inflation, they then should use this information in forecasting inflation.*

If they do, an expansionary MP will not cause the actual inflation rate to be above the expected one. Instead, the actual rate will equal to the expected rate, the *actual* real wage will equal the *expected* RW, and the UER will not fall below the NRU.
L&S argued that the observed SR trade-off bw UE and inflation (i.e., the SR PC is downward sloping, and not vertical) during the 1950s and 1960s was actually the result of \textit{unexpected} changes in MP.

During those years, the Fed didn’t announce changes in MP, so workers, firms, and financial markets didn’t have enough information about the MP, and thus an expansionary MP might cause the UER to fall because the expectation of workers and firms would be too low. L&S argued that a pre-announced policy would not cause a change in UE.
Two objections to the vertical SR-PC:

1. Workers and firms actually may not have RE: Many economists doubt that people are able to use information on the MP to make a reliable forecast of inflation. If workers and firms don’t have enough knowledge about the effects of MP on inflation, the actual real wage will still be below the expected one.

2. The rapid adjustment of wages and prices needed for the SR-PC to be vertical will not actually take place. Also, if the wages and prices are sticky due to some reasons, then an expansionary MP may still reduce the UER even if workers and firms have RE.
Solved Problem 16-3
Stagflation and the Short-Run Phillips Curve

16.3 LEARNING OBJECTIVE
Discuss how expectations of the inflation rate affect monetary policy.

YOUR TURN: For more practice, do related problem 3.9 at the end of this chapter.
Kydland and Prescott argued that Lucas was wrong in assuming that fluctuations in real GDP are caused by unexpected changes in the MS. Instead, fluctuations in real factors, particularly technology shocks (changes to the economy that make it possible to produce either more or less output with the same amount of workers, machines, and other inputs), can explain deviations of real GDP from its potential level.

Real business cycle models Models that focus on real rather than monetary explanations of fluctuations in real GDP.

Skeptical: Negative tech shocks are uncommon, and it is difficult to identify shocks that are large enough to cause recessions.
During the late 1960s and early 1970s, the high inflation rates were caused by keeping the UER below the NRU.

By the mid-1970s, the Fed also had to deal with the inflation pressure caused by the negative supply shock – increases in the OPEC oil price.

Some economists argued that the inflation rate could be reduced only at the cost of a temporary increase in the UER.

Followers of RE argued that a painless reduction in the inflation rate was possible.
Fed Policy from the 1970s to the Present

The Effect of a Supply Shock on the Phillips Curve

16.4 LEARNING OBJECTIVE
Use a Phillips curve graph to show how the Federal Reserve can permanently lower the inflation rate.

Figure 16-9
A Supply Shock Shifts the SRAS and the Short-Run Phillips Curve

When OPEC increased the price of a barrel of oil from less than $3 to more than $10, in panel (a), the SRAS curve shifted to the left. Between 1973 and 1975, real GDP declined from $4,917 billion to $4,880 billion, and the price level rose from 28.1 to 33.6.

Panel (b) shows that the supply shock shifted up the Phillips curve. In 1973, the U.S. economy had an inflation rate of about 5.5 percent and an unemployment rate of about 5 percent. By 1975, the inflation rate had risen to about 9.5 percent and the unemployment rate to about 8.5 percent.
Paul Volcker and Disinflation

- In 1979, Volcker decided to reduce the inflation rate by using contractionary MP. Consequently, IRs were increased, causing a decline in AD.
- Hence, this MP shifted the economy’s SR equilibrium down the SR-PC, lowering inflation from 11% in 1979 to 6% in 1982 at the cost of increasing UER from 6% to 10%.
- As workers and firms lowered their expectation about future inflation, the SR-PC shifted down, improving the SR trade-off bw inflation and UE.
- This adjustment allowed the Fed to use expansionary MP to fight recession. By 1987, the NRU was back to 6%.
- Under his leadership, the Fed had reduced inflation from more than 10% to less than 5%.
- *Disinflation* A significant reduction in the inflation rate.
- The disinflation had come at a very high price. From 1982 to 1983, the UER was above 10%.
Fed Policy from the 1970s to the Present

Paul Volcker and Disinflation

Figure 16-10

The Fed Tames Inflation, 1979–1989

The Fed, under Chairman Paul Volcker, began fighting inflation in 1979 by reducing the growth of the money supply, thereby raising interest rates. By 1982, the unemployment rate had risen to 10 percent, and the inflation rate had fallen to 6 percent. As workers and firms lowered their expectations of future inflation, the short-run Phillips curve shifted down, improving the short-run trade-off between unemployment and inflation. This adjustment in expectations allowed the Fed to switch to an expansionary monetary policy, which by 1987 brought the economy back to the natural rate of unemployment, with an inflation rate of about 4 percent. The orange line shows the actual combinations of unemployment and inflation for each year from 1979 to 1989. Note that during these years, the natural rate of unemployment was estimated to be about 6 percent.

Disinflation  A significant reduction in the inflation rate.

16.4 LEARNING OBJECTIVE

Use a Phillips curve graph to show how the Federal Reserve can permanently lower the inflation rate.
Some economists argued that the Volcker disinflation provided evidence against RE:

- Volcker’s announcement in 1979 about planning to fight inflation was widely publicized.
- If worker and firms have RE, they should quickly reduce their expectations of future inflation and the economy should moved smoothly down the LR-PC.
- But actually it took several years for shifting the SR PC down. It is \( AE \), not \( RE \).

L&S argued that the problem was that people didn’t believe Volcker’s announcement then because previous Chairmen made similar promises but failed to reduce inflation (*Credibility problem*).
Fed Policy from the 1970s to the Present

Paul Volcker and Disinflation

Don’t Let This Happen to YOU!
Don’t Confuse Disinflation with Deflation

Disinflation refers to a decline in the inflation rate. Deflation refers to a decline in the price level.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>CONSUMER PRICE INDEX</th>
<th>DEFLATION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>17.1</td>
<td>-</td>
</tr>
<tr>
<td>1930</td>
<td>16.7</td>
<td>-2.3%</td>
</tr>
<tr>
<td>1931</td>
<td>15.2</td>
<td>-9.0</td>
</tr>
<tr>
<td>1932</td>
<td>13.7</td>
<td>-9.9</td>
</tr>
<tr>
<td>1933</td>
<td>13.0</td>
<td>-5.1</td>
</tr>
</tbody>
</table>

16.4 LEARNING OBJECTIVE
Use a Phillips curve graph to show how the Federal Reserve can permanently lower the inflation rate.

YOUR TURN: Test your understanding by doing related problem 4.5 at the end of this chapter.
Solved Problem 16-4
Using Monetary Policy to Lower the Inflation Rate

16.4 LEARNING OBJECTIVE
Once the short-run Phillips curve has shifted down, the Fed can use an expansionary monetary policy to push the economy back to the natural rate of unemployment.

YOUR TURN: For more practice, do related problems 4.7 and 4.8 at the end of this chapter.
### Fed Policy from the 1970s to the Present

**Alan Greenspan, Ben Bernanke, and the Crisis in Monetary Policy**

#### Table 16-3

The Record of Fed Chairmen and Inflation

<table>
<thead>
<tr>
<th>FEDERAL RESERVE CHAIRMAN</th>
<th>TERM</th>
<th>AVERAGE ANNUAL INFLATION RATE DURING TERM</th>
</tr>
</thead>
<tbody>
<tr>
<td>William McChesney Martin</td>
<td>April 1951-January 1970</td>
<td>2.2%</td>
</tr>
<tr>
<td>G. William Miller</td>
<td>March 1978-August 1979</td>
<td>9.1</td>
</tr>
<tr>
<td>Paul Volcker</td>
<td>August 1979-August 1987</td>
<td>6.2</td>
</tr>
<tr>
<td>Alan Greenspan</td>
<td>August 1987-January 2006</td>
<td>3.1</td>
</tr>
<tr>
<td>Ben Bernanke</td>
<td>January 2006–</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**16.4 Learning Objective**

Use a Phillips curve graph to show how the Federal Reserve can permanently lower the inflation rate.
Alan Greenspan succeeded Volckers as Fed Chairman in 1987 and served for 18 years. When he stepped down in 2006, Bernanke took his place.

Like Volcker, Greenspan and Bernanke were determined to keep the inflation rate low. The table below shows that the average annual inflation rate was lower during Greenspan’s term and Bernanke’s term through mid-2009. Greenspan’s term was marked by only two short and mild recessions, in 1990 – 1991 and 2001.

But with the severity of the 2007 – 2009 recession, some critics questioned whether decisions made by the Fed under Greenspan’s leadership might have played a role in bringing the crisis.
Two Developments in MP: 1) De-emphasizing the Money Supply

- During Greenspan’s term, we observe the Fed’s continued movement away from using the money supply target. During the 1980s and 1990s, the close relationship bw growth in the MS and inflation broke down.

- As a result, the Fed chose to use the IR target instead of MS target to fight inflation or UE.
2) The Importance of Fed Credibility

- An important lesson from the disflation in the 1970s is that the Fed’s credibility plays an important role in reducing inflation.
- It took a severe recession to convince people that this time the inflation rate was really reduced in the Volcker’s term.
- In the past two decades, the Fed’s credibility was enhanced: any change in the MP was announced publicly and the change was actually taken place. During Greenspan’s terms, the U.S. experienced only two brief recessions and no periods of high inflation.
Two Arguments about Greenspan’s MP

Greenspan’s ability to help guide the economy through a long period of economic stability and his moves to enhance Fed credibility were widely applauded. However, two actions by the Fed during Greenspan’s term have been identified as possibly contributing to the financial crisis that increased the length and severity of the 2007 – 2009 recession.

1. The Decision to Intervene in the Failure of Long-Term Capital Management: One was the decision during 1998 to help save the hedge fund Long-Term Capital Management (LTCM). Hedge funds raise money, typically from wealthy investors, and use sophisticated investment strategies that often involve significant risk.

   Some critics argued that the Fed’s intervention had negative consequences in the long run because it allowed the owners of LTCM and the firms who had lent them money to avoid the full consequences of LTCM’s failed investments.
(Cont.) (1)

- They also argued that the Fed’s actions set the stage for other firms – particularly highly leveraged investment banks and hedge funds – to take on excess risk.

2) The Decision to Keep the Target for the Federal Funds Rate at 1% from June 2003 and June 2004: By keeping interest rates low for an extended period, the Fed helped to fuel the housing bubble that eventually deflated beginning in 2006, with disastrous results for the economy. Economists still continue to debate how important this low interest rate policy was in explaining the housing bubble.
The financial crisis of 2007 – 09 let the Fed to move well beyond the FFR as the focus of monetary policy.

With the target FFR having been driven to zero without much expansionary effect on the economy, some people began to speak of a crisis of MP.

The debate over whether the Fed’s policy actions reduced its independence. In arranging to inject funds into the banking system, the Fed worked closely with the Treasury Department. Typically, the Fed chairman has formulated policy independently of the Secretary of the Treasury, who is a political appointee and can be replaced at any time by the President.
The main reason to keep the Fed independent of the rest of the government is to avoid inflation. Whenever a government is spending more than it is collecting in taxes, it must borrow the difference by selling bonds. The more bonds the CB buys, the faster the money supply grows, and the higher the inflation rate will be.

Another fear is that if the government controls the CB, it may use that control to further its political interests. It is difficult in any democratic country for a government to be reelected at a time of high unemployment.
Fed Policy from the 1970s to the Present

Has the Fed Lost Its Independence?

Figure 16-11

The More Independent the Central Bank, the Lower the Inflation Rate

For 16 high-income countries, the greater the degree of central bank independence from the rest of the government, the lower the inflation rate. Central bank independence is measured by an index ranging from 1 (minimum independence) to 4 (maximum independence).

During these years, Germany had a high index of independence of 4 and a low average inflation rate of just over 3 percent. New Zealand had a low index of independence of 1 and a high average inflation rate of over 7 percent.

16.4 LEARNING OBJECTIVE

Use a Phillips curve graph to show how the Federal Reserve can permanently lower the inflation rate.
Key Terms

- Phillips curve
- Disinflation
- Natural rate of unemployment
- Nonaccelerating inflation rate of unemployment (NAIRU)
- Rational expectations
- Real business cycle models
- Structural relationship