

Chapter 12 INFLATION

Chapter Key Ideas

From Rome to Rio de Janeiro

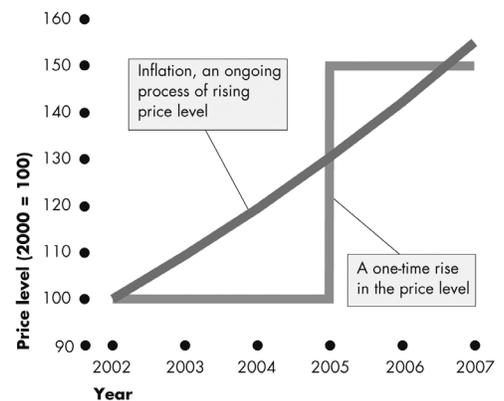
- A. Inflation is a very old problem and some countries even in recent times have experienced rates as high as 40 percent *per month*.
- B. The United States has low inflation now, but during the 1970s the price level doubled.
- C. Why does inflation occur, how do our expectations of inflation influence the economy, is there a tradeoff between inflation and unemployment, and how does inflation affect the interest rate?

Outline

I. Inflation and the Price Level

- A. **Inflation** is a process in which the *price level is rising* and *money is losing value*.
 - 1. Inflation is a rise in the price *level*, not in the price of a particular commodity.
 - 2. Figure 12.1 illustrates the distinction between inflation and a one-time rise in the price level.
 - 3. The inflation rate is the percentage change in the price level; that is, the inflation rate is $[(P_1 - P_0)/P_0] \times 100$ where P_1 is the current price level and P_0 is last year's price level.
 - 4. Inflation can result from either an increase in aggregate demand—demand-pull inflation—or a decrease in aggregate supply—cost-push inflation.

FIGURE 12.1 Inflation Versus a One-Time Rise in the Price Level



Along the red line, an economy experiences inflation because the price level is rising persistently. Along the blue line, an economy experiences a one-time rise in the price level.

II. Demand-Pull Inflation

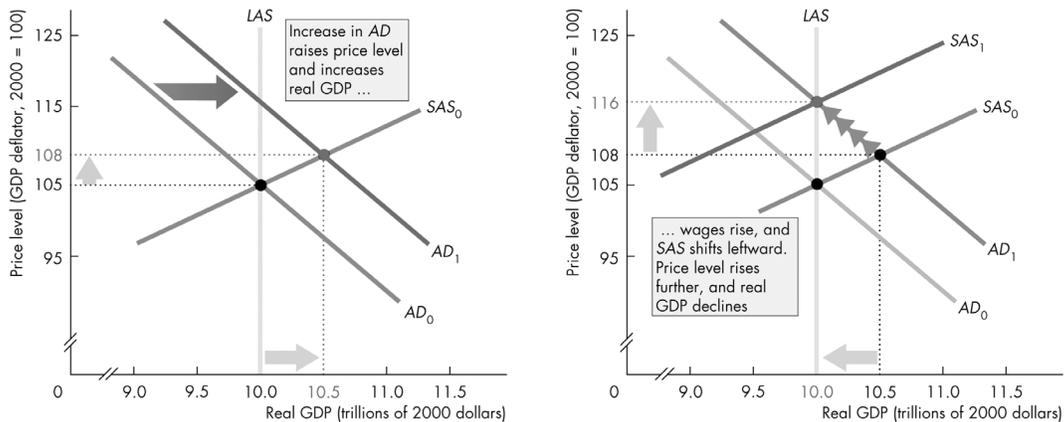
A. **Demand-pull inflation** is an inflation that results from an initial increase in aggregate demand.

1. Demand-pull inflation can result from any factor that increases aggregate demand.
2. Two factors controlled by the government are increases in the quantity of money and increases in government purchases.
3. A third possibility is an increase in exports.

B. **Initial Effect of an Increase in Aggregate Demand**

1. Figure 12.2 illustrates the start of a demand-pull inflation

FIGURE 12.2 A Demand-Pull Rise in the Price Level



(a) Initial effect

(b) Wages adjust

2. Starting from full employment, an increase in aggregate demand shifts the *AD* curve rightward. Real GDP increases, the price level rises, and an inflationary gap arises.
3. The rising price level is the first step in the demand-pull inflation.

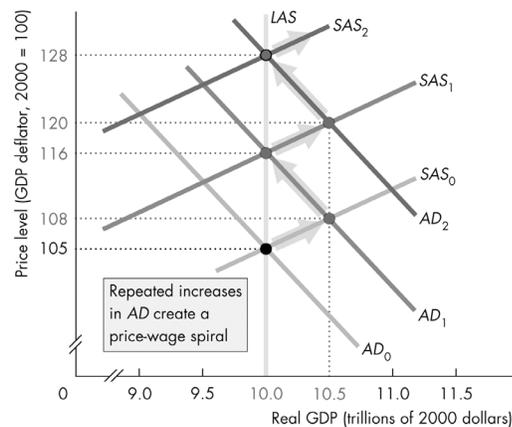
C. **Money Wage Rate Response**

1. The higher level of output means that real GDP exceeds potential GDP—an inflationary gap.
2. The money wage rate rises and the *SAS* curve shifts leftward.
3. Real GDP decreases back to potential GDP but the price level rises again.

D. **A Demand-Pull Inflation Process**

1. Figure 12.3 illustrates a demand-pull inflation spiral.
2. Aggregate demand keeps increasing and the process just described repeats indefinitely.
3. Although any of several factors can increase aggregate demand to start a demand-pull inflation, only an

FIGURE 12.3 A Demand-Pull Inflation Spiral



ongoing increase in the quantity of money can sustain it.

4. Demand-pull inflation occurred in the United States during the late 1960s and early 1970s.

III. Cost-Push Inflation

A. **Cost-push inflation** is an inflation that results from an initial increase in costs. There are two main sources of increased costs: an increase in the money wage rate or an increase in the money price of raw materials, such as oil.

B. **Initial Effect of a Decrease in Aggregate Supply**

1. Figure 12.4 illustrates the start of cost-push inflation.
2. A rise in the price of oil decreases short-run aggregate supply and shifts the *SAS* curve leftward. Real GDP decreases and the price level rises—a combination called stagflation.
3. The rising price level is the start of the cost-push inflation.

C. **Aggregate Demand Response**

1. The initial increase in costs creates a one-time rise in the price level, not inflation. To create inflation, aggregate demand must increase in response to the decrease in aggregate supply.
2. Figure 12.5 illustrates an aggregate demand response to stagflation, which might arise because the Fed stimulates demand to counter the higher unemployment rate and lower level of real GDP.
3. The increase in aggregate demand shifts the *AD* curve rightward.
4. Real GDP increases and the price level rises again.

FIGURE 12.4 A Cost-Push Rise in the Price Level

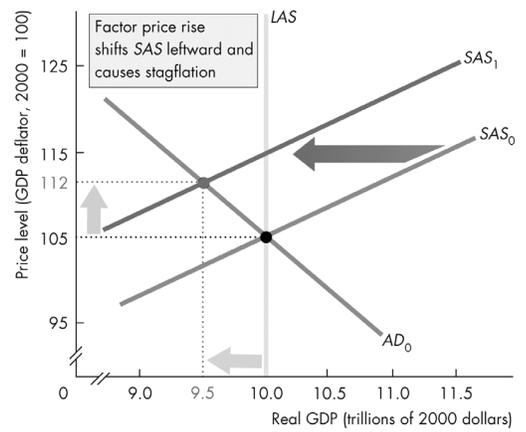
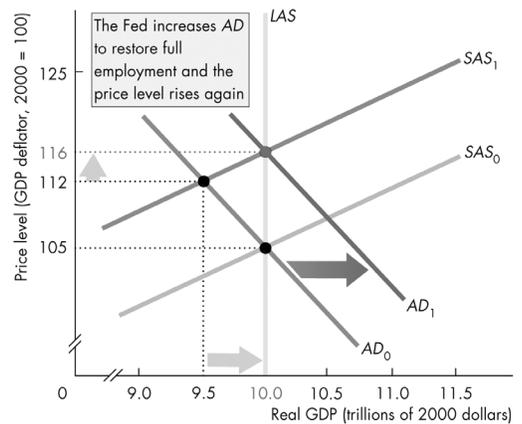


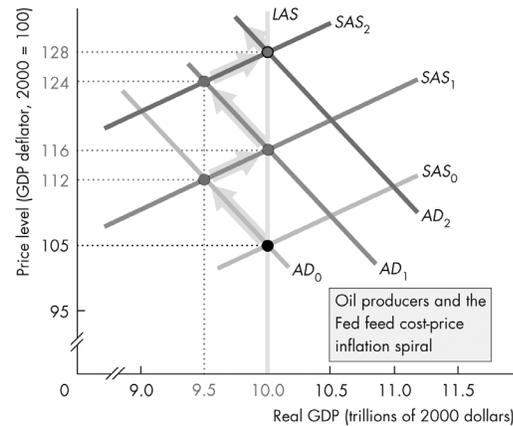
FIGURE 12.5 Aggregate Demand Response to Cost-Push



D. A Cost-Push Inflation Process

1. Figure 12.6 illustrates a cost-push inflation spiral.
2. If the initial decrease in aggregate supply was the result of oil producers raising the price of oil, what happens next depends on their response. If oil producers again raise the price of oil to try to keep its relative price higher, and the Fed responds with a further increase in aggregate demand, the process of cost-push inflation continues.
3. Cost-push inflation occurred in the United States during 1974–1978.

FIGURE 12.6 A Cost-Push Inflation Spiral



IV. Effects of Inflation

A. Unanticipated Inflation in the Labor Market

1. Unanticipated inflation has two main consequences in the labor market: it redistributes income and brings departures from full employment.
2. Higher than anticipated inflation lowers the real wage rate and employers gain at the expense of workers. Lower than anticipated inflation raises the real wage rate and workers gain at the expense of employers.
3. Higher than anticipated inflation lowers the real wage rate, increases the quantity of labor demanded, makes jobs easier to find, and lowers the unemployment rate. Lower than anticipated inflation raises the real wage rate, decreases the quantity of labor demanded, and increases the unemployment rate.
4. Unanticipated inflation imposes costs on both workers and firms.

B. Unanticipated Inflation in the Market for Financial Capital

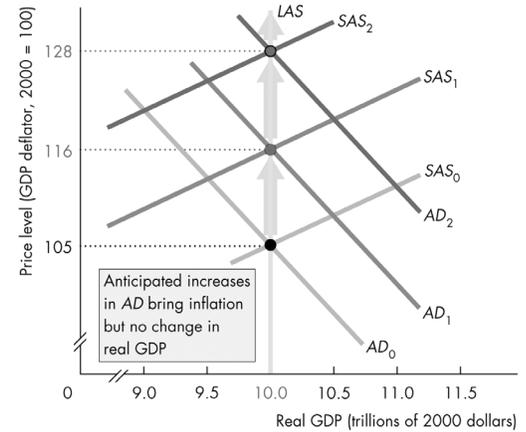
1. Unanticipated inflation has two main consequences in the market for financial capital: it redistributes income and results in too much or too little lending and borrowing.
2. If the inflation rate is unexpectedly high, borrowers gain but lenders lose. If the inflation rate is unexpectedly low, lenders gain but borrowers lose.
3. When the inflation rate is higher than anticipated, the real interest rate is lower than anticipated, and borrowers want to have borrowed more and lenders want to have loaned less. When the inflation rate is lower than anticipated, the real interest rate is higher than anticipated, and borrowers want to have borrowed less and lenders want to have loaned more.

C. Forecasting Inflation

1. To minimize the costs of incorrectly anticipating inflation, people form rational expectations about the inflation rate.
2. A **rational expectation** is one based on all relevant information and is the most accurate forecast possible, although that does not mean it is always right.

D. Anticipated Inflation

1. Figure 12.7 illustrates the effects of an anticipated inflation.
2. Aggregate demand increases, but the increase is anticipated, so its effect on the price level is anticipated.
3. The money wage rate rises in line with the anticipated rise in the price level.
4. The AD curve shifts rightward and the SAS curve shifts leftward so that the price level rises as anticipated and real GDP remains at potential GDP.

FIGURE 12.7 Anticipated Inflation**E. Unanticipated Inflation**

1. If aggregate demand increases by more than expected, inflation is higher than expected. The money wage rate does not adjust for all the inflation, and the SAS curve does not shift leftward enough to keep the economy at full employment. Real GDP exceeds potential GDP. The money wage rate eventually rises, which leads to a decrease in the SAS . The economy experiences more inflation as it returns to full employment. This inflation is like a demand-pull inflation.
2. If aggregate demand increases by less than expected, inflation is less than expected. The money wage rate rises too much and the SAS curve shifts leftward more than the AD curve shifts rightward. Real GDP is less than potential GDP. This inflation is like a cost-push inflation.

F. The Costs of Anticipated Inflation

1. Anticipated inflation occurs at full employment with real GDP equal to potential GDP.
2. But anticipated inflation, particularly high anticipated inflation, inflicts three costs:
 - a) *Transactions costs.* People spend money more rapidly when they anticipate high inflation and so transact more frequently, thereby incurring more transactions costs.
 - b) *Tax consequences.* Anticipated inflation reduces the after-tax return from saving, which decreases capital accumulation and long-term economic growth.
 - c) *Increased uncertainty.* A high inflation rate increases uncertainty, which makes long-term planning for investment more difficult and leads people to spend time forecasting inflation rather than undertaking more productive activities. Both of these effects reduce the economy's long-term growth rate.

V. Inflation and Unemployment: The Phillips Curve

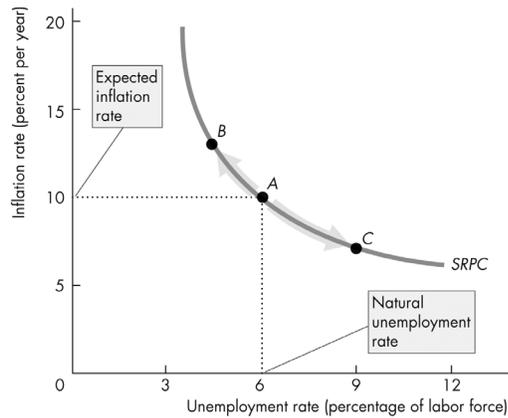
A. A **Phillips curve** is a curve that shows the relationship between the inflation rate and the unemployment rate. There are two time frames for Phillips curves.

B. The Short-Run Phillips Curve

1. The **short-run Phillips curve** shows the relationship between inflation and unemployment holding constant the expected inflation rate and natural unemployment rate.

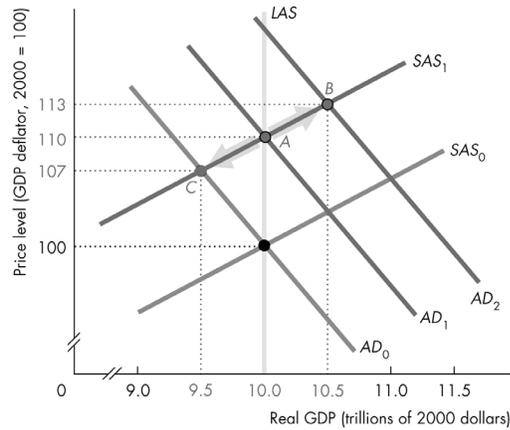
- Figure 12.8 illustrates a short-run Phillips curve (SRPC), which is a downward-sloping curve.

FIGURE 12.8 A Short-Run Phillips Curve



- Figure 12.9 shows that the negative relationship between the inflation rate and unemployment rate is explained by the *AS-AD* model. An unexpectedly large increase in aggregate demand raises the inflation rate and increases real GDP, which lowers the unemployment rate. So higher inflation is associated with lower unemployment, as shown by a movement along a short-run Phillips curve.

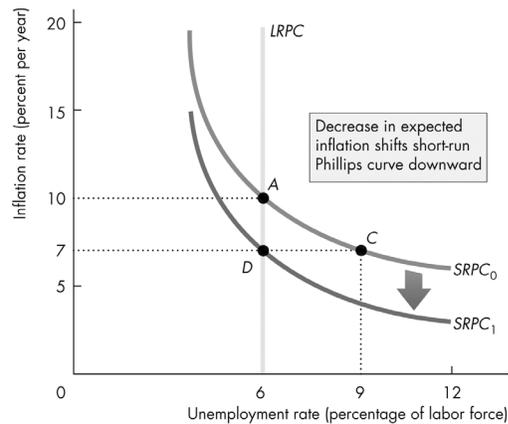
FIGURE 12.9 *AS-AD* and the Short-Run Phillips Curve



C. The Long-Run Phillips Curve

- The **long-run Phillips curve** shows the relationship between inflation and unemployment when the actual inflation rate equals the expected inflation rate.
- Figure 12.10 illustrates the long-run Phillips curve (LRPC), which is vertical at the natural unemployment rate.
- Along the long-run Phillips curve, because a change in the inflation rate is anticipated, it has no effect on the unemployment rate.
- Figure 12.10 also shows how the short-run Phillips curve *shifts when the expected inflation rate changes*. A lower expected inflation rate shifts

FIGURE 12.10 Short-Run and Long-Run Phillips Curves



the short-run Phillips curve downward by an amount equal to the decrease in the expected inflation rate.

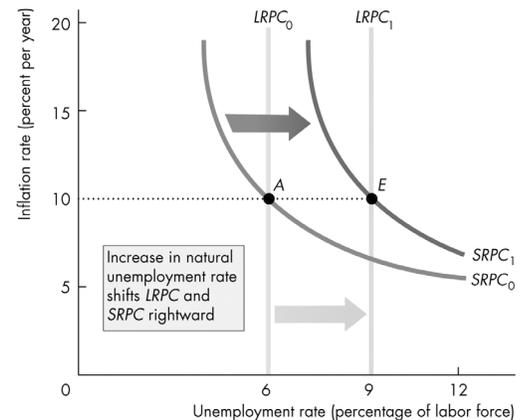
D. Changes in the Natural Rate of Unemployment

1. A change in the natural unemployment rate shifts *both* the long-run and short-run Phillips curves.
2. Figure 28.11 illustrates how an increase in the natural unemployment rate shifts both the long-run and short-run Phillips curves rightward by the amount of the increase.

E. The U.S. Phillips Curve

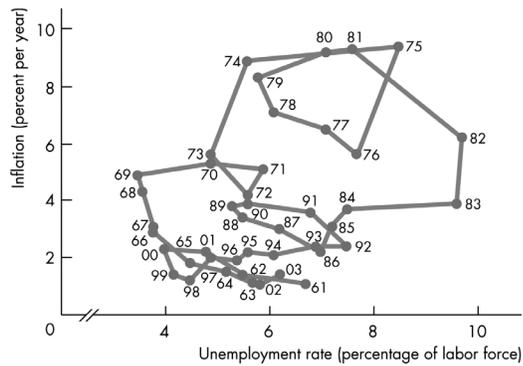
1. The data for the United States are consistent with a shifting short-run Phillips curve. The Phillips curve has shifted because of changes in the expected inflation rate and changes in the natural unemployment rate.

FIGURE 12.11 A Change in the Natural Unemployment Rate

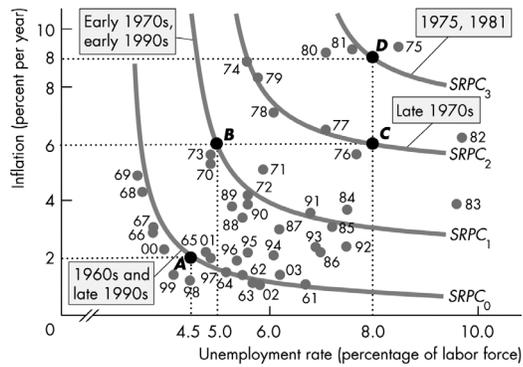


2. Figure 28.12(a) shows the actual path of unemployment and inflation for each year from 1960. Figure 28.12(b) interprets this path as four separate short-run Phillips curves.

FIGURE 12.12 Phillips Curves in the United States



(a) Time sequence



(b) Four Phillips curves

Source: Bureau of Labor Statistics and the author's calculations and assumptions.

VI. Interest Rates and Inflation

A. Interest rates and inflation rates are correlated, although they differ around the world.

1. Figure 28.13(a) plots U.S. data over time on inflation and the interest rate. Figure 28.13(b) plots international data on inflation and the interest rate. Both show that higher inflation correlates with higher nominal interest rates.

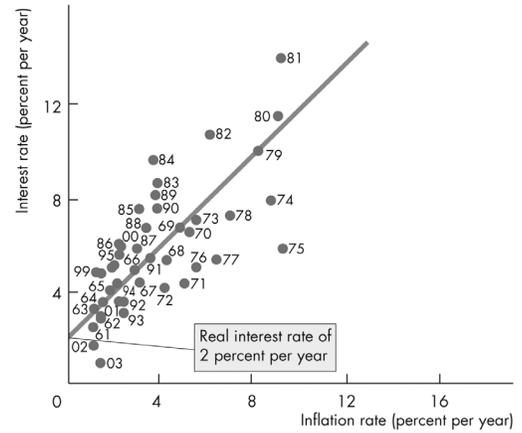
B. How Interest Rates are Determined

1. The nominal interest rate and the real interest rate differ.
2. The real interest rate is determined by investment demand and saving supply. The real interest rate adjusts to make the quantity of investment equal the quantity of saving.
3. The nominal interest rate is determined by the demand for money and the supply of money in each nation's money market. The nominal interest rate adjusts to make the quantity of money demanded equal to the quantity supplied.

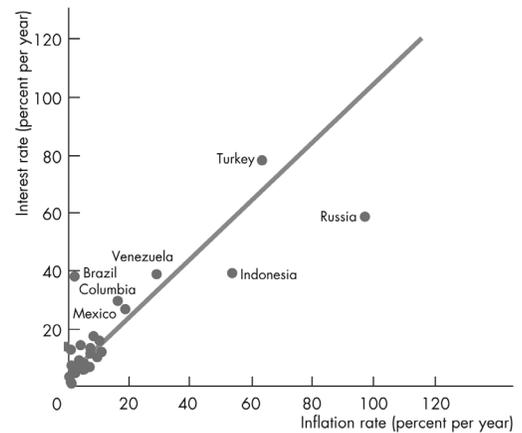
C. Why Inflation Influences the Nominal Interest Rate

The key relationship is that the nominal interest rate equals the real interest rate plus the expected inflation rate.

FIGURE 12.13 Inflation and the Interest Rate



(a) United States



(b) Around the world

Sources: Federal Reserve Board, Bureau of Labor Statistics, and International Monetary Fund.

Reading Between the Lines

The news article looks at relationship between inflation and unemployment. The analysis examines U.S. data on the inflation rate and the unemployment rate and shows that the long-run and short-run Phillips curves provide of good explanation for the behavior of these variables from 2000 to 2003.

New in the Seventh Edition

The data and graphs are updated. The Reading Between the Lines uses the Phillips curve to help understand how inflation and the unemployment rate were changing for the updated period of 2000 to 2003. It emphasizes how the impossibility of accurately predicting future changes in the natural unemployment rate and expected inflation limit the usefulness of the tradeoff for policy purposes, because the short-run Phillips curve is always liable to shift in unexpected ways.

Teaching Suggestions

1. Inflation and the Price Level

Stories and some data can make the impact of inflation real to students. Have them guess the price of something they buy (which has not changed much in its nature) when you were a student—possible items include a Macdonald’s hamburger, a cup of coffee, an Economics Principles textbook, a pencil, a concert ticket, a gallon of gasoline, a semester’s tuition, and so on (prepare—make a list before you come in with actual prices you remember). Contrast the difference between a one-time price increase (such as tuition going up this year) with inflation (tuition going up every term). There is a good story that sometimes makes an impression: a very famous German economist in the 1950s used to keep in his pocket a British penny that he claimed he had received as change on a London bus, and would show it to students when lecturing on inflation. The point was that it was an 1840s Queen Victoria penny, and it illustrated the relative price stability in the UK as opposed to Germany (the story is true; any Brit who was a child in the 1950s will remember occasionally seeing Queen Victoria pennies). A possible contrast is with countries that have experienced rapid inflations, in many of which there are no coins in circulation at all (examples include Ghana, Indonesia, and Vietnam); ask students why rapid inflation countries often have no coins.

2. Demand-Pull Inflation

The potential difficulty with both demand-pull and cost-push inflation stories is how the one-time increase translates into an inflationary process. It is relatively easy to come up with stories as to why aggregate demand might shift continuously to the right, for example because of persistent and growing government budget deficits. What is a little harder is to provide a plausible story as to why the monetary authorities would continue to accommodate this with continuous increases in the quantity of money. Point out that this has been rare in the United States, and has tended to happen when the political situation was such that the Fed was not willing to be blamed for an increase in unemployment. In other countries, particularly where the central bank is less independent than in the United States, it has been more common.

3. Cost-Push Inflation

The text gives a good description of the first oil price increase in the 1970s as a cost-push inflation, and contrasts it well with the Fed’s refusal to accommodate the second oil price increase in 1979. An explanation of how cost-push can be a more widespread cause of inflation in other countries can be given in terms of countries where labor is highly unionized, and in effect there are attempts by different interest groups to obtain shares of GDP that add up to more than 100 percent, with accommodation by a weak monetary authority. Such a process of repeated wage increases, inflation, and monetary accommodation can give rise to continuing inflation. Analysts often “explain” the cause of inflation by focusing attention on the good or service whose price increased the most during the most recent time period. This is incorrect; inflation is caused by monetary growth. One way to point out the fallacy is to use a baseball analogy. Several years ago the average number of home runs hit during major league baseball games increased. Virtually every commentator asked whether the ball had been doctored to make it livelier. No one explained the additional home runs by saying “Home runs are higher because McGuire and Sosa are hitting more home runs than last year.” To

explain inflation, economists are looking for an explanation similar to the “doctored ball” explanation of the additional home runs, not an explanation that focuses on the performance of specific players.

4. **Effects of Inflation**

Numerical exercises can illustrate the income distribution effects very clearly. The wage example is very easy to do, simply in terms of an expected inflation rate, an agreed money wage, and then what the actual real wage will be if the actual inflation rate is different. The effects in the capital market are not quite as obvious, but are easily demonstrated with the impact of unanticipated inflation on house-buyers and mortgage lenders in the case of fixed-rate mortgages, which still remain dominant in the United States at least in part because inflation does tend to be low and fairly stable. It is important to make sure that students also get the notion that unanticipated inflation results in either over-full employment and more inflation, or less than full employment and cyclical unemployment. The idea of rational expectations is brought in here, and it is worth making sure that students have got clear what it means from the beginning. It is another case of unfortunate jargon; the issue is that the forecast based on rational expectations makes use of all information available, up to the point where expected improvements in accuracy are no more valuable than their cost. A rational expectation forecast is therefore not expected to be correct, it is the best that can be done at acceptable cost, and the errors in it are random. The important point for students to grasp is that there is nothing systematic, and therefore correctable, about the errors in a rational expectation forecast—implying that departures of reality from the forecast are truly unanticipated because they could not have been forecast. The costs of anticipated inflation are also worth some discussion. Students do not always fully appreciate that inflation means that the average level of prices is rising, but that individual prices may rise, fall, or stay the same. Try picking two items that have stable and unstable prices (e.g. a newspaper and a fast food meal during a price war), and then ask students how much time they would typically spend on search before purchase if they were going to buy each; this will get across the shoe-leather cost idea. The tax and uncertainty effects are also amenable to numerical examples.

5. **Inflation and Unemployment: The Phillips Curve**

As a description of how economics advances, I like to give the students a stylized history of the Phillips curve. The story I tell starts in 1958 when A. W. Phillips published his empirical work. At that time the mainstream economic model was quite different from the AD/AS model derived in the text. Essentially, it was similar to the simple aggregate expenditure model presented in Chapter 29. The model was based on the assumption that the price level was constant, making the inflation rate zero. This assumption was not too unrealistic immediately after World War II. By 1955, though, the inflation rate began to creep higher and averaged 2.7 percent per year between 1956 and 1959. Inflation was beginning to be perceived as a problem, one that a model with a “fixed price level assumption” was poorly suited to solve.

In this environment, economists gladly welcomed the simple, short-run Phillips curve, for it gave them a handle on inflation. They believed that they could predict the unemployment rate from their standard model and then combine this unemployment rate with the Phillips curve to determine the resulting inflation rate. The vital assumption in this procedure is that the Phillips curve captures a fixed tradeoff between the actual inflation rate and the unemployment rate that is part of the economy’s structure.

This type of analysis reached its peak of popularity during the early and middle 1960s. By 1967, however, it was under attack. On a theoretical level, economist Milton Friedman—among others—pointed out the flimsy justification behind the simple, fixed Phillips curve assumption. On an empirical level, the simple, fixed Phillips curve failed as the inflation rate rose toward the end of the 1960s and into the 1970s: the unemployment rate did not fall as predicted by the fixed Phillips curve.

At this point the idea of a long-run Phillips curve (as distinct from the short-run one) was developed. The concept that aggregate supply is an important component of macroeconomics was taking hold, as was the idea that short-run Phillips curves shift because of changes in people's expectations. Thus the profession advanced significantly between the initial discussion of the Phillips curve and what students learn today. This advance was the result of the interaction between theory, suggesting that the idea of a fixed short-run Phillips curve was inadequate, and empirical work that reinforced the point that the simple, early approach was deficient.

Students can become confused about the tie between the Phillips curve and the aggregate supply/aggregate demand (*AS-AD*) model. Although this relationship is nicely developed in the text, some students will remain baffled. I do not think that a principles course is the appropriate place to derive the link between the two in much detail. But I do think that my lectures are an appropriate place to convey the idea of the relationship. Thus I point out that the vertical long-run aggregate supply curve is analogous to the vertical long-run Phillips curve. The point that the long-run aggregate supply curve is vertical means that a higher price level has no effect on real GDP and hence no effect on the unemployment rate. Similarly, the fact that the long-run Phillips curve is vertical implies that a higher inflation rate has no effect on the unemployment rate and hence no effect on real GDP. The analogy also carries over to the short-run curves: the positively sloped short-run aggregate supply curve shows that in the short-run an unexpected higher price level raises real GDP and thus lowers unemployment. In the same way, the negatively sloped short-run Phillips curve demonstrates that in the short-run an unexpected higher inflation rate lowers unemployment, thereby raising real GDP. Students find that the two diagrams actually complement each other. I think that this approach is preferable to having the two diagrams compete with each other!

6. Interest Rates and Inflation

This section has two main purposes: to reinforce that real interest rates and nominal interest rates are determined in wholly different ways, and then to remind students of the link between them via anticipated inflation. This is also a place where one can again show why and how short-term and long-term interest rates can and do diverge, and how even short-term real interest rates can differ between countries because of differences in perceived risk. With respect to short-term rates, this is mostly exchange rate risk, but that point does not need to be emphasized at this point. Using Web sites or newspapers, find the short-term interest rates and current inflation rates of some countries, including not only nice stable ones (U.S., Canada, UK, Germany, Switzerland, Japan) but a few that students, at least, will view as unstable and risky (e.g. South Africa, Russia, Brazil, Argentina, Indonesia). This will show that although differences in inflation explain part of the differences, there are also differences in real interest rates that arise from differences in risk perceptions. This can generate a useful discussion if you then ask students whether that might imply that there are potential investments in the "risky" countries that have higher expected rates of return than all investments undertaken in the "stable" countries.

The Big Picture

Where we have been

Chapter 12 uses the *AS-AD* model developed in Chapters 7 to explore inflation. The distinction between the short-run and long-run aggregate supply curves is useful for comprehending the difference between the short-run and long-run Phillips curves. Chapter 12 also draws on the definition of inflation in Chapter 6, but, in case students have forgotten the important points, Chapter 12 reviews them.

Where we are going

Chapter 12 is a capstone chapter. It completes the student's work on inflation and the price level. The description of the relationship between monetary growth and interest rates and the description of the Phillips curve are used in Chapter 16, the chapter dealing with monetary policy.

Overhead Transparencies

| Transparency | Text figure | Transparency title |
|---------------------|--------------------|--|
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Electronic Supplements**MyEconLab**

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This CD-ROM contains Computerized Test Bank Files, Test Bank, and Instructor's Manual files in Microsoft Word, and PowerPoint files. All test banks are available in Test Generator Software.

Additional Discussion Questions

1. Some economists claim that inflation is always a "monetary phenomenon." What do they mean by this claim and are they correct?
2. How can a higher price of oil create inflation?

3. “In both a demand-pull and cost-push inflation, aggregate demand increases and aggregate supply decreases. Thus there is no real difference between these two inflations.” Do you agree or disagree? Explain your answer.
4. Can inflation help an economy? Why or why not?
5. What is the relationship between the short-run aggregate supply curve and the short-run Phillips curve? Between the long-run aggregate supply curve and the long-run Phillips curve?
6. Draw a short-run Phillips curve for expected and actual inflation rates of 7 percent and a natural rate of unemployment of 6 percent. Suppose that the inflation rate falls to 5 percent while the expected inflation rate remains at 7 percent. What happens to the unemployment rate?
7. Draw a short-run Phillips curve for expected and actual inflation rates of 7 percent and a natural rate of unemployment of 6 percent. Suppose that the inflation rate falls to 5 percent *and* the expected inflation rate falls to 5 percent. What happens to the unemployment rate?
8. Suppose that the actual inflation rate is 7 percent and that the economy is at the natural rate of unemployment. If the Fed announces that it is going to lower the inflation rate and people believe this announcement (so that the decline in the inflation rate is not a surprise), what happens to the unemployment rate? Suppose that people believe the Fed’s announcement and that the expected inflation rate falls, but then the Fed keeps the inflation rate at 7 percent. Now what happens to the unemployment rate?
9. “Borrowers always gain from inflation; lenders always lose.” Analyze this statement. Be sure to distinguish between anticipated and unanticipated inflation.
10. Why does higher inflation cause higher nominal interest rates? Focus on the actions of borrowers and lenders to answer the question.
11. Between the 1980s and 2000, the natural rate of unemployment decreased from about 6 percent to about 4 percent. Draw a diagram showing both long-run and short-run Phillips curves to illustrate this. How would you show the same change in an AS-AD diagram?
12. Suppose you are about to buy a house. You have two options with respect to the 25-year mortgage with which you will finance the house: either a fixed rate mortgage at 8 percent interest per annum, or an adjustable rate mortgage, currently at 5 percent but indexed at the Federal Funds Rate plus 3.25 percent, adjusted annually. Which would you take, and why? How do your inflation expectations influence your answer? Does your attitude toward risk, or how long you expect to stay in the house, matter?
13. Now suppose you are buying a car, and are considering two three-year car loans. One has a fixed interest rate of 9 percent per annum, the other an adjustable rate, Federal Funds plus 5 percent, adjusted every three months. Which do you take and why?

Answers to the Review Quizzes

Page 281 (page 653 in *Economics*)

1. Demand-pull inflation begins with an increase in aggregate demand. The increase in aggregate demand increases real GDP and the price level.
2. When the economy is at an above full-employment equilibrium, the money wage rate rises. As a result, the short-run aggregate supply decreases. The decrease in the short-run aggregate supply decreases real GDP and raises the price level.
3. In order to create a demand-pull inflation spiral, aggregate demand must continue to increase.

Page 283 (page 655 in *Economics*)

1. Cost-push inflation begins with an increase in the money wage rate or in the money price of a key raw material, such as oil, that decreases aggregate supply. The rise in the price level decreases aggregate supply and decreases real GDP.
2. Stagflation occurs when real GDP decreases and the price level rises. Cost-push inflation causes stagflation when aggregate supply decreases because a decrease in aggregate supply raises the price level and decreases real GDP.
3. If the Fed responds to each decrease in aggregate supply by increasing aggregate demand to restore full employment, a freewheeling cost-push inflation ensues.

Page 288 (page 660 in *Economics*)

1. A rational expectation forecast is the most accurate forecast possible and is based on all relevant information. Similar to all forecasts, people making rational expectations may turn out to be incorrect, but nonetheless they made the best available forecast.
2. People strive to forecast inflation correctly because incorrectly expected inflation has adverse consequences. In the labor market, unexpected inflation redistributes income and causes departures from full employment. (For instance, inflation that is lower than expected redistributes income from employers to employees and decreases employment below full employment.) In the capital market, unexpected inflation redistributes income and causes either too much or too little lending and borrowing. (For instance, inflation that is lower than expected redistributes income from borrowers to lenders and causes lenders to want to have loaned more and borrowers to want to have borrowed less.) To forecast inflation people must forecast changes in aggregate demand and aggregate supply. Thus any factor (such as changes in government purchases or in the quantity of money) that changes either aggregate demand or aggregate supply will be used to help forecast inflation.
3. Anticipated increases in aggregate demand or decreases in aggregate supply create anticipated inflation.
4. A rapid anticipated inflation diverts resources from producing goods and services and so decreases potential GDP. There are three major reasons why anticipated inflation has adverse consequences for potential GDP: transactions costs, tax consequences, and increased uncertainty. Transactions costs refer to the fact that when anticipated inflation is high, people use resources spending money quickly. The tax effects result from the fact that anticipated inflation raises the nominal interest rate, which thereby increases the taxes on saving, thus lowering the real return from saving. The increased uncertainty makes long-term planning more difficult and also causes people to spend more resources on predicting the future course of inflation. Anticipated inflation tends to decrease real GDP because of these diversions of resources from productive uses.

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1. An unanticipated change in inflation causes a movement along the short-run Phillips curve.
2. An unanticipated increase in the inflation rate lowers the unemployment rate.
3. A 10 percentage point increase in the expected inflation rate shifts the short-run Phillips curve vertically upward by 10 percentage points. (Each point on the new short-run Phillips curve lies 10 percentage points above the point on the old Phillips curve below it). A 10 percentage point increase in the expected inflation rate does not change the long-run Phillips curve.
4. An increase in the natural unemployment rate shifts both the short-run and long-run Phillips curves rightward by an amount equal to the increase in the natural unemployment rate. The expected inflation rate does not change.
5. The United States has a short-run Phillips curve. The short-run Phillips curve has shifted with changes in the expected inflation rate and in the natural unemployment rate, so it is not stable.
6. The U.S. long-run Phillips curve has not remained stable because over the years the natural unemployment rate in the United States has changed.

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1. The real interest rate is equal to the nominal interest rate minus the inflation rate.
2. An increase in the inflation rate increases the nominal interest rate by an amount equal to the change in the inflation rate. The nominal interest rate changes when the expected inflation rate changes because the real interest rate, determined by the world market for saving and investment, does not change from its equilibrium when inflation changes.

Answers to the Problems

1.
 - a. An increase in the quantity of money, an increase in government expenditures, a tax cut, an increase in exports.
Anything that increases aggregate demand can set off a demand-pull inflation. But to sustain such an inflation, the quantity of money must keep increasing.
 - b. Starting out on AD_0 and SAS_0 , the price level is 120 and real GDP is at potential GDP of \$7 trillion. Aggregate demand increases and the AD curve shifts rightward to AD_1 . The price level rises and real GDP increases to the intersection of AD_1 and SAS_0 . There is now an inflationary gap.
 - c. Starting out on AD_1 and SAS_0 with an inflationary gap, the money wage rate rises and short-run aggregate supply decreases. The SAS curve starts to shift leftward towards SAS_1 . The price level keeps rising, but real GDP now decreases. The process now repeats. AD shifts to AD_2 , an inflationary gap opens again, the money wage rate rises again, and the SAS curve shifts toward SAS_2 .
2.
 - a. An increase in the money wage rate, an increase in the money price of raw materials.
Anything that decreases short-run aggregate supply can set off a cost-push inflation. But to sustain such an inflation, the quantity of money must keep increasing.
 - b. Starting out on AD_0 and SAS_0 , the price level is 120 and real GDP is at potential GDP of \$7 trillion. Short-run aggregate supply decreases and the SAS curve shifts leftward to SAS_1 . The price level rises and real GDP decreases to the intersection of AD_0 and SAS_1 . There is now a recessionary gap.
 - c. Starting out on AD_0 and SAS_1 with a recessionary gap, real GDP is below potential GDP and unemployment is above the natural rate. In an attempt to restore full employment, the central bank increases the money supply. The aggregate demand curve shifts rightward to AD_1 . Real GDP returns to \$7 trillion and the price level rises to 160. A further cost increase occurs, which shifts the short-run aggregate supply curve to SAS_2 and a recessionary gap opens up again. The economy is again below potential GDP. In an attempt to restore full employment, the central bank increases the money supply. The aggregate demand curve shifts rightward to AD_2 . Real GDP returns to \$7 trillion and the price level rises to 200.
3.
 - a. An *anticipated* increase in the quantity of money, an increase in government expenditures, a tax cut, an increase in exports.
Anything that increases aggregate demand can set off an anticipated inflation as long as the event is anticipated. But to sustain such an anticipated inflation, the quantity of money must keep increasing along its anticipated path.
 - b. Starting out on AD_0 and SAS_0 , the price level is 120 and real GDP is at potential GDP of \$7 trillion. Aggregate demand increases, and the AD curve shifts rightward to AD_1 . The increase in aggregate demand is anticipated so the money wage rate rises and the SAS curve shifts to SAS_1 . The price level rises, and real GDP remains at potential GDP.
 - c. Starting out on AD_1 and SAS_1 , a further anticipated increase in aggregate demand occurs. The AD curve shifts to AD_2 , and because the increase in aggregate demand is anticipated, the money wage rate rises again and the SAS curve shifts to SAS_2 . Again, the price level rises and real GDP remains at potential GDP.
4.
 - a. The short-run aggregate supply curve shifts rightward and the long-run aggregate supply curve does not change.

People anticipate that the price level will fall. The money wage rate falls in anticipation of the lower price level. The short-run aggregate supply curve shifts rightward. There is no change in potential GDP. The long-run aggregate supply curve does not shift.

- b. Starting out on AD_0 and SAS_0 , the price level is 120 and real GDP is at potential GDP of \$7 trillion. Short-run aggregate supply increases, and the SAS curve shifts rightward. The aggregate demand curve does not shift. The price falls, but by less than people expected. Real wages fall because money wages have fallen by more than the price level. Real GDP increases. Real GDP is greater than potential GDP and an inflation gap opens.
 - c. The money wage rate rises to reflect the higher expected price level. The rise in money wages decreases the short-run aggregate supply and the SAS curve shift leftward to SAS_0 . The price level rises to 120 and the economy returns to its potential GDP.
5.
 - a. Both the inflation rate and the unemployment rate have increased. So the expected inflation rate has increased and the natural rate of unemployment might have increased (but has not definitely increased). Any of the events that can increase the expected inflation rate might have occurred. Most likely, the expected growth rate of the money supply has increased. If the natural rate of unemployment has not increased, the economy is in a recession, despite the fact that the inflation rate has increased.
 - b. If point A is a long-run equilibrium, the $LRPC$ is vertical at an unemployment rate of 4 percent. The $SRPC$ slopes downward and passes through point A . If point A is *not* a long-run equilibrium, the $SRPC$ still passes through point A but the $LRPC$ is vertical at whatever unemployment rate is the natural rate.
 - c. If point D is a long-run equilibrium, the $LRPC$ is vertical at an unemployment rate of 8 percent. The $SRPC$ slopes downward and passes through point D . If point D is *not* a long-run equilibrium, the $SRPC$ still passes through point D but the $LRPC$ is vertical at whatever unemployment rate is the natural rate.
 6.
 - a. The inflation rate has decreased and the unemployment rate have increased. So the expected inflation rate has decreased and the natural rate of unemployment might have increased (but has not definitely increased). Any of the events that can decrease the expected inflation rate might have occurred. Most likely, the expected growth rate of the money supply has decreased. If the natural rate of unemployment has not increased, the economy is in a recession.
 - b. If point B is a long-run equilibrium, the $LRPC$ is vertical at an unemployment rate of 4 percent. The $SRPC$ slopes downward and passes through point B . If point B is *not* a long-run equilibrium, the $SRPC$ still passes through point B but the $LRPC$ is vertical at whatever unemployment rate is the natural rate.
 - c. If point C is a long-run equilibrium, the $LRPC$ is vertical at an unemployment rate of 8 percent. The $SRPC$ slopes downward and passes through point C . If point C is *not* a long-run equilibrium, the $SRPC$ still passes through point C but the $LRPC$ is vertical at whatever unemployment rate is the natural rate.
 7.
 - a. The inflation rate rises, then the unemployment rate increases, then the inflation rate falls, and finally the unemployment rate decreases. Initially any of the events that can increase the expected inflation rate might have occurred. Most likely, the expected growth rate of the money supply increased. To stop the inflation, the growth rate of the money supply might be decreased, which brings recession and an increase in the unemployment rate above the natural rate of unemployment. Now the inflation rate begins to fall. Eventually, the expected inflation rate falls and so does the unemployment rate.
 - b. The natural unemployment rate is between 4 percent and 8 percent, so draw a vertical $LRPC$ at an unemployment rate of 6 percent. The $SRPC$ slopes downward and passes through point A . Then the $SRPC$ shifts upward to pass through B and eventually through D . When the economy

- is at point *D*, the expected inflation rate falls and the *SRPC* curve shifts downward to pass through *C* and finally through *A* again.
- c. This sequence of events is most likely an unanticipated demand pull inflation and deflation.
8.
 - a. The unemployment rate increases, then the inflation rate rises, then the unemployment rate decreases, and finally the inflation rate falls. Initially any of the events that can increase the unemployment rate might have occurred. Most likely, the natural unemployment rate increased. Next, anything that can increase the actual and expected inflation rate occurred. Most likely, the growth rate of the money supply increased and was anticipated to do so. Then, anything that can lower the unemployment rate occurred. Most likely the natural unemployment rate decreased. Finally, anything that can lower the actual and expected inflation rate occurred. Most likely, the growth rate of the money supply slowed and was anticipated to do so.
 - b. The simplest story is that initially, the natural unemployment rate is 4 percent and the expected inflation rate is 5 percent a year, so the *LRPC* and *SRPC* pass through point *A*. The rise in the natural unemployment rate to 8 percent means that the two curves shift rightward to pass through point *C*. The rise in the expected inflation rate now shifts the *SRPC* upward to pass through *D*. The natural unemployment rate now falls and both curves shift leftward to pass through point *B*. Finally, the actual and expected inflation rate fall and the *SRPC* curve shifts downward to pass through point *A* again.
 - c. The sequence of events is most likely an increase in the natural unemployment rate, an anticipated rise in the inflation rate, a decrease in the natural unemployment rate and finally a fall in the anticipated inflation rate.
 9.
 - a. If the natural unemployment rate and the expected inflation rate remain constant between 1999 and 2003, the *SRPC* is linear and passes through the data points listed in the table provided. Note that one of these points is the natural rate of unemployment (4 percent) and the expected inflation rate (6 percent). The *LRPC* is vertical at an unemployment rate of 4 percent.
 - b. If the actual inflation rate rises from 6 percent to 8 percent a year, the unemployment rate decreases from 4 percent to 3 percent. This change would occur if aggregate demand were expected to increase.
 10. If the natural unemployment rate remains at 5 percent a year and the expected inflation rate remains at 5 percent a year between 1999 and 2003, then the short-run Phillips curve will shift downward by 1 percentage point because of the 1 percent decrease in expected inflation. The long-run Phillips curve and the short-run Phillips curve will both shift rightward by one percentage point because of the one percent increase in the natural unemployment rate. Note that both curves pass through the point where the natural rate of unemployment is 5 percent and the expected inflation rate is 5 percent.

