

FIGURE 1

The Phillips Curve

The Phillips curve illustrates a negative association between the inflation rate and the unemployment rate. At point A, inflation is low and unemployment is high. At point B, inflation is high and unemployment is low.

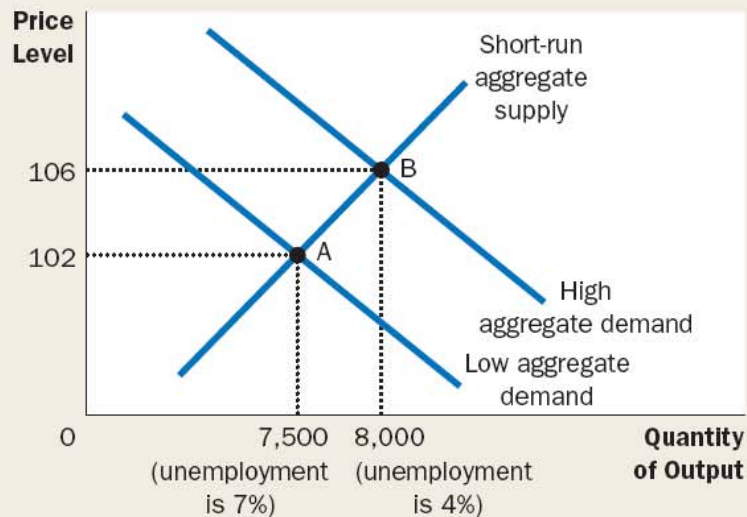


2 FIGURE

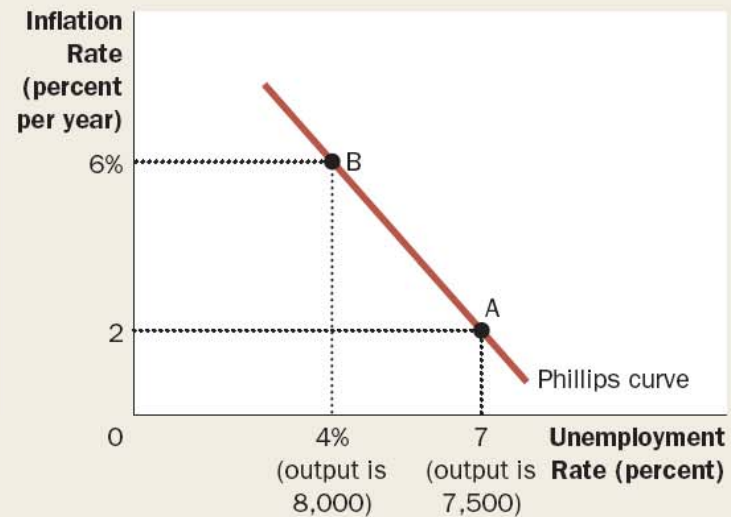
How the Phillips Curve Is Related to the Model of Aggregate Demand and Aggregate Supply

This figure assumes a price level of 100 for the year 2010 and charts possible outcomes for the year 2011. Panel (a) shows the model of aggregate demand and aggregate supply. If aggregate demand is low, the economy is at point A; output is low (7,500), and the price level is low (102). If aggregate demand is high, the economy is at point B; output is high (8,000), and the price level is high (106). Panel (b) shows the implications for the Phillips curve. Point A, which arises when aggregate demand is low, has high unemployment (7 percent) and low inflation (2 percent). Point B, which arises when aggregate demand is high, has low unemployment (4 percent) and high inflation (6 percent).

(a) The Model of Aggregate Demand and Aggregate Supply



(b) The Phillips Curve

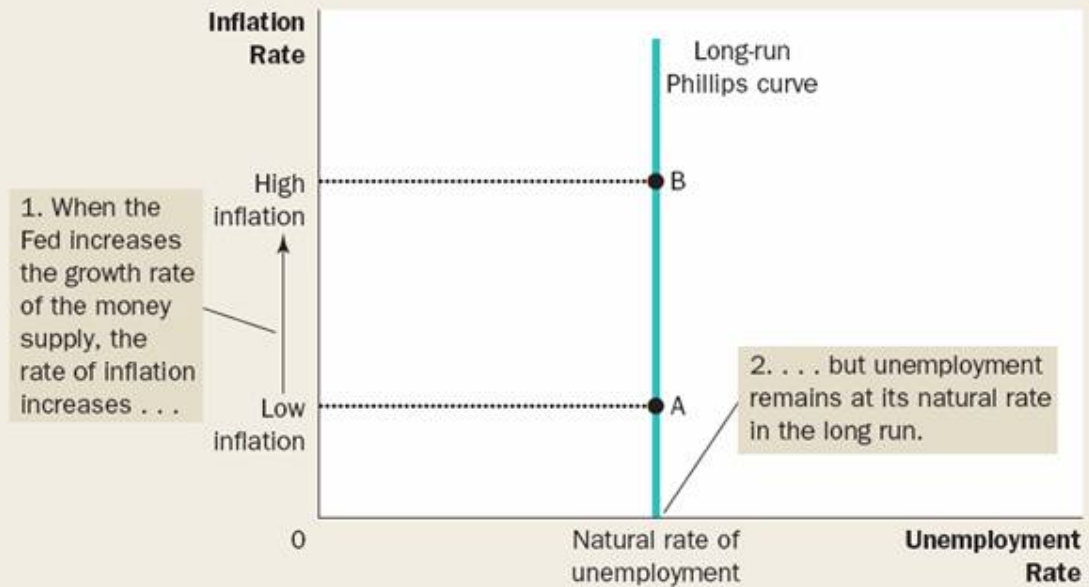


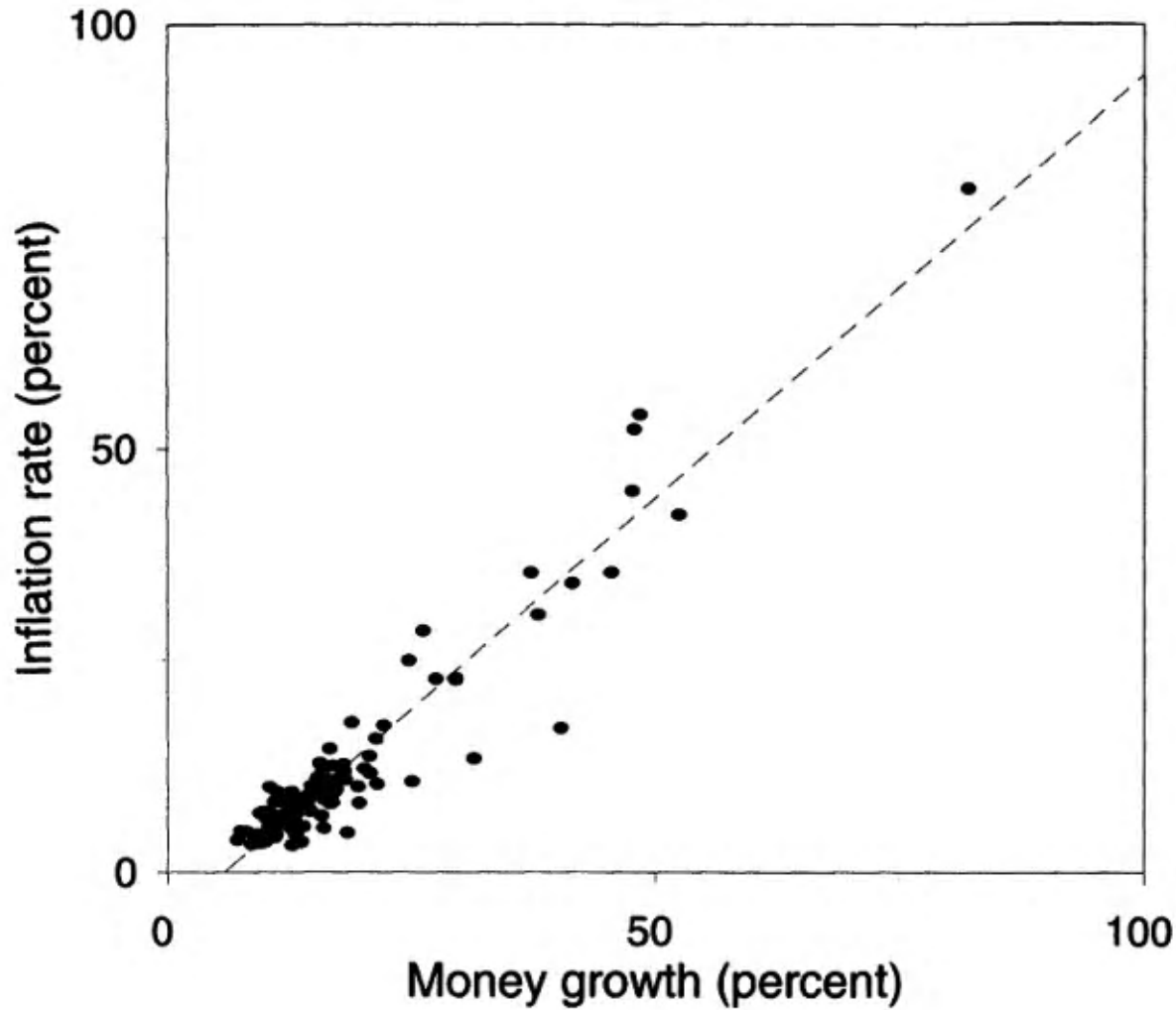


3 FIGURE

The Long-Run Phillips Curve

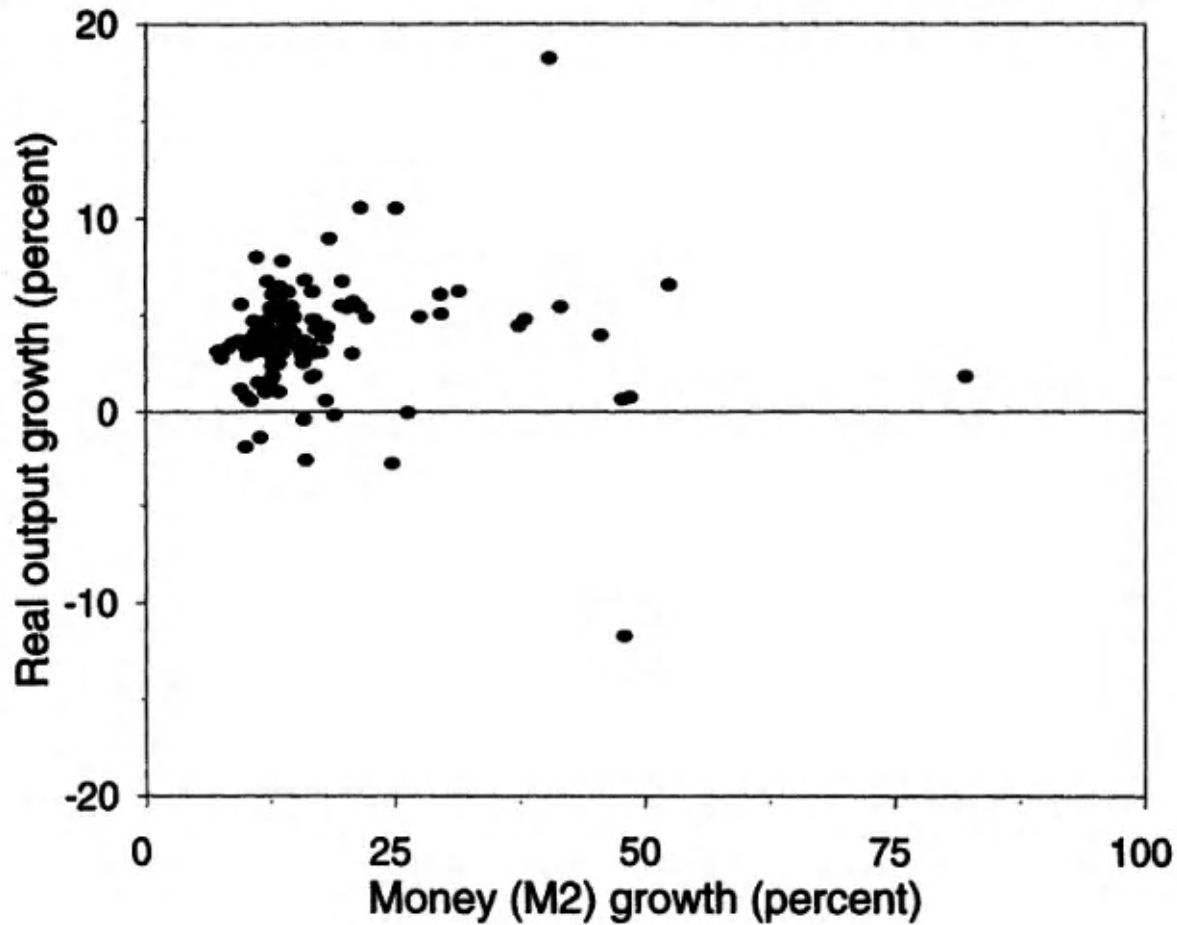
According to Friedman and Phelps, there is no trade-off between inflation and unemployment in the long run. Growth in the money supply determines the inflation rate. Regardless of the inflation rate, the unemployment rate gravitates toward its natural rate. As a result, the long-run Phillips curve is vertical.





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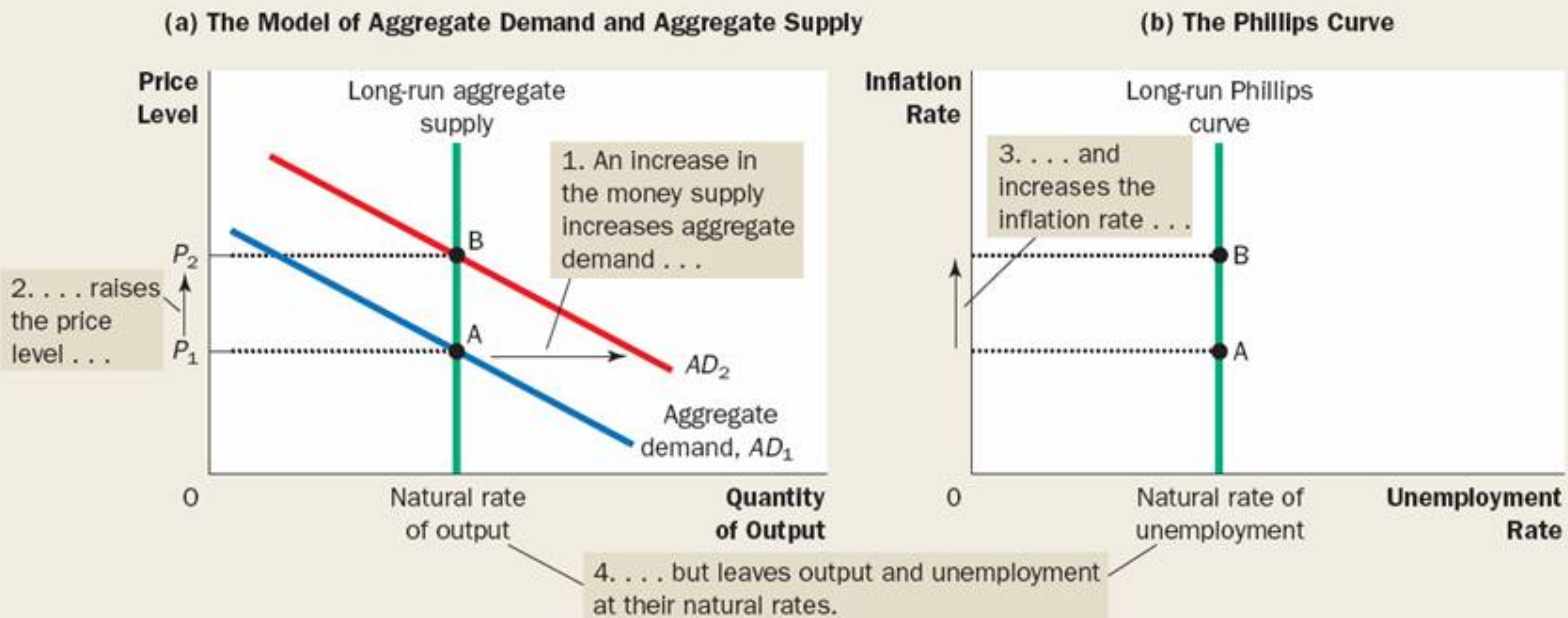
FIG. 2



FIGURE 4

Panel (a) shows the model of aggregate demand and aggregate supply with a vertical aggregate-supply curve. When expansionary monetary policy shifts the aggregate-demand curve to the right from AD_1 to AD_2 , the equilibrium moves from point A to point B. The price level rises from P_1 to P_2 , while output remains the same. Panel (b) shows the long-run Phillips curve, which is vertical at the natural rate of unemployment. Expansionary monetary policy moves the economy from lower inflation (point A) to higher inflation (point B) without changing the rate of unemployment.

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where π_t is inflation in year t and π_t^e is **expected** inflation in year t .

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 - ▶ The left-hand side is **unanticipated inflation**.
 - ▶ The right-hand side is the **deviation of the unemployment rate from its natural rate**.

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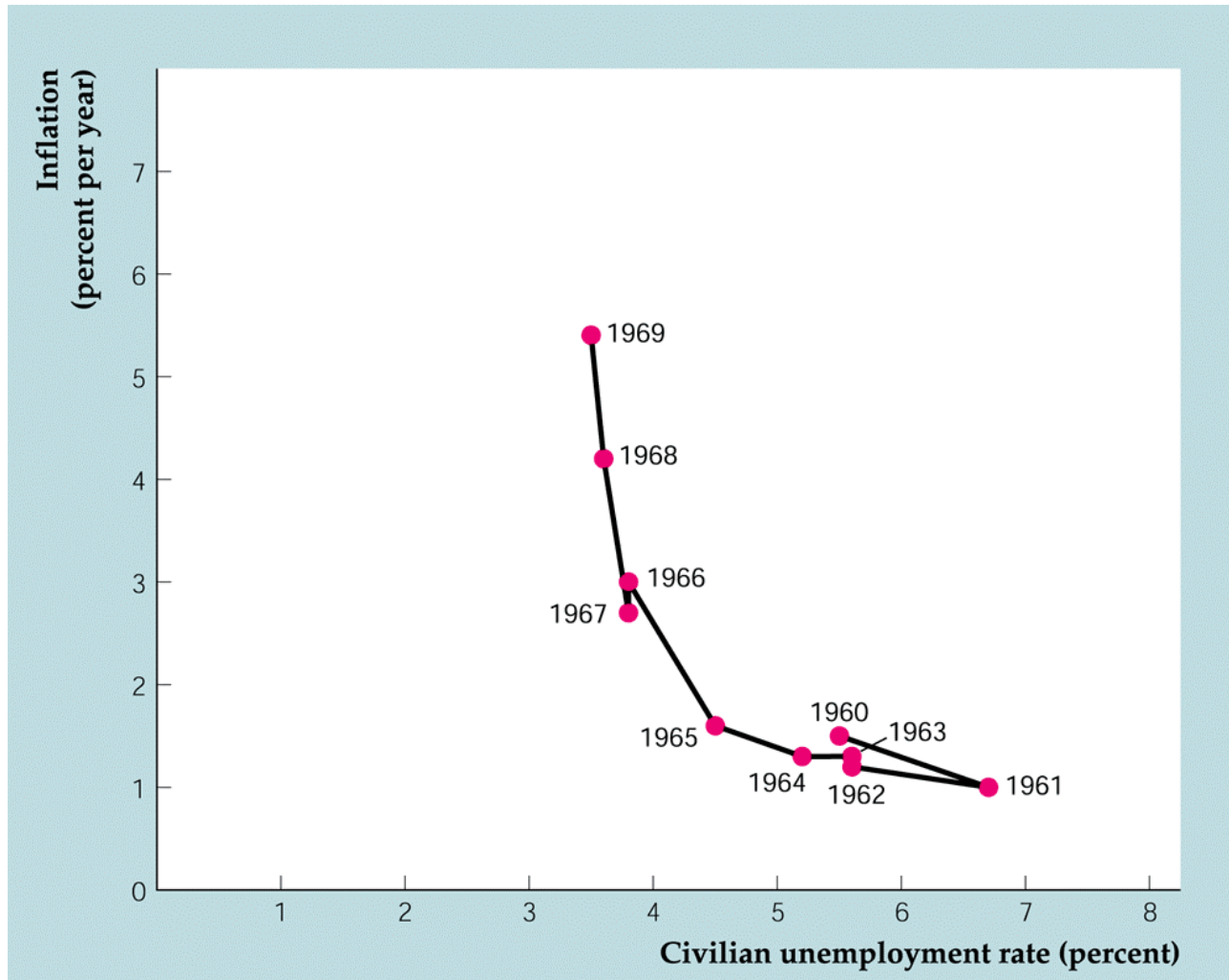
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Figure 12.1 The Phillips curve and the U.S. economy during the 1960s

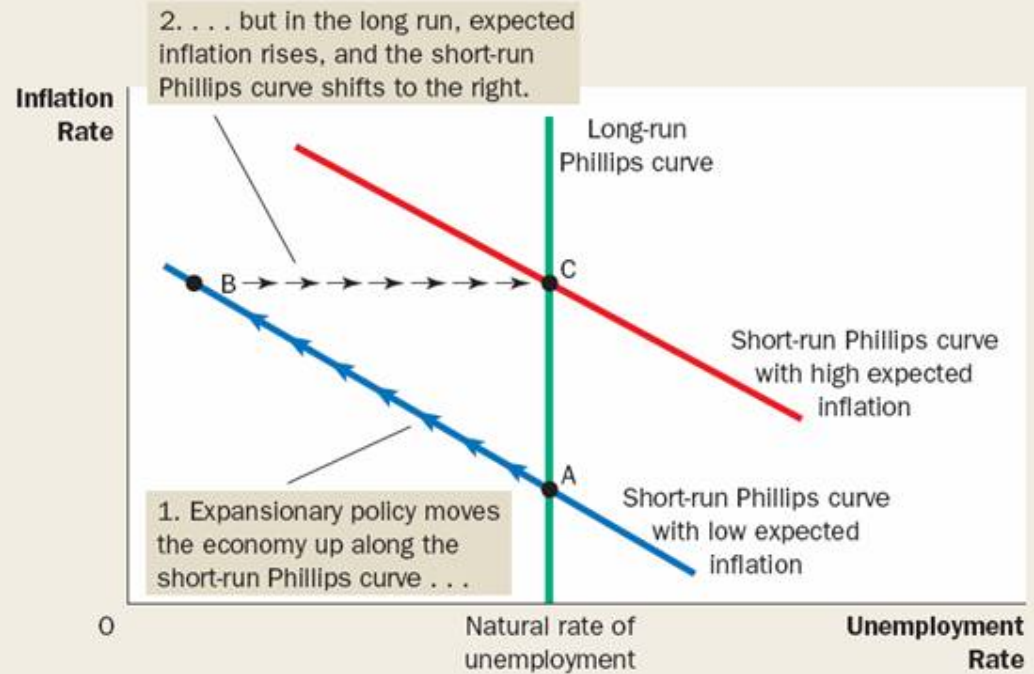




5 FIGURE

How Expected Inflation Shifts the Short-Run Phillips Curve

The higher the expected rate of inflation, the higher the short-run trade-off between inflation and unemployment. At point A, expected inflation and actual inflation are both low, and unemployment is at its natural rate. If the Fed pursues an expansionary monetary policy, the economy moves from point A to point B in the short run. At point B, expected inflation is still low, but actual inflation is high. Unemployment is below its natural rate. In the long run, expected inflation rises, and the economy moves to point C. At point C, expected inflation and actual inflation are both high, and unemployment is back to its natural rate.



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Figure 12.2 Inflation and unemployment in the United States, 1970–2002



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- ▶ Why? If the government tries to exploit the tradeoff, actors in the economy figure this out and **adjust their expectations about inflation**.
- ▶ **Lesson**: Surprises to the inflation rate can have real effects (on unemployment and output), but **predictable** or **systematic** movements in the inflation rate cannot.

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- ▶ The natural rate of unemployment (u^n) is, therefore, sometimes called the **non-accelerating inflation rate of unemployment**.

Figure 12.7 The expectations-augmented Phillips curve in the United States, 1970–2002

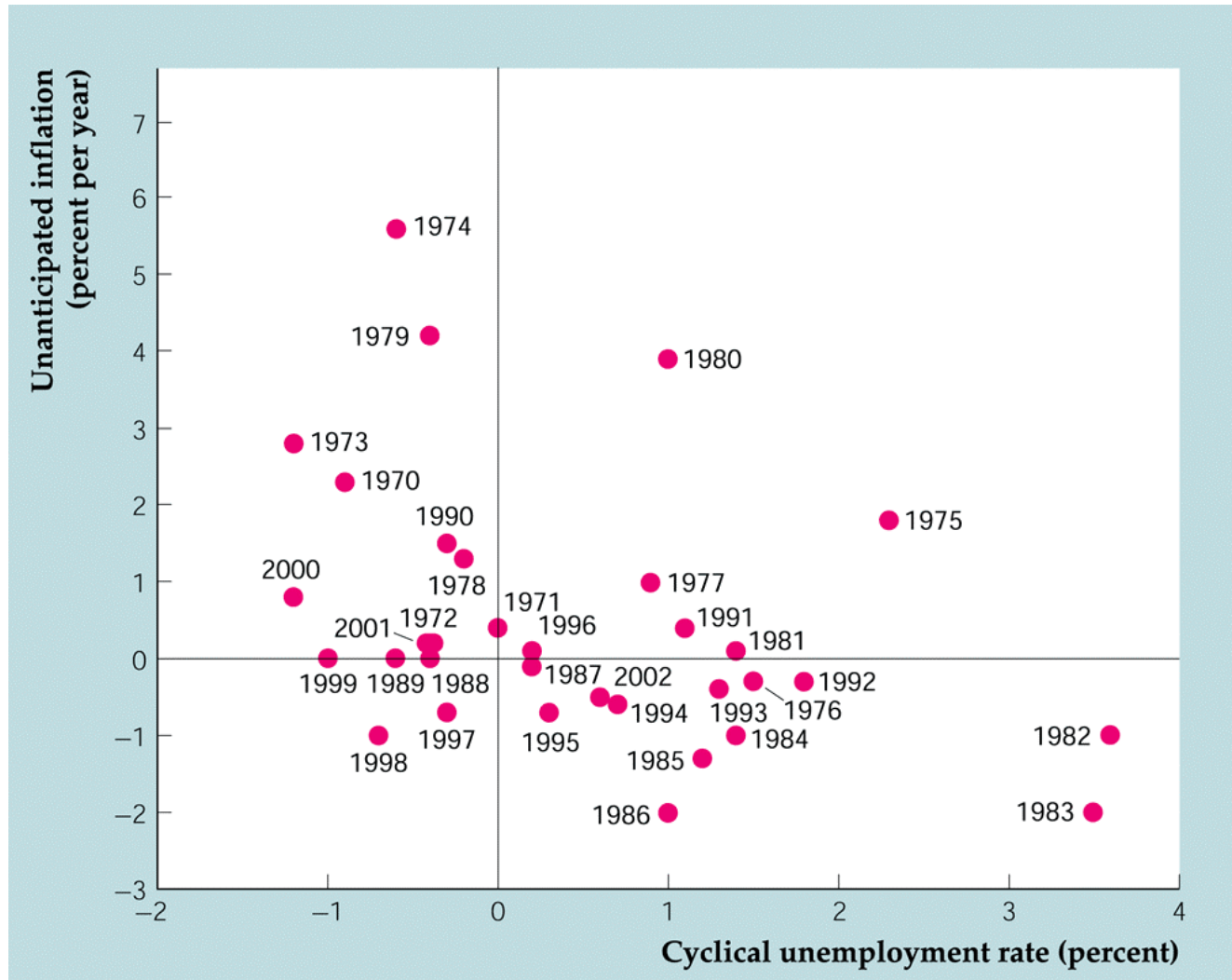
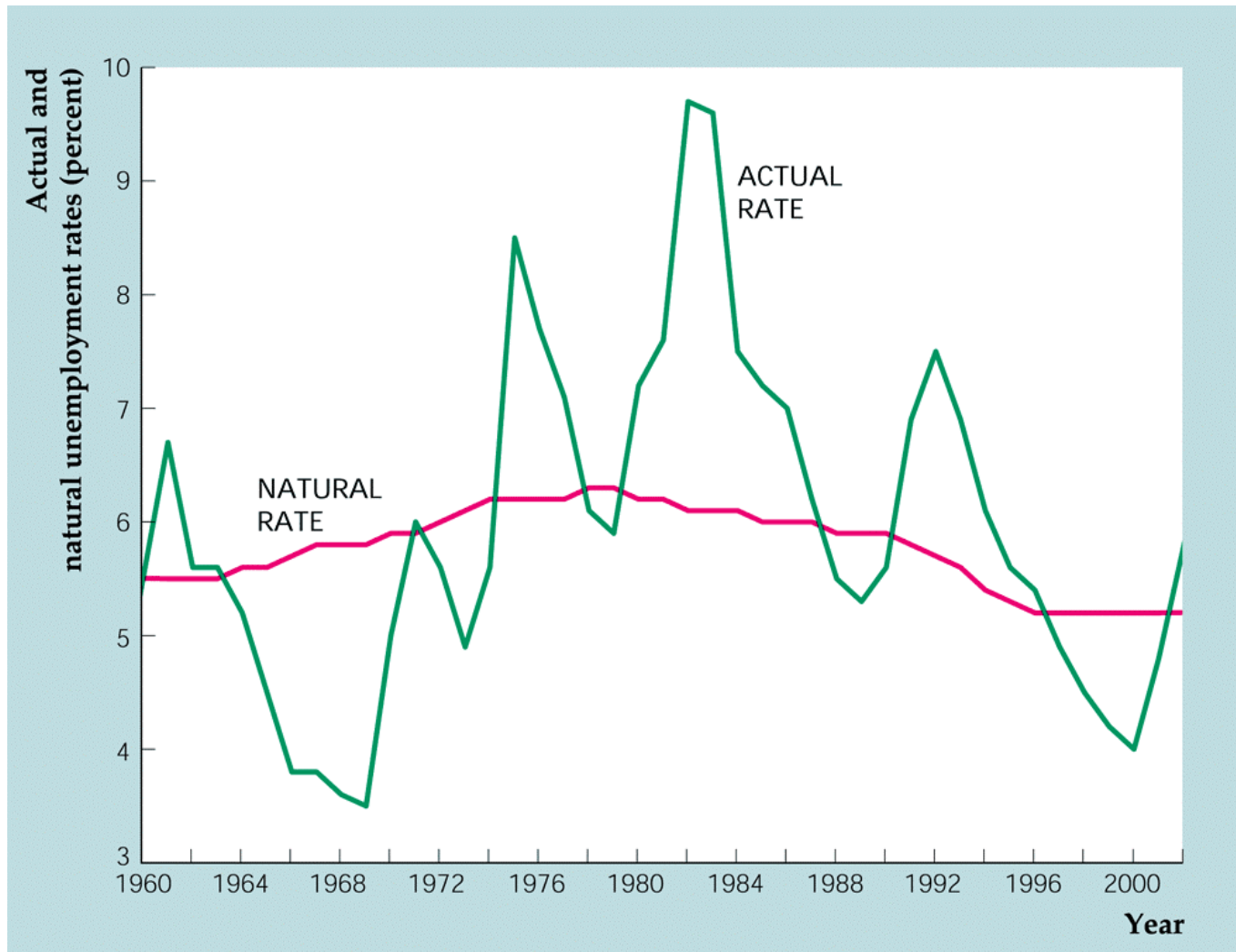


Figure 12.9 Actual and natural unemployment rates in the United States





**Inflation Rate
(percent per year)**

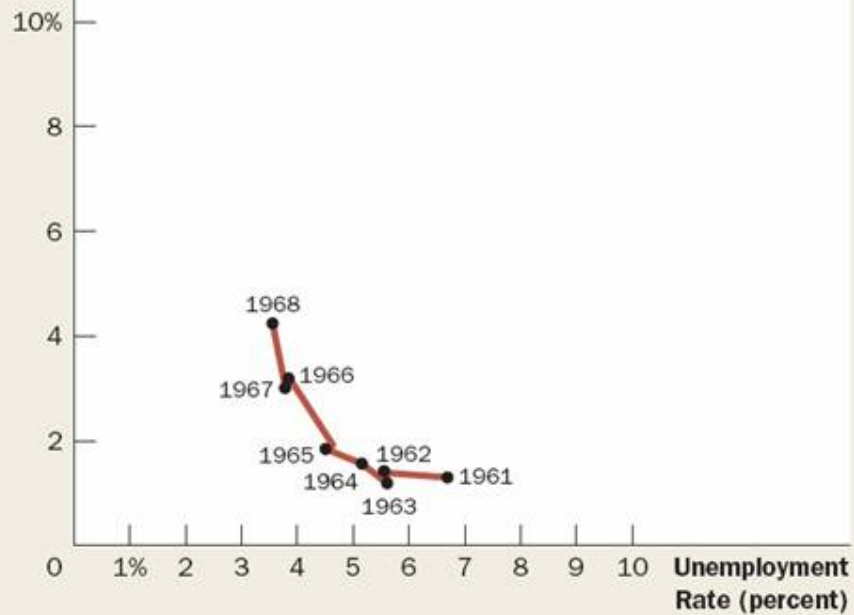


FIGURE 6

The Phillips Curve in the 1960s

This figure uses annual data from 1961 to 1968 on the unemployment rate and on the inflation rate (as measured by the GDP deflator) to show the negative relationship between inflation and unemployment.

Source: U.S. Department of Labor; U.S. Department of Commerce.

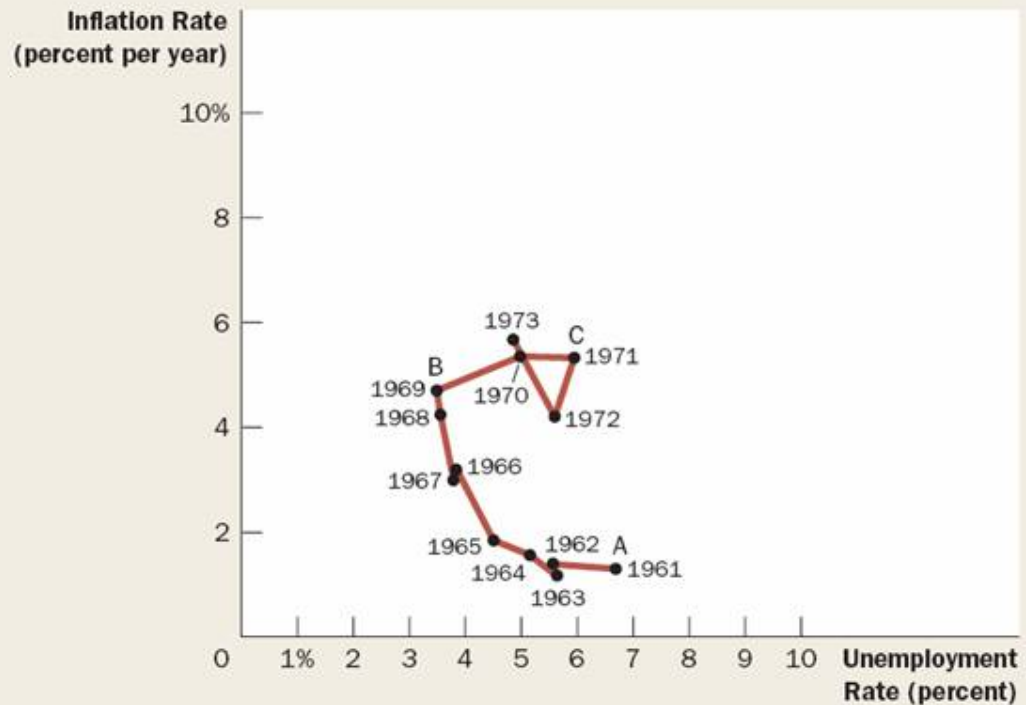


7 FIGURE

The Breakdown of the Phillips Curve

This figure shows annual data from 1961 to 1973 on the unemployment rate and on the inflation rate (as measured by the GDP deflator). The Phillips curve of the 1960s breaks down in the early 1970s, just as Friedman and Phelps had predicted. Notice that the points labeled A, B, and C in this figure correspond roughly to the points in Figure 5.

Source: U.S. Department of Labor; U.S. Department of Commerce.



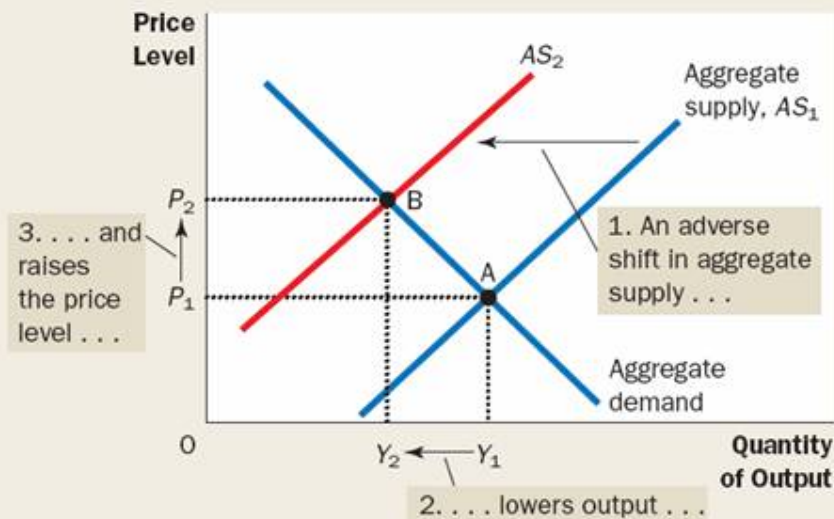


Panel (a) shows the model of aggregate demand and aggregate supply. When the aggregate-supply curve shifts to the left from AS_1 to AS_2 , the equilibrium moves from point A to point B. Output falls from Y_1 to Y_2 , and the price level rises from P_1 to P_2 . Panel (b) shows the short-run trade-off between inflation and unemployment. The adverse shift in aggregate supply moves the economy from a point with lower unemployment and lower inflation (point A) to a point with higher unemployment and higher inflation (point B). The short-run Phillips curve shifts to the right from PC_1 to PC_2 . Policymakers now face a worse trade-off between inflation and unemployment.

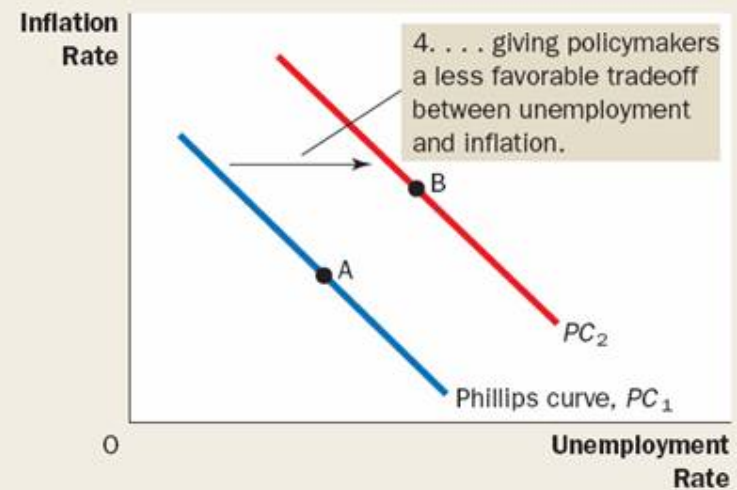
FIGURE 8

An Adverse Shock to Aggregate Supply

(a) The Model of Aggregate Demand and Aggregate Supply



(b) The Phillips Curve





9

FIGURE

The Supply Shocks of the 1970s

This figure shows annual data from 1972 to 1981 on the unemployment rate and on the inflation rate (as measured by the GDP deflator). In the periods 1973–1975 and 1978–1981, increases in world oil prices led to higher inflation and higher unemployment.

Source: U.S. Department of Labor; U.S. Department of Commerce.

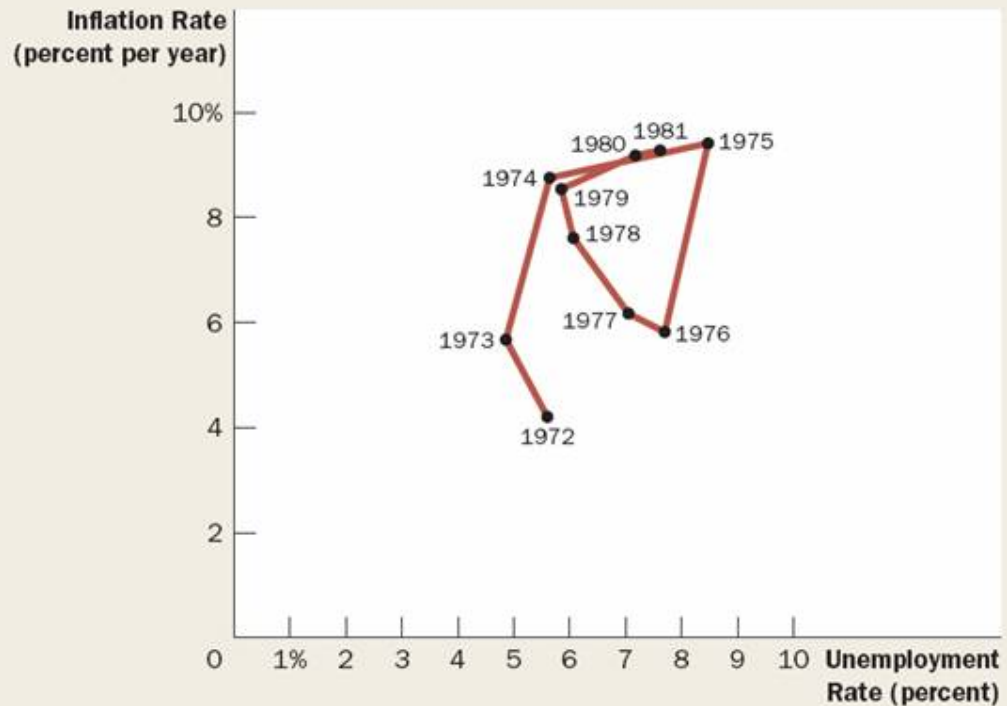
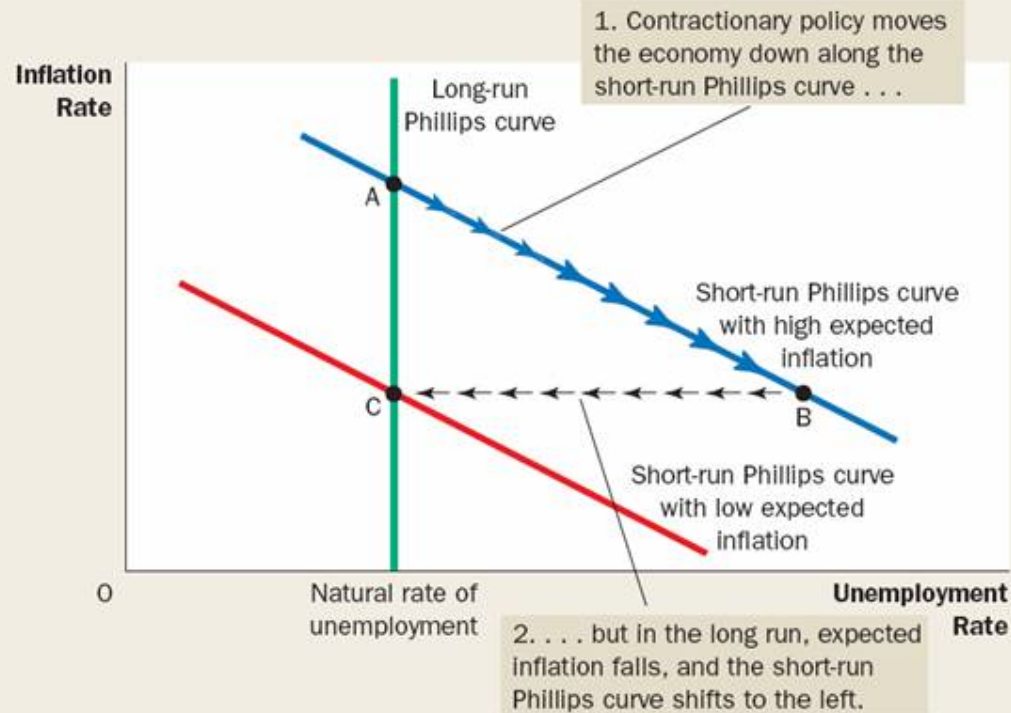




FIGURE 10



Disinflationary Monetary Policy in the Short Run and Long Run

When the Fed pursues contractionary monetary policy to reduce inflation, the economy moves along a short-run Phillips curve from point A to point B. Over time, expected inflation falls, and the short-run Phillips curve shifts downward. When the economy reaches point C, unemployment is back at its natural rate.



11 FIGURE

The Volcker Disinflation

This figure shows annual data from 1979 to 1987 on the unemployment rate and on the inflation rate (as measured by the GDP deflator). The reduction in inflation during this period came at the cost of very high unemployment in 1982 and 1983. Note that the points labeled A, B, and C in this figure correspond roughly to the points in Figure 10.

Source: U.S. Department of Labor; U.S. Department of Commerce.

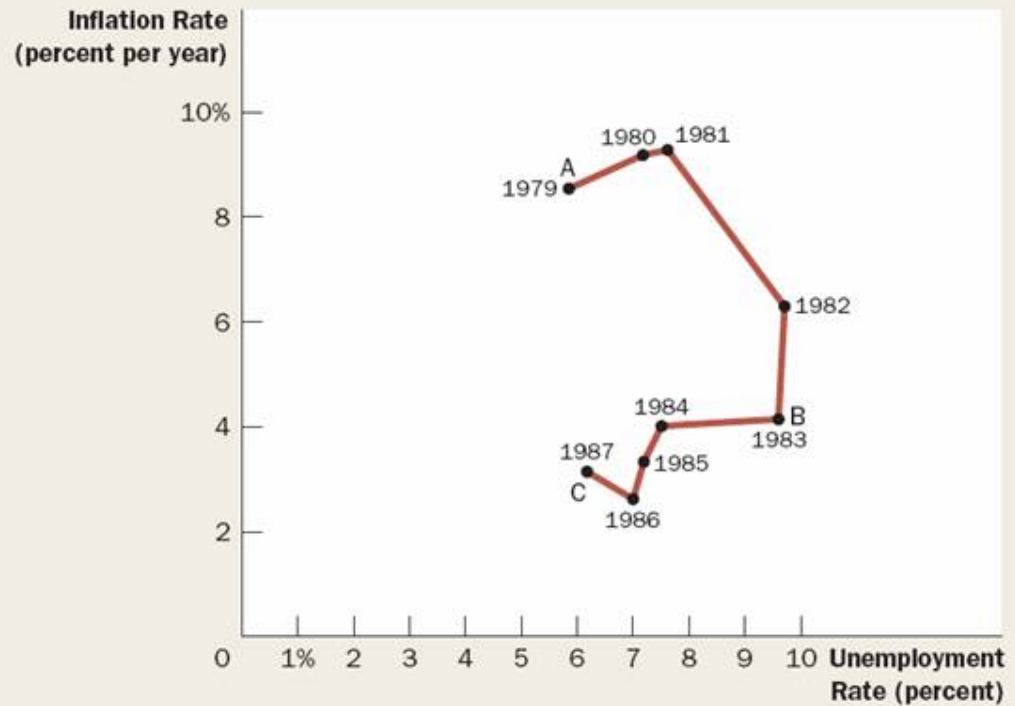
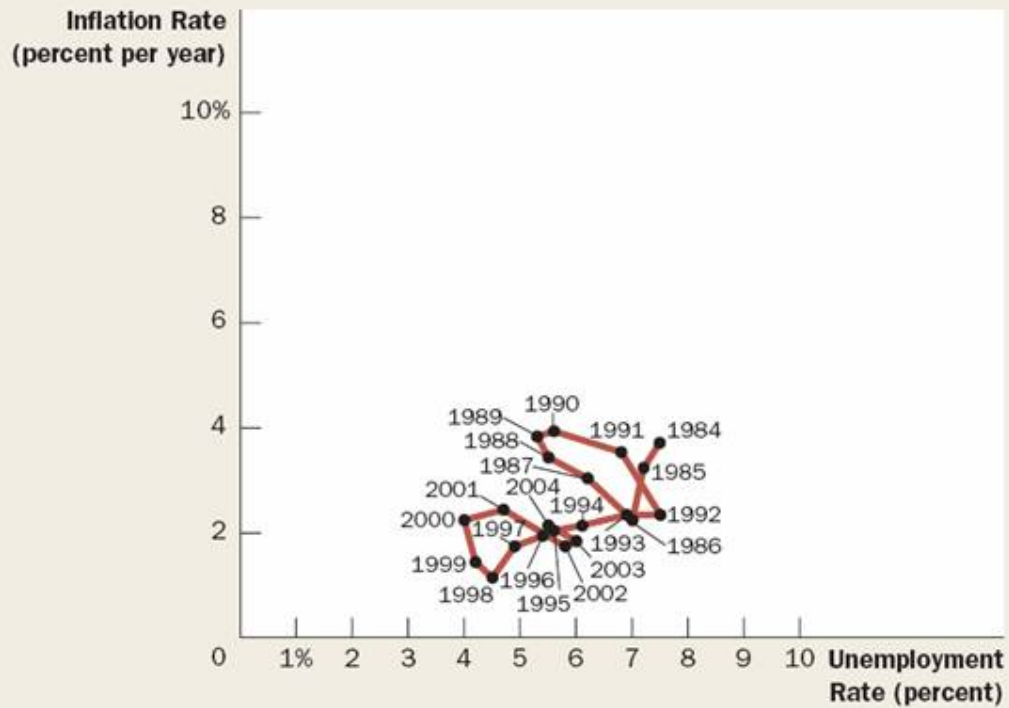




FIGURE 12



The Greenspan Era

This figure shows annual data from 1984 to 2004 on the unemployment rate and on the inflation rate (as measured by the GDP deflator). During most of this period, Alan Greenspan has been chairman of the Federal Reserve. Fluctuations in inflation and unemployment have been relatively small.

Source: U.S. Department of Labor; U.S. Department of Commerce.

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- ▶ That seems like a good thing!

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- ▶ **Cons:** Reducing inflation usually requires putting the economy through a recession (unless the Fed is very good at credibly manipulating inflation expectations).
- ▶ The **sacrifice ratio** is the number of percentage points of annual output lost in the process of reducing inflation by one percentage point.

Should the Fed Reduce Inflation to Zero?

- ▶ The inflation rate in the U.S. has been low for many years. Should the Fed try to reduce it further?
- ▶ **Pros:** Costs of inflation (shoeleather costs, menu costs, increased variability of relative prices, arbitrary redistributions of wealth associated with dollar-denominated debt) are reduced.
- ▶ But these costs are already low with low and stable inflation.
- ▶ **Cons:** Reducing inflation usually requires putting the economy through a recession (unless the Fed is very good at credibly manipulating inflation expectations).
- ▶ The **sacrifice ratio** is the number of percentage points of annual output lost in the process of reducing inflation by one percentage point.
- ▶ A typical estimate of the sacrifice ratio is 5: reducing inflation from 2% to 0% would entail the loss of 10% of output.