The Phillips Curve and the Short-Run Aggregate Supply Curve

This lecture examines the relationship between unemployment and inflation and shows how that relationship can be used to derive the short-run aggregate supply curve.
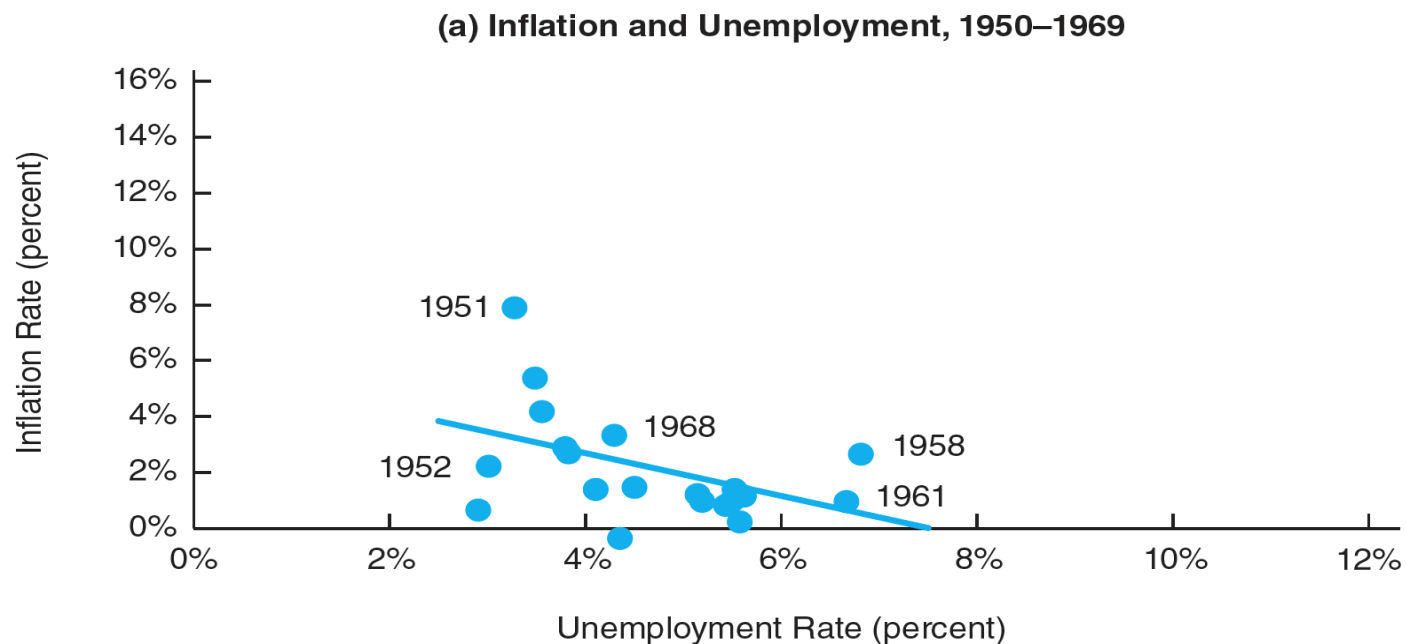
The Phillips Curve

A. A.W. Phillips found that unemployment was negatively related to wage growth in the United Kingdom.

1. Other economists have found this same negative relationship in many other countries.

2. The intuition behind this relationship is a strong economy increases labor demand, which pushes up nominal wages and reduces unemployment. The higher wages raise firms' costs, which encourages those firms to raise their prices.

3. Since inflation rises with nominal wage growth and inflation is a key macroeconomic variable, economists focus on the negative relationship between unemployment and inflation, which is known as the Phillips curve.

B. The Phillips Curve during the 1960s

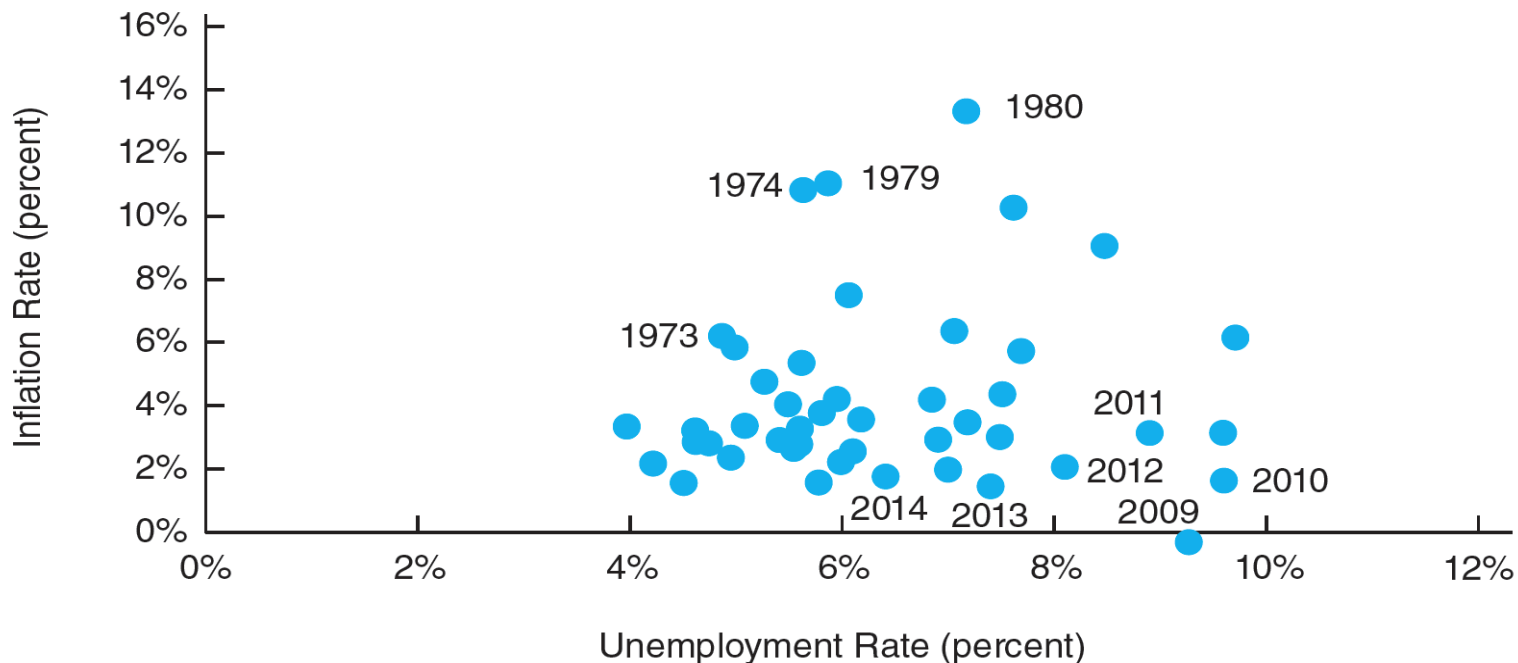1. U.S. data from 1950-1969 supports the Phillips curve claim that unemployment and inflation are negatively related.

(a) Inflation and Unemployment, 1950–1969

C. The Phillips Curve after the 1960s

1. The negative relationship between unemployment and inflation disappears after 1970 in U.S. data.

(b) Inflation and Unemployment, 1970–2014

D. The Friedman-Phelps Analysis of the Phillips Curve

   1. Both Milton Friedman and Edmund Phelps argued that nominal and real wages respond differently to changes in unemployment and inflation.

      a. When inflation rises, workers do not want their real wages to fall, so nominal wage growth moves one-for-one with the inflation rate.

      b. As the unemployment rate declines, firms have to pay a higher real wage to attract workers.

      c. In the long run, the unemployment rate (U) is at the natural rate of unemployment (U^N), which is independent of the inflation rate.

d. The Friedman-Phelps critique suggests the Phillips curve can be written as follows:

$$\pi = \pi^e - \omega \times (U - U^N) + \rho, \quad\quad (1)$$

where π^e is expected inflation, ρ is an inflation shock, and $\omega > 0$.

i. Inflation is negatively related to the gap between the unemployment rate and its natural rate. Thus, the short-run Phillips curve (SRPC) slopes downward.

ii. Inflation moves one-for-one with expected inflation. Thus, an increase in expected inflation shifts the SRPC up.

iii. In the long run, $U = U^N$, so inflation is independent of the unemployment rate. Thus, the long-run Phillips curve (LRPC) is vertical.

e. The Short-Run and Long-Run Phillips Curves

Assume $\pi^{e''} > \pi^{e'}$ and $\rho = 0$
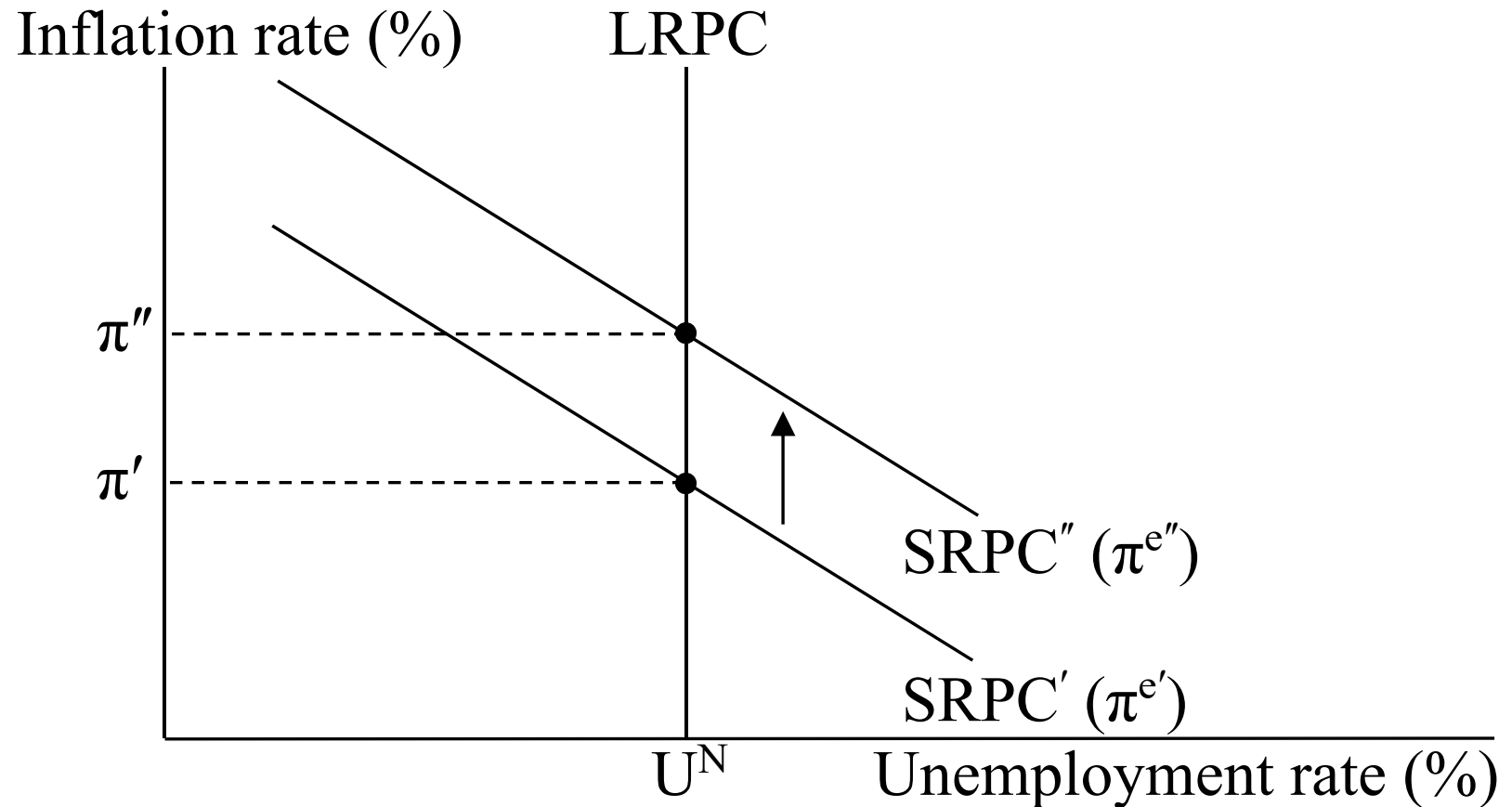
where $\pi' = \pi^{e'}$ and $\pi'' = \pi^{e''}$.

2. Friedman and Phelps arrive at three key conclusions.

   a. There are two types of Phillips curves: A long run and a short run.

   b. A short-run tradeoff exists between unemployment and inflation.

   c. No long-run tradeoff exists between unemployment and inflation.

E. The Phillips Curve with Backward-Looking Expectations

   1. Let's assume inflation expectations are based on last period's inflation

$$\pi^e = \pi_{-1}. \qquad (2)$$

   2. When (2) is substituted into (1), the Phillips curve becomes

$$\pi = \pi_{-1} - \omega \times (U - U^N) + \rho. \qquad (3)$$

3. Rearranging (3), we can see the change in inflation is negatively related to the unemployment rate gap

$$\Delta\pi = \pi - \pi_{-1} = -\omega \times (U - U^N) + \rho. \qquad (4)$$

4. The Phillips curve in (4) has three advantages.

   a. The Phillips curve has a simple mathematical form.

   b. Inflation expectations adjust slowly as inflation changes.

   c. The presence of last period's inflation rate reflects the fact that some price and wage contracts are backward-looking.

The Short-Run Aggregate Supply Curve

A. Combining the Phillips curve with Okun's law gives us the short-run aggregate supply curve.

B. Recall from (1), the Phillips curve is

$$\pi = \pi^e - \omega\times(U - U^N) + \rho.$$
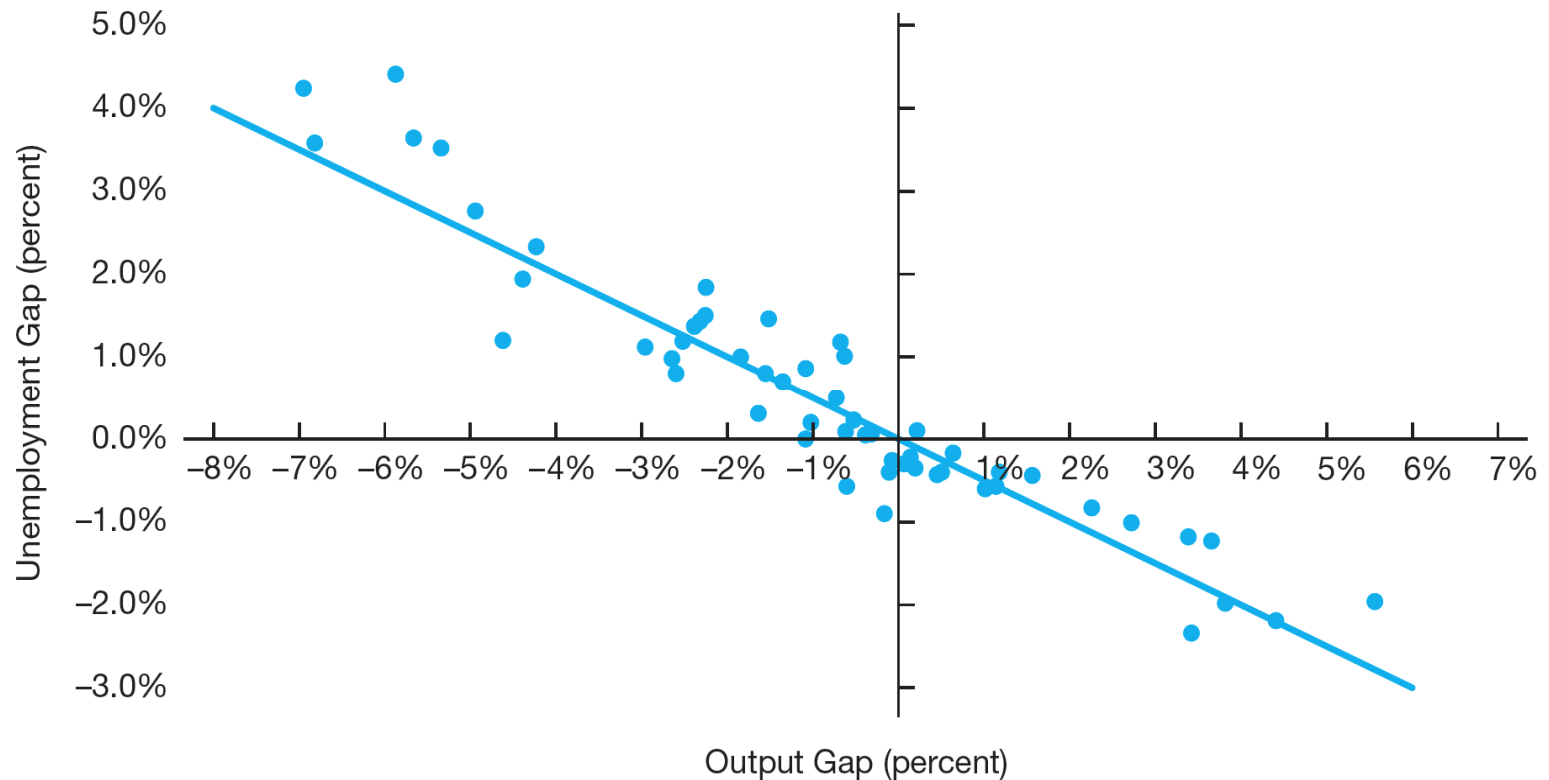
C. Okun's Law

1. Okun's law says that for every one percentage point the unemployment rate is above its natural rate, output is two percentage points below its potential

$$(Y - Y^P)/Y^P = -2\times(U - U^N). \qquad (5)$$

2. Alternatively, Okun's law (5) can be stated as follows:

$$U - U^N = -0.5\times(Y - Y^P)/Y^P. \qquad (6)$$

3. Okun's Law: U.S. Data from 1960-2014

D. The short-run aggregate supply curve is derived by substituting Okun's law (6) into the Phillips curve (1)

$$\pi = \pi^e + 0.5 \times \omega \times (Y - Y^P)/Y^P + \rho. \tag{7}$$