The overall price level is a weighted average of the prices set by the two types of firms:

$$P = sP^e + (1 - s)[P + a(Y - \overline{Y})].$$

Rearranging:

$$P = P^e + [a(1 - s)/s](Y - \overline{Y}).$$

a. If no firms have flexible prices, then $s = 1$. The above equation tells us that

$$P = P^e.$$

That is, the aggregate price level is fixed at the expected price level; the aggregate supply curve is horizontal in the short run, as assumed in Chapter 9.

b. If desired relative prices do not depend at all on the level of output, then $a = 0$ in the equation for the price level. Once again, we find $P = P^e$: the aggregate supply curve is horizontal in the short run, as assumed in Chapter 9.

2. In the sticky-wage model, we assumed that the wage did not adjust immediately to changes in the labor market. This resulted in an upward-sloping aggregate supply curve with the form

$$Y = \overline{Y} + \alpha(P - P^e).$$

In this problem, we consider the effect of allowing these contracts to be indexed for inflation.

a. In the simple sticky-wage model, the nominal wage W equals the desired real wage ω times the expected price level P^e:

$$W = \omega P^e.$$

Full indexing, however, makes the nominal wage depend on the *actual* price level. That is, the contract specifies the desired real wage ω, and the nominal wage adjusts fully to changes in the price level. As a result,

$$W = \omega P,$$

or

$$W/P = \omega.$$

This means that unexpected price changes do not affect the real wage and, hence, do not affect the amount of labor used or the amount of output produced. The aggregate supply schedule is thus vertical at $Y = \overline{Y}$.

b. If there is partial indexing, then the aggregate supply curve will be steeper than it is without indexing, although it will not be vertical. In the sticky-wage model, an unexpected increase in the price level reduces the real wage W/P, since the nominal wage W is unaffected. With partial indexing, the increase in the price level causes an increase in the nominal wage. Since the indexing is only partial, the nominal wage increases by less than the price level does, so the real wage falls. This causes firms to use more labor and increase production. However, the real wage does not fall as much as it does without indexing, so output does not rise as much.

In effect, this is like making the parameter α smaller in the equation for aggregate supply. That is, output fluctuations become less responsive to surprises in the price level.

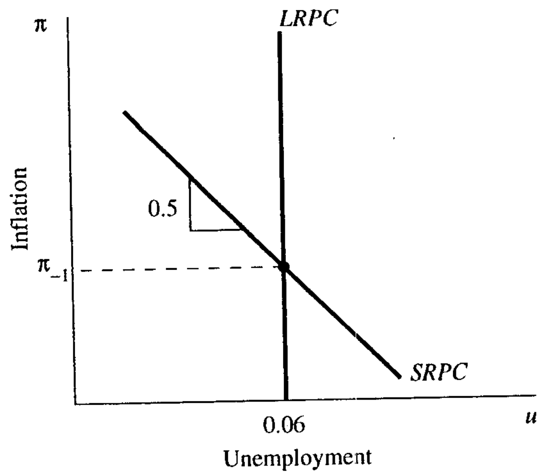
3. The economy has the Phillips curve:

$$\pi = \pi_{-1} - 0.5(u - 0.06).$$

a. The natural rate of unemployment is the rate at which the inflation rate does not deviate from the expected inflation rate. Here, the expected inflation rate is just last period's actual inflation rate. Setting the inflation rate equal to last period's inflation rate, that is, $\pi = \pi_{-1}$, we find that $u = 0.06$. Thus, the natural rate of unemployment is 6 percent.

b. In the short run (that is, in a single period) the expected inflation rate is fixed at the level of inflation in the previous period, π_{-1}. Hence, the short-run relationship between inflation and unemployment is just the graph of the Phillips curve: it has a slope of –0.5, and it passes through the point where $\pi = \pi_{-1}$ and $u = 0.06$. This is shown in Figure 13–1. In the long run, expected inflation equals actual inflation, so that $\pi = \pi_{-1}$, and output and unemployment equal their natural rates. The long-run Phillips curve thus is vertical at an unemployment rate of 6 percent.

Figure 13–1



c. To reduce inflation, the Phillips curve tells us that unemployment must be above its natural rate of 6 percent for some period of time. We can write the Phillips curve in the form

$$\pi - \pi_{-1} = 0.5(u - 0.06).$$

Since we want inflation to fall by 5 percentage points, we want $\pi - \pi_{-1} = -0.05$. Plugging this into the left-hand side of the above equation, we find

$$-0.05 = -0.5(u - 0.06).$$

We can now solve this for u:

$$u = 0.16.$$

Hence, we need 10 percentage point-years of cyclical unemployment above the natural rate of 6 percent.

Okun's law says that a change of 1 percentage point in unemployment translates into a change of 2 percentage points in GDP. Hence, an increase in unemployment of 10 percentage points corresponds to a fall in output of 20 percentage points. The sacrifice ratio is the percentage of a year's GDP that must be forgone to reduce inflation by 1 percentage point. Dividing the 20 percentage-point decrease in GDP by the 5 percentage-point decrease in inflation, we find that the sacrifice ratio is 20/5 = 4.

d. One scenario is to have very high unemployment for a short period of time. For example, we could have 16 percent unemployment for a single year. Alternatively, we could have a small amount of cyclical unemployment spread out over a long period of time. For example, we could have 8 percent unemployment for 5 years. Both of these plans would bring the inflation rate down from 10 percent to 5 percent, although at different speeds.