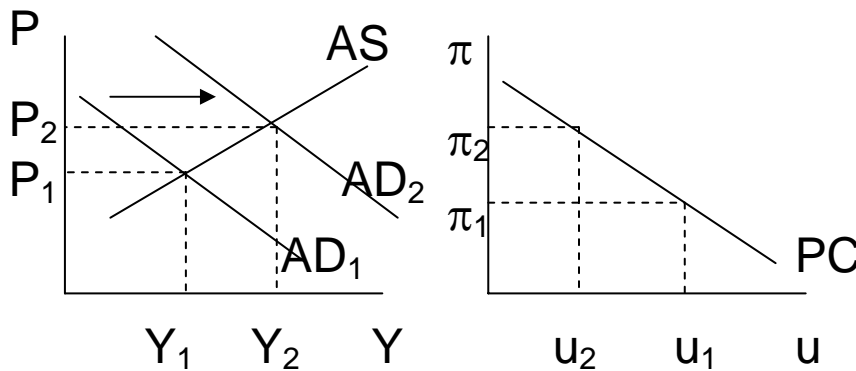


Note: AD&AS Model and the Phillips Curve. The Role of Expectation.

The Short-Run Phillips Curve

The model of aggregate demand (AD) and aggregate supply (AS) model provides an easy explanation for the menu of possible outcomes described by the Phillips curve. *The Phillips curve simply shows the combinations of inflation and unemployment that arise in the short run as shifts in the aggregate-demand curve move the economy along the short-run aggregate supply curve.*

As we saw in Handout 5, an increase in the AD for goods and services leads, in the short run, to a larger output of goods and services and a higher price level. Larger output means greater employment and, thus, a lower rate of unemployment. In addition, whatever the previous year's price level happens to be, the higher the price level in the current year, the higher the rate of inflation.



The Model of AS&AD The Phillips Curve

How the short-run Phillips curve is related to the AD&AS Model.

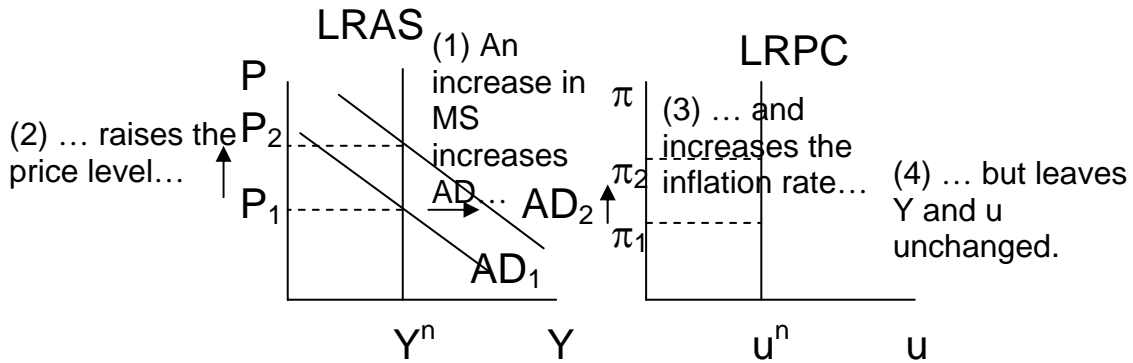
Figure 1

Again as we saw in the preceding Handout, monetary and fiscal policy can shift the aggregate-demand curve. Therefore, monetary and fiscal policy can move the economy along the Phillips curve. Increases in the money supply, increases in government spending, or cuts in taxes expand aggregate demand and move the economy to the point on Phillips curve with lower unemployment and higher inflation. Decreases in the money supply, cuts in government spending, or increases in taxes contract aggregate demand and move the economy to a point on the Phillips curve with lower inflation and higher unemployment. In this sense, the Phillips curve offers policy makers a menu of combinations of inflation and unemployment.

The Long-Run Phillips Curve

Friedman argued that one thing monetary policy cannot do, other than for only a short time, is pick a combination of inflation and unemployment on the Phillips curve. In the long-run, when expectation regarding the price level are correct ($P = P^e$), the aggregate supply curve is a vertical line at the natural rate of output ($Y = \bar{Y}$). In the situation such as this, shifts of aggregate demand can change the price level (and the

inflation rate), but they have no effect on output (and the unemployment rate). That means there is no trade off between unemployment and inflation in the long-run. Or, put differently, the long-run Phillips curve is vertical at the natural rate of unemployment, as depicted in the lower figure.



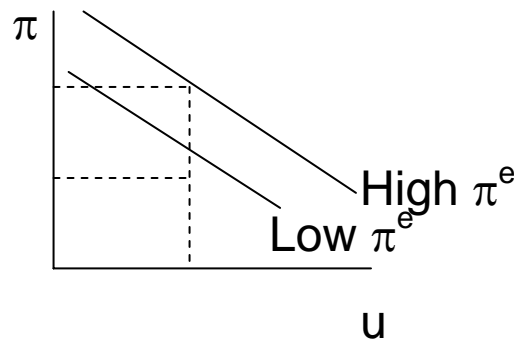
How the long run Phillips curve is related to the model of AD&AS
Figure 2

Shifts in the Phillips Curve: The Role of Expectation

Consider the Phillips curve equation (the previous handout)

$$\pi = \pi^e - (u - u^n) + v$$

In the short run, for a given level of expectation, policy makers can manipulate aggregate demand to choose a combination of inflation and unemployment on this curve. Notice that the position of the short run Phillips curve depends on the expected rate of inflation. If expected inflation rises, the curve shifts upward, and the policymaker's tradeoff becomes less favorable: inflation is high for any level of unemployment.



Shifts in the short run tradeoff
Figure 3

In the long-run, people come to expect whatever inflation rate the Bank of England chooses to produce. Because wages, prices and perceptions will eventually adjust to the inflation rate, the long run AS curve is vertical. In this case, changes in AD curve, such as those due to changes in the money supply, do not affect the economy's output of goods and services. Thus, the unemployment returns to its natural rate in the long run (without v and if $\pi = \pi^e$, then $u = u^n$).

To help explain the short-run and long-run relationship between inflation and unemployment, it is important to introduce a new variable to analysis: **expected inflation**. It is crucial to understand how people form expectations. Again as of previous handout, we have learned the adaptive expectation. **The adaptive expectations theory** assumes people form their expectations of future inflation on the basis of previous and present rates of inflation and only gradually change their expectations as experience unfolds. Although this assumption is plausible, it is probably too simple to apply in all circumstances.

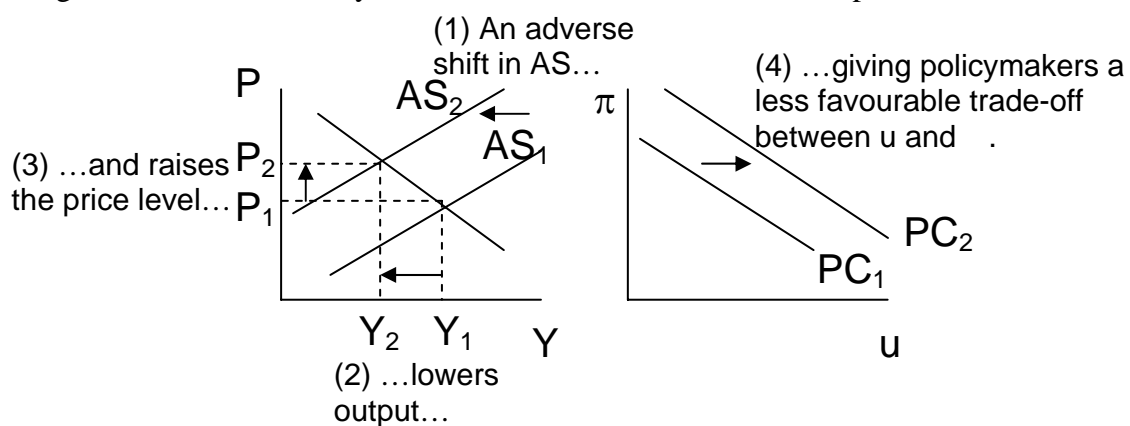
An alternative approach is to assume that people have **rational expectations**. This is, we might assume that people optimally use all the available information, including information about current government policies, to forecast the future. Because monetary and fiscal policies influence inflation, expected inflation should also depend on the monetary and fiscal policies in effect. According to the theory of rational expectations, a change in monetary or fiscal policy will change expectations, and an evaluation of any policy change must incorporate this effect on expectations.

Therefore, advocates of rational expectations argue that the short-run Phillips curve does not accurate. They believe that if policymakers are credibly committed to reducing inflation, rational people will understand the commitment and will quickly lower their expectations of inflation. Inflation can then come down without a rise in unemployment and fall in output.

A painless disinflation has two requirements. First, the plan to reduce inflation must be announced before the workers and firms who set wages and prices have formed their expectations. Second, the workers and firms must believe the announcement; otherwise, they will not reduce their expectations of inflation. If both requirements are met, the announcement will immediately shift the short-run tradeoff between inflation and unemployment downward, permitting a lower rate of inflation without higher unemployment.

Shifts in the Phillips Curve: The Role of Supply Shock

A large increase in the world price of oil is an example of supply shock. A supply shock is an event that directly affects firms' costs of production and thus the prices they charge; it shifts the economy's AS curve and, as a result, the Phillips curve.



An adverse shock to aggregate supply

Figure 4

The combination of rising prices and falling output is sometimes called *stagflation*. Thus, the shift in aggregate supply leads to higher unemployment and higher inflation. The short-run tradeoff between inflation and unemployment shifts to the right from PC_1 to PC_2 .

Deriving the Phillips curve from the Aggregate Supply Curve

You do not need to know this. However, if you understand it, you will gain the intuition of these two curves. I will go through it in the class, if we have enough time.

We should not lose sight of the fact that the Phillips curve and the aggregate supply curve are two sides of the same coin.

$$\begin{aligned} \text{AS Curve:} & \quad Y = \bar{Y} + \alpha(P - P^e) \\ \text{Phillips Curve:} & \quad \pi = \pi^e - \beta(u - u^n) + v \end{aligned}$$

Just as the AS curve slopes upward only in the short run, the tradeoff between inflation and unemployment holds only in the short run. And just as the long-run AS curve is vertical, the long-run Phillips curve is also vertical.

Recall the Phillips curve equation, $\pi = \pi^e - \beta(u - u^n) + v$, where does this equation come from? We can derive it from our equation of aggregate supply.

We start from AS curve equation,

$$Y = \bar{Y} + \alpha(P - P^e) \quad \text{or we can write in the form}$$

$$P = P^e + \frac{1}{\alpha}(Y - \bar{Y})$$

Let add v , the supply shock, to represent the exogenous events (such as the oil price shock). It follows that

$$P = P^e + \frac{1}{\alpha}(Y - \bar{Y}) + v$$

Just like what we already knew before, this equation argues that the shock alters the price level and shifts the short run AS curve inward.

We go from the price level to inflation rates by subtracting last year's price level P_{t-1} from both sides of the equation to obtain

$$(P_t - P_{t-1}) = (P_t^e - P_{t-1}) + \frac{1}{\alpha}(Y_t - \bar{Y}) + v_t \quad \text{or}$$

$$\pi_t = \pi_t^e + \frac{1}{\alpha}(Y_t - \bar{Y}) + v_t$$

To go from output to unemployment, we recall one version of the Okun's law, $\frac{1}{\alpha}(Y_t - \bar{Y}) = -\beta(u - u^n) + v$. It typically states that the output is inversely related to the unemployment.

Using this Okun's law relationship, we can substitute $\frac{1}{\alpha}(Y_t - \bar{Y}) = -\beta(u - u^n) + v$ in the previous equation to obtain

$$\pi_t = \pi_t^e - \beta(u_t - u^n) + v_t$$

Thus, we can derive the Phillips curve equation from the aggregate supply equation.

All this algebra is meant to show one thing; the Phillips curve equation and the short-run aggregate supply curve equation represent essentially the same macro economic ideas.

According to the short-run aggregate supply equation, output is related to unexpected movements in the price level. According to the Phillips curve equation, unemployment is related to unexpected movements in the inflation rate.

In the long-run, consider the Phillips curve without the supply shock

$$\pi_t = \pi_t^e - \beta(u_t - u^n) \quad \text{from a bit algebra work, we have}$$

$$u_t = u^n - a(\pi_t - \pi_t^e)$$

People come to expect whatever inflation the Bank of England produces ($\pi_t = \pi_t^e$). Thus, actual inflation equals expected inflation, and unemployment is at its natural rate ($u_t = u^n$).

In conclusion, the aggregate supply curve is more convenient when we are studying output and the price level, whereas the Phillips curve is more convenient when we are studying unemployment and inflation.