

Questions for Review

1. When GDP declines during a recession, growth in real consumption and investment spending both decline; unemployment rises sharply.
2. The price of a magazine is an example of a price that is sticky in the short run and flexible in the long run. Economists do not have a definitive answer as to why magazine prices are sticky in the short run. Perhaps customers would find it inconvenient if the price of a magazine they purchase changed every month.
3. Aggregate demand is the relation between the quantity of output demanded and the aggregate price level. To understand why the aggregate demand curve slopes downward, we need to develop a theory of aggregate demand. One simple theory of aggregate demand is based on the quantity theory of money. Write the quantity equation in terms of the supply and demand for real money balances as

$$M/P = (M/P)^d = kY,$$

where $k = 1/V$. This equation tells us that for any fixed money supply M , a negative relationship exists between the price level P and output Y , assuming that velocity V is fixed: the higher the price level, the lower the level of real balances and, therefore, the lower the quantity of goods and services demanded Y . In other words, the aggregate demand curve slopes downward, as in Figure 9–1.

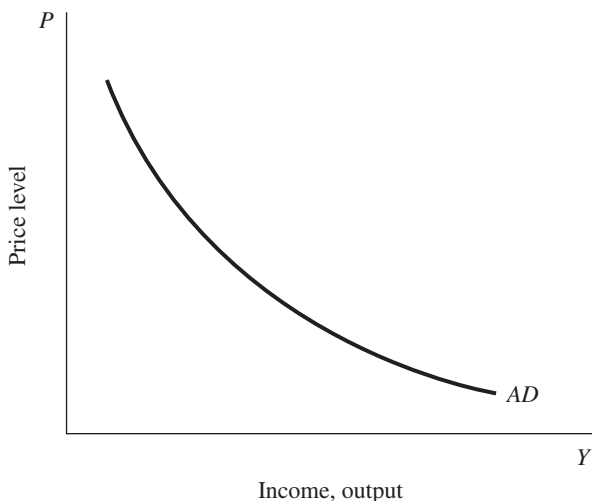


Figure 9–1

One way to understand this negative relationship between the price level and output is to note the link between money and transactions. If we assume that V is constant, then the money supply determines the dollar value of all transactions:

$$MV = PY.$$

An increase in the price level implies that each transaction requires more dollars. For the above identity to hold with constant velocity, the quantity of transactions and thus the quantity of goods and services purchased Y must fall.

4. If the Fed increases the money supply, then the aggregate demand curve shifts outward, as in Figure 9–2. In the short run, prices are sticky, so the economy moves along the short-run aggregate supply curve from point A to point B. Output rises above its natural rate level \bar{Y} : the economy is in a boom. The high demand, however, eventually causes wages and prices to increase. This gradual increase in prices moves the economy along the new aggregate demand curve AD_2 to point C. At the new long-run equilibrium, output is at its natural-rate level, but prices are higher than they were in the initial equilibrium at point A.

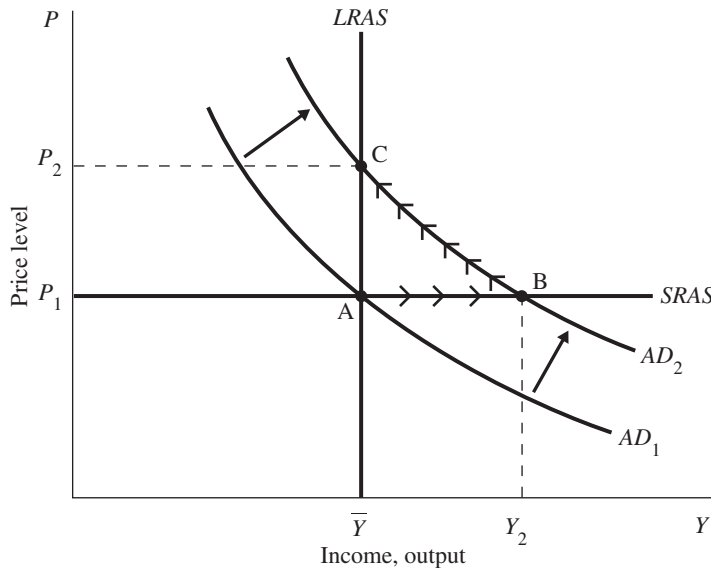


Figure 9–2

5. It is easier for the Fed to deal with demand shocks than with supply shocks because the Fed can reduce or even eliminate the impact of demand shocks on output by controlling the money supply. In the case of a supply shock, however, there is no way for the Fed to adjust aggregate demand to maintain both full employment and a stable price level.

To understand why this is true, consider the policy options available to the Fed in each case. Suppose that a demand shock (such as the introduction of automatic teller machines, which reduces money demand by decreasing the parameter k and therefore increasing velocity V) shifts the aggregate demand curve outward, as in Figure 9–3. Output increases in the short run to Y_2 . In the long run output returns to the natural-

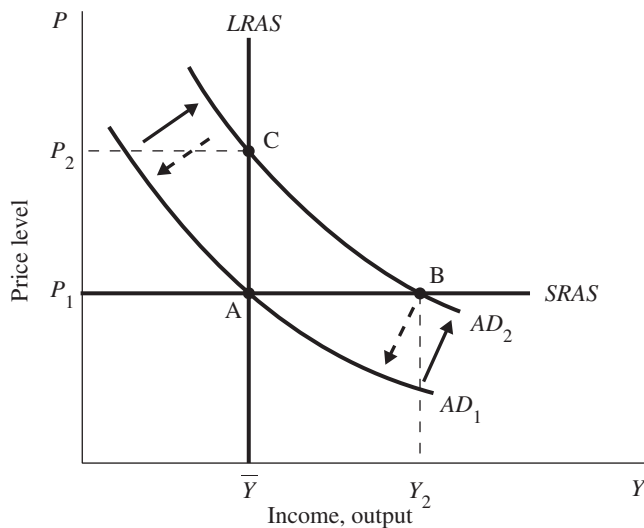


Figure 9–3

rate level, but at a higher price level P_2 . The Fed can offset this increase in velocity, however, by reducing the money supply; this returns the aggregate demand curve to its initial position, AD_1 . To the extent that the Fed can control the money supply, it can reduce or even eliminate the impact of demand shocks on output.

Now consider how an adverse supply shock (such as a crop failure or an increase in union aggressiveness) affects the economy. As shown in Figure 9-4, the short-run aggregate supply curve shifts up, and the economy moves from point A to point B.

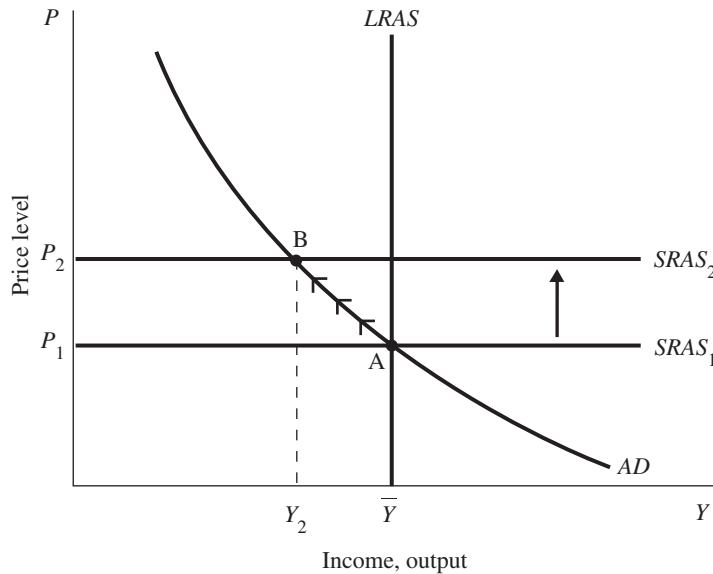


Figure 9-4

Output falls below the natural rate and prices rise. The Fed has two options. Its first option is to hold aggregate demand constant, in which case output falls below its natural rate. Eventually prices fall and restore full employment, but the cost is a painful

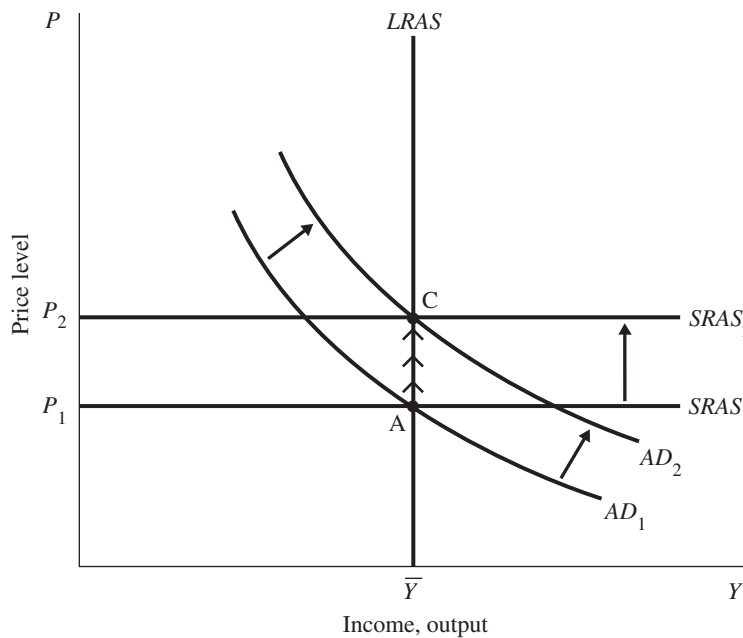


Figure 9-5

recession. Its second option is to increase aggregate demand by increasing the money supply, bringing the economy back toward the natural rate of output, as in Figure 9–5.

This policy leads to a permanently higher price level at the new equilibrium, point C. Thus, in the case of a supply shock, there is no way to adjust aggregate demand to maintain both full employment and a stable price level.

Problems and Applications

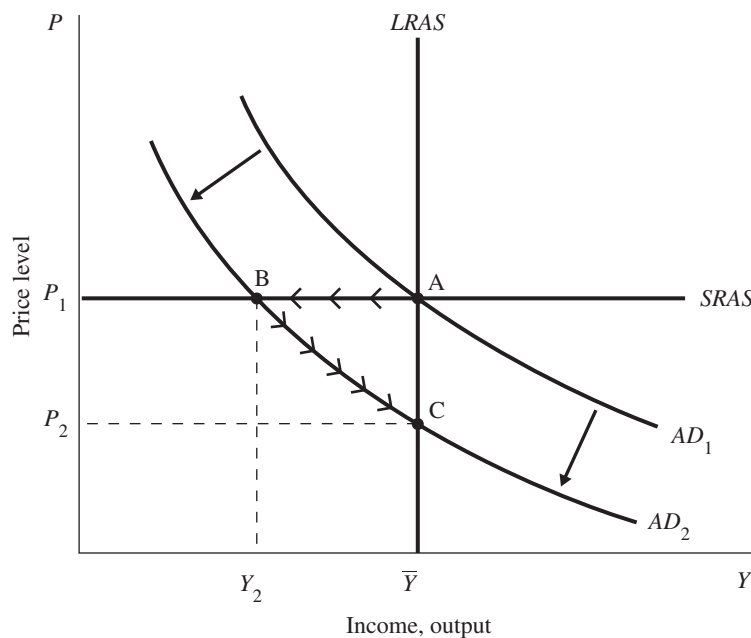
1. a. Interest-bearing checking accounts make holding money more attractive. This increases the demand for money.
- b. The increase in money demand is equivalent to a decrease in the velocity of money. Recall the quantity equation

$$M/P = kY,$$

where $k = 1/V$. For this equation to hold, an increase in real money balances for a given amount of output means that k must increase; that is, velocity falls. Because interest on checking accounts encourages people to hold money, dollars circulate less frequently.

- c. If the Fed keeps the money supply the same, the decrease in velocity shifts the aggregate demand curve downward, as in Figure 9–6. In the short run when prices are sticky, the economy moves from the initial equilibrium, point A, to the short-run equilibrium, point B. The drop in aggregate demand reduces the output of the economy below the natural rate.

Figure 9–6



Over time, the low level of aggregate demand causes prices and wages to fall. As prices fall, output gradually rises until it reaches the natural-rate level of output at point C.

- d. The decrease in velocity causes the aggregate demand curve to shift downward. The Fed could increase the money supply to offset this decrease and thereby return the economy to its original equilibrium at point A, as in Figure 9–7.

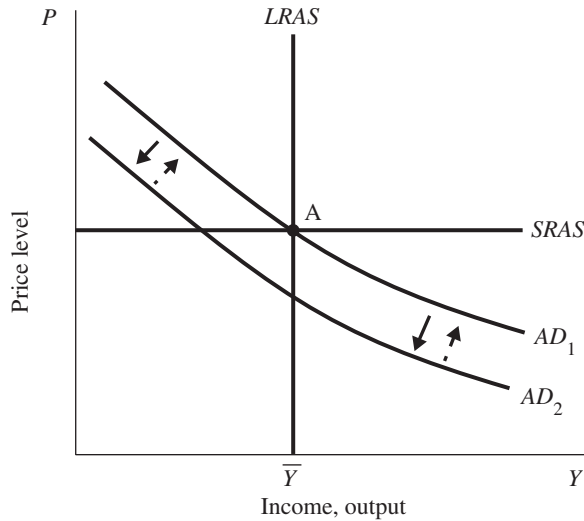


Figure 9–7

To the extent that the Fed can accurately measure changes in velocity, it has the ability to reduce or even eliminate the impact of such a demand shock on output. In particular, when a regulatory change causes money demand to change in a predictable way, the Fed should make the money supply respond to that change in order to prevent it from disrupting the economy.

- e. The decrease in velocity shifts the aggregate demand curve down and to the left. In the short run, the price level remains the same and the level of output falls below the natural rate. If the Fed wants to stabilize output and return it to the natural rate, they should increase the money supply. Note that increasing the money supply in this case will stabilize both output and the price level so that the answer here is the same as in part d.
2. a. If the Fed reduces the money supply, then the aggregate demand curve shifts down, as in Figure 9–8. This result is based on the quantity equation $MV = PY$, which tells us that a decrease in money M leads to a proportionate decrease in nominal output PY (assuming that velocity V is fixed). For any given price level P , the level of output Y is lower, and for any given Y , P is lower.

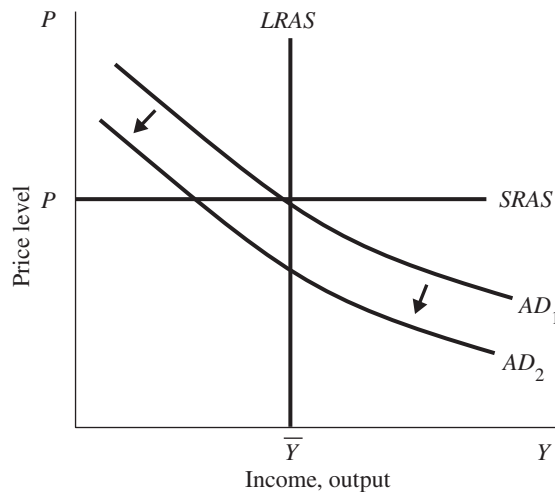


Figure 9–8

- b. In the short run, we assume that the price level is fixed and that the aggregate supply curve is flat. As Figure 9–9 shows, in the short run, the leftward shift in the aggregate demand curve leads to a movement from point A to point B—output falls but the price level doesn’t change. In the long run, prices are flexible. As prices fall, the economy returns to full employment at point C.

If we assume that velocity is constant, we can quantify the effect of the 5-percent reduction in the money supply. Recall from Chapter 4 that we can express the quantity equation in terms of percentage changes:

$$\% \Delta \text{ in } M + \% \Delta \text{ in } V = \% \Delta \text{ in } P + \% \Delta \text{ in } Y.$$

If we assume that velocity is constant, then the $\% \Delta \text{ in } V = 0$. Therefore,

$$\% \Delta \text{ in } M = \% \Delta \text{ in } P + \% \Delta \text{ in } Y.$$

We know that in the short run, the price level is fixed. This implies that the $\% \Delta \text{ in } P = 0$. Therefore,

$$\% \Delta \text{ in } M = \% \Delta \text{ in } Y.$$

Based on this equation, we conclude that in the short run a 5-percent reduction in the money supply leads to a 5-percent reduction in output. This is shown in Figure 9–9.

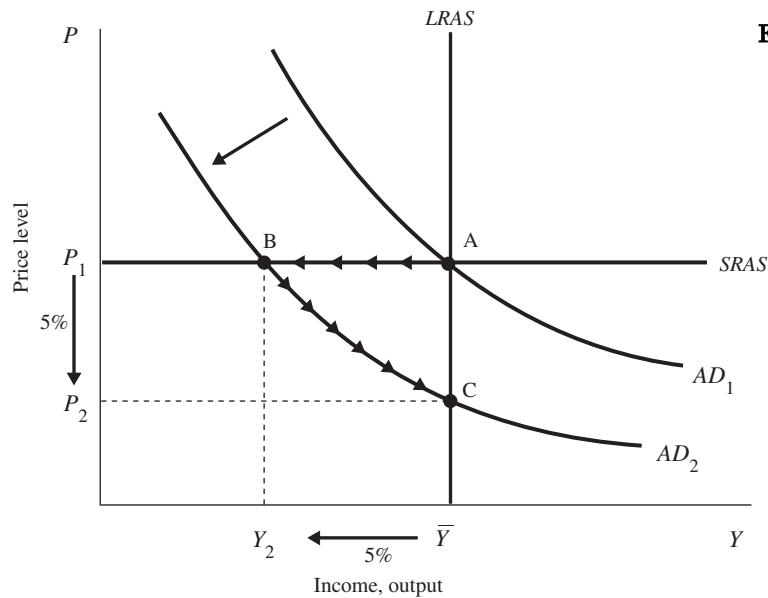


Figure 9–9

In the long run we know that prices are flexible and the economy returns to its natural rate of output. This implies that in the long run, the $\% \Delta \text{ in } Y = 0$. Therefore,

$$\% \Delta \text{ in } M = \% \Delta \text{ in } P.$$

Based on this equation, we conclude that in the long run a 5-percent reduction in the money supply leads to a 5-percent reduction in the price level, as shown in Figure 9–9.

- c. Okun’s law refers to the negative relationship that exists between unemployment and real GDP. Okun’s law can be summarized by the equation:

$$\% \Delta \text{ in Real GDP} = 3\% - 2 \times [\Delta \text{ in Unemployment Rate}].$$

That is, output moves in the opposite direction from unemployment, with a ratio of 2 to 1. In the short run, when output falls, unemployment rises. Quantitatively,

if velocity is constant, we found that output falls 5 percentage points relative to full employment in the short run. Okun's law states that output growth equals the full employment growth rate of 3 percent minus two times the change in the unemployment rate. Therefore, if output falls 5 percentage points relative to full-employment growth, then actual output growth is -2 percent. Using Okun's law, we find that the change in the unemployment rate equals 2.5 percentage points:

$$-2 = 3 - 2 \times [\Delta \text{ in Unemployment Rate}]$$

$$[-2 - 3]/[-2] = [\Delta \text{ in Unemployment Rate}]$$

$$2.5 = [\Delta \text{ in Unemployment Rate}]$$

In the long run, both output and unemployment return to their natural rate levels. Thus, there is no long-run change in unemployment.

- d. The national income accounts identity tells us that saving $S = Y - C - G$. Thus, when Y falls, S falls (assuming the marginal propensity to consume is less than one). Figure 9–10 shows that this causes the real interest rate to rise. When Y returns to its original equilibrium level, so does the real interest rate.

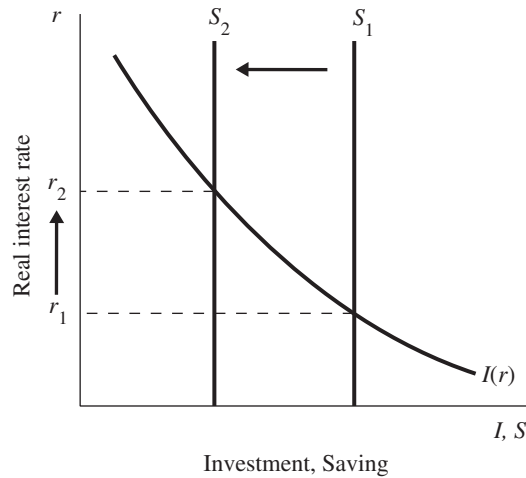


Figure 9–10

3. a. An exogenous decrease in the velocity of money causes the aggregate demand curve to shift downward, as in Figure 9–11. In the short run, prices are fixed, so output falls.

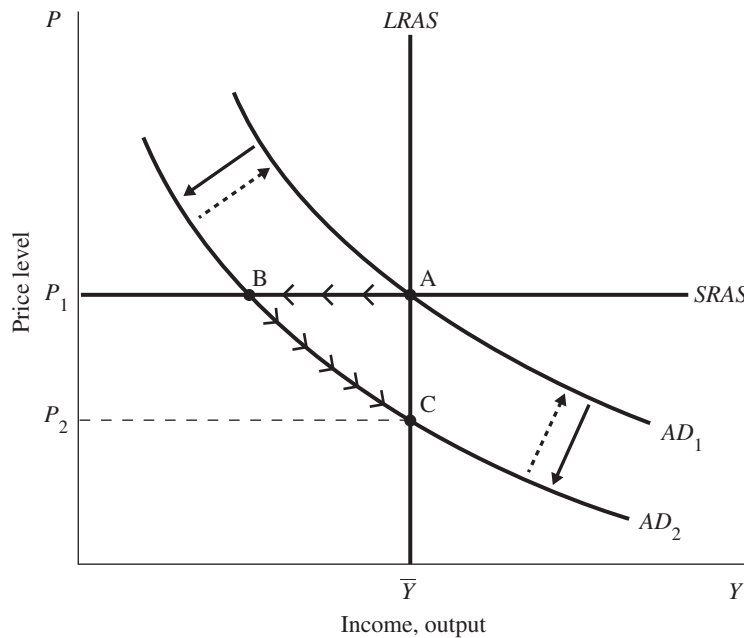


Figure 9–11

If the Fed wants to keep output and employment at their natural-rate levels, it must increase aggregate demand to offset the decrease in velocity. By increasing the money supply, the Fed can shift the aggregate demand curve upward, restoring the economy to its original equilibrium at point A. Both the price level and output remain constant.

If the Fed wants to keep prices stable, then it wants to avoid the long-run adjustment to a lower price level at point C in Figure 9–11. Therefore, it should increase the money supply and shift the aggregate demand curve upward, again restoring the original equilibrium at point A.

Thus, both Feds make the same choice of policy in response to this demand shock.

- b. An exogenous increase in the price of oil is an adverse supply shock that causes the short-run aggregate supply curve to shift upward, as in Figure 9–12.

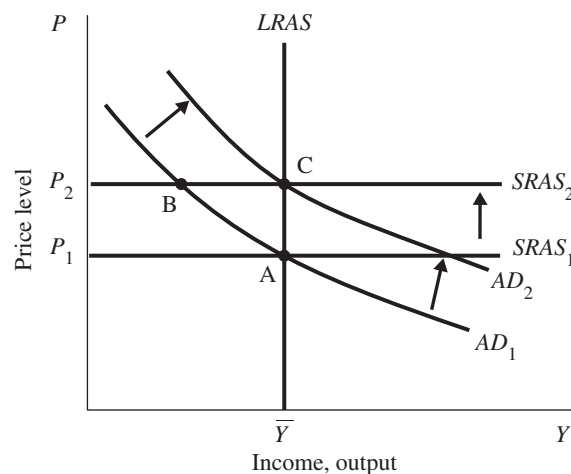


Figure 9–12

If the Fed cares about keeping output and employment at their natural-rate levels, then it should increase aggregate demand by increasing the money supply. This policy response shifts the aggregate demand curve upwards, as shown in the shift from AD_1 to AD_2 in Figure 9–12. In this case, the economy immediately reaches a new equilibrium at point C. The price level at point C is permanently higher, but there is no loss in output associated with the adverse supply shock.

If the Fed cares about keeping prices stable, then there is no policy response it can implement. In the short run, the price level stays at the higher level P_2 . If the Fed increases aggregate demand, then the economy ends up with a permanently higher price level. Hence, the Fed must simply wait, holding aggregate demand constant. Eventually, prices fall to restore full employment at the old price level P_1 . But the cost of this process is a prolonged recession.

Thus, the two Feds make a different policy choice in response to a supply shock.

4. From the main NBER web page (www.nber.org), I followed the link to Business Cycle Dates (downloaded February 19, 2009). As of this writing, the latest turning point was in December 2007, when the economy switched from expansion to contraction. As of this writing, the recession is still ongoing.

Previous recessions (contractions) over the past three decades were March 2001 to November 2001; July 1990 to March 1991; July 1981 to November 1982; January 1980 to July 1980; and November 1973 to March 1975.