Macroeconomics
Topic 8: "Explain how slow price adjustments might affect
the short-run response of the economy to economic shocks."

Reference: Gregory Mankiw's *Principles of Microeconomics*, 2nd edition, Chapter 19.

Introduction

One of the most important issues addressed in macroeconomics is the cause or causes of short-run fluctuations in aggregate economic activity. The role of slow price adjustments in explaining these short-run fluctuations will be addressed in this review. The aggregate supply-aggregate demand model provides a framework which allows us to examine this issue. We shall start our review by discussing aggregate demand. We will then discuss both the long-run and short-run aggregate supply curves. The important role of slow price adjustments will become apparent in our discussion of the short-run aggregate-supply curve. The review will end with some applications of this model.
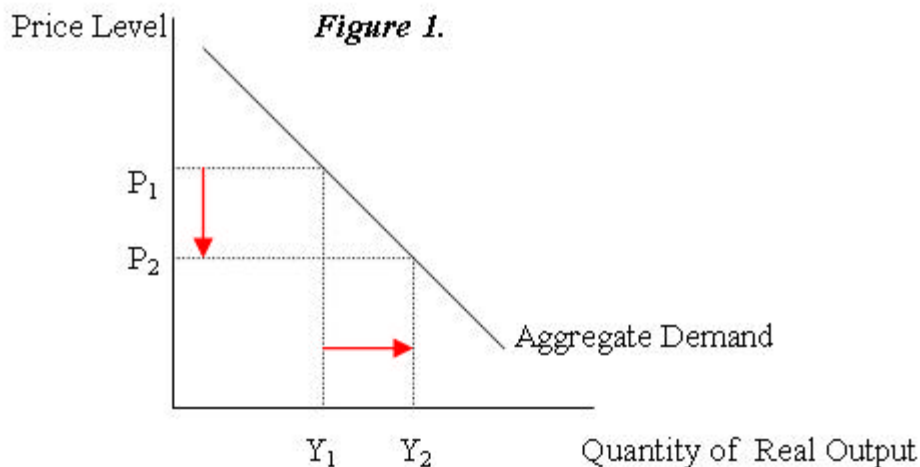
Aggregate Demand

What is the definition of aggregate demand? What are the components of aggregate demand? What relationship is expressed by the aggregate-demand curve? What does the aggregate demand curve have a negative slope? What are the shift variables for the aggregate-demand curve? These are the questions that will be covered in this section.

• Defining Aggregate Demand

Aggregate demand refers to quantity of goods and services that households, firms, and the government want to buy at each price level. Aggregate demand consists of real consumption spending (C), real investment spending (I), real government spending on goods and services, and net exports (NX). The aggregate-demand curve shows the relationship between the quantity of goods and services that households, firms, and the government are willing to buy and the price level, as in Figure 1 (see next page).

As can be seen in Figure 1, a decrease in the price level leads to an increase in the aggregate quantity of goods and services demanded—that is, the aggregate-demand curve has a negative slope.

Figure 1.

- Slope of Aggregate Demand

As Figure 1 shows, when the price level rises, the quantity of real output demanded falls. This implies that the slope of Aggregate Demand is negative. Unlike ordinary demand curves, it is not obvious why increasing the price level should reduce real output. Economists offer the following three reasons for negatively sloped Aggregate Demand.

Wealth Effect
The nominal value of money is fixed ("it takes one dollar to buy one dollar"). It follows that a fall in the price level increases the purchasing power of a given amount of dollars. This makes consumers feel wealthier, which in turn encourages consumers to spend more. The increase in the spending means a larger quantity of goods and services demanded.

Interest-Rate Effect
A decrease in the price level causes a decrease in the demand for money. The public will therefore attempt to reduce their money holdings by purchasing other assets. For example, the public will convert some of their money into interest-bearing assets, which will lead to a drop in the interest rate (r). Lower interest rates, in turn, stimulate borrowing by firms that want to invest in new capital goods. The increase in investment spending causes aggregate demand to rise.

Exchange-Rate Effect
As discussed above, a lower domestic price level leads to a lower domestic interest rate. With the lower return on domestic assets, holding foreign assets becomes more desirable. The purchase of foreign assets requires the sale of dollars to acquire foreign currency in the foreign-exchange market, the rise in the supply of dollars in the foreign exchange market causes the dollar to depreciate relative to other currencies (the real exchange rate, E, falls). This makes domestic goods cheaper abroad and foreign goods more expensive domestically, which, in turn, causes an increase in net exports. The rise in net exports means a rise in aggregate demand.

- Events that shift the aggregate-demand curve

Shifts from Consumption
Any event that changes how much people want to consume at a given price level shifts the aggregate-demand curve. Changes in expected-future income ("consumer confidence"), wealth, and taxes would all affect current consumption spending. For example, suppose new information leads consumers to expect that their future income will fall ("drop in consumer confidence"). The resulting drop in consumption spending will cause the aggregate-demand curve to shift to the left. On the other hand, an increase in consumer confidence will cause the aggregate demand curve to shift to the right. As another example, suppose that a stock market boom makes people feel wealthier such that consumption spending rises. This would shift the aggregate demand to the right. As a final example, suppose the government cuts taxes. This encourages spending which increases aggregate demand.

Shifts from Investment
Any event that changes how much firms want to invest at a given price level shifts the aggregate-demand curve. For example, changes in firms' expectations about future cash flows from investment projects, changes in the tax rate on capital, and changes in the money supply which lead to short-run changes in the interest rate will all have an impact on current investment spending. Thus, an increase in business confidence will encourage investment spending. This causes the aggregate demand curve to shift to the right. Likewise, a reduction in the tax rate on capital will also encourage investment spending. As a final example, consider the impact of an increase in the money supply. As explained elsewhere, this will lower the interest rate in the short run. The lower interest rate will stimulate investment spending, thereby shifting out the aggregate-demand curve.

Shifts from government spending
Changes in government spending on goods and services will also shift the aggregate-demand curve. For example, an increase in federal spending on national defense will lead to a rightward shift in the aggregate-demand curve. Changes in spending by other levels of government would also shift the aggregate demand curve.

Shifts arising from net exports
Any event that changes net exports for a given price level also shifts the aggregate-demand curve. For example, a recession abroad would tend to lower the demand for domestic goods, so net exports would fall. The fall in net exports would result in a leftward in the aggregate-demand curve. A change in the exchange rate (for reasons other than that given above in our discussion of the Exchange-Rate Effect) would also cause a change in net exports. If the dollar appreciates, domestic goods become more expensive abroad and this would depress net exports. The drop in net exports would shift the aggregate demand curve to the left.
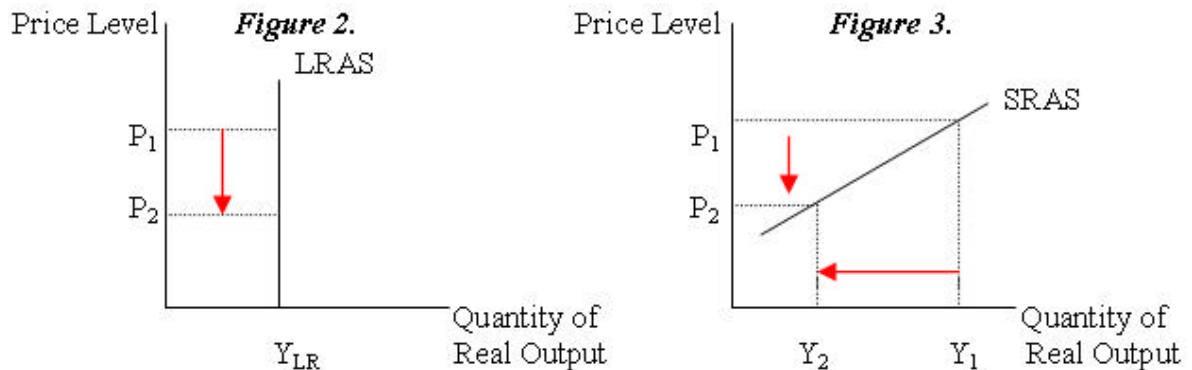
Aggregate Supply

- Defining Aggregate Supply

Aggregate supply shows the quantity of goods and services that firms choose to produce and sell at each price level.

- Long Run Aggregate Supply

In the long run, an economy's production of goods and services (real output) depends on its supply of labor, capital, and natural resources and on the available technology used to turn these inputs into goods and services. Because the price level does not affect these underlying determinants of real output, the long-run aggregate supply curve is vertical, as in Figure 2. This level of output is known as the natural rate of output (Y_{LR} in Figure 2).

- Short Run Aggregate Supply

In the short run, the quantity of real output supply is thought to increase as the price level rises. That is to say, short run Aggregate Supply (SRAS) is upward sloping. This is illustrated in Figure 3.

- Events that shift Long Run Aggregate Supply

Shifts Arising from Labor
Changes in the working-age population or changes in the labor-force participation rate would change the number of workers in the economy and would therefore change aggregate supply. For example, a sudden wave of immigration would lead to a rightward shift in the long-run aggregate supply curve. The long-run aggregate-supply curve also depends on the natural rate of unemployment. For instance, if the government was to increase the minimum wage this would raise the natural rate of unemployment and

reduce output—a leftward shift in the long-run aggregate-supply curve. A change in labor laws that reduce labor mobility would have the same impact on this curve.

Shifts Arising from Capital
An increase in the economy's capital stock allows an economy to produce more goods and services and therefore shifts the long-run aggregate supply curve to the right. On the other hand, a reduction in a country's capital stock, due perhaps to war or some natural disaster, would shift the long-run aggregate-supply curve to the left. The same is true for human capital. An increase in human capital, due perhaps to a general increase in the level of education or to a general increase in the level of health, would shift the long-run aggregate-supply to the right.

Shifts Arising from Natural Resources
An economy's level of production also depends on its natural resources, including its minerals, land, and weather. For example, the opening of land for settlement in the 19th century in the U.S. West led to a rightward shift in the long-run aggregate-supply curve. A sustained severe drought would shift the long-run aggregate-supply curve to the left. A prolonged cutoff of oil to a country that imports significant amounts of oil would shift this curve to the left.

Shifts Arising Technological Knowledge
Advances in our technological knowledge alter the amount of goods and services an economy can produce from a given set on inputs. The invention of the computer, for example, has increased input productivity and has thus lead to a rightward shift in the long-run aggregate-supply curve. The adoption of the assembly-line technique in certain industries has had a similar impact. There are other events that act like changes in technology. For example, a free-trade agreement that open up international trade, or the adoption of new forms of business organization, would shift the long-run aggregate-supply curve to the right. Government regulations preventing the use of certain techniques, perhaps because of environmental issues or worker-safety concerns, would result in a leftward shift.

- Reasons that Short Run Aggregate Supply Slopes Upward

When the price level rises, the quantity of real output supplied in the short run increases. It is important to understand the significance of the upward sloping short-run aggregate-supply curve. If the short-run aggregate-supply curve were vertical, then shifts in the aggregate demand curve would have no impact on real output in the short run. This would mean that changes in such variables as the money supply, government spending, or consumer confidence would be unable to explain short-run fluctuations in economic activity, such as recessions. Instead, only shifts in the aggregate supply curve could explain these short-run fluctuations. On the other hand, if the short-run aggregate-supply curve has a positive slope, then unexpected shifts in aggregate demand would indeed lead to short-run fluctuations in real output.

Why should a decrease in the price level result in a drop in real output in the short run? We shall examine three theories that attempt to justify the upward-slopping short-run aggregate-supply curve.

Misperceptions Theory
Sellers base their supply decisions on the relative price of their product. The relative price of their product depends on the price of the product they sell and the price level. If we assume that sellers do not know all prices at all times, then an unexpected drop in the price level may cause some sellers to mistakenly believe that the relative price of the product they sell has declined. This will lead them to reduce output. For example, suppose ALL prices fall by 10%, so that no relative price has changed. Sellers can readily observe that their prices have fallen by 10%, but they may not immediately perceive that other prices have also fallen by 10%. In fact, if some sellers believe (mistakenly) that the price level has not changed, then they will conclude (again, mistakenly) that their relative price has declined by 10%.

Sticky-Wage Theory
This theory claims that the nominal wage rate (W) is slow to adjust, or is "sticky", in the short run. For example, suppose a long-term contract fixes the nominal wage for a non-trivial period of time. If the price level now unexpectedly declines, the real wage rate (defined as W/P) will rise. The rise in the cost of hiring labor will reduce the quantity of labor demanded. Consequently, employment and real output decrease when the price level rises.

Sticky-Price Theory
Suppose firms set price at the beginning of each period in anticipation of a certain level of demand for their product. Once price is set, it is costly to change. The costs of changing prices are called menu costs ("costly to print up new menu"). Assume now, due perhaps to an unexpected decline in the money supply, that firms discover that demand for their product is lower than anticipated. In the long-run, of course, this will simply lead to a decline in the price level with no change in real output. In the short run, however, some firms may not immediately adjust their prices due to menu costs. As a consequence, these firms will experience a drop in sales and production.

- Events that shift Short Run Aggregate Supply

Events that shift LRAS also shift SRAS
The same variables that shift the long-run aggregate-supply curve also shift the short-run aggregate-supply curve. This means that changes in labor, capital, natural resources and technological knowledge would all shift the short-run curve.

The Expected Price Level
To understand why the expected price level shifts SRAS, it is important to recall that all of theories we examined in our discussion of the slope of the short-run aggregate supply curve relied upon *unexpected* changes in the price level to justify their claims of an
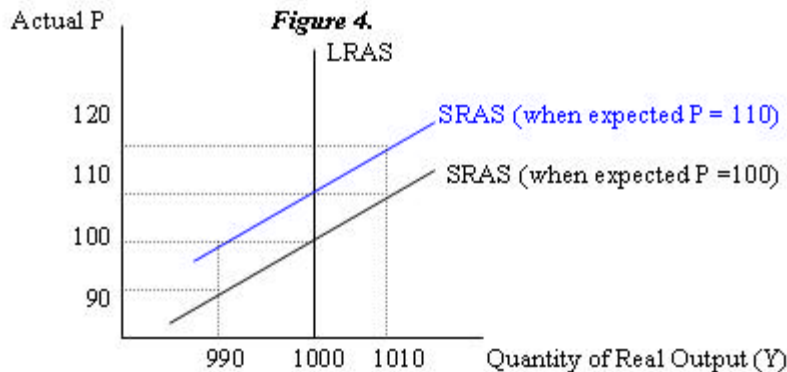
upward-slopping short-run aggregate-supply curve. All three theories imply the following equation for the short-run aggregate-supply curve:

Quantity of output supplied (Y) = Natural Rate of Output
+ a(Actual P - Expected P)

Only when the actual price level differs from the expected price level will real output depart from its natural rate (that is, its long-run value of Y_{LR}). A simple numerical example is instructive. Suppose the natural rate of output is 1,000, a = 1, and expected P is 100. We would then have Y = 1000 +1(Actual P-100). We can then construct Table 1 from this equation. Using the numbers in the Table 1, we can sketch in the short-run aggregate supply curve corresponding to the expected P of 100 (See Figure 4). Let us now assume that the expected price level is 110, which gives us the equation Y=1000 + 1(Actual P - 110). We can construct Table 2 from this equation and draw in the new short-run aggregate supply curve using the numbers from this table.

Table 1 (Expected P=100)				Table 2 (Expected P = 110)	
Actual P	Y			Actual P	Y
110	1010			120	1010
100	1000			110	1000
90	990			100	990

Figure 4.

Application of the Aggregate Demand and Aggregate Supply Model

In each of the following cases, we will consider the effect of an event on the Aggregate Demand and Aggregate Supply curves.

An unexpected decline in the money supply
The decline in the money supply reduces aggregate demand from AD_1 to AD_2 (see Figure 5, next page). As is illustrated below, this decline in aggregate demand results in drop in the price level from P_1 to P_{SR} and a drop in real output from Y_1 to Y_{SR} in the short run.

An unexpected increase in consumer confidence
The rise in consumer confidence increases aggregate demand from AD_1 to AD_2 (See Figure 6). It is clear from the graph below, that this change in aggregate demand results

in an increase in the price level from P_1 to P_{SR} and a rise in real output from Y_1 to Y_{SR} in the short run.

Oil supply is cut off to a country that imports it

This oil shock will cause the short-run aggregate-supply curve to shift from $SRAS_1$ to $SRAS_2$ (See Figure 7). Since the cutoff is assumed to be temporary the long-run aggregate-supply curve does not shift. As can be seen in Figure 7, the result is an increase in the price level from P1 to P_{SR} and a drop in real output from Y_1 to Y_{SR} in the short run. This outcome of falling real output and a rising price level is referred to as stagflation.

A perfectly anticipated increase in the money supply

Since the resulting change in the price level is perfectly anticipated there will be no short-run impact on real output. The increase in the money supply will shift the aggregate demand curve from AD_1 to AD_2, and the change in the expected price level shifts the short-run aggregate-supply from $SRAS_1$ to $SRAS_2$ (See Figure 8). The price level increases from P_1 to P_2. There is no change in real output.

Figure 5.

Figure 6.

Figure 7.

Figure 8.