

LECTURE NOTES ON MACROECONOMIC PRINCIPLES

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Ch 33 Aggregate Demand and Aggregate Supply

Introduction

Typically, increases in the labor force, increases in the capital stock, and advances in technological knowledge allow the economy to produce more and more over time.

But in some years, this normal growth does not occur. These periods of declining incomes and rising unemployment are called **recessions** when they are relatively minor and **depressions** when they are more severe. What causes these short-run fluctuations in economic activity?

This chapter starts by presenting some facts about short-run economic fluctuations and then develops the model of **aggregate demand and aggregate supply** to help explain and understand those facts.

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Three Key Facts About Economic Fluctuations

Fact 1: Economic Fluctuations are Irregular and Unpredictable

Fluctuations in economic activity are often called the **business cycle**. But this term is somewhat misleading, since these fluctuations do not follow a regular and predictable pattern.

Panel (a) of Figure 1 shows that recessions are sometimes close together, as in 1980 and 1982, but sometimes farther apart, as with 1991 and 2001.

Fact 2: Most Macroeconomic Quantities Fluctuate Together

Although real GDP is the variable that is most commonly used to monitor the economy, other variables also fluctuate along with GDP: corporate profits, investment, consumption, retail sales, home sales, etc.

But some variables fluctuate more than others. Panel (b) of Figure 1 shows that investment spending, in particular, tends to fluctuate widely. Even though investment averages only about one-seventh of GDP, its fluctuations account for about two-thirds of the decline in GDP that takes place during recessions.

Fact 3: As Output Falls, Unemployment Rises

Panel (c) of Figure 1 shows that the unemployment rate rises considerably during recessions.

When the recession ends and real GDP begins to grow again, the unemployment declines.

But notice that the unemployment rate never falls to zero; instead, it fluctuates around its natural rate of 5 or 6 percent.

Explaining Short-Run Economic Fluctuations

The Assumptions of Classical Economics

Recall that the **classical dichotomy** is the separation of economic variables into **real variables**, which are measured in units of physical quantities, and **nominal variables**, which are measured in units of money.

According to classical macroeconomic theory, changes in the money supply affect nominal variables but not real variables.

The classical idea of monetary neutrality allows us to study the determination of real variables, like output and unemployment, separately from the determination of nominal variables, like inflation.

The Reality of Short-Run Fluctuations

Most economists believe that monetary neutrality holds in the long run but not in the short run, and hence that changes in the money supply do have short-run effects.

Even the classical economists, like David Hume, observed that changes in the money supply appear to affect output and employment in the short run.

The Model of Aggregate Demand and Supply

The model of **aggregate demand and aggregate supply** is used by economists to explain short-run fluctuations in economic activity around its long-run trend.

The model focuses on the behavior of two variables:

- The economy's quantity of output, which can be measured by real GDP.

- The economy's price level, which can be measured by the CPI or the GDP deflator.

Since the first of these two variables is a real variable and the second a nominal variable, the model departs from the classical assumptions that allow these variables to be considered separately.

Figure 2 illustrates the model.

- The downward-sloping **aggregate demand curve** shows the quantity of goods and services that households, firms, the government, and customers abroad want to buy at each price level.
- The upward-sloping **aggregate supply curve** shows the quantity of goods and services that firms choose to produce at each price level.

But where do these curves come from, and why do they have the slopes shown in Figure 2?

The Aggregate Demand Curve

In figure 2 and again in figure 3, the aggregate demand curve slopes down, indicating that as the price level falls, the quantity of goods and services demand rises.

Why the Aggregate Demand Curve Slopes Downward

Recall that an economy's GDP (Y) can be decomposed into four components: consumption (C), investment (I), government purchases (G), and net exports (NX):

$$Y = C + I + G + NX$$

For now, let's take G as being fixed by government policy, independent of the price level.

Why might the demand for consumption, investment, and net exports fall as the price level rises?

The Price Level and Consumption: The Wealth Effect

Some of the wealth that individuals possess is held in nominal form: as money in their wallets or in the bank.

When the price level falls, the real value of this wealth – that is, its value in terms of the goods it can purchase – rises. This increase in wealth increases consumer spending, and hence also increases the quantity of goods and services demanded.

Conversely, when the price level rises, the real value of monetary wealth falls, leading to a decrease in consumer spending and the quantity of goods and services demanded.

The Price Level and Investment: The Interest Rate Effect

When the price level falls, the real value of each consumer's money holdings rises.

In response, some consumers will attempt to reduce their money holdings by purchasing more bonds.

As they do so, the interest rate on these bonds will fall.

And when interest rates fall, firms will become more willing to borrow to finance new investment projects.

Conversely, when the price level rises, the real value of each consumer's money holdings falls. In response, some households will try to acquire more money by selling bonds. As they do, the interest rate of these bonds will rise. And, as the interest rate rises, firms will become less willing to borrow to finance new investment projects.

Hence, as the price level falls, the demand for investment goods rises; and as the price level rises, the demand for investment goods falls.

Note, too, that this interest effect can also impact on household's purchases of consumer durables, which may be bought on credit.

The Price Level and Net Exports: The Exchange Rate Effect

When the price level falls in the US, the US interest rate falls as well.

This makes US bonds less attractive to investors, both in the US and overseas. As these investors turn to other countries' bonds as alternative, higher-yielding investments, they will sell dollars and buy foreign currencies.

As a result, the US dollar **depreciates**, that is, its value in terms of foreign currencies falls. Since each dollar buys fewer units of foreign currencies, foreign goods become more expensive than US goods.

This change in relative prices affects spending both in the US and abroad. US consumers buy fewer goods from abroad, and foreign consumers buy more US goods.

Both of these changes cause net exports to rise.

Conversely, when the US price level rises, the US interest rate rises as well. Since US bonds become more attractive to international investors, they buy dollars and sell foreign currencies. Hence, the US dollar **appreciates**, that is, its value in terms of foreign currencies rises. Since each dollar buys more units of foreign currencies, foreign goods become less expensive than US goods. This change in relative prices makes US consumers buy more goods from abroad and foreign consumers buy fewer US goods. Both of these changes cause net exports to fall.

Hence, as the price level falls, net exports rise; and as the price level rises, net exports fall.

Why the Aggregate Demand Curve Might Shift

Shifts Arising from Changes in Consumption

If consumers become more concerned about saving for retirement, they will reduce their demand for goods and services at any given price level. The aggregate demand curve shifts left.

If consumers feel wealthier because the stock market rises, they will increase their demand for goods and services at any given price level. The aggregate demand curve shifts right.

When the government cuts taxes, consumers have more after-tax income to spend. They will increase their demand for goods and services at any given price level. The aggregate demand curve shifts right.

Shifts Arising from Changes in Investment

If firms become more optimistic about future business conditions, they will want to invest more at any given price level. The aggregate demand curve shifts right.

An investment tax credit, that is a tax rebate that is tied to firms' investment decisions, will also make firms want to invest more at any given price level. Again, the aggregate demand curve will shift right.

As we discussed previously, when the Federal Reserve conducts an open market operation intended to bring about a "monetary policy easing," it increases the amount of reserves supplied to the banking system and simultaneously causes the federal funds rate to decrease. When the federal funds rate decreases, other interest rates economywide tend to decline as well, making firms want to invest more at any given price level and shifting the aggregate demand curve to the right.

Conversely, the Fed "tightens" monetary policy through an open market operation that drains reserves from the banking system and increase the federal funds rate. As the increase in the federal funds rate leads to an increase in interest rates economywide, firms want to invest less at any given price level and the aggregate demand curve shifts to the left.

Shifts Arising from Changes in Government Purchases

The most direct way for government policy to shift the aggregate demand curve is simply by changing government purchases: an increase in government purchases shifts the aggregate demand curve to the right, and a decrease in government purchases shifts the aggregate demand curve to the left.

Shifts Arising from Changes in Net Exports

When Europe experiences an economic boom, its demand for US exports rises at any given price level. Net exports rise, shifting the aggregate demand curve to the right.

Conversely, when Europe (or any other foreign economy) experiences a recession, the demand for US exports falls, shifting the aggregate demand curve left.

Net exports can also change because of exchange rate movements. Suppose, for instance, that speculators lose confidence in foreign currencies, and purchase US dollars instead. This leads to an appreciation of the dollar, which in turn makes US goods more expensive relative to foreign goods. This depresses net exports and causes a leftward shift in the aggregate demand curve.

The Aggregate Supply Curve

Unlike the aggregate demand curve, which always slopes downward, the aggregate supply curve describes a relationship between output and the price level that depends crucially on the time horizon being considered.

In the long run, the aggregate supply curve is vertical, whereas in the short run, it slopes upward.

Why the Aggregate Supply Curve is Vertical in the Long Run

In the long run, an economy's production of goods and services depends on its supplies of capital, labor, and natural resources as well as its stock of technological knowledge. The long-run neutrality of money implies that if two countries are identical except that one has a money supply that is twice as large, then the price level in that economy will be twice as large too, but the output of goods and services will be the same.

The way of depicting the classical dichotomy and the neutrality of money in the aggregate demand-aggregate supply model is to draw the aggregate supply curve as vertical in the long run, as shown in figure 4.

Why the Long-Run Aggregate Supply Curve Might Shift

The position of the vertical long-run aggregate supply curve is often called **potential output**, **full employment output**, or the **natural rate of output**. The last term captures the idea that this is the level of output that results when the unemployment rate is at its natural rate, or normal level.

And just as the unemployment rate tends to gravitate towards its natural rate over time, so too will the level of output tend to gravitate towards its natural rate.

Then what causes the aggregate supply curve to shift? Anything that would cause the natural rate of output to change, including:

1. Changes in the supply of labor, due to immigration.
2. Changes in natural rate of unemployment, due to changes in minimum wages, changes in unionization, etc.
3. Changes in the stock of capital, physical or human.
4. Discoveries or depletion of stocks of natural resources.
5. Changes in technological knowledge.

Using Aggregate Demand and Aggregate Supply to Depict Long-Run Growth and Inflation

Figure 5 uses the aggregate demand and aggregate supply model to describe the behavior of output and prices over long periods of time.

The initial aggregate demand curve is downward sloping. The aggregate supply curve is vertical, as the graph focuses on the long run.

In the long run, growth in the labor force and, more importantly, growth in the stocks of capital and technological knowledge shift the aggregate supply curve to the right, as the natural rate of output rises.

If the Federal Reserve keeps the money supply constant, this long-run economic growth will tend to reduce the price level, that is, cause deflation.

But, historically, the Federal Reserve has acted to increase the money supply over long periods of time. This increase in the money supply has shifted the aggregate demand curve to the right, too. Indeed, the

money supply has grown at a rate that has caused the aggregate demand curve to shift rightward at a pace that is associated with inflation.

Why the Aggregate Supply Curve Slopes Upward in the Short Run

Most economists believe in the long-run neutrality of money, but also believe that changes in money or other nominal variables are associated with changes in output, employment, and other real variables in the short run.

That is, most economists believe that while the long-run aggregate supply curve is vertical, the short-run aggregate supply curve is upward sloping, as shown in figure 6.

The upward-sloping short-run aggregate supply curve implies that the quantity of output supplied deviates from its natural rate when the actual price level in the economy deviates from the price level that most people expect to prevail:

- When prices rise above the level that people expect, output rises above its natural rate.
- When prices fall below the level that people expect, output falls below its natural rate.

Economists have devised several explanations for the upward-sloping short-run aggregate supply curve.

Sticky Wage Theory

As its name suggests, sticky wage theory posits that wages are slow to adjust to changing economic conditions, either because workers and firms sign long-term contracts or because wage-setting conventions make it difficult for firms to rapidly adjust the wages they pay.

An example best illustrates how the theory works:

- Suppose that one year ago, a firm expected the price level P to equal 100, and based on this expectation, agreed to pay its workers \$20 per hour.
- Now suppose that, instead, the price level turns out to be $P = 105$.
- In the long run, the firm will have to pay its workers higher wages to compensate them for the higher cost of living, but in the short run the wages it pays are, in real terms (that is, in units of output), "too low."
- Since the firm can hire workers at relatively low wages, it hires more and produces more output.
- The unexpectedly high price level leads to an increase in output above its natural rate.
- And the same story works in reverse: if the price level turns out to be unexpectedly low, real wages rise in the short run, leading firms to hire fewer workers and produce less.

Sticky Price Theory

Sticky price theory emphasizes, instead, that the prices of certain goods and services are slow to adjust to changing economic conditions.

This theory uses the metaphor of **menu costs**: a restaurant may print up new menus, with new prices, only once or twice per year. In the short run, its prices are fixed even if economic conditions change.

Menus and mail order catalogs provide literal examples of menu costs to changing prices. But other prices may be slow to change because of managerial costs. For example, executives at Dunkin Donuts may decide at the beginning of the year that \$1.49 is the “right price” to charge for a cup of coffee. They may meet again later in the year to reconsider the pricing decision, but until then the price stays fixed.

So suppose that Dunkin Donuts sets its price at \$1.49 but the price level, reflecting mainly the prices of other goods and services, turns out to be unexpectedly high. A cup of coffee now looks “cheap” to consumers. More will visit Dunkin Donuts and buy coffee. Dunkin Donuts will hire more workers and produce more output. Hence, the unexpectedly high price level leads to an increase in output above its natural rate.

And the same story works in reverse: if the price level turns out to be unexpectedly low, a cup of coffee with a “sticky” price of \$1.49 will look expensive. People will buy less; Dunkin Donuts will hire fewer workers and produce less. The unexpectedly low price level leads to a decrease in output below its natural rate.

But, like sticky wage theory, sticky price theory also suggests that in the long run, prices will adjust and output will return to its natural rate.

Misperceptions Theory

A third story to explain the upward-sloping short-run aggregate supply curve is the misperceptions theory.

Another example illustrates how this theory works:

- Suppose, at the beginning of the year, everyone expects the price level P to equal 100.
- But instead, the price level rises to $P = 110$.
- This means that, on average, the prices of *all* goods and services have risen by 10 percent.
- In the short-run, however, individual firms may mistakenly believe that it is really just the price of their particular good that is rising.
- Believing that it is an especially good time to produce, those firms will hire more workers.
- As a result, the unexpectedly high price level will lead to an increase in output above its natural rate.
- Conversely, if the price level unexpectedly falls, each individual firm might mistakenly believe that it is really just the price of its own output that is falling. The firm will hire fewer workers. The unexpectedly low price will lead to a decrease in output below its natural rate.

Summary

Although some economists debate over which of these three theories – sticky wages, sticky prices, or misperceptions – comes closest to describing actual economies, there is probably an element of truth in each of them. And they are not mutually inconsistent, that is, they could all work together to describe why the aggregate supply curve slopes upward.

And all three imply a short-run relationship of the form:

$$\text{Quantity of Output Supplied} = \text{Natural Rate of Output} + a(\text{Actual Price Level} - \text{Expected Price Level})$$

Where a is a number that governs the extent to which actual output responds to unexpected changes in the price level.

Note that this same equation – and each of the three theories – also captures the idea that in the long run, after expectations have shifted to recognize actual changes in the price level, the long-run aggregate supply curve is vertical.

Why the Short-Run Aggregate Supply Curve Might Shift

The equation from above also allows us to identify factors that will shift the short-run aggregate supply curve:

1. Anything that shifts the natural rate of output (and hence the long-run aggregate supply curve).
2. Changes in the expected price level.

The equation indicates that an increase in the expected price level causes the quantity of output supplied at any given actual price level to decrease. How?

Consider the answer given by sticky wage theory:

- If the expected price level increases, firms will set higher wages to compensate workers for the higher cost of living.
- But, if the actual price level is held constant, this means higher real wages.
- Firms will hire fewer workers, and produce less output, at the given price level.
- The short-run aggregate supply curve shifts to the left.
- Conversely, if the expected price level falls, firms will be able to set lower wages, hire more workers, and produce more output, all at any given price level. The short-run aggregate supply curve shifts to the right.

Can you give the answers as they would be provided by the sticky price and misperceptions theories?

Two Causes of Economic Fluctuations

Figure 7 depicts in the economy in its long-run equilibrium:

- Aggregate demand intersects with long-run aggregate supply, determining output and the price level.
- But here, the short-run aggregate supply passes through the equilibrium point as well, indicating that the expected price level has adjusted to this long-run equilibrium as well.

From this starting point, we can consider the effects of forces that shift either aggregate demand or aggregate supply, according to these four steps:

1. Decide whether the event shifts the aggregate demand curve, the aggregate supply curve, or both.

2. Decide in which direction the curve shifts.
3. Use the aggregate demand and aggregate supply diagram to see how output and the price level change in the short run.
4. Use the same diagram to see how output and the price level change in the long run.

The Effects of a Shift in Aggregate Demand

Let's consider a specific example: a wave of pessimism hits the economy, because of a political scandal, a stock market crash, or a steep decline in house prices. What happens to the economy as a result?

1. Since the wave of pessimism affects spending plans, it shifts the aggregate demand curve.
2. Because households and firms want to buy a smaller quantity of goods at a given price level, the aggregate demand curve shifts left.
3. Figure 8 shows that in the short run this leftward shift of aggregate demand causes output to fall below its natural rate. The price level falls as well. (Can you tell the specific stories implied by sticky wage, sticky price, and misperceptions theories?) We have now moved from point A to point B in figure 8.
4. As time passes, however, the expected price level will also fall. This shifts the aggregate supply curve to the right (again, can you tell the specific stories implied by sticky wage, sticky price, and misperceptions theories?). Now we move to point C in figure 8: the price level falls still further, but output returns to its natural rate.

In this example, we implicitly assumed that the government does not respond to any of these events. Another possibility is that the Federal Reserve could respond to the initial fall in aggregate demand by increasing the money supply:

- As discussed earlier, a monetary policy easing, associated with an increase in reserves and the money supply and a decrease in interest rates, will shift the aggregate demand curve to the right, offsetting the initial leftward shift.
- In this case, the economy can move back to its initial long-run equilibrium point A without a shift in the expected price level and without a shift in aggregate supply.

Figure 9 shows changes in real GDP in the US since 1900. Two large swings stand out: the decline in GDP during the Great Depression and the growth in GDP during World War II.

Most economists now blame the Great Depression on a large decline in the money supply.

- From 1929 to 1933, the money supply fell by 28 percent.
- To a large extent, this decline in the money supply was the result of bank failures, which led to a contraction of the money multiplier.
- Most economists believe that the Fed should have and could have used additional monetary policy easing to offset this decline in the money supply, holding the aggregate demand in place.
- But, without this monetary policy easing, the decline in the money supply caused the aggregate demand curve to shift to the left.

- According to the diagram, in the short run, output falls as does the price level. And, indeed, the Great Depression was not only a period of falling output, it was also a period of falling prices, or deflation.
- Eventually, expectations adjust to the lower price level. The aggregate supply curve shifts to the right. The price level falls further, but output returns to its natural rate.

During World War II, government (military) spending rose dramatically.

- An increase in government purchases causes the aggregate demand curve to shift to the right.
- In the short run, output rises as does the price level.
- In the long run, the expected price level also rises. The aggregate supply curve shifts to the left. The price level rises further, but output returns to its natural rate.

The US economy also experienced a recession during 2001, most likely due to shifts in aggregate demand:

- Between August 2000 and August 2001, stock prices fell by about 25 percent.
- A fall in stock prices shifts aggregate demand to the left.
- Then in September 2001, terrorist attacks hit New York and Washington.
- Increased pessimism and uncertainty brought about by the attacks also shift the aggregate demand curve to the left.
- But the Federal Reserve responded by cutting interest rates, which as we discussed previously involves an increase in the money supply. Also, Congress responded by cutting taxes. All of these policy decisions work to shift aggregate demand back to the right.

Note that a story along much the same lines can be told to explain the most recent recession, in 2008 and 2009, except that instead of the fall in stock prices and the terrorist attacks, we had a fall in housing prices and a liquidity/solvency crises in the financial system.

- And, once again in 2008 and 2009, the Fed responded by cutting interest rates and Congress responded by certain taxes but also with a massive increase in government spending.
- During the most recent recession, in fact, the Federal Reserve lowered interest rates all the way to zero. At this point, further decreases in interest rates become impossible, so that the Fed has had to resort to unconventional monetary policy strategies, such as buying long-term government bonds and even mortgage-backed securities.

Let's consider one final example. What happens when the Federal Reserve just decides to ease monetary policy?

- Again, the increase in reserves and the money supply and the decline in the federal funds rate and other interest rates will shift the aggregate demand curve to right.
- Output increases in the short run, as does the price level.
- But, in the long run, the expected price level will rise as well, shifting the aggregate supply curve to the left. Output returns to its natural rate, but the price level is permanently higher.

- This example illustrates how the aggregate demand and aggregate supply model reconciles the short and long-run effects of monetary policy.

The Effects of a Shift in Aggregate Supply

Let's suppose again that the economy starts out in its long run equilibrium, in which aggregate demand, long-run aggregate supply, and short-run aggregate supply all intersect.

Now suppose that there is a disruption to worldwide oil supplies. What happens to the economy as a result?

1. Because the availability of natural resources affects firms' ability to produce goods, the aggregate supply curve shifts.
2. Because the reduction in oil supplies makes it more difficult and costly for firms to produce goods, the aggregate supply curve shifts to the left.
3. Figure 10 shows that in the short run, output falls and the price level rises. The economy experiences **stagflation**: stagnation of economic growth and inflation.
4. Assuming that oil supplies are eventually restored in full, however, the long-run aggregate supply curve remains fixed. Instead, as oil supplies come back, the short-run aggregate supply curve will shift back to its original position.

This example assumes that government policymakers do not respond to the oil supply shock.

- Figure 11 shows what happens when, instead, the Federal Reserve expands the money supply or Congress increases government spending in an attempt to counteract the short-run decline in output.
- Now, in the short run, the aggregate demand curves to the right. If the monetary and/or fiscal stimulus to demand is sufficiently strong, the government can bring output back to its natural rate even in the short run.
- But, as the figure shows, this comes at the cost of making the inflation even worse.
- In cases like this one, the government is said to **accommodate** the shift in aggregate supply, accepting a permanently higher price level in order to insulate output and employment from the effects of the shift in aggregate supply.
- Some economists use this story to explain the high inflation experienced in the US during the 1970s: the Organization of Petroleum Exporting Countries (OPEC) cartel acted repeatedly to curtail the supply of oil to world markets in an effort to increase the price of oil. The Fed, wishing to avoid a deep recession, eased monetary policy: it accommodated the shift in aggregate supply, but at the cost of subjecting the economy to higher and higher rates of inflation.