

Aggregate Demand and Aggregate Supply

IN EARLY 2000, Alan Greenspan, chair of the Federal Reserve Board, stated:

Through the so-called wealth effect, [huge gains in the stock market] have tended to foster increases in aggregate demand beyond the increases in supply. It is this imbalance . . . that contains the potential seeds of rising inflationary . . . pressures that could undermine the current expansion. . . . Our goal [at the Federal Reserve] is to extend the expansion by containing its imbalances and avoiding the very recession that would complete the business cycle.¹

This is precisely the language of the **aggregate demand–aggregate supply (AD-AS) model** that we will develop in this chapter. The aggregate expenditures model of Chapters 9 and 10 is a *fixed-price-level model*—it emphasizes changes in real GDP. The AD-AS model is a *variable-price-level model* that enables us to analyze changes in both real GDP and the price level simultaneously. The AD-AS model builds on the aggregate expenditures model and provides numerous insights on inflation, unemployment, and economic growth. In later chapters, we will see that it also explains the logic of macroeconomic stabilization policies.

¹Alan Greenspan, speech to the New York Economics Club, Jan. 13, 2000.

I Aggregate Demand

Aggregate demand is a schedule or curve that shows the amounts of real output that buyers collectively desire to purchase at each possible price level. The relationship between the price level and the amount of real GDP demanded is inverse or negative: When the price level rises, the quantity of real GDP demanded decreases; when the price level falls, the quantity of real GDP demanded increases.

Aggregate Demand Curve

The inverse relationship between the price level and real GDP is shown in Figure 11.1, where the aggregate demand curve AD slopes downward, as does the demand curve for an individual product.

Why the downward slope? *The explanation is not the same as that for why the demand for a single product slopes downward.* That explanation centered on the income effect and the substitution effect. When the

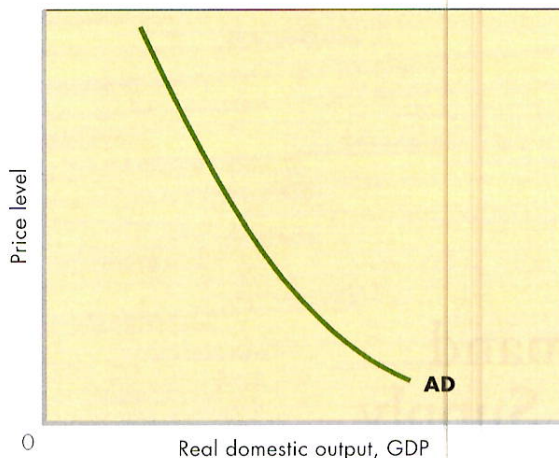



Figure 11.1

The aggregate demand curve. The downsloping aggregate demand curve AD indicates an inverse relationship between the price level and the amount of real output purchased.

price of an *individual* product falls, the consumer's (constant) nominal income allows a larger purchase of the product (the income effect). And, as price falls, the consumer wants to buy more of the product because it becomes relatively less expensive than other goods (the substitution effect).

But these explanations do not work for aggregates. In Figure 11.1, when the economy moves down its aggregate demand curve, it moves to a lower general price level. But our circular flow model tells us that when consumers pay lower prices for goods and services, less nominal income flows to resource suppliers in the form of wages, rents, interest, and profits. As a result, a decline in the price level does not necessarily mean an increase in the nominal income of the economy as a whole. Thus, a decline in the price level need not produce an income effect, where more output is purchased because lower prices leave buyers with greater real income.

Similarly, in Figure 11.1 prices in general are falling as we move down the aggregate demand curve, so the rationale for the substitution effect (where more of a product is purchased because it becomes cheaper relative to all other products) is not applicable. There is no *overall* substitution effect among domestically produced goods when the price level falls.

If the conventional substitution and income effects do not explain the downward slope of the aggregate demand curve, what does? That explanation rests on three effects of a price-level change.  11.1

Real-Balances Effect A change in the price level produces a **real-balances effect**. Here is how it works: A higher price level reduces the real value or purchasing power of the public's accumulated saving balances. In particular, the real value of assets with fixed money values, such as savings accounts or bonds, diminishes. Because of the erosion of the purchasing power of such assets, the public is poorer in real terms and will reduce its spending. A household might buy a new car or a sailboat if the purchasing power of its financial asset balances is, say, \$50,000. But if inflation erodes the purchasing power of its asset balances to \$30,000, the family may defer its purchase. So a higher price level means less consumption spending.

Interest-Rate Effect The aggregate demand curve also slopes downward because of the **interest-rate effect**. When we draw an aggregate demand curve, *we assume that the supply of money in the economy is fixed*. But when the price level rises, consumers need more money for purchases and businesses need more money to meet their payrolls and to buy other resources. A \$10 bill will do when the price of an item is \$10, but a \$10 bill plus a \$1 bill is needed when the item costs \$11. In short, a higher price level increases the demand for money. So, given a fixed supply of money, an increase in money demand will drive up the price paid for its use. That price is the interest rate.

Higher interest rates curtail investment spending and interest-sensitive consumption spending. Firms that expect a 6 percent rate of return on a potential purchase of capital will find that investment profitable when the interest rate is, say, 5 percent. But the investment will be unprofitable and will not be made when the interest rate has risen to 7 percent. Similarly, consumers may decide not to purchase a new house or new automobile when the interest rate on loans goes up. So, by increasing the demand for money and consequently the interest rate, a higher price level reduces the amount of real output demanded.

Foreign Purchases Effect The final reason why the aggregate demand curve slopes downward is the **foreign purchases effect**. When the U.S. price level rises relative to foreign price levels, foreigners buy fewer U.S. goods and Americans buy more foreign goods. Therefore U.S. exports fall and U.S. imports rise. In short, the rise in the price level reduces the quantity of U.S. goods demanded as net exports.

These three effects, of course, work in the opposite direction for a decline in the price level. Then the quantity demanded of consumption goods, investment goods, and net exports rises.

Derivation of the Aggregate Demand Curve from the Aggregate Expenditures Model²

We can derive the downward-sloping aggregate demand curve of Figure 11.1 directly from the aggregate expenditures model discussed in Chapters 9 and 10. We simply need to relate the various possible price levels to corresponding equilibrium GDPs.

²This section presumes knowledge of the aggregate expenditures model discussed in Chapters 9 and 10 and may be skipped by readers who were not assigned those chapters.

Note that in Figure 11.2 we have stacked the aggregate expenditures model (Figure 11.2a) and the aggregate demand curve (Figure 11.2b) vertically. We can do this because the horizontal axes of both models measure real GDP. Now let's derive the AD curve in three distinct steps. (Throughout this discussion, keep in mind that price level $P_1 <$ price level $P_2 <$ price level P_3 .)

- First suppose that the economy's price level is P_1 and its aggregate expenditures schedule is AE_1 , the top schedule in Figure 11.2a. The equilibrium GDP is then GDP_1 at point 1. So in Figure 11.2b we can plot the equilibrium real-output GDP_1 and the corresponding price level P_1 . This gives us point 1' in Figure 11.2b.
- Now assume the price level rises from P_1 to P_2 . Other things equal, this higher price level will (1) decrease the value of wealth, decreasing

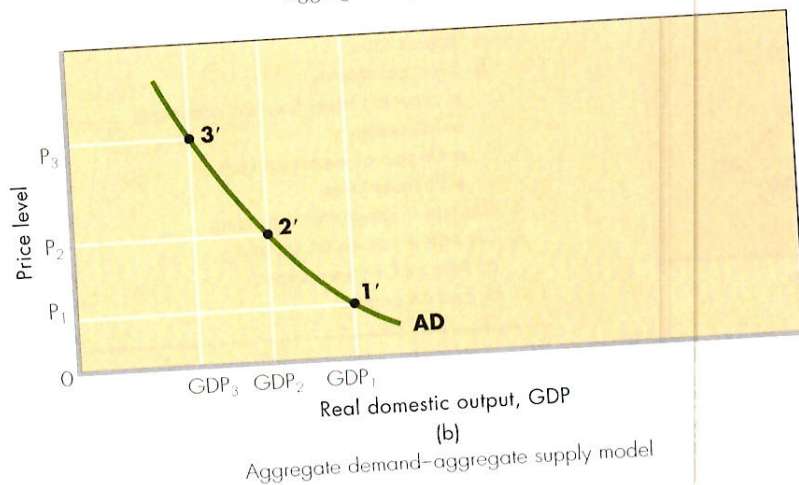
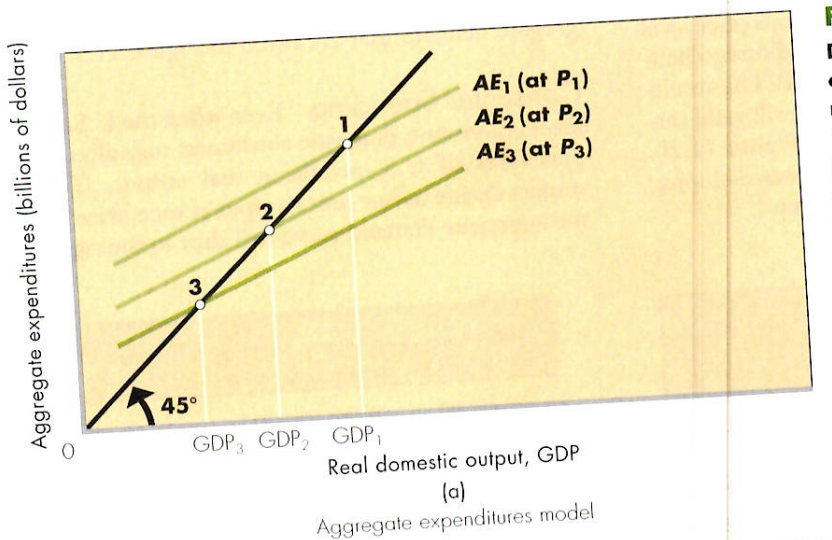


Figure 11.2

Deriving the aggregate demand curve from the expenditures-output model.

Through the real-balances, interest-rate, and foreign purchases effects, the aggregate expenditures schedule will fall when the price level rises and will rise when the price level falls. If the aggregate expenditures schedule is AE_1 when the price level is P_1 , the equilibrium output is GDP_1 ; then P_1 and GDP_1 determine one point (1') on the aggregate demand curve. A higher price level such as P_2 reduces aggregate expenditures to AE_2 , providing point 2' on the aggregate demand curve. Similarly, an increase in the price level from P_2 to P_3 drops aggregate expenditures to AE_3 , so P_3 and GDP_3 yield another point on the aggregate demand curve at 3'.

consumption expenditures; (2) increase the interest rate, reducing investment and interest-sensitive consumption expenditures; and (3) increase imports and decrease exports, reducing net export expenditures. The aggregate expenditures schedule will fall from AE_1 to, say, AE_2 in Figure 11.2a, giving us equilibrium GDP₂ at point 2. In Figure 11.2b we plot this new price-level–real-output combination, P_2 and GDP₂, as point 2'.

- Finally, suppose the price level rises from P_2 to P_3 . The value of real balances falls, the interest rate rises, exports fall, and imports rise. Consequently, the consumption, investment, and net export schedules fall, shifting the aggregate expenditures schedule downward from AE_2 to AE_3 , which gives us equilibrium GDP₃ at point 3. In Figure 11.2b, this enables us to locate point 3', where the price level is P_3 and real output is GDP₃.

In summary, increases in the economy's price level will successively shift its aggregate expenditures schedule downward and will reduce real GDP. The resulting price-level–real GDP combinations will yield various points such as 1', 2', and 3' in Figure 11.2b. Together, such points locate the downward-sloping aggregate demand curve for the economy.

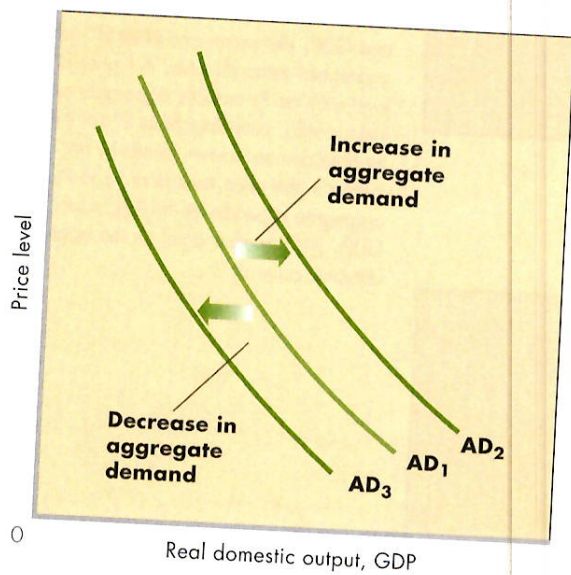


Figure 11.3

Changes in aggregate demand. A change in one or more of the listed determinants of aggregate demand will change aggregate demand. An increase in aggregate demand is shown as a rightward shift of the AD curve, here from AD_1 to AD_2 ; a decrease in aggregate demand is shown as a leftward shift, here from AD_1 to AD_3 .

Determinants of Aggregate Demand

Other things equal, a change in the price level will change the amount of aggregate spending and therefore change the amount of real GDP demanded by the economy. Movements along a fixed aggregate demand curve represent these changes in real GDP. However, if one or more of those “other things” change, the entire aggregate demand curve will shift. We call these other things **determinants of aggregate demand** or, less formally, *aggregate demand shifters*.

In Figure 11.3, the rightward shift of the curve from AD_1 to AD_2 shows an increase in aggregate demand. At each price level, the amount of real goods and services demanded is larger than before. The leftward shift of the curve from AD_1 to AD_3 shows a decrease in aggregate demand, the lesser amount of real GDP demanded at each price level.

Let's examine each of the determinants of aggregate demand that are listed in Figure 11.3.

Consumer Spending Even when the U.S. price level is constant, domestic consumers may alter their purchases of U.S.-produced real output. If consumers decide to buy more output at each price level, the aggregate demand curve will shift to the right, as

Determinants of Aggregate Demand: Factors that Shift the Aggregate Demand Curve

1. Change in consumer spending
 - a. Consumer wealth
 - b. Consumer expectations
 - c. Household indebtedness
 - d. Taxes
2. Change in investment spending
 - a. Interest rates
 - b. Expected returns
 - Expected future business conditions
 - Technology
 - Degree of excess capacity
 - Business taxes
3. Change in government spending
4. Change in net export spending
 - a. National income abroad
 - b. Exchange rates

from AD_1 to AD_2 in Figure 11.3. If they decide to buy less output, the aggregate demand curve will shift to the left, as from AD_1 to AD_3 .

Several factors other than a change in the price level may change consumer spending and thus shift the aggregate demand curve. As Figure 11.3 shows, those factors are real consumer wealth, consumer expectations, household indebtedness, and taxes.

Consumer Wealth Consumer wealth includes both financial assets, such as stocks and bonds, and physical assets, such as houses and land. A sharp increase in the real value of consumer wealth (for example, because of a rise in stock market values) prompts people to save less and buy more products. The resulting increase in consumer spending—called the *wealth effect*—will shift the aggregate demand curve to the right. In contrast, a major decrease in the real value of consumer wealth at each price level will reduce consumption spending and thus shift the aggregate demand curve to the left.

Consumer Expectations Changes in expectations about the future may alter consumer spending. When people expect their future real incomes to rise, they spend more of their current incomes. Thus current consumption spending increases (current saving falls), and the aggregate demand curve shifts to the right. Similarly, a widely held expectation of surging inflation in the near future may increase aggregate demand today because consumers will want to buy products before their prices escalate. Conversely, expectations of lower future income or lower future prices may reduce current consumption and shift the aggregate demand curve to the left.

Household Indebtedness Households finance some of their spending by borrowing. If household indebtedness from past spending rises beyond normal levels, consumers may be forced to cut current spending in order to pay the interest and principle on their debt. Consumption spending will then decline, and the aggregate demand curve will shift to the left. Alternatively, when household indebtedness is unusually low, consumers have considerable leeway to borrow and spend today. Then the aggregate demand curve may shift to the right.

Taxes A reduction in personal income tax rates raises take-home income and increases consumer purchases at each possible price level. Tax cuts shift

the aggregate demand curve to the right. Tax increases reduce consumption spending and shift the curve to the left.

Investment Spending Investment spending (the purchase of capital goods) is a second major determinant of aggregate demand. A decline in investment spending at each price level will shift the aggregate demand curve to the left. An increase in investment spending will shift it to the right. In Chapter 9 we saw that investment spending depends on the real interest rate and the expected return from the investment.

Real Interest Rates Other things equal, an increase in interest rates will lower investment spending and reduce aggregate demand. We are not referring here to the “interest-rate effect” resulting from a change in the price level. Instead, we are identifying a change in the interest rate resulting from, say, a change in the nation’s money supply. An increase in the money supply lowers the interest rate, thereby increasing investment and aggregate demand. A decrease in the money supply raises the interest rate, reduces investment, and decreases aggregate demand.

Expected Returns Higher expected returns on investment projects will increase the demand for capital goods and shift the aggregate demand curve to the right. Alternatively, declines in expected returns will decrease investment and shift the curve to the left. Expected returns, in turn, are influenced by several factors:

- **Expectations about future business conditions** If firms are optimistic about future business conditions, they are more likely to forecast high rates of return on current investment and therefore may invest more today. On the other hand, if they think the economy will deteriorate in the future, they will forecast low rates of return and perhaps will invest less today.
- **Technology** New and improved technologies enhance expected returns on investment and thus increase aggregate demand. For example, recent advances in microbiology have motivated pharmaceutical companies to establish new labs and production facilities.
- **Degree of excess capacity** A rise in excess capacity—unused capital—will reduce the expected return on new investment and hence decrease aggregate demand. Other things equal,

firms operating factories at well below capacity have little incentive to build new factories. But when firms discover that their excess capacity is dwindling or has completely disappeared, their expected returns on new investment in factories and capital equipment rises. Thus, they increase their investment spending, and the aggregate demand curve shifts to the right.

- **Business taxes** An increase in business taxes will reduce after-tax profits from capital investment and will lower expected returns. So investment and aggregate demand will decline. A decrease in business taxes will have the opposite effects.

Government Spending Government purchases are the third determinant of aggregate demand. An increase in government purchases (for example, more computers for government agencies) will shift the aggregate demand curve to the right, as long as tax collections and interest rates do not change as a result. In contrast, a reduction in government spending (for example, a cutback in orders for military hardware) will shift the curve to the left.

Net Export Spending The final determinant of aggregate demand is net export spending. A greater level of U.S. *exports* constitutes an increased foreign demand for U.S. goods, whereas a lesser level of U.S. *imports* implies that American consumers have increased their demand for U.S.-produced products. So a rise in net exports (higher exports and/or lower imports) shifts the aggregate demand curve to the right. In contrast, a decrease in U.S. net exports shifts the aggregate demand curve leftward. (These changes in net exports are *not* those prompted by a change in the U.S. price level—those associated with the foreign purchases effect. The changes here explain shifts in the curve, not movements along the curve.)

What might cause net exports to change, other than the price level? Two possibilities are changes in national income abroad and changes in exchange rates.

National Income Abroad Rising national income abroad encourages foreigners to buy more products, some of which are made in the United States. U.S. net exports thus rise, and the U.S. aggregate demand curve shifts to the right. Declines in national income abroad, of course, do the opposite:

They reduce U.S. net exports and shift the U.S. aggregate demand curve to the left.

Exchange Rates Changes in exchange rates (Chapter 6) may affect U.S. net exports and therefore aggregate demand. Suppose the dollar depreciates in terms of the euro (the euro appreciates in terms of the dollar). The new relative lower value of dollars and higher value of euros enable European consumers to obtain more dollars with each euro. From their perspective, U.S. goods are now less expensive; it takes fewer euros to obtain them. So European consumers buy more U.S. goods and U.S. exports rise. But American consumers can now obtain fewer euros for each dollar. Because they must pay more dollars to buy European goods, Americans reduce their imports. U.S. exports rise and U.S. imports fall. *Depreciation* of the dollar increases U.S. net exports, thereby shifting the U.S. aggregate demand curve to the right.

Think through the opposite scenario, in which the dollar *appreciates* and the euro depreciates.

Aggregate Demand Shifts and the Aggregate Expenditures Model³

The determinants of aggregate demand listed in Figure 11.3 are the components of the aggregate expenditures model discussed in Chapter 10. When one of those determinants changes, the aggregate expenditures schedule shifts too. We can easily link such shifts in the aggregate expenditures schedule to shifts of the aggregate demand curve.

Let's suppose that the price level is constant. In Figure 11.4 we begin with the aggregate expenditures schedule at AE_1 in the top diagram, yielding real output of GDP_1 . Assume now that investment spending increases in response to more optimistic business expectations, so the aggregate expenditures schedule rises from AE_1 to AE_2 . (The notation "at P_1 " reminds us that the price level is assumed to be constant.) The result will be a multiplied increase in real output from GDP_1 to GDP_2 .

In the lower graph the increase in investment spending is reflected in the horizontal distance between AD_1 and the broken curve to its right. The immediate effect of the increase in investment is an increase in aggregate demand by the exact amount

³This section presumes knowledge of the aggregate expenditures model (Chapters 9 and 10).

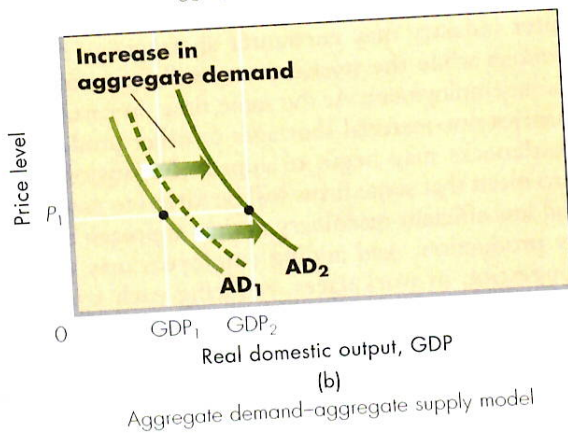
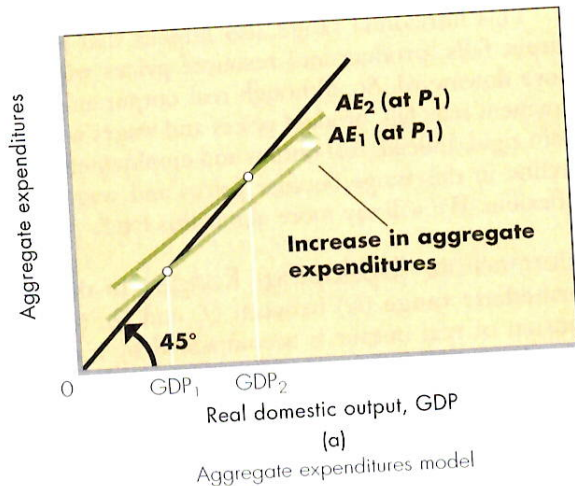


Figure 11.4
Shifts in the aggregate expenditures schedule and in the aggregate demand curve. (a) A change in some determinant of consumption, investment, or net exports (other than the price level) shifts the aggregate expenditures schedule upward from AE_1 to AE_2 . The multiplier increases real output from GDP_1 to GDP_2 . (b) The counterpart of this change is an initial rightward shift of the aggregate demand curve by the amount of initial new spending (from AD_1 to the broken curve). This leads to a multiplied rightward shift of the curve to AD_2 , which is just sufficient to show the same increase in GDP as in the aggregate expenditures model.

of the new spending. But then the multiplier process magnifies the initial increase in investment into successive rounds of consumption spending and an ultimate multiplied increase in aggregate demand from AD_1 to AD_2 . Equilibrium real output rises from GDP_1 to GDP_2 , the same multiplied increase in real GDP as that in the top graph. The initial increase in investment in the top graph has shifted the AD curve in the lower graph by a horizontal distance equal to the change in investment times the

multiplier. This particular change in real GDP is still associated with the constant price level P_1 . To generalize,

$$\text{Shift of AD curve} = \text{initial change in spending} \times \text{multiplier}$$

QUICK REVIEW 11.1

- Aggregate demand reflects an inverse relationship between the price level and the amount of real output demanded.
- Changes in the price level create real-balances, interest-rate, and foreign purchases effects that explain the downward slope of the aggregate demand curve.
- Changes in one or more of the determinants of aggregate demand (Figure 11.3) alter the amounts of real GDP demanded at each price level; they shift the aggregate demand curve.
- An increase in aggregate demand is shown as a rightward shift of the aggregate demand curve; a decrease, as a leftward shift of the curve.

Aggregate Supply

Aggregate supply is a schedule or a curve showing the level of real domestic output that firms will produce at each price level. Higher price levels create an incentive for firms to produce and sell more output, while lower price levels prompt them to reduce output. As a result, there is a direct or positive relationship between the price level and the amount of real output that firms offer for sale.

Aggregate Supply Curve

For now, think of the aggregate supply curve as having three distinct segments or ranges: (1) the horizontal range, (2) the intermediate (upsloping) range, and (3) the vertical range. The shape of the aggregate supply curve reflects what happens to the per-unit production cost as GDP expands or contracts. Recall from Chapter 8 that the per-unit production cost is found by dividing the total cost of all the resources used in production by the total quantity of output. That is, the per-unit production cost of a particular level of output is the average cost of that output. And the average cost of output establishes that output's price level because the price level must cover all the costs of production, including profit "costs."

With that background, let's examine the three ranges shown in Figure 11.5 and see what each represents. (Until later chapters, we assume the aggregate supply curve itself does not shift when the price level changes.)

Horizontal Range In Figure 11.5 we designate the full-employment real output as Q_f . That is the output at which the *natural rate of unemployment* (Chapter 8) occurs. Observe in the figure that the **horizontal range** (ab) of aggregate supply includes only levels of real output that are substantially less than the full-employment output Q_f . Thus, the horizontal range implies that the economy is in a recession or depression and has large amounts of unused machinery and equipment and unemployed workers available for production. Firms can put these idle human and property resources back to work with no upward pressure on the price level. As output expands over this range from a to b , no shortages or production bottlenecks will arise to raise prices. Workers unemployed for 2 or 3 months will hardly expect a wage increase when recalled to their jobs. Because producers can acquire labor and other inputs at stable prices, per-unit production costs will stay constant as firms expand output up to Q_u . So firms will have no reason to raise product prices.

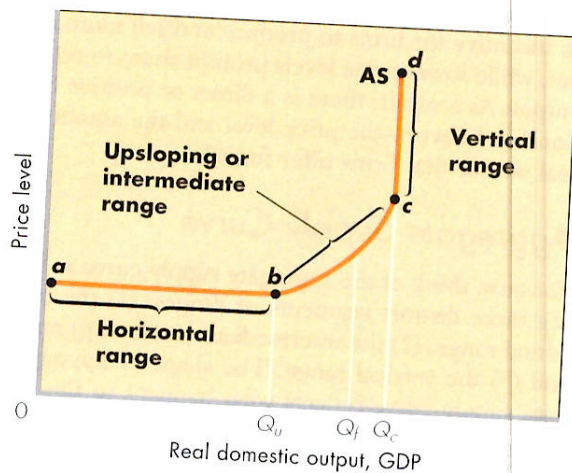


Figure 11.5

The aggregate supply curve. The aggregate supply curve shows the levels of real output that firms will produce at various price levels. It has three ranges: a horizontal range ab , where the price level remains constant as real output varies; an intermediate range bc , where both real output and the price level are variable; and a vertical range cd , where real output is constant at the full-capacity level and only the price level can vary.

This horizontal range also implies that if real output falls, product and resource prices will not move downward. So, although real output and employment may fall, product prices and wages will remain rigid. Indeed, real output and employment will decline in this range because prices and wages are inflexible. We will say more about this later.

Intermediate (Upsloping) Range In the **intermediate range** (bc) between Q_u and Q_c , an expansion of real output is accompanied by a rising price level. The aggregate economy is made up of innumerable product and resource markets, and full employment is not reached evenly or simultaneously in all the industries. Example: As the economy expands in real-output range bc , the high-tech computer industry may encounter shortages of skilled workers while the steel industry still faces substantial unemployment. At the same time, in certain industries raw-material shortages or other production bottlenecks may begin to appear. Expansion may also mean that some firms will be forced to use older and less efficient machinery as they approach capacity production. And adding employees may create congestion in workplaces, reducing each worker's output. Perhaps, too, less capable workers may be hired as output expands. All these factors tend to increase per-unit production costs and boost prices as production increases in range bc .

Once the full-employment level of GDP is reached at Q_f , further price-level increases may bring forth added real output for a time. We know from Chapter 8 that employment and real GDP can expand beyond the full-employment level of output until the economy reaches its maximum capacity. That is, actual GDP can occasionally exceed full-employment GDP. In a prosperous economy, the size of the labor force, daily working hours, and the workweek can be extended. Workers can also "moonlight"—hold more than one job. But once the economy's full capacity is reached at Q_c , the aggregate supply curve becomes vertical.

In the intermediate range of aggregate supply, per-unit production costs rise and firms must receive higher product prices for their output in order to be profitable. In this range a rising price level accompanies rising real output.

Vertical Range The economy reaches its full-capacity real output at Q_c . Increases of the price level in the **vertical range** (cd) will produce no additional real output since the economy already is operating