keygraph

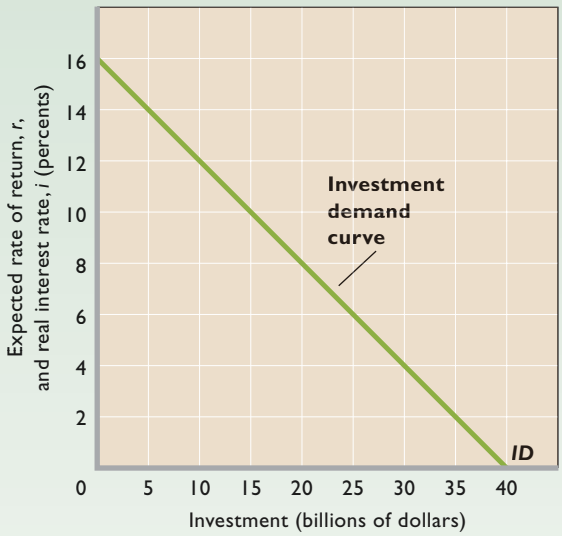


FIGURE 27.5 The investment demand curve. The investment demand curve is constructed by arraying all potential investment projects in descending order of their expected rates of return. The curve slopes downward, reflecting an inverse relationship between the real interest rate (the financial "price" of each dollar of investing) and the quantity of investment demanded.

QUICK QUIZ FOR FIGURE 27.5

1. The investment demand curve:
   a. reflects a direct (positive) relationship between the real interest rate and investment.
   b. reflects an inverse (negative) relationship between the real interest rate and investment.
   c. shifts to the right when the real interest rate rises.
   d. shifts to the left when the real interest rate rises.
2. In this figure:
   a. greater cumulative amounts of investment are associated with lower expected rates of return on investment.
   b. lesser cumulative amounts of investment are associated with lower expected rates of return on investment.
   c. higher interest rates are associated with higher expected rates of return on investment, and therefore greater amounts of investment.
   d. interest rates and investment move in the same direction.
3. In this figure, if the real interest rate falls from 6 to 4 percent:
   a. investment will increase from 0 to $30 billion.
   b. investment will decrease by $5 billion.
   c. the expected rate of return will rise by $5 billion.
   d. investment will increase from $25 billion to $30 billion.
4. In this figure, investment will be:
   a. zero if the real interest rate is zero.
   b. $40 billion if the real interest rate is 16 percent.
   c. $30 billion if the real interest rate is 4 percent.
   d. $20 billion if the real interest rate is 12 percent.

Answers: 1. b; 2. a; 3. d; 4. c

To cumulate these figures for each rate of return, r, we add the amounts of investment that will yield each particular rate of return r or higher. This provides the data in Table 27.2, shown graphically in **Figure 27.5 (Key Graph).** In Table 27.2 the number opposite 12 percent, for example, means there are $10 billion of investment opportunities that will yield an expected rate of return of 12 percent or more. The $10 billion includes the $5 billion of investment expected to yield a return of 14 percent or more plus the $5 billion expected to yield between 12 and 14 percent.

We know from our example of the sanding machine that an investment project will be undertaken if its expected rate of return, r, exceeds the real interest rate, i. Let's first suppose i is 12 percent. Businesses will undertake all investments for which r exceeds 12 percent. That is, they will invest until the 12 percent rate of return equals the 12 percent interest rate. Figure 27.5 reveals that $10 billion of investment spending will be undertaken at a 12 percent interest rate; that means $10 billion of investment projects have an expected rate of return of 12 percent or more.

TABLE 27.2 Expected Rate of Return and Investment

Expected Rate of Return (r)	Cumulative Amount of Investment Having This Rate of Return or Higher, Billions per Year
16%	$ 0
14	5
12	10
10	15
8	20
6	25
4	30
2	35
0	40

Put another way: At a financial "price" of 12 percent, $10 billion of investment goods will be demanded. If the interest rate is lower, say, 8 percent, the amount of investment for which r equals or exceeds i is $20 billion. Thus, firms will demand $20 billion of investment goods at an 8 percent real interest rate. At 6 percent, they will demand $25 billion of investment goods.

By applying the marginal-benefit–marginal-cost rule that investment projects should be undertaken up to the point where $r = i$, we see that we can add the real interest rate to the vertical axis in Figure 27.5. The curve in Figure 27.5 not only shows rates of return; it shows the quantity of investment demanded at each "price" i (interest rate) of investment. The vertical axis in Figure 27.5 shows the various possible real interest rates, and the horizontal axis shows the corresponding quantities of investment demanded. The inverse (downsloping) relationship between the interest rate (price) and dollar quantity of investment demanded conforms to the law of demand discussed in Chapter 3. The curve ID in Figure 27.5 is the economy's **investment demand curve.** It shows the amount of investment forthcoming at each real interest rate. The level of investment depends on the expected rate of return and the real interest rate. **(Key Question 8)**

ORIGIN OF THE IDEA
O 27.2
Interest-rate–investment relationship

INTERACTIVE GRAPHS
G 27.2
Investment demand curve

Shifts of the Investment Demand Curve

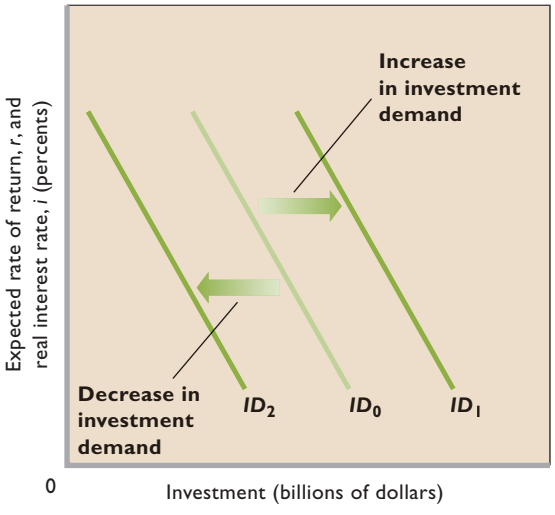
Figure 27.5 shows the relationship between the interest rate and the amount of investment demanded, other things equal. When other things change, the investment demand curve shifts. In general, any factor that leads businesses collectively to expect greater rates of return on their investments increases investment demand. That factor shifts the investment demand curve to the right, as from ID_0 to ID_1 in Figure 27.6. Any factor that leads businesses collectively to expect lower rates of return on their investments shifts the curve to the left, as from ID_0 to ID_2. What are those non-interest-rate determinants of investment demand?

Acquisition, Maintenance, and Operating Costs The initial costs of capital goods, and the estimated costs of operating and maintaining those goods, affect the expected rate of return on investment. When these costs rise, the expected rate of return from prospective investment projects falls and the investment demand curve shifts to the left. Example: Higher electricity costs associated with operating tools and machinery shifts the investment demand curve to the left. Lower costs, in contrast, shift it to the right.

Business Taxes When government is considered, firms look to expected returns *after taxes* in making their investment decisions. An increase in business taxes lowers the expected profitability of investments and shifts the investment demand curve to the left; a reduction of business taxes shifts it to the right.

Technological Change Technological progress—the development of new products, improvements in existing

FIGURE 27.6 Shifts of the investment demand curve. Increases in investment demand are shown as rightward shifts of the investment demand curve; decreases in investment demand are shown as leftward shifts of the investment demand curve.



products, and the creation of new machinery and production processes—stimulates investment. The development of a more efficient machine, for example, lowers production costs or improves product quality and increases the expected rate of return from investing in the machine. Profitable new products (cholesterol medications, Internet services, high-definition televisions, cellular phones, and so on) induce a flurry of investment as businesses tool up for expanded production. A rapid rate of technological progress shifts the investment demand curve to the right.

Stock of Capital Goods on Hand The stock of capital goods on hand, relative to output and sales, influences investment decisions by firms. When the economy is overstocked with production facilities and when firms have excessive inventories of finished goods, the expected rate of return on new investment declines. Firms with excess production capacity have little incentive to invest in new capital. Therefore, less investment is forthcoming at each real interest rate; the investment demand curve shifts leftward.

When the economy is understocked with production facilities and when firms are selling their output as fast as they can produce it, the expected rate of return on new investment increases and the investment demand curve shifts rightward.

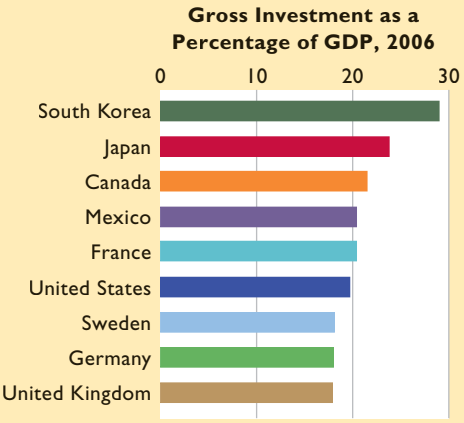
Planned Inventory Changes Recall from Chapter 24 that the definition of investment includes changes in inventories of unsold goods. An increase in inventories is counted as positive investment while a decrease in inventories is counted as negative investment. It is important to remember that some inventory changes are planned, while others are unplanned. Since the investment demand curve deals only with *planned* investment, it is only affected by *planned* changes that firms desire to make to their inventory levels. If firms are planning to increase their inventories, the investment demand curve shifts to the right. If firms are planning on decreasing their inventories, the investment demand curve shifts to the left.

Firms make planned changes to their inventory levels mostly because they are expecting either faster or slower sales. A firm that expects its sales to double in the next year will want to keep more inventory in stock, thereby increasing its investment demand. By contrast, a firm that is expecting slower sales will plan on reducing its inventory, thereby reducing its overall investment demand. But because life often does not turn out as expected, firms often find that the actual amount of inventory investment that they end up making is either greater or less than what they had planned. The size of the gap is, naturally, the dollar amount of their *unplanned* inventory changes. These unplanned inventory adjustments will play a large role in the aggregate expenditures model studied in Chapter 28.

GLOBAL PERSPECTIVE 27.2

Gross Investment Expenditures as a Percentage of GDP, Selected Nations

As a percentage of GDP, investment varies widely by nation. These differences, of course, can change from year to year.



Source: International Financial Statistics, International Monetary Fund, **www.imf.org.** Used by permission.

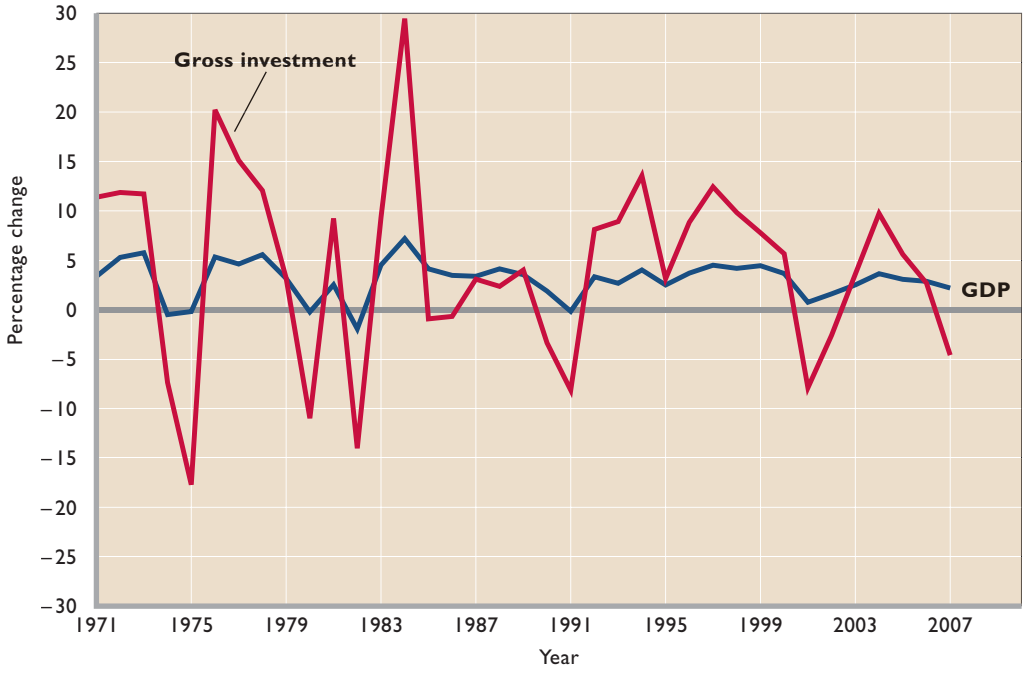
Expectations We noted that business investment is based on expected returns (expected additions to profit). Most capital goods are durable, with a life expectancy of 10 or 20 years. Thus, the expected rate of return on capital investment depends on the firm's expectations of future sales, future operating costs, and future profitability of the product that the capital helps produce. These expectations are based on forecasts of future business conditions as well as on such elusive and difficult-to-predict factors as changes in the domestic political climate, international relations, population growth, and consumer tastes. If executives become more optimistic about future sales, costs, and profits, the investment demand curve will shift to the right; a pessimistic outlook will shift the curve to the left.

Global Perspective 27.2 compares investment spending relative to GDP for several nations in a recent year. Domestic real interest rates and investment demand determine the levels of investment relative to GDP.

Instability of Investment

In contrast to consumption, investment is unstable; it rises and falls quite often. Investment, in fact, is the most volatile component of total spending—so much so that most of the fluctuations in output and employment that happen over

FIGURE 27.7 The volatility of investment. Annual percentage changes in investment spending are often several times greater than the percentage changes in GDP. (Data are in real terms.)



Source: Bureau of Economic Analysis, **www.bea.gov.**

the course of the business cycle can be attributed to increases and decreases in investment. Figure 27.7 shows just how volatile investment in the United States has been. Note that its swings are much greater than those of GDP.

Several factors explain the variability of investment.

Durability Because of their durability, capital goods have indefinite useful lifespans. Within limits, purchases of capital goods are discretionary and therefore can be postponed. Firms can scrap or replace older equipment and buildings, or they can patch them up and use them for a few more years. Optimism about the future may prompt firms to replace their older facilities and such modernizing will call for a high level of investment. A less optimistic view, however, may lead to smaller amounts of investment as firms repair older facilities and keep them in use.

Irregularity of Innovation We know that technological progress is a major determinant of investment. New products and processes stimulate investment. But history suggests that major innovations such as railroads, electricity, automobiles, fiber optics, and computers occur quite irregularly. When they do happen, they induce a vast upsurge or "wave" of investment spending that in time recedes.

A contemporary example is the tremendous popularity of the personal computer and Internet, which has caused a wave of investment in those industries and in many related industries such as computer software and electronic commerce. Some time in the future, this particular surge of investment undoubtedly will level off.

Variability of Profits When evaluating whether or not to undertake a given investment, a firm's expectations about the potential profitability of that potential investment are influenced to some degree by the size of the profits currently being earned by other firms that have made similar investments. Current profits, however, are themselves highly variable. Thus, the variability of profits contributes to the volatile nature of the incentive to invest.

The instability of profits may cause investment fluctuations in a second way. Profits are a major source of funds for business investment. U.S. businesses sometimes prefer this internal source of financing to increases in external debt or stock issue.

In short, expanding profits give firms both greater incentives and greater means to invest; declining profits have the reverse effects. The fact that actual profits are variable thus adds doubly to the instability of investment.

Variability of Expectations Firms tend to project current business conditions into the future. But their expectations can change quickly when some event suggests a significant possible change in future business conditions.

Changes in exchange rates, changes in the outlook for international peace, court decisions in key labor or antitrust cases, legislative actions, changes in trade barriers, changes in governmental economic policies, and a host of similar considerations may cause substantial shifts in business expectations.

The stock market also can influence business expectations because firms look to it as one of several indicators of society's overall confidence in future business conditions. Rising stock prices tend to signify public confidence in the business future, while falling stock prices may imply a lack of confidence. The stock market, however, is often driven by "herd behavior" in which financial investors follow the lead of others rather than think independently. When stock prices rise because others are buying, they also buy; when stock prices are falling because others are selling, they also sell. This behavior can greatly magnify the volatility of stock prices that otherwise would be much more stable. Business can easily confuse these large swings in stock prices for real changes in society's optimism or pessimism about future business conditions. If they do, businesses are likely to respond by overadjusting their investment plans in one direction or the other. In this way, stock market volatility can add to the instability of investment spending.

For all these reasons, changes in investment cause most of the fluctuations in output and employment that occur over the course of the business cycle. In terms of Figures 27.5 and 27.6, we would represent volatility of investment as occasional and substantial shifts in the investment demand curve.

QUICK REVIEW 27.2

- A specific investment will be undertaken if the expected rate of return, r, equals or exceeds the real interest rate, i.
- The investment demand curve shows the total monetary amounts that will be invested by an economy at various possible real interest rates.
- The investment demand curve shifts when changes occur in (a) the costs of acquiring, operating, and maintaining capital goods, (b) business taxes, (c) technology, (d) the stock of capital goods on hand, and (e) business expectations.

The Multiplier Effect*

A final basic relationship that requires discussion is the relationship between changes in spending and changes in real GDP. Assuming that the economy has room to expand—so that increases in spending do not lead to increases in prices—there is a direct relationship between these two aggregates. More spending results in a higher GDP; less spending results in a lower GDP. But there is much more to this relationship. A change in spending, say, investment, ultimately changes output and income by more than the initial change in investment spending. That surprising result is called the *multiplier effect:* a change in a component of total spending leads to a larger change in GDP. The **multiplier** determines how much larger that change will be; it is the ratio of a change in GDP to the initial change in spending (in this case, investment). Stated generally,

$$\text{Multiplier} = \frac{\text{change in real GDP}}{\text{initial change in spending}}$$

By rearranging this equation, we can also say that

$$\text{Change in GDP} = \text{multiplier} \times \text{initial change in spending}$$

So if investment in an economy rises by $30 billion and GDP increases by $90 billion as a result, we then know from our first equation that the multiplier is 3 (= $90/$30).

Note these three points about the multiplier:

- The "initial change in spending" is usually associated with investment spending because of investment's volatility. But changes in consumption (unrelated to changes in income), net exports, and government purchases also lead to the multiplier effect.
- The "initial change in spending" associated with investment spending results from a change in the real interest rate and/or a shift of the investment demand curve.
- Implicit in the preceding point is that the multiplier works in both directions. An increase in initial spending will create a multiple increase in GDP, while a decrease in spending will create a multiple decrease in GDP.

Rationale

The multiplier effect follows from two facts. First, the economy supports repetitive, continuous flows of expenditures and income through which dollars spent by Smith are received as income by Chin and then spent by Chin and received as income by Gonzales, and so on. (This chapter's Last Word presents this idea in a humorous way.) Second, any change in income will change both consumption and saving in the same direction as, and by a fraction of, the change in income.

It follows that an initial change in spending will set off a spending chain throughout the economy. That chain of

*Instructors who cover the full aggregate expenditures (AE) model (Chapter 28) rather than moving directly to aggregate demand and aggregate supply (Chapter 29) may choose to defer this discussion until after the analysis of equilibrium real GDP.

spending, although of diminishing importance at each successive step, will cumulate to a multiple change in GDP. Initial changes in spending produce magnified changes in output and income.

Table 27.3 illustrates the rationale underlying the multiplier effect. Suppose that a $5 billion increase in investment spending occurs. We assume that the MPC is .75, the MPS is .25, and prices remain constant. That is, neither the initial increase in spending nor any of the subsequent increases in spending will cause prices to rise.

The initial $5 billion increase in investment generates an equal amount of wage, rent, interest, and profit income because spending and receiving income are two sides of the same transaction. How much consumption will be induced by this $5 billion increase in the incomes of households? We find the answer by applying the marginal propensity to consume of .75 to this change in income. Thus, the $5 billion increase in income initially raises consumption by $3.75 (= .75 × $5) billion and saving by $1.25 (= .25 × $5) billion, as shown in columns 2 and 3 in Table 27.3.

Other households receive as income (second round) the $3.75 billion of consumption spending. Those households consume .75 of this $3.75 billion, or $2.81 billion, and save .25 of it, or $.94 billion. The $2.81 billion that is consumed flows to still other households as income to be spent or saved (third round). And the process continues, with the added consumption and income becoming less in each round. The process ends when there is no more additional income to spend.

Figure 27.8 shows several rounds of the multiplier process of Table 27.3 graphically. As shown by rounds 1 to 5, each round adds a smaller and smaller violet block to national income and GDP. The process, of course, continues beyond the five rounds shown (for convenience we have simply cumulated the subsequent declining blocks into a single block labeled "All other"). The accumulation of the additional income in each round—the sum of the violet blocks—is the total change in income or GDP resulting from the initial $5 billion change in spending. Because the spending and respending effects of the increase in investment diminish with each successive round of spending, the cumulative increase in output and income eventually ends. In this case, the ending occurs when $20 billion of additional income accumulates. Thus, the multiplier is 4 (= $20 billion/$5 billion).

FIGURE 27.8 The multiplier process (MPC = .75). An initial change in investment spending of $5 billion creates an equal $5 billion of new income in round 1. Households spend $3.75 (= .75 × $5) billion of this new income, creating $3.75 of added income in round 2. Of this $3.75 of new income, households spend $2.81 (= .75 × $3.75) billion, and income rises by that amount in round 3. Such income increments over the entire process get successively smaller but eventually produce a total change of income and GDP of $20 billion. The multiplier therefore is 4 (= $20 billion/$5 billion).

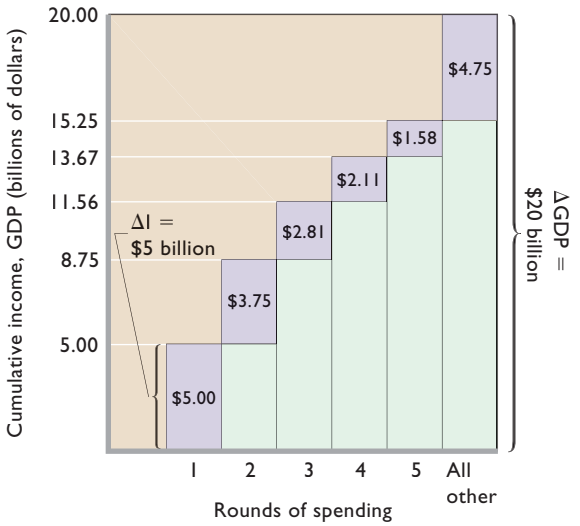


TABLE 27.3 The Multiplier: A Tabular Illustration (in Billions)

	(1) Change in Income	(2) Change in Consumption (MPC = .75)	(3) Change in Saving (MPS = .25)
Increase in investment of **$5.00**	$5.00	$ 3.75	$1.25
Second round	3.75	2.81	.94
Third round	2.81	2.11	.70
Fourth round	2.11	1.58	.53
Fifth round	1.58	1.19	.39
All other rounds	4.75	3.56	1.19
Total	**$20.00**	$15.00	$5.00

The Multiplier and the Marginal Propensities

You may have sensed from Table 27.3 that the fractions of an increase in income consumed (MPC) and saved (MPS) determine the cumulative respending effects of any initial change in spending and therefore determine the size of the multiplier. The MPC and the multiplier are directly related and the MPS and the multiplier are inversely related. The precise formulas are as shown in the next two equations:

$$\text{Multiplier} = \frac{1}{1 - \text{MPC}}$$

Recall, too, that MPC + MPS = 1. Therefore MPS = 1 − MPC, which means we can also write the multiplier formula as

$$\text{Multiplier} = \frac{1}{\text{MPS}}$$

This latter formula is a quick way to determine the multiplier. All you need to know is the MPS.

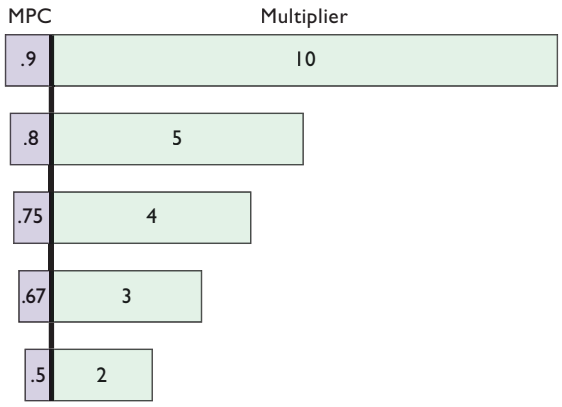
The smaller the fraction of any change in income saved, the greater the respending at each round and, therefore, the greater the multiplier. When the MPS is .25, as in our example, the multiplier is 4. If the MPS were .2, the multiplier would be 5. If the MPS were .33, the multiplier would be 3. Let's see why.

Suppose the MPS is .2 and businesses increase investment by $5 billion. In the first round of Table 27.3, consumption will rise by $4 billion (= MPC of .8 × $5 billion) rather than by $3.75 billion because saving will increase by $1 billion (= MPS of .2 × $5 billion) rather than $1.25 billion. The greater rise in consumption in round 1 will produce a greater increase in income in round 2. The same will be true for all successive rounds. If we worked through all rounds of the multiplier, we would find that the process ends when income has cumulatively increased by $25 billion, not the $20 billion shown in the table. When the MPS is .2 rather than .25, the multiplier is 5 (= $25 billion/$5 billion) as opposed to 4 (= $20 billion/$5 billion.)

If the MPS were .33 rather than .25, the successive increases in consumption and income would be less than those in Table 27.3. We would discover that the process ended with a $15 billion increase in income rather than the $20 billion shown. When the MPS is .33, the multiplier is 3 (= $15 billion/$5 billion). The mathematics works such that the multiplier is equal to the reciprocal of the MPS. The reciprocal of any number is the quotient you obtain by dividing 1 by that number.

A large MPC (small MPS) means the succeeding rounds of consumption spending shown in Figure 27.8 diminish slowly and thereby cumulate to a large change in income. Conversely, a small MPC (a large MPS) causes the increases in consumption to decline quickly, so the cumulative change in income is small. The relationship between the MPC (and thus the MPS) and the multiplier is summarized in Figure 27.9.

FIGURE 27.9 The MPC and the multiplier. The larger the MPC (the smaller the MPS), the greater the size of the multiplier.



WORKED PROBLEMS

W 27.2
Multiplier effect

QUICK REVIEW 27.3

- The multiplier effect reveals that an initial change in spending can cause a larger change in domestic income and output. The multiplier is the factor by which the initial change is magnified: multiplier = change in real GDP/initial change in spending.
- The higher the marginal propensity to consume (the lower the marginal propensity to save), the larger the multiplier: multiplier = 1/(1 − MPC) or 1/MPS.

How Large Is the Actual Multiplier Effect?

The multiplier we have just described is based on simplifying assumptions. Consumption of domestic output rises by the increases in income minus the increases in saving. But in reality, consumption of domestic output increases in each round by a lesser amount than implied by the MPS alone. In addition to saving, households use some of the extra income in each round to purchase additional goods from abroad (imports) and pay additional taxes. Buying imports and paying taxes drains off some of the additional

Squaring the Economic Circle

Humorist Art Buchwald Examines the Multiplier

WASHINGTON—The recession hit so fast that nobody knows exactly how it happened. One day we were the land of milk and honey and the next day we were the land of sour cream and food stamps.

This is one explanation.

Hofberger, the Ford salesman in Tomcat, Va., a suburb of Washington, called up Littleton, of Littleton Menswear & Haberdashery, and said, "Good news, the new Fords have just come in and I've put one aside for you and your wife."

Littleton said, "I can't, Hofberger, my wife and I are getting a divorce."

"I'm sorry," Littleton said, "but I can't afford a new car this year. After I settle with my wife, I'll be lucky to buy a bicycle."

Hofberger hung up. His phone rang a few minutes later.

"This is Bedcheck the painter," the voice on the other end said. "When do you want us to start painting your house?"

"I changed my mind," said Hofberger, "I'm not going to paint the house."

"But I ordered the paint," Bedcheck said. "Why did you change your mind?"

"Because Littleton is getting a divorce and he can't afford a new car."

That evening when Bedcheck came home his wife said, "The new color television set arrived from Gladstone's TV Shop."

"Take it back," Bedcheck told his wife.

"Why?" she demanded.

"Because Hofberger isn't going to have his house painted now that the Littletons are getting a divorce."

The next day Mrs. Bedcheck dragged the TV set in its carton back to Gladstone. "We don't want it."

Gladstone's face dropped. He immediately called his travel agent, Sandstorm. "You know that trip you had scheduled for me to the Virgin Islands?"

"Right, the tickets are all written up."

"Cancel it. I can't go. Bedcheck just sent back the color TV set because Hofberger didn't sell a car to Littleton because they're going to get a divorce and she wants all his money."

Sandstorm tore up the airline tickets and went over to see his banker, Gripsholm. "I can't pay back the loan this month because Gladstone isn't going to the Virgin Islands."

Gripsholm was furious. When Rudemaker came in to borrow money for a new kitchen he needed for his restaurant, Gripsholm turned him down cold. "How can I loan you money when Sandstorm hasn't repaid the money he borrowed?"

Rudemaker called up the contractor, Eagleton, and said he couldn't put in a new kitchen. Eagleton laid off eight men.

Meanwhile, Ford announced it was giving a rebate on its new models. Hofberger called up Littleton immediately. "Good news," he said, "even if you are getting a divorce, you can afford a new car."

"I'm not getting a divorce," Littleton said. "It was all a misunderstanding and we've made up."

"That's great," Hofberger said. "Now you can buy the Ford."

"No way," said Littleton. "My business has been so lousy I don't know why I keep the doors open."

"I didn't realize that," Hofberger said.

"Do you realize I haven't seen Bedcheck, Gladstone, Sandstorm, Gripsholm, Rudemaker or Eagleton for more than a month? How can I stay in business if they don't patronize my store?"

Source: Art Buchwald, "Squaring the Economic Circle," *Cleveland Plain Dealer*, Feb. 22, 1975. Reprinted by permission.

consumption spending (on domestic output) created by the increases in income. So the multiplier effect is reduced and the 1/MPS formula for the multiplier overstates the actual outcome. To correct that problem, we would need to change the multiplier equation to read "1 divided by the fraction of the change in income that is not spent on domestic output." Also, we will find in later chapters that an increase in spending may be partly dissipated as inflation rather than realized fully as an increase in real GDP. This happens when increases in spending drive up prices. The multiplier process still happens, but it induces a much smaller change in real output because, at higher prices, any given amount of spending buys less real output. The Council of Economic Advisers, which advises the U.S. president on economic matters, has estimated that the actual multiplier effect for the United States is about 2. So keep in mind throughout later discussions that the actual multiplier is less than the multipliers in our simple examples. **(Key Question 9)**

Summary

1. Other things equal, there is a direct (positive) relationship between income and consumption and income and saving. The consumption and saving schedules show the various amounts that households intend to consume and save at the various income and output levels, assuming a fixed price level.
2. The *average* propensities to consume and save show the fractions of any total income that are consumed and saved; APC + APS = 1. The *marginal* propensities to consume and save show the fractions of any change in total income that are consumed and saved; MPC + MPS = 1.
3. The locations of the consumption and saving schedules (as they relate to real GDP) are determined by (a) the amount of wealth owned by households, (b) expectations of future prices and incomes, (c) real interest rates, (d) household debt, and (e) tax levels. The consumption and saving schedules are relatively stable.
4. The immediate determinants of investment are (a) the expected rate of return and (b) the real rate of interest. The economy's investment demand curve is found by cumulating investment projects, arraying them in descending order according to their expected rates of return, graphing the result, and applying the rule that investment should be undertaken up to the point at which the real interest rate, i, equals the expected rate of return, r. The investment demand curve reveals an inverse (negative) relationship between the interest rate and the level of aggregate investment.
5. Shifts of the investment demand curve can occur as the result of changes in (a) the acquisition, maintenance, and operating costs of capital goods; (b) business taxes; (c) technology; (d) the stocks of capital goods on hand; and (e) expectations.
6. Either changes in interest rates or shifts of the investment demand curve can change the level of investment.
7. The durability of capital goods, the irregular occurrence of major innovations, profit volatility, and the variability of expectations all contribute to the instability of investment spending.
8. Through the multiplier effect, an increase in investment spending (or consumption spending, government purchases, or net export spending) ripples through the economy, ultimately creating a magnified increase in real GDP. The multiplier is the ultimate change in GDP divided by the initiating change in investment or some other component of spending.
9. The multiplier is equal to the reciprocal of the marginal propensity to save: The greater is the marginal propensity to save, the smaller is the multiplier. Also, the greater is the marginal propensity to consume, the larger is the multiplier.
10. Economists estimate that the actual multiplier effect in the U.S. economy is about 2, which is less than the multiplier in the text examples.

Terms and Concepts

45° (degree) line
consumption schedule
saving schedule
break-even income
average propensity to consume (APC)
average propensity to save (APS)
marginal propensity to consume (MPC)
marginal propensity to save (MPS)
wealth effect
expected rate of return
investment demand curve
multiplier