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## Input Demand: The Capital Market and the Investment Decision



# 11

**CHAPTER OUTLINE**

**Capital, Investment, and Depreciation**

- Capital
- Investment and Depreciation

**The Capital Market**

- Capital Income: Interest and Profits
- Financial Markets in Action
- Mortgages and the Mortgage Market
- Capital Accumulation and Allocation

**The Demand for New Capital and the Investment Decision**

- Forming Expectations
- Comparing Costs and Expected Return

**A Final Word on Capital**

**Appendix: Calculating Present Value**

## Capital, Investment, and Depreciation

### Capital

**capital** Those goods produced by the economic system that are used as inputs to produce other goods and services in the future.

### Tangible Capital

**physical, or tangible, capital** Material things used as inputs in the production of future goods and services. The major categories of physical capital are nonresidential structures, durable equipment, residential structures, and inventories.

### Social Capital: Infrastructure

**social capital, or infrastructure** Capital that provides services to the public. Most social capital takes the form of public works (roads and bridges) and public services (police and fire protection).

### Intangible Capital

**intangible capital** Nonmaterial things that contribute to the output of future goods and services.

**human capital** A form of intangible capital that includes the skills and other knowledge that workers have or acquire through education and training and that yields valuable services to a firm over time.

### Measuring Capital

**capital stock** For a single firm, the current market value of the firm's plant, equipment, inventories, and intangible assets.

Capital is measured in terms of money, or value, as a *stock* value at a point in time.

When we speak of capital, we refer not to money or to financial assets such as bonds and stocks, but instead to the firm's actual capital stock.



Which of the following is the best measure of the capital stock of a business firm?

- a. Book value, or the value of the company on its books.
- b. Historic value, or the trend in value added to a company over its history.
- c. Current market value, or the value of company's capital stock in the market today.
- d. All of the above are equally accurate measures of the capital stock of a business firm.

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## ECONOMICS IN PRACTICE

### Investment Banking, IPOs, and Electric Cars

Automobile production is subject to economies of scale.

In the summer of 2010 Tesla Motors, a new electric car manufacturer, turned to the public to seek capital by becoming a *public company*, with shares offered to the public on a stock exchange.

Managing initial public offerings (IPOs) is one of the functions of investment banks, as they help move capital from households to entrepreneurs with new ideas.

#### THINKING PRACTICALLY

1. Stock prices after an IPO are often quite volatile. Why?

### Investment and Depreciation

**investment** New capital additions to a firm's capital stock. Although capital is measured at a given point in time (a stock), investment is measured over a period of time (a flow). The flow of investment increases the capital stock.

TABLE 11.1 Private Investment in the U.S. Economy, 2009

GDP = \$14,256.3 billion

	Billions of Current Dollars	As a Percentage of Total Gross Investment	As a Percentage of GDP
Nonresidential structures	480.0	29.5	3.4
Equipment and software	908.8	55.8	6.4
Change in private inventories	-120.9	-7.4	-0.8
Residential structures	361.0	22.2	2.5
Total gross private investment	1,628.9	100.0	11.4
- depreciation	-1,538.8	-94.5	-10.8
Net investment = gross investment - depreciation	90.1	5.5	0.6

**depreciation** The decline in an asset's economic value over time.



Which of the following statements is correct?

- a. Net investment equals gross investment plus depreciation.
- b. Gross investment minus depreciation equals net investment.
- c. Capital stock at the end of last year plus gross investment this year equals capital stock at the end of this year.
- d. Net investment equals depreciation.

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## The Capital Market

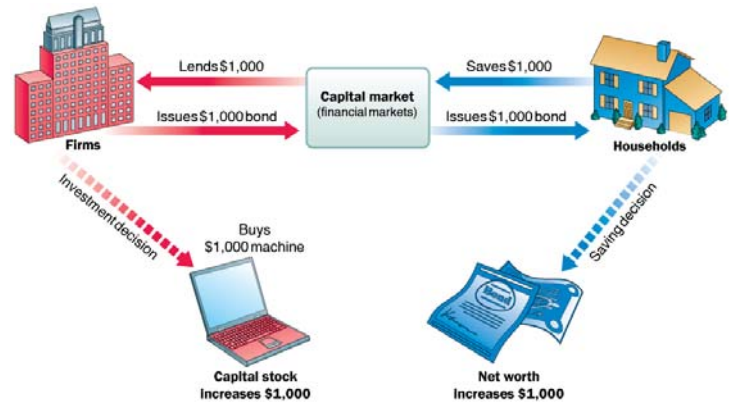
**capital market** The market in which households supply their savings to firms that demand funds to buy capital goods.

Investment by firms is the *demand for capital*. Saving by households is the *supply of capital*. Various financial institutions facilitate the transfer of households' savings to firms that use them for capital investment.

**bond** A contract between a borrower and a lender, in which the borrower agrees to pay the loan at some time in the future, along with interest payments along the way.

An *entrepreneur* is one who organizes, manages, and assumes the risk of a new firm. When entrepreneurs start a new business by buying capital with their own savings, they are both demanding capital and supplying the resources (that is, their savings) needed to purchase that capital.

**financial capital market** The part of the capital market in which savers and investors interact through intermediaries.



▲ FIGURE 11.1 \$1,000 in Savings Becomes \$1,000 of Investment



Which of the following constitutes the *demand* for capital in the capital market?

- Saving.
- Depreciation.
- Investment.
- Financial institutions.

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## Capital Income: Interest and Profits

**capital income** Income earned on savings that have been put to use through financial capital markets.

### Interest

**interest** The payments made for the use of money.

**interest rate** Interest payments expressed as a percentage of the loan.

Sometimes borrowers and lenders agree to periodically adjust the level of interest payments depending on market conditions. These types of loans are called *adjustable* or *floating-rate loans*. (*Fixed rate loans* are loans in which the interest rate never varies.)



How is the decision to undertake a new investment project made?

- The decision is based on the expected depreciation schedule of the new asset.
- The decision to undertake a new investment project is based on the relative contribution of the investment to the capital stock of the firm.
- Projects are undertaken as long as the revenues likely to be realized from the investment are sufficient to cover the interest payments to the household.
- The decision to undertake a new investment project is based on the ability of the firm to raise capital.

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Profits

**common stock** A share of stock is an ownership claim on a firm, entitling its owner to a profit share.

**dividend** Payment made to shareholders of a corporation.

In discussing profit, it is important to distinguish between profit as defined by generally accepted *accounting* principles (GAAP) and *economic* profits as we defined them in Chapter 7.

Functions of Interest and Profit

Interest may function as an incentive to postpone gratification.

Profit serves as a reward for innovation and risk taking.



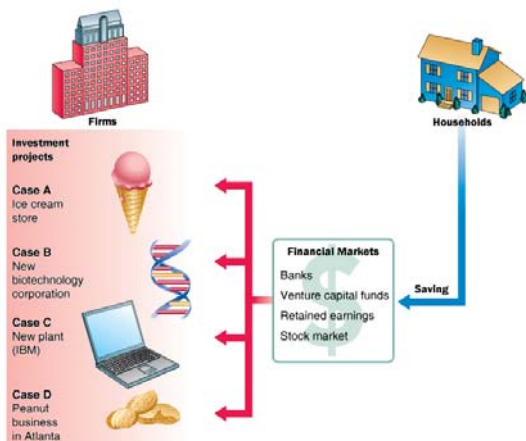
When an entrepreneur starts a new business by buying capital with her own savings, that person is:

- a. Supplying capital but not demanding capital.
- b. Demanding capital but not supplying capital.
- c. Both supplying and demanding capital.
- d. Neither supplying nor demanding capital.

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Financial Markets in Action



▲ FIGURE 11.2 Financial Markets Link Household Saving and Investment by Firms

Case A: Business Loans

Banks have these funds to lend only because households deposit their savings there.

Case B: Venture Capital

Household funds make it possible for firms to undertake investments. If a venture succeeds, those owning shares in the venture capital fund receive substantial profits.

Case C: Retained Earnings

In essence, when a firm retains earnings for investment purposes, it is actually saving on behalf of its shareholders.

Case D: The Stock Market

Households' shares of stock become part of their net worth. The proceeds from stock sales are used to buy plant equipment and inventory. Savings flow into investment, and the firm's capital stock goes up by the same amount as household net worth.



Which of the following mechanisms are used to channel household savings into investment projects?

- a. Business loans
- b. Venture capital
- c. Retained earnings
- d. The stock market
- e. All of the above

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## ECONOMICS IN PRACTICE

### Who Owns Stocks in the United States?

There have always been individuals who have invested in stocks in specific companies through brokerage firms.

In the last decade, we have seen the growth of *day traders*, individuals who buy and sell shares of stock quickly in the hopes of making money.

In terms of value, the bulk of the stock in the United States is held by households through institutions, pension funds, insurance companies, mutual funds, etc.

In the two charts below, we see the extent of institutional holding in two companies:

Microsoft Data Share Statistics		Activision Data Share Statistics	
Avg Vol (3 month):	69,351,300	Avg Vol (3 month):	14,813,700
Avg Vol (10 day):	55,999,100	Avg Vol (10 day):	14,016,300
Shares Outstanding:	8.76B	Shares Outstanding:	1.24B
% Held by Insiders:	12.25%	% Held by Insiders:	58.03%
% Held by Institutions:	64.60%	% Held by Institutions:	36.40%

### THINKING PRACTICALLY

Why do "insiders" hold so much of Activision's shares?

## Capital Accumulation and Allocation

Various connections between households and firms facilitate the movement of savings into productive investment.

Industrialized or agrarian, small or large, simple or complex, all societies exist through time and must allocate resources over time.

In modern industrial societies, investment decisions (capital production decisions) are made primarily by firms. Households decide how much to save, and in the long run, savings limit or constrain the amount of investment that firms can undertake. The capital market exists to direct savings into profitable investment projects.

## Mortgages and the Mortgage Market

Most real estate in the United States is financed by mortgages.

A mortgage, like a bond, is a contract in which the borrower promises to repay the lender in the future.

Until the last decade, most mortgage loans were made by banks and savings and loans.

Most mortgages are now written by mortgage brokers or mortgage bankers who immediately sell the mortgages to a secondary market.

Loans in this market are "securitized"—mortgage-backed securities are sold to investors who want to take different degrees of risk.

In 2007, the mortgage market was hit by a dramatic increase in the number of defaults and foreclosures.

In 2013, many homes remain in foreclosure and the housing market, though better, was still not fully recovered.

## The Demand for New Capital and the Investment Decision

Firms have an incentive to expand in industries that earn positive profits—that is, a rate of return above normal—and in industries in which economies of scale lead to lower average costs at higher levels of output.

Positive profits in an industry stimulate the entry of new firms.

The expansion of existing firms and the creation of new firms both involve investment in new capital.

A perfectly competitive firm invests in capital up to the point at which the marginal revenue product of capital is equal to the price of capital.

## Forming Expectations

Capital produces useful services over *some period of time*, though capital goods do not begin to yield benefits until they are *used*.

### The Expected Benefits of Investments

The investment process requires that the potential investor evaluate the expected flow of future productive services that an investment project will yield.

### The Expected Costs of Investments

The ability to lend at the market rate of interest means that there is an *opportunity cost* associated with every investment project.

The evaluation process involves not only estimating future benefits but also comparing them with the possible alternative uses of the funds required to undertake the project.



Which investment projects are more likely to be funded?

- Only those investment projects that are expected to yield a rate of return higher than the market interest rate.
- Only those investment projects that are expected to yield a rate of return lower than the market interest rate.
- As long as market interest rates are rising, any investment project will be funded, regardless of the market interest rate.
- Only those investment projects that are expected to yield a rate of return exactly equal to the market interest rate.

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## Comparing Costs and Expected Return

**expected rate of return** The annual rate of return that a firm expects to obtain through a capital investment.

The expected rate of return on an investment project depends on the price of the investment, the expected length of time the project provides additional cost savings or revenue, and the expected amount of revenue attributable each year to the project.

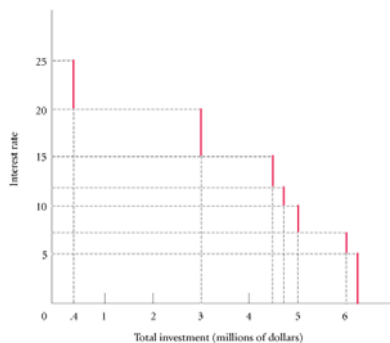
**TABLE 11.2** Potential Investment Projects and Expected Rates of Return for a Hypothetical Firm, Based on Forecasts of Future Profits Attributable to the Investment

Project	(1) Total Investment (Dollars)	(2) Expected Rate of Return (Percent)
A. New computer network	400,000	25
B. New branch plant	2,600,000	20
C. Sales office in another state	1,500,000	15
D. New automated billing system	100,000	12
E. Ten new delivery trucks	400,000	10
F. Advertising campaign	1,000,000	7
G. Employee cafeteria	100,000	5

**FIGURE 11.3** Total Investment as a Function of the Market Interest Rate

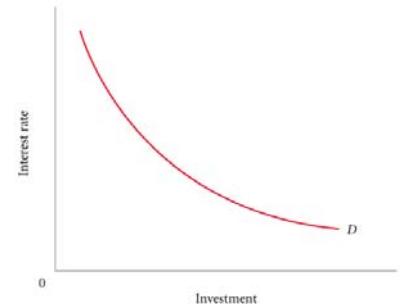
The demand for new capital depends on the interest rate. When the interest rate is low, firms are more likely to invest in new plant and equipment than when the interest rate is high.

This is so because the interest rate determines the direct cost (interest on a loan) or the opportunity cost (alternative investment) of each project.



**FIGURE 11.4** Investment Demand

Lower interest rates are likely to stimulate investment in the economy as a whole, whereas higher interest rates are likely to slow investment.



The most important thing to remember about the investment demand curve is that its shape and position depend critically on the *expectations* of those making the investment decisions.

Recall that we defined an input's marginal revenue product as the additional revenue a firm earns by employing one additional unit of that input, *ceteris paribus*.

A perfectly competitive profit-maximizing firm will keep investing in new capital up to the point at which the expected rate of return is equal to the interest rate.

The firm will continue investing up to the point at which the marginal revenue product of capital is equal to the price of capital, or  $MRP_K = P_K$ .

## A Final Word on Capital

The concept of capital is one of the central ideas in economics.

Capital is produced by the economic system itself.

Capital generates services over time, and it is used as an input in the production of goods and services.

All the analysis done by financial managers seeking to earn a high yield for clients, by managers of firms seeking to earn high profits for their stockholders, and by entrepreneurs seeking profits from innovation serves to channel capital into its most productive uses.

## REVIEW TERMS AND CONCEPTS

bond	human capital
capital	intangible capital
capital income	interest
capital market	interest rate
capital stock	investment
depreciation	physical, or tangible, capital
expected rate of return	social capital, or infrastructure
financial capital market	stock

In general, the present value (*PV*), or present discounted value (*PDV*), of *R* dollars to be received in *t* years is

$$PV = \frac{R}{(1 + r)^t}$$

**TABLE 11A.2** Calculation of Total Present Value of a Hypothetical Investment Project (Assuming *r* = 10 Percent)

END OF...	\$(R)	DIVIDED BY (1 + r) <sup>t</sup>	=	PRESENT VALUE (\$)
Year 1	100	(1.1)		90.91
Year 2	100	(1.1) <sup>2</sup>		82.64
Year 3	400	(1.1) <sup>3</sup>		300.53
Year 4	500	(1.1) <sup>4</sup>		341.51
Year 5	500	(1.1) <sup>5</sup>		<u>310.46</u>
Total present value				1,126.05

## CHAPTER 11 APPENDIX

### Calculating Present Value

#### Present Value

**TABLE 11A.1** Expected Profits from a \$1,200 Investment Project

Year 1	\$100
Year 2	100
Year 3	400
Year 4	500
Year 5	500
All later years	<u>0</u>
Total	1,600



What is the impact of an increase in the interest rate on present value?

- A higher interest rate increases present value.
- A higher interest rate decreases present value.
- None. The interest rate is not a component of present value.
- A higher interest rate makes the present value of an investment project more attractive.

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**Lower Interest Rates, Higher Present Values**

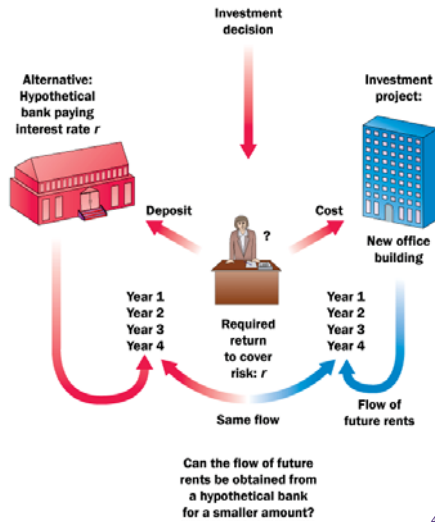
TABLE 11A.3 Calculation of Total Present Value of a Hypothetical Investment Project (Assuming $r = 5$ Percent)			
END OF...	\$(R)	DIVIDED BY $(1 + r)^t$	= PRESENT VALUE (\$)
Year 1	100	$(1.05)$	95.24
Year 2	100	$(1.05)^2$	90.70
Year 3	400	$(1.05)^3$	345.54
Year 4	500	$(1.05)^4$	411.35
Year 5	500	$(1.05)^5$	<u>391.76</u>
Total present value			1,334.59

The basic rule is as follows:

If the present value of an expected stream of earnings from an investment exceeds the cost of the investment necessary to undertake it, the investment should be undertaken.

If the present value of an expected stream of earnings falls short of the cost of the investment, the financial market can generate the same stream of income for a smaller initial investment and the investment should not be undertaken.

► FIGURE 11A.1 Investment Project: Go or No? A Thinking Map



— APPENDIX REVIEW TERMS AND CONCEPTS —

**present discounted value (PDV), or present value (PV)** The present discounted value of  $R$  dollars to be paid  $t$  years in the future is the amount you need to pay today, at current interest rates, to ensure that you end up with  $R$  dollars  $t$  years from now. It is the current market value of receiving  $R$  dollars in  $t$  years.

$$PV = \frac{R}{(1 + r)^t}$$