

# STUDY UNIT NINE

## LONG-TERM CAPITAL FINANCING

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The first subject covered in this study unit is long-term financing, which is accomplished principally by issuance of common stock and bonds. The second subunit addresses methods of optimizing the permanent capital structure of the firm, with an emphasis on the cost of the various types of capital. The third subunit discusses strategies for providing equity holders with a return on their investment through corporate distributions. The final subunit outlines various financial models for evaluating investments.

### 9.1 SOURCES OF LONG-TERM FINANCING

1. A firm may have long-term funding requirements that it cannot, or does not want to, meet using retained earnings. It must therefore issue equity or debt securities to obtain the necessary funding. Certain hybrid forms are also used for long-term financing, e.g., convertible securities.
2. The principal considerations when reviewing financing choices are cost, risk, and the lender's (investor's) view of the financing device.
3. **Common stock.** The common shareholders are the owners of the corporation, and their rights as owners, although reasonably uniform, depend on the laws of the state in which the firm is incorporated. Equity ownership involves risk because holders of common stock are not guaranteed a return and are last in priority in a liquidation. Equity provides the cushion for creditors if any losses occur on liquidation.
  - a. **Advantages of Common Stock to the Issuer**
    - 1) Dividends are not fixed. They are paid from profits when available.
    - 2) There is no fixed maturity date for repayment of the capital.
    - 3) The sale of common stock increases the creditworthiness of the firm by providing more equity.
    - 4) Common stock is frequently more attractive to investors than debt because it grows in value with the success of the firm.
      - a) The higher the common stock value, the more advantageous equity financing is over debt financing.
  - b. **Disadvantages of Common Stock to the Issuer**
    - 1) Control (voting rights) is usually diluted as more common stock is sold.
    - 2) New common stock sales dilute earnings available to existing shareholders because of the greater number of shares outstanding.
    - 3) Underwriting costs are typically higher for common stock issues.
    - 4) Too much equity may raise the average cost of capital of the firm above its optimal level.
    - 5) Cash dividends are not deductible as an expense and thus reduce after-tax cash flows of the firm.

c. Common shareholders ordinarily have **preemptive rights**.

- 1) Preemptive rights give common shareholders the right to purchase any additional stock issuances in proportion to their current ownership.
- 2) If state law or the corporate charter does not provide preemptive rights, the firm may nevertheless sell to the common shareholders in a **rights** offering. Each shareholder is issued a certificate or warrant that is an option to buy a certain number of shares at a fixed price within a given time.
  - a) Until the rights are actually issued, the stock trades **rights-on**, that is, the stock and the rights are not separable. After the rights are received, the stock trades **ex-rights** because the rights can be sold separately. The price of a stock right sold rights-on is

$$\frac{P - S}{N + 1}$$

If: P = value of a share rights-on  
 S = subscription price of a share  
 N = number of rights needed to buy a share

d. **Stock warrants** (certificates evidencing call options to buy stock at a given price within a certain period) may be issued to employees as compensation, or they may be issued with bonds or preferred stock.

- 1) Issuance with other securities may permit the firm to pay a lower interest rate or preferred dividend. Purchasers have an opportunity to share in the growth of the firm as holders of common equity.
- 2) One can **distinguish between warrants and rights** because a warrant is sometimes defined as an option having a relatively long exercise period and an exercise price greater than the market price at the time of its issuance. A right is an option with a relatively brief exercise period and an exercise price lower than the market price at the time of its issuance.
- 3) Most warrants issued with other securities are **detachable**. Thus, they trade separately. When the warrant is in the money (market price exceeds the exercise price), exercise is likely when the warrants are about to expire, dividends on common stock are attractive, or the exercise price is about to increase. Absent these factors, the warrants would not be exercised. Their value on the market would be greater than their value when exercised.
- 4) A virtue of warrants is that they normally generate funds when the firm is successful and most in need of new equity. A disadvantage of warrants is that exercise results in issuance of new equity and a dilution of the holdings of current shareholders.
- 5) Warrants should be distinguished from the call options and put options traded in the markets that were not written by the issuer of the common stock.

e. A stock's **par value** represents legal capital. It is an arbitrary value assigned to stock before the stock is issued. It also represents the maximum liability of a shareholder.

4. **Preferred stock** is a hybrid of debt and equity. It has a fixed charge and increases leverage, but payment of dividends is not a legal obligation.

a. **Advantages of Preferred Stock to the Issuer**

- 1) It is a form of equity and therefore builds the creditworthiness of the firm.
- 2) Control is still held by common shareholders.
- 3) Superior earnings of the firm are usually still reserved for the common shareholders.

- b. **Disadvantages of Preferred Stock to the Issuer**
  - 1) Preferred stock cash dividends paid are not tax deductible. The result is a substantially greater cost relative to bonds because there is not a tax shield.
  - 2) In periods of economic difficulty, accumulated (past) dividends may create major managerial and financial problems for the firm.
- c. **Typical Provisions of Preferred Stock Issues**
  - 1) **Par value.** Par value is the liquidation value, and a percentage of par equals the preferred dividend.
  - 2) **Priority** in assets and earnings. If the firm goes bankrupt, the preferred shareholders have priority over common shareholders.
  - 3) **Accumulation of dividends.** If preferred dividends in arrears are cumulative, they must be paid before any common dividends can be paid.
  - 4) **Convertibility.** Preferred stock issues may be convertible into common stock at the option of the shareholder.
  - 5) **Participation.** Preferred stock may participate with common in excess earnings of the firm. For example, 8% participating preferred stock might pay a dividend each year greater than 8% when the corporation is extremely profitable. But nonparticipating preferred receives no more than the stated rate.
  - 6) **Redeemability.** Some preferred stock may be redeemed at a given time or at the option of the holder or otherwise at a time not controlled by the issuer. This feature makes preferred stock more nearly akin to debt, particularly in the case of **transient preferred stock**, which must be redeemed within a short time (e.g., 5 to 10 years). The SEC requires a separate presentation of redeemable preferred, nonredeemable preferred, and common stock.
  - 7) **Voting rights.** These may be conferred if preferred dividends are in arrears for a stated period.
  - 8) **Callability.** The issuer may have the right to repurchase the stock. For example, the stock may be noncallable for a stated period, after which it may be called if the issuer pays a call premium (an amount exceeding par value).
  - 9) **Maturity.** Preferred stock may have a sinking fund that allows for the purchase of a given annual percentage of the outstanding shares.
- d. Investing in preferred stock rather than bonds provides corporations a tax advantage because of the **dividends received deduction**. At least 70% of the dividends received from preferred stock may be tax deductible, but all bond interest received is taxable.
  - 1) The dividends received deduction also applies to common stock.
  - 2) Because of the tax advantage, nonconvertible preferred stock is held almost entirely by corporations. Individuals can earn higher yields at lower risk by purchasing bonds.
- 5. **Bonds** are long-term debt instruments. They are similar to term loans except that they are usually offered to the public and sold to many investors.
  - a. **Advantages of Bonds to the Issuer**
    - 1) Basic control of the firm is not shared with the debtholder.
    - 2) Cost of debt is limited. Bondholders usually do not participate in the superior earnings of the firm.
    - 3) Ordinarily, the expected yield of bonds is lower than the cost of stock.
    - 4) Interest paid on debt is tax deductible.
    - 5) Debt may add substantial flexibility in the financial structure of the corporation through the use of call provisions.

b. **Disadvantages of Bonds to the Issuer**

- 1) Debt has a fixed charge. If the earnings of the firm fluctuate, the risk of insolvency is increased by the fixed interest obligation.
- 2) Debt adds risk to a firm. Shareholders will consequently demand higher capitalization rates on equity earnings, which may result in a decline in the market price of stock.
- 3) Debt usually has a maturity date.
- 4) Debt is a long-term commitment, a factor that can affect risk profiles. Debt originally appearing to be profitable may become a burden and drive the firm into bankruptcy.
- 5) Certain managerial prerogatives are usually surrendered in the contractual relationship defined in the bond indenture. For example, specific ratios may have to remain above a certain level during the term of the loan.
- 6) The amount of debt financing available to the individual firm is limited. Generally accepted standards of the investment community will usually dictate a certain debt-equity ratio for a firm. Beyond this limit, the cost of debt may rise rapidly, or debt financing may not be available.
- 7) Loan covenants sometimes include an **acceleration clause** that allows the lender to demand early payment of the entire balance or additional collateral under certain circumstances, such as failure to make timely payments, filing for bankruptcy, or not maintaining key ratios at a certain level.

c. Interest paid on bonds is calculated as follows: face amount  $\times$  stated interest rate

- 1) Compound interest in any year may be found using the following formula:  

$$P = C (1 + r)^t$$
- 2) P is the future amount, C is the initial investment, r is the interest rate, and t is the number of years invested.

d. The **bond indenture** is the contractual arrangement between the issuer and the bondholders. It contains restrictive covenants intended to prevent the issuer from taking actions contrary to the interests of the bondholders. A trustee, often a bank, is appointed to ensure compliance.

- 1) **Call provisions** give the corporation the right to redeem bonds. If interest rates decline, the company can call high-interest bonds and replace them with low-interest bonds.
- 2) Bonds are **putable** or redeemable if the holder has the right to exchange them for cash. This option is usually not activated unless the issuer takes a stated action, for example, greatly increasing its debt or being acquired by another entity.
- 3) **Sinking fund** requirements provide for the firm to retire a certain portion of its bonds each year or to set aside money for repayment in the future. Such terms increase the probability of repayment for bondholders but require the use of capital by the firm.
- 4) The issuer may be required to maintain its financial ratios, e.g., times-interest-earned, at specified levels.
- 5) Dividends may be limited if earnings do not meet specified requirements.
- 6) The amount of new bonds issued may be restricted to a percentage of bondable property (fixed assets).
- 7) Bonds may be issued at a premium or discount, depending upon whether they are issued for more than their face amount (premium) or less (discount).

### e. Types of Bonds

- 1) Securitization
  - a) **Mortgage bonds** are backed by specific assets, usually real estate.
  - b) **Debentures** are backed by the borrower's general credit, not by specific collateral.
  - c) **Collateral trust bonds** are backed by specific securities.
  - d) **Guaranty bonds** are guaranteed by a third party, e.g., the parent firm of the issuer.
- 2) Maturity Pattern
  - a) A **term bond** has a single maturity date at the end of its term.
  - b) A **serial bond** matures in stated amounts at regular intervals.
- 3) Ownership
  - a) **Registered bonds** are issued in the name of the owner. Interest payments are sent directly to the owner. When the owner sells registered bonds, the bond certificates must be surrendered and new certificates issued.
  - b) **Bearer bonds**, also called coupon bonds, are bearer instruments. Whoever presents the periodic interest coupons is entitled to payment.
- 4) Priority
  - a) **Subordinated debentures** and **second mortgage bonds** are junior securities with claims inferior to those of senior bonds.
- 5) Repayment Provisions
  - a) **Income bonds** pay interest contingent on the debtor's profitability.
  - b) Some bond indentures require the issuer to establish a **sinking fund** (a long-term investment) to set aside assets for the repayment of interest and principal. The amounts transferred plus the revenue earned on the investments provide the necessary funds.
  - c) **Revenue bonds** are issued by governmental units and are payable from specific revenue sources.
  - d) **Participating bonds** share in excess earnings of the debtor as defined in the bond indenture.
  - e) **Indexed bonds** (purchasing power bonds) pay interest that is indexed to a measure of general purchasing power, such as the Consumer Price Index.
- 6) Valuation
  - a) **Variable rate bonds** pay interest that is dependent on market conditions.
  - b) **Zero-coupon bonds** pay no interest but sell at a deep discount.
    - i) The need to reinvest the periodic payments from normal bonds makes their final return uncertain because future reinvestment rates are uncertain. But investors know the exact return on a zero-coupon bond. Investors might therefore be willing to pay a premium (an amount greater than the maturity amount discounted at the market rate) for them, which in turn might lead firms to issue them.
    - ii) The lack of interest payments means the firm faces no additional insolvency risk from the issue until it matures.

- c) **Commodity-backed bonds** are payable at prices related to a commodity such as gold.
  - d) **High-yield bonds**, also called non-investment grade bonds or junk bonds, are issued to finance leveraged buyouts and mergers. Their high yields are commensurate with their high degree of risk. They also are issued by troubled firms. They exploit the large tax deductions for interest paid by entities with high debt ratios.
- 7) Redemption Provisions
  - a) **Callable bonds** may be repurchased by the issuer before maturity.
  - b) **Redeemable bonds** may be presented for payment by the creditor prior to the maturity date. The bonds usually are redeemable only after a specified period.
  - c) **Convertible bonds** may be converted into equity securities of the issuer at the option of the holder (buyer) under the conditions specified in the bond indenture.
- 8) International Bonds
  - a) **Foreign bonds** are denominated in the currency of the nation in which they are sold.
  - b) **Eurobonds** are denominated in a currency other than that of the nation where they are sold.
    - i) Foreign bonds issued in the United States and denominated in dollars must be registered with the SEC, but such extensive disclosure is not required in most European nations. Thus, an American firm may elect to issue Eurobonds denominated in dollars in a foreign nation because of the convenience of not having to comply with registration requirements.
- f. **Bond ratings** play a role in bond yields. The correlation between the bond rating (based on risk) and the interest rate that is attractive to an investor tends to be inverse. A high rating (low risk) will lead to a lower interest rate.
  - 1) The two largest bond rating agencies are Standard and Poor's and Moody's.
  - 2) **Investment-grade bonds** are the safest and receive the highest ratings. Some fiduciary organizations (such as banks and insurance companies) are only allowed to invest in investment-grade bonds.
  - 3) **Speculative-grade bonds** are riskier than investment-grade bonds.
  - 4) The bond rating agencies base their evaluations on the profitability of the issuing corporation, stability of the industry, competitive position, and the usual financial ratios.
- 6. **American depository receipts (ADRs)** are ownership rights in foreign corporations.
  - a. Foreign stocks are deposited with a large U.S. bank, which in turn issues ADRs representing ownership in the foreign shares. The ADR shares then trade on a U.S. stock exchange, and the firm's original shares trade on a foreign stock market.
  - b. ADRs permit foreign firms to increase their development of a U.S. shareholder base.
  - c. Foreign firms want to participate in the U.S. equity market for a number of reasons, including a desire to increase liquidity of stocks and to raise equity capital without putting pressure on the stock price in the home market.

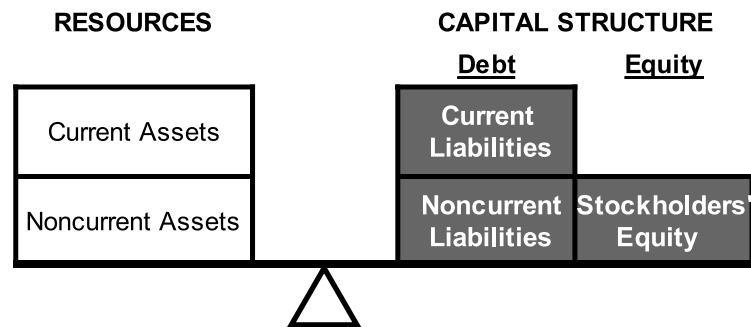
7. **Dividend reinvestment plans (DRPs).** Any dividends due to shareholders are automatically reinvested in shares of the same corporation's common stock. Broker's fees on such purchases of stock are either zero (the costs absorbed by the corporation) or only a few cents per shareholder because only one purchase is made and the total fee is divided among all shareholders participating.
8. **Intermediate-term financing** involves debt issues with approximate maturities of greater than 1 but fewer than 10 years. The principal types of intermediate-term financing are term loans and lease financing. Major lenders under term agreements are commercial banks, life insurance companies, and, to some extent, pension funds.
  - a. **Term loans.** One possible feature of a term loan is tying the interest payable to a variable rate. This **floating rate**, usually stated as some percentage over the prime, may result in extremely high borrowing costs.
    - 1) This risk must be traded off against
      - a) The need of the firm to obtain the loan
      - b) The flexibility inherent in term borrowing
      - c) The ability of the firm to borrow in the capital market
      - d) Other available types of debt financing
      - e) The amount of privacy desired
        - i) Term loans are private contracts between private firms, but long-term debt securities usually involve the SEC and massive disclosure.
    - 2) Variable or floating rate loans are advantageous to lenders because they permit better matching of interest costs and revenues. The market values of these loans also tend to be more stable than those for fixed rate loans.
      - a) The disadvantages include a heightened risk of default, losses of expected revenues if interest rates decline or if market rates rise above the ceiling specified in the agreement, and the difficulty of working with a more complex product.
  - b. **Lease financing** must be analyzed by comparing the cost of owning to the cost of leasing. Leasing has become a major means of financing because it offers a variety of tax and other benefits. If leases are not accounted for as installment purchases, they provide off-balance-sheet financing. Thus, under an operating lease, the lessee need not record an asset or a liability, and rent expense rather than interest is recognized. The following are three principal forms of leases:
    - 1) A **sale-leaseback** is a financing method. A firm seeking financing sells an asset to an investor (creditor) and leases the asset back, usually on a noncancelable lease. The lease payments consist of principal and interest paid by the lessee to the lessor.
    - 2) **Operating leases** usually provide for financing and maintenance services.
    - 3) **Capital leases (or financial leases)**, which do not provide for maintenance services, are noncancelable and fully amortize the cost of the leased asset over the term of the basic lease contract; i.e., they are installment purchases.
9. **Maturity matching** (equalizing the life of an asset acquired with the debt instrument used to finance it) is an important factor in choosing the source of funds. Financing long-term assets with long-term debt allows the firm to generate sufficient cash flows from the assets to satisfy obligations as they mature.

10. **Initial public offerings (IPOs).** A firm's first issuance of securities to the public is an IPO. The process by which a closely held corporation issues new securities to the public is called **going public**. When a firm goes public, it issues its securities on a **new issue** or **IPO market** (a primary market).
- a. **Advantages of Going Public**
    - 1) The ability to raise additional funds
    - 2) The establishment of the firm's value in the market
    - 3) An increase in the liquidity of the firm's stock
  - b. **Disadvantages of Going Public**
    - 1) Costs of the reporting requirements of the SEC and other agencies
    - 2) Access to the firm's operating data by competing firms
    - 3) Access to net worth information of major shareholders
    - 4) Limitations on self-dealing by corporate insiders
    - 5) Pressure from outside shareholders for earnings growth
    - 6) Stock prices that do not accurately reflect the true net worth of the firm
    - 7) Loss of control by management as ownership is diversified
    - 8) Need for improved management control as operations expand
    - 9) Increased shareholder servicing costs
  - c. To have its stock listed (have it traded on a stock exchange), the firm must apply to a stock exchange, pay a fee, and fulfill the exchange's requirements for membership. Included in the requirements for membership is disclosure of the firm's financial data.
  - d. The firm's next step is to prepare and file an SEC registration statement and prospectus, unless an exemption is available.
    - 1) A **registration statement** is a complete disclosure to the SEC of all material information with respect to the issuance of the specific securities.
    - 2) A **prospectus** must be furnished to any interested investor. Its purpose is to supply sufficient facts to make an informed investment decision. The prospectus contains material information (financial and otherwise) with respect to the offering and the issuer.
    - 3) The entire allotment of securities ordinarily is made available for purchase on the effective date of the registration statement.
  - e. In an IPO, the value of a stock is determined by an underwriter on the basis of a number of factors, including general market conditions, book value of the stock, earning potential of the firm, and the P-E ratios of competing firms. Nevertheless, such arbitrary assignments of value are rarely accurate, and a major change in stock price often occurs in the week of the IPO.



## 9.2 OPTIMAL CAPITALIZATION AND COST OF CAPITAL

1. The **financial structure** of a firm encompasses the right-hand side of the balance sheet, which describes how the firm's assets are financed.



2. Capital structure is the **permanent financing** of the firm and is represented primarily by
  - a. **Long-term debt**, which is the creditor interest in the firm.
    - 1) The firm is contractually obligated to repay debtholders. The terms of repayment (i.e., timing of interest and principal) are specified in the debt agreement.
    - 2) As long as the return on debt capital exceeds the amount of interest paid, the use of debt financing is advantageous to a firm. This is due to the fact that interest payments on debt are tax-deductible.
    - 3) Most firms renew (roll over) their long-term obligations. Thus, long-term debt is often effectively permanent.
  - b. **Preferred Stock**
  - c. **Common Equity**
    - 1) Common stock
    - 2) Additional paid-in capital
    - 3) Retained earnings
3. The following factors influence financial structure:
  - a. Growth rate and stability of future sales
  - b. Competitive structures in the industry
  - c. Asset makeup of the individual firm
  - d. Attitude of owners and management toward risk
  - e. Control position of owners and management
  - f. Lenders' attitudes toward the industry and a particular firm
  - g. Tax considerations
4. **Leverage** is the attempt of the firm to borrow money at a stated rate with the intent to provide a greater return on the funds than the cost of borrowing them. This allows the firm's potential returns (positive and negative) to be magnified. Traditionally, firms with significant debt (i.e., leverage) enjoy higher returns on equity.
  - a. Leverage, by definition, **creates financial risk**, which relates directly to the question of the cost of capital. The more leverage, the higher the financial risk, and the higher the cost of debt capital.
  - b. **Earnings per share** will ordinarily be higher if debt is used to raise capital instead of equity, provided that the firm is not over-leveraged. The reason is that the cost of debt is lower than the cost of equity because interest is tax deductible. However, the prospect of higher EPS is accompanied by greater risk to the firm resulting from required interest costs, creditors' liens on the firm's assets, and the possibility of a proportionately lower EPS if sales volume fails to meet projections.

- c. The **degree of financial leverage (DFL)** is the percentage change in earnings available to common shareholders that is associated with a given percentage change in net operating income.

$$d. \quad DFL = \frac{\% \Delta \text{ in net income}}{\% \Delta \text{ in net operating income}} = \frac{EBIT}{EBIT - I}$$

- 1) Net income means earnings available to common shareholders.
- 2) Net operating income equals earnings before interest and taxes (EBIT).
- 3) I equals interest expense. If the firm has preferred stock, the second formula is further modified as follows (if P = preferred dividends and T is the tax rate):

$$\frac{EBIT}{EBIT - I - [P \div (1 - T)]}$$

- 4) The greater the DFL, the riskier the firm.
  - e. If the return on assets exceeds the cost of debt, additional leverage is favorable.
5. **Operating leverage** concerns the extent to which fixed costs are used in the production process. A firm with a high percentage of fixed costs is more risky than a firm in the same industry that relies more heavily on variable production costs.

- a. The **degree of operating leverage (DOL)** is the change in net operating income (EBIT) resulting from a percentage change in revenues. It measures the extent to which a firm incurs fixed rather than variable costs in operations. Thus, the greater the DOL, the greater the risk of loss when revenues decline and the greater the reward when revenues increase.

$$1) \quad \text{Operating leverage} = \frac{\% \Delta \text{ in net operating income}}{\% \Delta \text{ in revenues}}$$

- 2) The assumption is that firms with larger investments (and greater fixed costs) will have higher contribution margins and more operating leverage. Thus, as they invest in better and more expensive equipment, their variable production costs should decrease.

a) EXAMPLE: If revenues increase by 40% and net operating income increases by 50%, the DOL is 1.25 (50% ÷ 40%).

- 3) If Q equals the number of units sold, P is unit price, V is unit variable cost, and F is fixed cost, the DOL also can be calculated by dividing total contribution margin by net operating income (total contribution margin – fixed cost). This formula is derived from the formula above, but the derivation is not given.

$$\frac{Q(P - V)}{Q(P - V) - F} = \frac{\text{Total contribution margin (TCM)}}{\text{Net operating income}}$$

- 4) The DOL is calculated with respect to a given **base level of revenues**. The significance of the DOL is that a given percentage increase in revenues yields a percentage increase in net operating income equal to the DOL for the base revenues level times the percentage increase in revenues.

- b. The **degree of total leverage (DTL)** combines the DFL and the DOL. It equals the degree of financial leverage times the degree of operating leverage. Thus, it also equals the percentage change in net income that is associated with a given percentage change in revenues.

$$1) \quad DTL = DFL \times DOL = \frac{\% \Delta \text{ in net income}}{\% \Delta \text{ in net operating income}} \times \frac{\% \Delta \text{ in net operating income}}{\% \Delta \text{ in revenues}}$$

$$= \frac{\% \Delta \text{ in net income}}{\% \Delta \text{ in revenues}}$$

- a) **EXAMPLE:** If net income increases 15% with a 5% increase in revenues, DTL is 3.0.
- 2) Firms with a high degree of operating leverage do not usually employ a high degree of financial leverage and vice versa. One of the most important considerations in the use of financial leverage is operating leverage.
- a) **EXAMPLE:** A firm has a highly automated production process. Because of automation, the degree of operating leverage is 2. If the firm wants a degree of total leverage not exceeding 3, it must restrict its use of debt so that the degree of financial leverage is not more than 1.5. If the firm had committed to a production process that was less automated and had a lower DOL, more debt could be employed, and the firm could have a higher degree of financial leverage.
6. A firm's **cost of capital** is the price, in both dollar terms and opportunity cost, of raising funds.
- a. Managers must know the firm's cost of capital when making investment (long-term funding) decisions because investments with a return higher than the cost of capital will increase the value of the firm (shareholders' wealth).
- b. The theory underlying the cost of capital applies to new, long-term funding because long-term funds finance **long-term investments**. Long-term investment decisions are typically made using the cost of capital to discount future cash flows.
- 1) Working capital and other temporary needs are met with short-term funds. Thus, cost of capital is of less concern for short-term funding.
7. The **weighted-average cost of capital (WACC)** weights the cost of each debt and equity component by the percentage of that component in the financial structure.
- a. The **cost of debt** is the after-tax interest rate of the debt.
- $$\text{Interest rate} \times (1 - \text{Marginal tax rate})$$
- 1) The after-tax rate is used because interest paid is a tax deduction to the firm. Hence, as tax rates go up, debt becomes a more attractive financing option.
- b. The **cost of preferred stock** includes flotation costs necessary to offer the stock to the investing public.
- $$\text{Dividend per share} \div \text{Net issuance cost per share}$$
- 1) Because preferred dividends paid are not deductible by the firm, the tax rate is not taken into account.

- c. The **cost of new external common equity** factors in the return that potential shareholders expect. It is higher than the cost of retained earnings because of stock flotation costs.

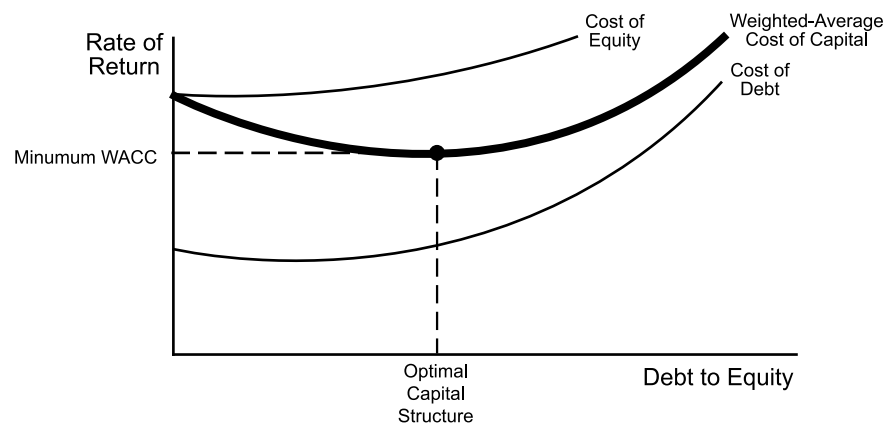
$$\text{Dollar return demanded by investors} \div \text{Net issuance cost per share}$$

- 1) An issue of new common stock is used mostly by young, growing companies. Mature firms rarely issue new common stock to the general public because of the issue costs involved and the depressing influence a new issue can have on the stock's price.
- d. The **cost of retained earnings** is an opportunity cost, i.e., the rate that investors can earn elsewhere on investments of comparable risk.
  - 1) If the firm is not able to generate a shareholder's required rate of return, the retained earnings should be paid out in the form of dividends so that the shareholders can find their own, higher-return investments.
- e. **Providers of equity capital** are exposed to **more risk** than are lenders because the firm is not obligated to pay them a return. Also, in case of liquidation, equity investors trail creditors in priority.
  - 1) Thus, **equity financing is more expensive than debt** because equity investors require a higher return to compensate for the greater risk assumed.
- f. **EXAMPLE:** Note that short-term debt is not part of a firm's capital structure.

	(1)	(2)	(3)	(4)	(5)	(3) × (5)
Component	Carrying Amount	Interest or Dividend Rate	After-Tax Rate or Expected Return	Market Value	Weight (Proportion of Total Market Value)	Weighted-Average Cost of Capital
Bonds Payable	\$ 2,000,000	8.5%	7.4%	\$ 2,200,000	0.1000	0.7400%
Preferred Stock	4,000,000	14.0%	10.0%	4,600,000	0.2091	2.0909%
Common Stock	12,000,000		16.0%	14,000,000	0.6364	10.1818%
Retained Earnings	1,200,000		16.0%	1,200,000	0.0545	0.8727%
Totals	<u>\$19,200,000</u>			<u>\$22,000,000</u>	<u>1.0000</u>	<u>13.8855%</u>

8. Standard financial theory provides a model for the **optimal capital structure** of every firm. This model holds that shareholder wealth-maximization results from **minimizing the weighted-average cost of capital**.

- a. Thus, the focus of management should **not** be on **maximizing earnings per share**. EPS can be increased by taking on debt, but debt increases risk.
  - 1) The optimal capital structure usually involves some debt but not 100% debt.
- b. The relevant relationships are depicted below:



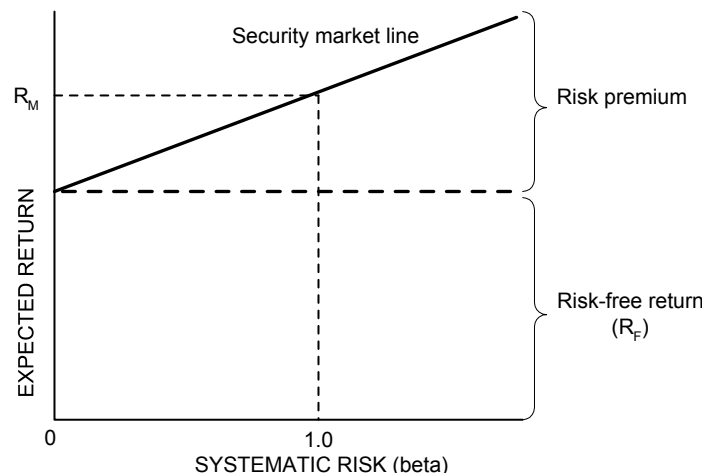
- c. Ordinarily, firms cannot identify this optimal point precisely. Thus, they should attempt to find an optimal range for the capital structure.

d. The **required rate of return on equity capital (R)** can be estimated as follows:

- 1) The **capital asset pricing model (CAPM)** adds the risk-free rate (determined by government securities) to the product of the beta coefficient (a measure of the firm's risk) and the difference between the market return and the risk-free rate. Below is the basic equilibrium equation for the CAPM.

$$R = R_F + \beta(R_M - R_F)$$

- a) The **market risk premium** ( $R_M - R_F$ ) is the amount above the risk-free rate required to induce average investors to enter the market.
- b) The **beta coefficient** ( $\beta$ ) of an individual stock is the correlation between the volatility (price variation) of the stock market and the volatility of the price of the individual stock.
  - i) **EXAMPLE:** If an individual stock rises 10% and the stock market 10%, the beta coefficient is 1.0. If the stock rises 15% and the market only 10%, beta is 1.5.
  - ii) The CAPM is a model that uses just one systematic risk factor to explain the asset's return. That factor is the expected return on the market portfolio, i.e., the market-valued weighted average return for all securities available in the market.
- c) **EXAMPLE:** Assuming a beta of 1.20, a market rate of return of approximately 17%, and an expected risk-free rate of 12%, the required rate of return on equity capital is  $.12 + 1.20 (.17 - .12)$ , or 18%.
- d) The graph of this equation (with interest rates plotted on the vertical axis and betas on the horizontal axis) is the **security market line (SML)**. The slope of the SML equals the market risk premium, and the y-intercept is the risk-free rate.



- e) The **risk premium** is the difference in expected rates of return on a risky asset and a less risky asset.
- 2) **Arbitrage pricing theory (APT)** is based on the assumption that an asset's return is based on multiple systematic risk factors. In contrast, the CAPM is a model that uses just one systematic risk factor.
    - a) The difference between actual and expected returns on an asset is attributable to systematic and unsystematic risks.
      - i) **Unsystematic risk** (also called company-specific risk or diversifiable risk) is specific to a particular asset and can be eliminated by sufficient diversification.

- ii) However, **systematic risk** (also called market risk or nondiversifiable risk) affects many assets and is undiversifiable.
- iii) Thus, investors must be paid a risk premium to compensate them for systematic (market) risk.
- b) Accordingly, APT provides for a separate beta and a separate risk premium for each systematic risk factor identified in the model. Examples of the many potential systematic risk factors are the gross domestic product (GDP), inflation, and real interest rates. The APT for a three-factor model may be formulated as follows:

$$R = R_F + \beta_1 k_1 + \beta_2 k_2 + \beta_3 k_3$$

If:  $R$  = expected rate of return  
 $R_F$  = risk-free rate  
 $\beta_{1,2,3}$  = individual factor beta coefficients  
 $k_{1,2,3}$  = individual factor risk premiums

- c) EXAMPLE: Assume  $R_F = 9\%$  and
 

$k_1 = 2\%$	$\beta_1 = .6$
$k_2 = 5\%$	$\beta_2 = .4$
$k_3 = 8\%$	$\beta_3 = .2$

Applying the above values, the expected rate of return is  $.09 + (.6)(.02) + (.4)(.05) + (.2)(.08)$ , or 13.8%.

- 3)  $R$  also may be estimated by adding a percentage to the firm's long-term cost of debt. A 3% to 5% premium is frequently used.
- 4) The **dividend growth model** estimates the cost of retained earnings using the dividends per share, the expected growth rate, and the market price. To justify retention of earnings, management must expect a return at least equal to the dividend yield plus a growth rate.

- a) The formula for calculating the cost of retained earnings is

$$R = \frac{D_1}{P_0} + G$$

If:  $P_0$  = current price  
 $D_1$  = next dividend  
 $R$  = required rate of return  
 $G$  = growth rate in dividends per share (but the model assumes that the dividend payout ratio, retention rate, and therefore the EPS growth rate are constant)

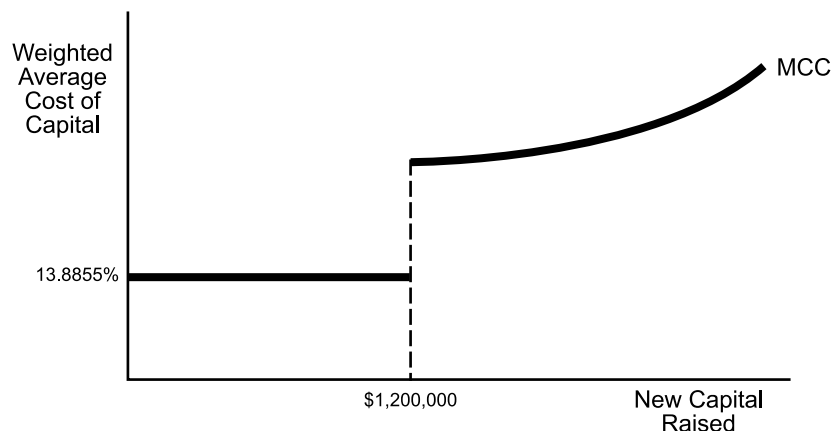
- i) EXAMPLE: If a company's dividend is expected to be \$4 while the market price is \$50 and the dividend is expected to grow at a constant rate of 6%, the required rate of return is 14% ( $\$4 \div \$50 + .06$ ).
- b) To determine the **cost of new common stock** (external equity), the model is altered to incorporate the flotation cost. As the **flotation cost** rises,  $R$  increases accordingly.

$$R = \frac{D_1}{P_0(1 - \text{Flotation cost})} + G$$

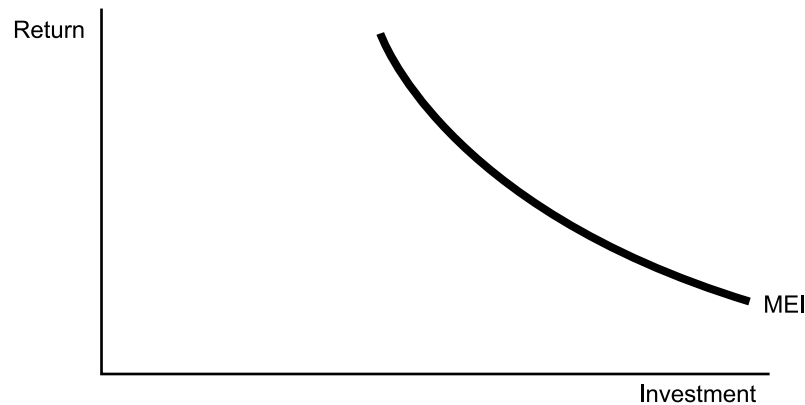
- c) The dividend growth model is also used for **stock price evaluation**. The formula can be restated in terms of  $P_0$  as follows:

$$P_0 = \frac{D_1}{R - G}$$

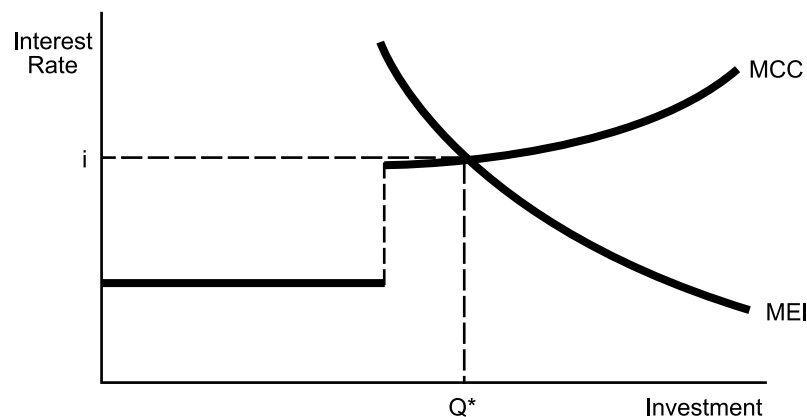
- d) The stock price is affected by the **dividend payout ratio** because some investors may want capital gains, but others may prefer current income. Thus, investors will choose stocks that give the proper mix of capital gains and dividends.
- e. A firm cannot continue to raise unlimited amounts of new funds at its historical cost of capital. At some point, the costs of servicing new sources of funding will increase a firm's cost of capital.
- 1) The **marginal cost of capital (MCC)** is the cost to a firm of the next dollar of new capital raised.
  - 2) EXAMPLE: The company depicted in the schedule in item 2.f. on page 12 has determined that it requires \$2,000,000 of new funding to fulfill its plans.
    - a) The simplest source of new funding is retained earnings, but they are insufficient. The additional \$800,000 will have to come from another source.
      - i) If the company issues new bonds, the firm's debt-to-equity ratio will be increased, revealing the company to be a riskier investment, forcing a higher interest rate than the one on the currently outstanding bonds.
      - ii) If the company issues new preferred stock, the investors will demand a priority dividend.
      - iii) If the company issues new preferred or common stock, issue costs will be involved.
    - b) Clearly, the company's cost of capital will be its current marginal rate of 13.8855% for the \$1,200,000 of retained earnings, but will shift to a higher marginal rate for the next dollar after that.
  - 3) This phenomenon can be depicted as follows:



- 4) The **marginal efficiency of investment** is the decrease in return on additional dollars of capital investment because the most profitable investments are made initially.



- a) Combining the MCC and MEI curves highlights the equilibrium investment level for the firm ( $Q^*$ ) at a particular interest rate ( $i$ ) and given capital budget.



9. The foregoing outline describes the traditional approach to analysis of capital structure. A contrary view is asserted in the **Modigliani-Miller Hypothesis**, a proposition largely responsible for winning Nobel prizes for its authors. It states that, in an efficient capital market with no tax distortions, the relative proportion of debt and equity in a corporate capitalization does not affect the total market value of the firm, which is dependent on its profitability and risk. Thus, no unique capital structure maximizes firm value.
- In a world with no taxes, leverage raises the required rate of return on equity by increasing the risk of equity. In other words, the weighted average cost of capital is constant because the cost of equity will increase as the cost of debt decreases. The implication is that issuing debt is not advantageous merely because its cost is low. Nevertheless, corporate financial officers and financial engineers continue to search for market inefficiencies and tax-related opportunities that can lower a corporation's cost of capital in the real world.
  - Dividends play no role in the Modigliani-Miller analysis because the cost of capital is the same regardless of the source.
  - The hypothesis also assumes that there are no transaction costs for selling equity or debt securities.



### 9.3 DIVIDEND POLICY

1. **Dividend policy** determines what portion of a corporation's net income is distributed to shareholders and what portion is retained for reinvestment.
  - a. A high dividend rate means a slower rate of growth, and a high growth rate usually means a low dividend rate. A growing company keeps its profits for reinvestment in fixed assets or R&D. Therefore, growing companies pay small dividends if any. On the other hand, a high dividend correlates to a stable cash cow company.
  - b. Because both a high growth rate and a high dividend rate may be desirable, the financial manager attempts to determine the balance of dividend and growth rates that maximizes the price of the firm's shares.
  - c. Normally, corporations try to maintain a stable level of dividends, even though profits may fluctuate considerably, because many shareholders buy stock with the expectation of receiving a certain dividend every year. Hence, management tends not to raise dividends if the payout cannot be sustained. For example, a firm with fluctuating earnings might pay out \$1 every year whether earnings per share are \$10 (10% payout rate) or \$1 (100% payout rate).
    - 1) The tendency toward stability is the basis for the **information content or signaling hypothesis**: A change in dividend policy is a signal to the market regarding management's forecast of future earnings. The firm's stock price tends to increase (decrease) if dividends are unexpectedly high (low).
    - 2) Another possible reason for changes in stock prices after changes in dividend policy is the **clienteles effect**.
      - a) Some shareholders, e.g., retired people, desire immediate income. However, other shareholders, e.g., those in the highest tax bracket, may prefer a low payout. These shareholders may not need income and therefore favor capital gains, which may be taxed at a lower rate and are deferred until shares are sold. Furthermore, taxes may be avoided altogether by the beneficiaries if the shareholder dies.
      - b) In accordance with the clienteles effect, a firm attracts investors that prefer its dividend policy. Changes in that policy are likely to cause investor switching due to market inefficiencies (brokers' fees, capital gains taxes).
  - d. No theoretical agreement exists concerning the optimal dividend policy.
    - 1) Some theorists argue that capital gains are riskier than dividends and that a high dividend payout will maximize the stock price.
    - 2) A second position is that a low dividend payout is preferable for tax reasons.
    - 3) Still another position is that dividend policy is irrelevant to the firm's valuation. According to this view, espoused by Modigliani and Miller, the value of the firm is determined solely by its earning capacity and its risk. Whether earnings are paid out or retained is not important because most investors reinvest their dividends in the same or similar companies. Moreover, risk is a function of the firm's future cash flows, not its dividend payout.
2. Other factors influence a company's dividend policy.
  - a. **Legal restrictions.** Dividends ordinarily cannot be paid out of paid-in capital. A corporation must have a credit balance in its retained earnings account.
  - b. **Rate of growth.** A firm with a faster growth rate will have a greater need to finance that growth with retained earnings. Thus, fast-growing firms usually have lower dividend payout ratios. Shareholders hope for large future capital gains.
  - c. **Cash position.** Regardless of a firm's earnings record, cash must be available before a dividend can be paid. No dividend can be declared if all of a firm's earnings are tied up in receivables and inventories.

- d. **Restrictions in debt agreements.** Bond indentures and other debt agreements often place restrictions on the amount of dividends that a firm can declare.
- e. **Accumulated earnings tax.** An accumulated earnings tax is assessed on a corporation if it has accumulated retained earnings beyond its reasonably expected needs. Thus, tax law indirectly penalizes shareholders who postpone paying taxes because of low dividend payouts.
- f. Under the residual theory of dividends, the amount (residual) of earnings paid as dividends depends on the available investment opportunities and the debt-equity at which cost of capital is minimized.

### 3. Important dates concerning dividends

- a. The **date of declaration** is the date the directors meet and formally vote to declare a dividend. On this date, the dividend becomes a liability of the corporation.
- b. The **date of record** is the date as of which the corporation determines the shareholders who will receive the declared dividend. Essentially, the corporation closes its shareholder records on this date. Only those shareholders who own the stock on the date of record will receive the dividend. It typically falls from 2 to 6 weeks after the declaration date.
- c. The **date of payment** is the date on which the dividend is actually paid (when the checks are sent to the investors). The payment date is usually from 2 to 4 weeks after the date of record.
- d. The **ex-dividend date** is a date established by the stock exchanges, such as 4 business days before the date of record, because it takes three days to settle the transaction. The period between the ex-dividend date and the date of record gives the stock exchange members time to process any transactions, which is the settlement. Unlike the other dates, it is not established by the corporate board of directors.
  - 1) An investor who buys a share of stock before the ex-dividend date will receive the dividend that has been previously declared.
  - 2) An investor who buys the stock after the ex-dividend date (but before the date of record or payment date) will not receive the declared dividend. Instead, the individual who sold the stock will receive the dividend because (s)he owned it on the ex-dividend date.
  - 3) Usually, a stock price will drop on the ex-dividend date by the amount of the dividend because the new investor will not receive it.

### 4. Stock dividends and stock splits involve issuance of additional shares to existing shareholders. Shareholders receive no actual increase in the value of their holdings. The previous holdings are simply divided into more pieces (additional shares).

- a. A **stock dividend** is an issuance of stock and entails the transfer of a sum from the retained earnings account to a paid-in capital account.
  - 1) Casual investors may believe they are receiving something of value when in essence their previous holdings are merely being divided across more shares.
  - 2) Stock dividends are often used by growing companies that wish to retain earnings in the business while placating shareholders.
- b. A **stock split** does not involve any accounting entries. Instead, the existing shares are divided into more pieces so that the market price per share will be reduced.
  - 1) **EXAMPLE:** If a corporation has 1 million shares outstanding, each of which sells for \$90, a 2-for-1 stock split will result in 2 million shares outstanding, each of which sells for \$45.
  - 2) **Reverse stock splits** are the exact opposite. They reduce the shares outstanding and increase the price per share.

c. **Advantages of issuing stock splits and dividends**

- 1) Because more shares will be outstanding, the price per share will be lower, and more small investors may purchase the company's stock. Thus, because demand for the stock is greater, the price may increase. However, EPS and book value per share will be lower.
  - a) **EXAMPLE:** In the previous example, the additional investors interested in the company at the lower price may drive the price up to \$46 or \$47, or slightly higher than the theoretical price of \$45. Hence, current shareholders may benefit from the split (or dividend) after all.
- 2) A dividend or split can be a publicity gesture. Because shareholders may believe they are receiving value (and perhaps indirectly they are), they will have a better opinion of their company.
- 3) If more shares are outstanding, the number of shareholders who are usually good customers for their own firm's products will be larger.

5. **Treasury stock** is stock that a corporation has issued and reacquired. It is usually purchased on the open market at the current market price. The effect is to distribute retained earnings to shareholders. Regular repurchases are therefore a substitute for cash dividends.

a. A corporation repurchases its stock to

- 1) Meet employee stock option and bonus plan requirements
- 2) Buy out a shareholder when the stock cannot be sold on the open market or when the sale would adversely affect the market price
- 3) Support the market for the stock
- 4) Reduce the size of the business
- 5) Acquire stock needed to undertake a merger
- 6) Decrease the number of shares outstanding in hopes of increasing EPS
- 7) Increase the book value per share of the remaining shares outstanding
  - a) The market value must be less than the book value.
- 8) Hold the shares until the market rises, at which time the stock will be resold
  - a) Management treats the treasury stock as an investment in the belief that the stock is undervalued.
- 9) Provide a quick and simple means of adjusting a firm's capital structure or its financial leverage
  - a) A repurchase of shares using debt financing is an even more dramatic way of quickly changing the relationship between debt and equity.

b. An advantage of buying treasury stock is that it decreases the likelihood of the firm's acquisition by another corporation because fewer shares are outstanding. Additionally, a treasury stock purchase can thwart a hostile takeover. If the price is above market, this practice is known as "paying greenmail."

c. Disadvantages of buying treasury stock include

- 1) A higher debt-equity ratio and increased financial leverage, which may increase the difficulty of obtaining loans.
- 2) Liquidity problems because cash is being paid out to shareholders.

## 9.4 RANKING INVESTMENT PROPOSALS

1. **Book rate of return.** A common misstep in regard to capital budgeting is the temptation to gauge the desirability of a project by using accrual accounting numbers instead of cash flows. Shareholders and financial analysts use GAAP-based numbers because they are readily available.

- a. The measure usually produced this way is called **book rate of return** or **accrual accounting rate of return**.

$$\text{Book rate of return} = \frac{\text{GAAP net income from investment}}{\text{Book value of investment}}$$

- b. The weakness of book rate of return is that it ignores the time value of money (discussed below).
2. A dollar received in the future is worth less than a dollar received today. Thus, when analyzing capital projects, the accountant must discount the relevant cash flows using the **time value of money**.
  - a. A firm's goal is for its **discount rate** to be **as low as possible**.
    - 1) The lower the firm's discount rate, the lower the "hurdle" the company must clear to achieve profitability. For this reason, the rate is sometimes called the **hurdle rate**.
  - b. The **two most widely used rates** in capital budgeting are
    - 1) The firm's weighted-average cost of capital or
    - 2) The shareholders' opportunity cost of capital
  - c. A **common pitfall** in capital budgeting is the tendency to use the company's current rate of return as the benchmark. This can lead to rejecting projects that should be accepted.
    - 1) **EXAMPLE:** A firm's current rate of return on all projects is 12%. Its shareholders' opportunity cost of capital is 10%. The company incorrectly rejects a project earning 11%.
  - d. The **two principal methods** for projecting the profitability of an investment are net present value and internal rate of return.
3. The **net present value (NPV) method** expresses a project's return in **dollar terms**.
  - a. NPV **nets the expected cash streams** related to a project (inflows and outflows), then discounts them at the hurdle rate, also called the **desired rate of return**.
    - 1) If the NPV of a project is **positive**, the project is **desirable** because it has a higher rate of return than the company's desired rate.
  - b. **EXAMPLE:**
    - 1) The company discounts a series of net cash flows using a hurdle rate of 6% (its desired rate of return).

Period	Net Cash Flow	6% PV Factor	Discounted Cash Flows
Initial Investment	\$(501,000)	1.00000	\$(501,000)
Year 1	77,000	0.94340	72,642
Year 2	77,000	0.89000	68,530
Year 3	77,000	0.83962	64,651
Year 4	77,000	0.79209	60,991
Year 5	85,000	0.74726	63,517
Year 6	85,000	0.70496	59,922
Year 7	85,000	0.66506	56,530
Year 8	101,800	0.62741	63,870
<b>Net Present Value</b>			<b>\$ 9,653</b>

- 2) Because the project has net present value > \$0, it is profitable given the company's hurdle rate.
4. The **internal rate of return (IRR)** expresses a project's return in **percentage terms**.
  - a. The IRR of an investment is the **discount rate** at which the investment's **NPV equals zero**. In other words, it is the rate that makes the present value of the expected cash inflows equal the present value of the expected cash outflows.
    - 1) If the IRR is **higher** than the company's desired rate of return, the investment is **desirable**.
  - b. EXAMPLE:
    - 1) The discounted cash flows used in the NPV exercise on the previous page can be recalculated using a higher discount rate (a higher rate will drive down the present value) in an attempt to get the solution closer to \$0.

Period	Net Cash Flow	7% PV Factor	Discounted Cash Flows
Initial Investment	\$(501,000)	1.00000	\$(501,000)
Year 1	77,000	0.93458	71,963
Year 2	77,000	0.87344	67,255
Year 3	77,000	0.81630	62,855
Year 4	77,000	0.76290	58,743
Year 5	85,000	0.71299	60,604
Year 6	85,000	0.66634	56,639
Year 7	85,000	0.62275	52,934
Year 8	101,800	0.58201	59,249
<b>Net Present Value</b>			<b><u>\$ (10,759)</u></b>

- 2) The higher hurdle rate causes the NPV to be negative. Thus, the IRR of this project is somewhere around 6.5%.
- 3) Because the company's desired rate of return is 6%, the project should be accepted, the same decision that was arrived at using the net present value method.
5. **Cash Flows and Discounting**
  - a. Conceptually, net present value is calculated using the following formula:
 
$$NPV = \frac{Cash\ Flow_0}{(1+r)^0} + \frac{Cash\ Flow_1}{(1+r)^1} + \frac{Cash\ Flow_2}{(1+r)^2} + \frac{Cash\ Flow_3}{(1+r)^3} + etc.$$
    - 1) The subscripts and exponents represent the discount periods. The variable  $r$  is the discount rate.
  - b. Present value tables are available as a convenient way to discount cash flows.
6. **Pitfalls of IRR.** IRR used in isolation is seldom the best route to a sound capital budgeting decision.
  - a. **Direction of cash flows.** When the direction of the cash flows changes, focusing simply on IRR can be misleading.
    - 1) EXAMPLE: Below are the net cash flows for two potential capital projects.

	Initial	Period 1
Project X	\$(222,222)	\$ 240,000
Project Y	222,222	(240,000)

The cash flow amounts are the same in absolute value, but the directions differ.

- 2) The IRR for both projects is 8%, which can be proved as follows:

Project X	Project Y
$\frac{\$ (222,222)}{1.08^0} + \frac{\$ 240,000}{1.08^1} = \$0$	$\frac{\$ 222,222}{1.08^0} + \frac{\$ (240,000)}{1.08^1} = \$0$

- 3) In choosing between the two, a decision maker might be tempted to select the project that has a cash inflow earlier and a cash outflow later.
- 4) Discounting the cash flows at the company's hurdle rate reveals a different picture.

Project X	Project Y
$\frac{\$ (222,222)}{1.06^0} + \frac{\$ 240,000}{1.06^1} = \$4,193$	$\frac{\$ 222,222}{1.06^0} + \frac{\$ (240,000)}{1.06^1} = \$ (4,193)$

- a) It turns out that, given a hurdle rate of 6%, the project with the positive cash flow earlier is by far the less desirable of the two.
- b) Clearly, a decision maker can be seriously misled if (s)he uses the simple direction of the cash flows as the tiebreaker when two projects have the same IRR.
- 5) This effect is known as the **multiple IRR problem**. Essentially, there are **as many solutions** to the IRR formula as there are **changes in the direction** of the net cash flows.
- b. **Mutually exclusive projects.** As with changing cash flow directions, focusing only on IRR when capital is limited can lead to unsound decisions.
- 1) **EXAMPLE:** Below are the cash flows for two potential capital projects.

	<u>Initial</u>	<u>Period 1</u>	<u>IRR</u>
Project S	\$(178,571)	\$200,000	12%
Project T	(300,000)	330,000	10%

- 2) If capital is available for only one project, using IRR alone would suggest that Project S be selected.
- 3) Once again, however, discounting both projects' net cash flows at the company's hurdle rate suggests a different decision.

Project S	Project T
$\frac{\$ (178,571)}{1.06^0} + \frac{\$ 200,000}{1.06^1} = \$10,108$	$\frac{\$ (300,000)}{1.06^0} + \frac{\$ 330,000}{1.06^1} = \$11,321$

- a) While Project S has the distinction of giving the company a higher internal rate of return, Project T is in fact preferable because it adds more to shareholder value.
- c. **Varying rates of return.** A project's NPV can easily be determined using different desired rates of return for different periods. The IRR is limited to a single summary rate for the entire project.
- d. **Multiple investments.** NPV amounts from different projects can be added, but IRR rates cannot. The IRR for the whole is not the sum of the IRRs for the parts.

## 7. Comparing Cash Flow Patterns

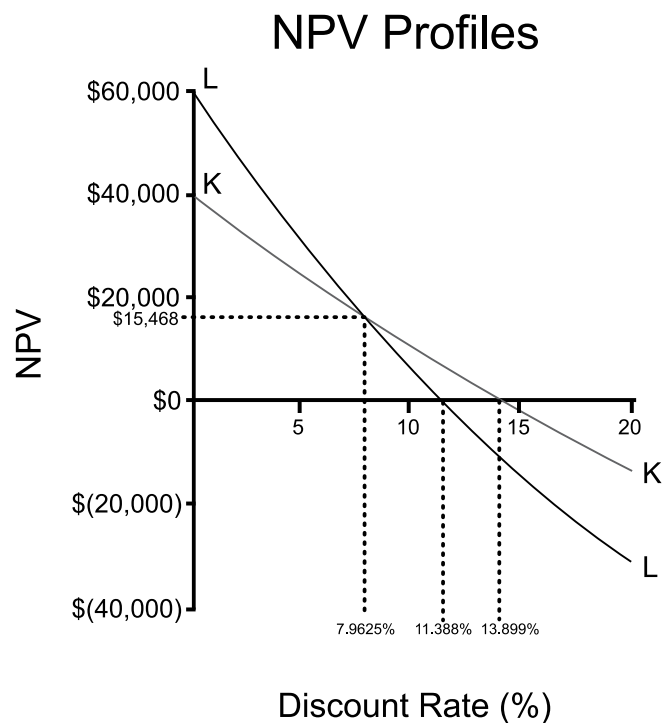
- a. Often a decision maker must choose between two mutually exclusive projects, one whose **inflows are higher in the early years** but fall off drastically later and one whose **inflows are steady** throughout the project's life.

- 1) The **higher a firm's hurdle rate**, the more quickly a project must pay off.
- 2) Firms with **low hurdle rates** prefer a slow and steady payback.

- b. EXAMPLE: Consider the net cash flows of these two projects:

	Initial	Year 1	Year 2	Year 3	Year 4
Project K	\$(200,000)	\$140,000	\$100,000	—	—
Project L	(200,000)	65,000	65,000	\$65,000	\$65,000

- 1) A graphical representation of the two projects at various discount rates helps to illustrate the factors a decision maker must consider in such a situation.



- c. The NPV profile can be of great practical use to managers trying to make investment decisions. It gives the manager a clear insight into the following questions:
- 1) How sensitive is a project's profitability to changes in the discount rate?
    - a) At a hurdle rate of **exactly** 7.9625%, a decision maker is indifferent between the two projects. The net present value of both is \$15,468 at that discount rate.
    - b) At hurdle rates **below** 7.9625%, the project whose **inflows last longer** into the future is the better investment (L).
    - c) At hurdle rates **above** 7.9625%, the project whose **inflows are "front-loaded"** is the better choice (K).
  - 2) At what discount rates is an investment project still a profitable opportunity?
    - a) At any hurdle rate **above** 13.899%, Project K **loses money**. This is its IRR, i.e., the rate at which its NPV = \$0 (Project L's is 11.388%).

8. The **payback period** is the **number of years** required to return the original investment; that is, the time necessary for a new asset to pay for itself. Note that **no accounting is made for the time value of money** under this method.

- a. Companies using the payback method set a maximum length of time within which projects must pay for themselves to be considered acceptable.
- b. **If the cash flows are constant**, the formula is

$$\text{Payback period} = \frac{\text{Initial net investment}}{\text{Annual expected cash flow}}$$

- 1) **EXAMPLE:** A project is being considered that will require an outlay of \$200,000 immediately and will return a steady cash flow of \$52,000 for the next four years. The company requires a 4-year payback period on all capital projects.

- a) Payback period = \$200,000 ÷ \$52,000 = 3.846 years
- b) The project's payback period is less than the company's maximum, and the project is thus acceptable.

- c. **If the cash flows are not constant**, the calculation must be in cumulative form.

- 1) **EXAMPLE:** Instead of the smooth inflows predicted above, the project's cash stream is expected to vary. The payback period is calculated as follows:

<u>End of Year</u>	<u>Cash Inflow</u>	<u>Remaining Initial Investment</u>
Year 0	\$ 0	\$200,000
Year 1	48,000	152,000
Year 2	54,000	98,000
Year 3	54,000	44,000
Year 4	42,000	2,000

- a) At the end of four years, the original investment has still not been recovered, so the project is rejected.

- d. The **strength** of the payback method is its simplicity.

- 1) The payback method is sometimes used for foreign investments if foreign expropriation of firm assets is feared. Even in these circumstances, it is most often used in addition to a more sophisticated method.
- 2) To some extent, the payback period measures risk. The longer the period, the more risky the investment.

- e. The payback method has two significant **weaknesses**:

- 1) It disregards all cash inflows after the payback cutoff date. Applying a single cutoff date to every project results in accepting many marginal projects and rejecting good ones.
- 2) It disregards the time value of money. Weighting all cash inflows equally ignores the fact that money has a cost.



9. The **discounted payback method** is sometimes used to overcome the second of the drawbacks inherent in the basic payback method.
- The net cash flows in the denominator are discounted to calculate the period required to recover the initial investment.

Period	Cash Inflow	6% PV Factor	Discounted Cash Flow	Remaining Initial Investment
Initial Investment	\$ 0	1.00000	\$ 0	\$200,000
Year 1	48,000	0.94340	45,283	154,717
Year 2	54,000	0.89000	48,060	106,657
Year 3	54,000	0.83962	45,339	61,317
Year 4	42,000	0.79209	33,268	28,050

- After four years, the project is much further from paying off than under the basic method.
  - Clearly then, this is a **more conservative** technique than the traditional payback method.
- The discounted payback method's advantage is that it acknowledges the time value of money.
    - Its drawbacks are that it loses the simplicity of the basic payback method and still ignores cash flows after the arbitrary cutoff date.
10. **Other Payback Methods**
- The **bailout payback method** incorporates the salvage value of the asset into the calculation. It measures the length of the payback period when the periodic cash inflows are combined with the salvage value.
  - The **payback reciprocal** ( $1 \div \text{payback}$ ) is sometimes used as an estimate of the internal rate of return.
  - The **breakeven time** is the period required for the discounted cumulative cash inflows on a project to equal the discounted cumulative cash outflows (usually but not always the initial cost).
    - Thus, it is the time necessary for the present value of the discounted cash flows to equal zero. This period begins at the outset of a project, not when the initial cash outflow occurs.
    - An alternative that results in a longer breakeven time is to consider the time required for the present value of the cumulative cash inflows to equal the present value of all the expected future cash outflows.
11. **Capital rationing** exists when a firm sets a limit on the amount of funds to be invested during a given period. In such situations, a firm cannot afford to undertake all profitable projects.
- Another way of stating this is that the firm cannot invest the entire amount needed to fund its theoretically optimal capital budget.
    - Only those projects that will return the **greatest NPV** for the limited capital available in the **internal capital market** can be undertaken.
  - Reasons** for capital rationing include
    - A lack of nonmonetary resources (e.g., managerial or technical personnel)
    - A desire to control estimation bias (overly favorable projections of a project's cash flows)
    - An unwillingness to issue new equity (e.g., because of its cost or a reluctance to reveal data in regulatory filings)

12. The **profitability index** (or excess present value index) is a method for ranking projects to ensure that limited resources are placed with the investments that will return the highest NPV.

$$\text{Profitability index} = \frac{\text{NPV of future cash flows}}{\text{Net investment}}$$

- a. EXAMPLE: A company has \$200,000 to invest. It can therefore either invest in Project F below or in Projects G and H.

	<u>Initial</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Project F	\$(200,000)	\$140,000	\$100,000	-	-
Project G	(100,000)	30,000	30,000	\$30,000	\$30,000
Project H	(100,000)	30,000	28,000	28,000	34,000

- 1) Discounting each project at 6% results in the following:

	<u>NPV</u>	<u>NPV ÷ Net Initial Investment</u>
Project F	\$21,075	0.105
Project G	15,002	0.150
Project H	15,222	0.152

- 2) In an environment of capital rationing, the company can see that it should invest first in Project H, then in Project G, and, if new funding is found, last in Project F.

13. **Internal capital market** is a way of referring to the provision of funds by one division of a firm to another division. A division operating in a mature industry that generates a lot of cash can provide funding to another division that is in the cash-hungry development stage.
- An advantage is the avoidance of stock issue costs or interest costs on new debt.
  - A disadvantage is that calling it a “market” is somewhat misleading. The dynamics of the process are more akin to centralized planning and budgeting than to the workings of a free marketplace.
14. **Linear programming** is a technique (now usually computerized) for optimizing resource allocations so as to select the most profitable or least costly way to use available resources.
- It involves optimizing an objective function subject to the net of constraint equations.
  - For example, a linear programming application can maximize NPV for a group of projects in a capital rationing situation (expenditure constraint).

## 15. Comprehensive Examples

- a. **EXAMPLE:** Hazman Company plans to replace an old piece of equipment that is obsolete and expected to be unreliable under the stress of daily operations. The equipment is fully depreciated, and no salvage value can be realized upon its disposal. One piece of equipment being considered as a replacement will provide an annual cash savings of \$7,000 before income taxes and without regard to the effect of depreciation. The equipment costs \$18,000 and has an estimated useful life of 5 years. No salvage value will be used for depreciation purposes because the equipment is expected to have no value at the end of 5 years. Hazman uses the straight-line depreciation method on all equipment for both book and tax purposes. Hence, annual depreciation is \$3,600. The company is subject to a 40% tax rate. Hazman's desired rate of return is 8%, so it will use the 8% column from a present value table. The company has projected the following cash flows related to the equipment:

		<b>Annual Before-Tax Cash Flow</b>	<b>Annual Tax Savings (Tax)</b>	<b>Annual After-Tax Cash Flow</b>	<b>Annual After-Tax Net Income</b>
Investment	Year 0	<u>\$(18,000)</u>	<u>-0-</u>	<u>\$(18,000)</u>	<u>-0-</u>
Annual cash savings	Years 1-5	7,000	\$(2,800)	4,200	\$ 4,200
Depreciation tax shield	Years 1-5		1,440	1,440	(2,160)
Totals				<u>\$ 5,640</u>	<u>\$ 2,040</u>

$$\begin{aligned}
 1) \quad \text{Net present value} &= (\text{After-tax cash flows} \times \text{Present value of an annuity}) \\
 &\quad - \text{Net investment} \\
 &= (\$5,640 \times 3.993) - \$21,000 \\
 &= \$22,521 - \$21,000 \\
 &= \mathbf{\$1,521}
 \end{aligned}$$

- 2) **Internal rate of return.** The goal is to find the discount rate that most nearly equals the net investment.

	<b>10%</b>	<b>11%</b>
After-tax cash flows	\$ 5,640	\$ 5,640
Times: present value factor	3.791	3.696
Net present value	\$21,381	\$20,845
Net initial investment	21,000	21,000
Difference	\$ 381	\$ (155)
Difference between NPVs	\$ 536	\$ 536
Ratio	71.2%	(28.8%)
Times: gap between discount rates	1%	1%
Percentage increment	0.712%	(0.288%)
<b>Actual IRR</b>	<b>10.712%</b>	<b>10.712%</b>

$$\begin{aligned}
 3) \quad \text{Payback period} &= \text{Net investment} \div \text{After-tax cash flow} \\
 &= \$21,000 \div \$5,640 \\
 &= \mathbf{3.72 \text{ years}}
 \end{aligned}$$

$$\begin{aligned}
 4) \quad \text{Profitability index} &= \text{NPV of future cash flows} \div \text{Net investment} \\
 &= (\$5,640 \times 3.993) \div \$21,000 \\
 &= \$22,521 \div \$21,000 \\
 &= \mathbf{1.07}
 \end{aligned}$$

- b. **EXAMPLE:** The management of Flesher Farms is trying to decide whether to buy a new team of mules at a cost of \$1,000 or a new tractor at a cost of \$10,000. They will perform the same job. But because the mules require more laborers, the annual return is only \$250 of net cash inflows. The tractor will return \$2,000 of net cash inflows per year. The mules have a working life of 8 years and the tractor 10 years. Neither investment is expected to have a salvage value at the end of its useful life. Flesher's desired rate of return is 6%.

1) **Net Present Value**

	<u><b>Mules</b></u>	<u><b>Tractor</b></u>
Net cash inflows	\$ 250	\$ 2,000
Times: present value factor	6.209	7.360
Present value	1,552	14,720
Less: initial investment	(1,000)	(10,000)
<b>Net present value</b>	<u><u><b>\$ 552</b></u></u>	<u><u><b>\$ 4,720</b></u></u>

2) **Internal Rate of Return**

- a) **Mules:** Initial investment  $\div$  Net cash inflows =  $\$1,000 \div \$250 = 4$   
 i) On the 8-year line, a factor of 4 indicates a rate of return of approximately **18.7%**.
- b) **Tractor:** Initial investment  $\div$  Net cash inflows =  $\$10,000 \div \$2,000 = 5$   
 i) On the 10-year line, a factor of 5 indicates a rate of return of approximately **15.2%**.

3) **Payback Period**

- a) **Mules:** Initial investment  $\div$  Net cash inflows =  $\$1,000 \div \$250 = \mathbf{4 \text{ years}}$   
 b) **Tractor:** Initial investment  $\div$  Net cash inflows =  $\$10,000 \div \$2,000 = \mathbf{5 \text{ years}}$

4) **Profitability Index**

- a) **Mules:** Present value of cash inflows  $\div$  Initial investment =  $\$1,552 \div \$1,000 = \mathbf{1.552}$
- b) **Tractor:** Present value of cash inflows  $\div$  Initial investment =  $\$14,720 \div \$10,000 = \mathbf{1.472}$

- 5) The mule investment has the higher IRR, the quicker payback, and the better profitability index.

- a) However, the tractor has the better net present value. The various methods thus give different answers to the investment question.
- b) Either investment will be profitable. Management may decide to let noneconomic factors influence the decision.
- i) For example, the mules will require the use of more laborers. If unemployment in the community is high, management might wish to achieve a social goal of providing more jobs.
- ii) Alternatively, a labor shortage might convince management to buy the tractor to reduce labor worries.

16. **Post-investment audits** should be conducted to serve as a control mechanism and to deter managers from proposing unprofitable investments.
- a. Actual-to-expected cash flow comparisons should be made, and unfavorable variances should be explained. The reason may be an inaccurate forecast or implementation problems.
  - b. Individuals who supplied unrealistic estimates should have to explain differences. Knowing that a post-investment audit will be conducted may cause managers to provide more realistic forecasts in the future.
  - c. The temptation to evaluate the outcome of a project too early must be overcome. Until all cash flows are known, the results can be misleading.
  - d. Assessing the receipt of expected nonquantitative benefits is inherently difficult.