

Online Instructor's Solutions Manual

For

Foundations of Finance

Eighth Edition

Arthur J. Keown

Virginia Polytechnic Institute and State University

R. B. Pamplin Professor of Finance

John D. Martin

Baylor University

Professor of Finance

Carr P. Collins Chair in Finance

J. William Petty

Baylor University

Professor of Finance

W. W. Caruth Chair in Entrepreneurship

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CHAPTER 1

An Introduction to the Foundations of Financial Management

CHAPTER ORIENTATION

This chapter lays a foundation for what will follow. First, it focuses on the goal of the firm, followed by the five principles that form the foundations of financial management and the role of finance in business. The chapter then reviews the legal forms of business organization and discusses the tax implications relating to financial decisions. Finally, the chapter discusses the new role multinational firm and its role in finance.

CHAPTER OUTLINE

I. The Goal of the Firm

- A. In this book, we will designate maximization of shareholder wealth, by which we mean maximization of the total market value of the firm's common stock, to be the goal of the firm. To understand this goal and its inclusive nature, it is first necessary to understand the difficulties involved with the frequently suggested goal of profit maximization.
- B. We have chosen the goal of shareholder wealth maximization because the effects of all financial decisions are included in this goal.
- C. In order to employ this goal, we need not consider every price change to be a market interpretation of the worth of our decisions. What we do focus on is the effect that our decision *should* have on the stock price if everything were held constant.

II. Five Principles That Form the Foundations of Finance

- A. **Principle 1: Cash Flow Is What Matters.** In measuring value we will use cash flows rather than accounting profits because it is only cash flows that the firm receives and is able to reinvest. In addition, in making business decisions, we will concern ourselves with only what happens as a result of that decision.
- B. **Principle 2: Money Has a Time Value.** Almost all financial decisions involve comparing money in different time periods, perhaps investing today and receiving

returns later, or borrowing money today and paying it off later. A dollar received today is worth more than a dollar received in the future because of the time value of money.

- C. **Principle 3: Risk Requires a Reward.** There is a risk-return trade-off in finance—we won't take additional risk unless we expect to be compensated with additional return. Almost all financial decisions involve some sort of risk-return trade-off.
- D. **Principle 4: Market Prices Are Generally Right.** In general, the markets are quick to impound new information into stock prices, and the prices tend to be correct.
- E. **Principle 5: Conflicts of Interest Cause Agency Problems.** As a result of the agency problem, managers will not work for the owners' best interest unless it is in the managers' best interest as well. The agency problem is a result of the separation of the decision makers and the owners of the firm. As a result, managers may make decisions that are not in line with the goal of maximization of shareholder wealth.
- F. **The Current Global Financial Crisis.**
- G. **Avoiding Financial Crisis—Back to the Principles.** Many of the financial problems of the past can be traced back to ignoring the basic principles of finance.
- H. **The Essential Elements of Ethics and Trust.** Ethical behavior is doing the right thing, and ethical dilemmas are everywhere in finance. Ethical behavior is important in financial management, just as it is important in everything we do. Unfortunately, precisely how we define what is and is not ethical behavior is sometimes difficult. Nevertheless, we should not give up the quest. In addition, businesses cannot interact unless they trust each other.

III. The Role of Finance in Business

- A. **Why Study Finance?** There are three basic types of issues that are addressed by the study of finance.
 - 1. What long-term investments should the firm undertake? This area of finance is generally referred to as capital budgeting.
 - 2. How should the firm raise money to fund these investments? The firm's funding choices are generally referred to as capital structure decisions.
 - 3. How can the firm best manage its cash flows as they arise in its day-to-day operations? This area of finance is generally referred to as working capital management.

B. The Role of the Financial Manager

IV. The Legal Forms of Business Organization

A. Sole Proprietorships

- 1. **Sole proprietorship:** A business owned by a single person and which has a minimum amount of legal structure.
- 2. The predominant form of business organization in the United States in pure numbers is the sole proprietorship.

3. Advantages

- a. Easily established with few complications
- b. Minimal organizational costs
- c. Does not have to share profits or control with others

4. Disadvantages

- a. Unlimited liability for the owner
- b. Owner must absorb all losses
- c. Equity capital limited to the owner's personal investment
- d. Business terminates immediately upon owner's death

B. Partnership

1. **Partnership:** An association of two or more individuals coming together as co-owners to operate a business for profit.

2. Two types of partnerships

- a. General partnership: Relationship between partners is dictated by the partnership agreement.

(1) Advantages

- (a) Minimal organizational requirements
- (b) Negligible government regulations

(2) Disadvantages

- (a) All partners have unlimited liability
- (b) Difficult to raise large amounts of capital
- (c) Partnership dissolved by the death or withdrawal of general partner

b. Limited partnership

(1) Advantages

- (a) For the limited partners, liability limited to the amount of capital invested in the company
- (b) Withdrawal or death of a limited partner does not affect continuity of the business
- (c) Stronger inducement in raising capital

(2) Disadvantages

- (a) There must be at least one general partner who has unlimited liability in the partnership
- (b) Names of limited partners may not appear in the name of the firm

- (c) Limited partners may not participate in the management of the business
- (d) More expensive to organize than general partnership, as a written agreement is mandatory

C. Corporations

1. **The corporation:** An “impersonal” legal entity having the power to purchase, sell, and own assets and to incur liabilities while existing separately and apart from its owners.
2. Ownership is evidenced by shares of stock.
3. Advantages
 - a. Limited liability of owners
 - b. Ease of transferability of ownership (i.e., by the sale of one’s shares of stock)
 - c. The death of an owner does not result in the discontinuance of the firm’s life
 - d. Ability to raise large amounts of capital is increased
4. Disadvantages
 - a. Most difficult and expensive form of business to establish
 - b. Control of corporation not guaranteed by partial ownership of stock
 - c. Corporations also suffer from a double taxation on dividends. The firm first pays taxes on the income it earns; after taxes have been paid on this income, it is paid to investors in the form of dividends. The investor then pays personal taxes on that dividend income.

D. S-Type Corporations and Limited Liability Companies (LLC)

1. The S-type corporation provides limited liability while allowing the business owners to be taxed as if they were a partnership—that is, distributions back to the owners are not taxed twice as is the case with dividends in the corporate form.
2. The limited liability company (LLC) is a cross between a partnership and a corporation. The LLC retains limited liability for its owners, but is run and taxed like a partnership.

E. Organizational Form and Taxes: The Double Taxation on Dividends

F. S-Corporations and Limited Liability Companies (LLCs)

G. Which Organizational Form Should Be Chosen?

V. Finance and the Multinational Firm: The New Role

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 1-1. The goal of profit maximization is too simplistic in that it assumes away the problems of uncertainty of returns and the timing of returns. Rather than use this goal, we have chosen maximization of shareholders' wealth—that is, maximization of the market value of the firm's common stock—because the effects of all financial decisions are included. The shareholders react to poor investment or dividend decisions by causing the total value of the firm's stock to fall and react to good decisions by pushing the price of the stock upward. In this way, all financial decisions are evaluated, and all financial decisions affect shareholder wealth.
- 1-2. The goal of shareholder wealth maximization must be looked at as a long-run goal. As such, the public image of the firm may be of concern inasmuch as it may affect sales and legislation. Thus, while these actions may not directly result in increased profits, they may affect consumers' and legislators' attitudes.
- 1-3. Almost all financial decisions involve some sort of risk-return trade-off. The more risk the firm is willing to accept, the higher the expected return for the given course of action. For example, in the area of working capital management, the less inventory held, the higher the expected return, but also the greater the risk of running out of inventory. While one manager might accept a given level of risk, another more risk-averse manager may not accept that level of risk. This does not mean that one manager is correct and one is not; rather, it only means that not all managers will view the risk-return trade-off in the same manner.
- 1-4. The agency problem is a result of the separation of owners and managers, where managers do what's in their own best interests rather than what is in the best interest of the shareholders. Large firms are typically run by professional managers who own a small fraction of the firms' equity. The individual actions of these managers are often motivated by self-interest, which may result in managers not acting in the best interests of the firm's owners. When this happens the firm's owners will lose value.
- 1-5. a. A sole proprietorship is a business owned by a single individual who maintains complete title to the assets and is also personally liable for all indebtedness incurred.
- b. A partnership is an association of two or more individuals coming together as co-owners for the purpose of operating a business for profits. The partnership is equivalent to the sole proprietorship, except that the partnership has multiple owners.
- c. A corporation is a legal entity functioning separate and apart from its owners. It can individually sue and be sued, purchase, sell, or own property, and be subject to criminal punishment for crimes.
- 1-6. a. The sole proprietor maintains title to the firm's assets, has unlimited liability, is entitled to the profits from the business, but must also absorb any losses realized. This form of business is easily initiated. Termination of the business comes by the owner discontinuing the business or upon his death.

- b. In a partnership, all general partners have unlimited liability. Each partner is liable for the actions of the other partners. The partnership agreement dictates the basic relationships among the partners within the firm. As with the sole proprietorship, the partnership is terminated upon the desires of any partner within the organization, or upon a partner's death. Under certain conditions a partner's liability may be restricted to the amount of capital invested in the partnership. However, at least one general partner must remain in the association for whom the privilege of limited liability does not apply.
 - c. The corporation is legally separate from its owners. Ownership of the corporation is determined by the number of shares of common stock owned by an individual. Since the shares are transferable, the ownership in a corporation may be easily transferred. Investors' liability is limited to the amount of their investment. The life of the corporation is not dependent upon the status of the investors. The death or withdrawal of an investor does not disrupt the corporate life. However, the cost of forming a corporation is more expensive than a proprietorship or partnership.
- 1-7.
 - a. Organizational requirements and costs favor the sole proprietorship or possibly the general partnership depending upon the approach taken in forming the partnership.
 - b. Under corporation, owners have minimum liabilities.
 - c. The corporation is definitely the most favorable form of business because it provides the continuity of the business regardless of an owner's withdrawal or death.
 - d. If ease of ownership transferability is desired, the corporation is best. However, because of certain circumstances, the owners may prefer that ownership not be easily transferred, in which case the partnership would be the most desirable.
 - e. The sole proprietor is able to maintain complete and ultimate control and minimize regulations.
 - f. The corporation is the strongest form of legal entity in terms of the ease of raising capital from external investors.
 - g. In regard to income taxes, it is difficult to determine which form of business is the most advantageous. Such a selection is dependent upon individual circumstances.
- 1-8. This is an Internet question.
- 1-9. This is an Internet question.
- 1-10. This is an Internet question.

SOLUTION TO MINI CASE

- a. The goal of profit maximization is too simplistic in that it assumes away the problems of uncertainty of returns and the timing of returns. Rather than use this goal, we have chosen maximization of shareholders' wealth—that is, maximization of the market value of the firm's common stock—because the effects of all financial decisions are included. The shareholders react to poor investment or dividend decisions by causing the total value of the firm's stock to fall and react to good decisions by pushing the price of the stock upward. In this way, all financial decisions are evaluated, and all financial decisions affect shareholder wealth.
- b. Simply put, investors will not put their money in risky investments unless they are compensated for taking on that additional risk. In effect, the return investors expect is composed of two parts. First, they receive a return for delaying consumption, which must be greater than the anticipated rate of inflation. Second, they receive a return for taking on added risk. Otherwise, both risky and safe investments would have the same expected return associated with them, and no one would take on the risky investments.
- c. The firm receives cash flows and is able to reinvest them, which cannot be done with accounting profits. In effect, accounting profits are shown when they are earned rather than when the money is actually in hand. Unfortunately, a firm's accounting profits and cash flows may not be timed to occur together. For example, capital expenses, such as the purchase of a new plant or piece of equipment, are depreciated over several years, with the annual depreciation subtracted from profits. However, the cash flow associated with these expenses generally occurs immediately. It is the cash inflows that can be reinvested and cash outflows that involve paying out money. Therefore, cash flows correctly reflect the true timing of the benefits and costs.
- d. In an efficient market, information is impounded into security prices with such speed that there are no opportunities for investors to profit from publicly available information. Actually, what types of information are immediately reflected in security prices and how quickly that information is reflected determine how efficient the market actually is. The implications for us are that stock prices reflect all publicly available information regarding the value of the company. This means we can implement our goal of maximization of shareholder wealth by focusing on the effect each decision should have on the stock price, all else held constant. It also means that earnings manipulations through accounting changes should not result in price changes. In effect, our preoccupation with cash flows is validated.
- e. The agency problem is the result of the separation of management and the ownership of the firm. As a result, managers may make decisions that are not in line with the goal of maximization of shareholder wealth. To control this problem, we monitor managers and try to align the interests of shareholders and managers. The interests of shareholders and managers can be aligned by setting up stock options, bonuses, and perquisites that are tied directly to how closely management decisions coincide with the interest of shareholders.

- f. Ethical errors are not forgiven in the business world. Business interaction is based upon trust, and there is no way that trust can be eliminated quicker than through an ethical violation. The fall of Ivan Boesky and Drexel, Burnham, Lambert and the near collapse of Salomon Brothers illustrates this fact. As a result, acting in an ethical manner is not only morally correct, but it is congruent with our goal of maximization of shareholder wealth.
- g.
 - (1) A sole proprietorship is a business owned by a single individual who maintains complete title to the assets, but who is also personally liable for all indebtedness incurred.
 - (2) A partnership is an association of two or more individuals coming together as co-owners for the purpose of operating a business for profit. The partnership is equivalent to the sole proprietorship, except that the partnership has multiple owners.
 - (3) A corporation is a legal entity functioning separate and apart from its owners. It can individually sue and be sued, purchase, sell, or own property, and be subject to criminal punishment for crimes.

CHAPTER 2

The Financial Markets and Interest Rates

CHAPTER ORIENTATION

This chapter considers the market environment in which long-term capital is raised. The underlying rationale for the existence of security markets is presented, investment banking services and procedures are detailed, private placements are discussed, and security market regulation is reviewed. Further discussions cover rates of return over long periods and recent periods, interest rate determinants, and theories of the term structure of interest rates.

CHAPTER OUTLINE

I. Financing of Business: The Movement of Funds Through the Economy

A. Public Offerings Versus Private Placements

1. The public (financial) market is an impersonal market in which both individual and institutional investors have the opportunity to acquire securities.
 - a. A **public offering** takes place in the public market.
 - b. The security-issuing firm does not meet (face-to-face) the actual investors in the securities.
2. In a **private placement** of securities, only a limited number of investors have the opportunity to purchase a portion of the issue.
 - a. The market for private placements is more personal than its public counterpart.
 - b. The specific details of the issue may actually be developed on a face-to-face basis among the potential investors and the issuer.
3. Private placements and venture capital.
 - a. Private placements can involve issuing both debt and equity, and “venture capitalists” can play an active role in both placements.
 - b. For startup companies or companies in the early stages of business, as well as firms in “turnaround” situations, venture capital is a prime source of funds. The

venture capital firm will frequently acquire a meaningful dollar state in the startup firm.

B. Primary Markets Versus Secondary Markets

1. Securities are first offered for sale in a **primary market**. For example, the sale of a new bond issue, preferred stock issue, or common stock issue takes place in the primary market. These transactions increase the total stock of financial assets in existence within the economy.
2. Trading in currently existing securities takes place in the **secondary market**. The total stock of financial assets is unaffected by such transactions.

C. The Money Market Versus the Capital Market

1. The **money market** consists of the institutions and procedures that provide for transactions in short-term debt instruments, which are generally issued by borrowers who have very high credit ratings.
 - a. “Short-term” means that the securities traded in the money market have maturity periods of not more than one year.
 - b. Equity instruments are not traded in the money market.
 - c. Typical examples of money market instruments are (1) U.S. Treasury bills, (2) federal agency securities, (3) bankers’ acceptances, (4) negotiable certificates of deposit, and (5) commercial paper.
2. The capital market consists of the institutions and procedures that provide for transactions in long-term financial instruments. This market encompasses those securities that have maturity periods exceeding one year.

D. Spot Markets Versus Futures Markets

1. Cash markets are where something sells today, right now, on the spot; in fact, cash markets are often referred to as **spot markets**.
2. **Futures markets** are where you can set a price to buy or sell something at some future date; in effect, you sign a contract that states what you’re buying, how much of it you’re buying, at what price you’re buying it, and when you will actually make the purchase.

E. Stock Exchanges: Organized Security Exchanges Versus Over-the-Counter Markets, A Blurring Difference

1. Because of the technological advances over the past 10 years coupled with deregulation and increased competition, the difference between an organized exchange and the over-the-counter market has been blurred. **Organized security exchanges** are tangible entities whose activities are governed by a set of bylaws. **Security exchanges** physically occupy space, and financial instruments are traded on the premises.
2. Stock Exchange Benefits. Both corporations and investors enjoy several benefits provided by the existence of organized security exchanges. These include:

- a. Providing a continuous market. A continuous market provides a series of continuous security prices.
- b. Establishing and publicizing fair security prices. An organized exchange permits security prices to be set by competitive forces with the specific price of a security is determined in the manner of an auction.
- c. Helping business raise new capital. Because a continuous secondary market exists, it is easier for firms to float, or issue, new security offerings at competitively determined prices.

II. Selling Securities to the Public

The **investment banker** is a financial specialist who acts as an intermediary in the selling of securities. He or she works for an investment banking firm (house).

A. Three basic functions are provided by the investment banker:

1. He or she assumes the risk of selling a new security issue at a satisfactory (profitable) price. This is called **underwriting**. Typically, the investment banking house, along with the underwriting syndicate, actually buys the new issue from the corporation that is raising funds. The syndicate (group of investment banking firms) then sells the issue to the investing public (hopefully) at a higher price than it paid.
2. He or she provides for the **distribution** of the securities to the investing public.
3. He or she **advises** firms on the details of selling securities.

B. Distribution Methods

Several distribution methods are available for placing new securities into the hands of final investors. The investment banker's role is different in each case.

1. In a **negotiated purchase**, the firm in need of funds contacts an investment banker and begins the sequence of steps leading to the final distribution of the offered securities. The price that the investment banker pays for the securities is "negotiated" with the issuing firm.
2. In a **competitive-bid purchase**, the investment banker and underwriting syndicate are selected by an auction process. The syndicate willing to pay the issuing firm the greatest dollar amount per new security wins the competitive bid. This means that it will underwrite and distribute the issue. In this situation, the price paid to the issuer is not negotiated, instead it is determined by a sealed-bid process, much on the order of construction bids.
3. In a **commission** (or **best-efforts**) offering, the investment banker does not act as an underwriter. He or she attempts to sell the issue in return for a fixed commission on each security that is actually sold. Unsold securities are simply returned to the firm that was hoping to raise funds.
4. In a **privileged subscription**, the new issue is not offered to the investing public. It is sold to a definite and limited group of investors. Current stockholders are often the privileged group.

5. In a **Dutch auction**, investors first put in bids giving the number of shares they would like to buy and the price they are willing to pay for them. Once the bids are in, they are ranked, and the selling price is calculated as the highest price that allows all the stock to be sold.
6. In a **direct sale**, the issuing firm sells the securities to the investing public without involving an investment banker. This is not a typical procedure.

C. Private Debt Placements

1. Each year, billions of dollars of new securities are privately (directly) placed with final investors. In a private placement, a small number of investors purchase the entire security offering. Most private placements involve debt instruments.
2. Large financial institutions are the major investors in private placements. These include (1) life insurance firms, (2) state and local retirement funds, and (3) private pension funds.
3. The advantages and disadvantages of private placements as opposed to public offerings must be carefully evaluated by management.
 - a. The advantages include (1) greater speed than a public offering in actually obtaining the needed funds, (2) lower flotation costs than are associated with a public issue, and (3) increased flexibility in the financing contract.
 - b. The disadvantages include (1) higher interest costs than are ordinarily associated with a comparable public issue, (2) the imposition of several restrictive covenants in the financing contract, and (3) the possibility that the security may have to be registered some time in the future at the lender's option.

D. Flotation Costs

1. The firm raising long-term capital typically incurs two types of **flotation costs**: (1) the underwriter's spread and (2) issuing costs. The former is typically the larger.
 - a. The underwriter's spread is the difference between the gross and net proceeds from a specific security issue. This absolute dollar difference is usually expressed as a percent of the gross proceeds.
 - b. Many components comprise issue costs. The two most significant are (1) printing and engraving and (2) legal fees. For comparison purposes, these, too, are usually expressed as a percent of the issue's gross proceeds.
2. SEC data reveal two relationships about flotation costs.
 - a. Issue costs (as a percent of gross proceeds) for common stock exceed those of preferred stock, which in turn exceed those of bonds.
 - b. Total flotation costs per dollar raised decrease as the dollar size of the security issue increases.

E. Regulation Aimed at Making the Goal of the Firm Work: The Sarbanes-Oxley Act

1. In July 2002 Congress passed the Public Company Accounting Reform and Investor Protection Act. The short name for the act became the Sarbanes-Oxley Act of 2002.
 - a. The Sarbanes-Oxley Act was passed as the result of a large series of corporate indiscretions.
 - b. The act holds corporate advisors (like accountants, lawyers, company officers, and boards of directors) who have access to or influence over company decisions strictly accountable in a legal sense for any instances of misconduct.

III. Rates of Return in the Financial Markets.

A. Rates of Return over Long Periods

While interest rates are presently at historically low levels and stock prices have been extremely volatile since 2007, over the longer run:

1. The average inflation rate (the “inflation-risk premium”) has been about 3.0 percent annually.
2. The default-risk premium for long-term corporate bonds over long-term government bonds has been about 0.4 percent annually.
3. Large common stocks earned 3.7 percent more than the rate earned on long-term corporate bonds.

B. Interest Rate Levels in Recent Periods

1. **Maturity-risk premium** is another factor that affects interest rate levels and arises even if security possesses equal odds of default.
2. The **liquidity-risk premium** needs to be identified and defined to help determine interest rate levels.

IV. Interest Rate Determinants in a Nutshell

The real risk-free interest rate is a required rate of return on a fixed-income security that has no risk in an economic environment of zero inflation.

A. Estimating Specific Interest Rates Using Risk Premiums

B. Real Risk-Free Interest Rates and the Risk-Free Interest Rate

1. Putting the term “real” in front of an interest rate means the rate has been adjusted for inflation.

C. Real and Nominal Rates of Interest

1. The **real rate of interest** is the difference in the nominal rate and the anticipated rate of inflation.
2. It tells you how much more purchasing power you have.

3. The nominal rate of interest can be viewed as,

$$\begin{aligned}\text{nominal interest rate} &= \text{real risk-free interest rate} \\ &+ \text{inflation premium} \\ &+ \text{default-risk premium} \\ &+ \text{maturity-risk premium} \\ &+ \text{liquidity-risk premium}\end{aligned}$$

D. Inflation and Real Rates of Return: The Financial Analyst's Approach

1. Practicing analysts and executives employ an approximation method to estimate the real rate of interest over a selected past time frame.
2. The relationship between the nominal interest rate, the rate of inflation, and the real rate of interest is expressed by the following equation:

$$1 + \text{nominal rate of interest} = (1 + \text{real rate of interest})(1 + \text{anticipated rate of inflation})$$

or

$$\text{nominal rate of interest} = \text{real rate of interest} + \text{anticipated rate of inflation} + (\text{real rate of interest})(\text{anticipated rate of inflation})$$

For example, if the real rate is 5% and the expected inflation rate is 4%, the nominal rate would then be 9.2%, computed as follows:

$$\begin{aligned}\text{nominal rate of interest} &= .05 + .04 + (.05)(.04) \\ &= .092 \text{ or } 9.2\%\end{aligned}$$

E. The Structure of Interest Rates

1. The relationship between a debt security's rate of return and the length of time until the debt matures is known as the **term structure of interest rates** or the **yield to maturity**.

F. Observing the Historical Term Structures of Interest Rates

1. The term structure of interest rates changes over time, depending on the environment.
2. The particular term structure observed today may be quite different from the term structure 1 month ago and different still from the term structure 1 month from now.
3. The term structure reflects observed rates or yields on similar securities, except for the length of time until maturity, at a particular moment in time.

G. What Explains the Shape of the Term Structure?

1. The **unbiased expectations theory** says that the term structure is determined by an investor's expectations about future interest rates.
2. The **liquidity preference theory** suggests that investors require liquidity premiums (additional returns) to compensate them for buying securities that expose them to a greater risk of fluctuating interest rates.
3. The **market segmentation theory** is built on the notion that legal restrictions and personal preferences limit investment choices to certain ranges of maturities and therefore affect the rates of return required in each range.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 2-1. The **money market** consists of all institutions and procedures that accomplish transactions in short-term debt instruments issued by borrowers with (typically) high credit ratings. Examples of securities traded in the money market include U.S. Treasury bills, bankers acceptances, and commercial paper. Notice that all of these are debt instruments. Equities are not traded in the **money market**. The money market is entirely an over-the-counter market. On the other hand, the **capital market** provides for transactions in long-term financial claims (those claims with maturity periods extending beyond one year). Trades in the capital market can take place on organized exchanges or over-the-counter.
- 2-2. Organized stock exchanges provide for:
- (1) A continuous market. This means a series of continuous security prices is generated. Price changes between trades are dampened, reducing price volatility, and enhancing the liquidity of securities.
 - (2) Establishing and publicizing fair security prices. Prices on an organized exchange are determined in the manner of an auction. Moreover, the prices are published in widely available media like newspapers.
 - (3) An aftermarket to aid businesses in the flotation of new security issues. The continuous pricing mechanism provided by the exchanges facilitates the determination of offering prices in new flotations. The initial buyer of the new issue has a ready market in which he can sell the security should he need liquidity rather than a financial asset.
- 2-3. The criteria for listing can be labeled as follows: (1) profitability; (2) size; (3) market value; (4) public ownership.
- 2-4. Most bonds are traded among very large financial institutions. Life insurance companies and pension funds are typical examples. These institutions deal in large quantities (blocks) of securities. An over-the-counter bond dealer can easily bring together a few buyers and sellers of these large quantities of bonds. By comparison, common stocks are owned by millions of investors. Organized exchanges are necessary to accomplish the “fragmented” trading in equities.
- 2-5. The investment banker is a middleman involved in the channeling of savings into long-term investment. He performs the functions of: (1) underwriting; (2) distributing; (3) advising. By assuming underwriting risk, the investment banker and his syndicate purchase the securities from the issuer and hope to sell them at a higher price. Distributing the securities means getting those financial claims into the hands of the ultimate investor. This is accomplished through the syndicate’s selling group. Finally, the investment banker can provide the corporate client with sound advice on which type of security to issue, when to issue it, and how to price it.

- 2-6. In a negotiated purchase, the corporate security-issuer and the managing investment banker negotiate the price that the investment banker will pay the issuer for the new offering of securities. In a competitive-bid situation, the price paid to the corporate security-issuer is determined by competitive (sealed) bids, which are submitted by several investment banking syndicates, each hoping to win the right to underwrite the offering.
- 2-7. Investment banking syndicates are established for three key reasons: (1) the investment banker who originates the business probably cannot afford to purchase the entire new issue himself; (2) to spread the risk of loss among several underwriters; (3) to widen the distribution network.
- 2-8. Several positive benefits are associated with private placements. The first is **speed**. Funds can be obtained quickly, primarily due to the absence of a required registration with the SEC. Second, flotation **costs** are lower compared to public offerings of the same dollar size. Third, greater financing **flexibility** is associated with the private placement. All of the funds, for example, need not be borrowed at once. They can be taken down over a period of time. Also, elements of the debt contract can be renegotiated during the life of the loan.
- 2-9. As a percent of gross proceeds, flotation costs are inversely related to the dollar size of the new issue. Additionally, common stock is more expensive to issue than preferred stock, which is more expensive to issue than debt.
- 2-10. First, there may be a direct transfer of savings from the investor to the borrower. Second, there may be an indirect transfer that uses the services provided by an investment banker. Third, there may be an indirect transfer that uses the services of a financial intermediary. Private pension funds and life insurance companies are prominent examples of the latter case.
- 2-11. As a net user of funds, a firm must raise funds in the financial markets, either in the form of debt or of equity. Also, since there will be other entities in need of funds, including both businesses and governments, the firm must offer the investor a return that is attractive, given the investor's next best opportunity. Thus, the cost of money to the firm will invariably be determined by the investor's next best opportunity for the given level of risk being assumed—that is, the investor's opportunity cost. Otherwise, the investor will not be interested in purchasing the company's bonds or stocks. We should never base our decisions on past or historical costs, even when they represent the actual out-of-pocket costs to the firm. Maximizing shareholder wealth means that we make decisions based upon our understanding of the investor's best alternative opportunities. In the case of investment and financing decisions, the opportunity cost for the firm's investors is captured in the rates of return available in the financial markets.
- 2-12. Historically, returns of different types of securities have followed the risk-return relationship with securities, with higher levels of risk producing higher returns.

- 2-13. We may think of the difference in the nominal rate and real rate of return as the “inflation premium.” As the expected rate of inflation increases, investors will demand a higher rate of return (a higher inflation premium) to compensate for the potential loss of purchasing power.
- 2-14. The term structure of interest rates represents the relationship between a debt security’s rate of return and the length of time until the debt matures. For the relationship to be meaningful to us, all other factors than maturity, such as the chance of the bond defaulting, must be held constant.
- 2-15. Three theories were given in the chapter for explaining the term structure of interest rates, (1) the unbiased expectations theory, (2) the liquidity preference theory, and (3) the market segmentation theory.
- (1) The unbiased expectations theory states that the term structure is determined by an investor’s expectations about future interest rates. Looking at the current term structure of interest rates we can estimate what investors should expect future interest rates to be. For instance, if we know the current interest rates for securities maturing one and two years, we can estimate what rate investors expect on a similar security issued one year from now with a one-year maturity date.
 - (2) According to the liquidity preference theory, investors require a liquidity premium to compensate for buying securities that expose them to the risks of fluctuating future interest rates.
 - (3) The market segmentation theory is built on the notion that legal restrictions and personal preferences limit investment choices to certain ranges of maturities. For example, commercial banks prefer short- to medium-term maturities as a result of their short-term deposit liabilities. They simply do not like to invest in long-term securities. Life insurance companies, on the other hand, have longer-term liabilities, so they prefer longer maturities when they invest. The market segmentation theory implies that the rate of interest for a particular maturity is determined solely by demand and supply conditions for a given maturity, and is independent of the demand and supply for securities having different maturities.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

2-1. We know that $NI = RI + IP + DF + MP + LP$, where:

NI = Nominal interest rate

RI = Real- risk free interest rate

IP = Inflation premium

DF = default-risk premium

MP = maturity-risk premium

LP = Liquidity-risk premium

$k_{10\text{-year Treasury bond}} = 4\% = RI + IP + DF + MP + LP$; where $DF = 0$ and $LP = 0$
(remember, this is a Treasury security, so it should have no DF or LP)

Thus, $k_{10\text{-year Treasury bond}} = 4\% = RI + IP + MP$

$k_{10\text{-year Corporate bond}} = 6.8\% = RI + IP + DF + MP + 0.4\%$

Since both bonds are 10-year bonds, they should have the same inflation premium (IP) and the same maturity-risk premium (MP). Thus, we can substitute $4\% = RI + IP + MP$ into the 10-year corporate bond interest rate formula,

$k_{10\text{-year Corporate bond}} = 6.8\% = RI + IP + DP + MP + 0.4\%$

$k_{10\text{-year Corporate bond}} = 6.8\% = 4\% + DP + 0.4\%$

Thus, $DP = 2.4\%$

2-2. Letting NI = nominal rate

RI = real risk-free rate

IP = inflation rate

DP = Default-risk premium

MP = Maturity premium

LP = Liquidity premium

Since this is a Treasury security, there is not a Default-risk premium (DP) or Liquidity-risk premium (LP), thus,

$k_{2\text{-year Treasury bond}} = 4.5\% = RI + IP + MP$

$4.5\% = 2\% + 2\% + MP$

Thus, $MP = 0.5\%$

2-3. According to the problem, we are given the following information:

Nominal (quoted) rate of return: 8%

Real rate of return: 6%

The formula for the calculation of Expected Inflation is:

$$(1 + \text{Inflation}) = (1 + \text{Nominal}) / (1 + \text{real rate of return})$$

Solving this, we see that:

$$(1 + \text{Inflation}) = (1.08) / (1.06)$$

$$(1 + \text{Inflation}) = 1.0189$$

$$\text{Inflation rate} = 0.0189 \text{ or } 1.89\%$$

2-4. If k = nominal rate

k^* = real rate

IRP = inflation rate

then, $k = k^* + \text{IRP} + (\text{IRP})(k^*)$

$$k = 0.04 + 0.07 + (0.07)(0.04) = 11.28\%$$

2-5. If k = nominal rate

k^* = real rate

IRP = inflation rate

then, $k = k^* + \text{IRP} + (\text{IRP})(k^*)$

$$k = 0.06 + 0.04 + (0.06)(0.04) = 10.24\%$$

2-6. The difference between the nominal yield and the inflation rate indicates the inferred real interest rate, which can serve as an approximation of the increase in real purchasing power over the study period. Those calculations are shown below.

Security	Mean Nominal Yield %	Mean Inflation Rate %	Inferred Real Rate %
Treasury bill	4.31	2.78	1.53
Treasury bonds	7.33	2.78	4.55

The 30-year real rate exceeds the three-month real rate because of the maturity premium demanded by investors.

- 2-7. Ignoring the cross-product involves using the simple arithmetic calculation, rather than the geometric one.

Nominal (quoted) rate of return: 4.5%

Expected Inflation Rate : 2.1%

The formula for the Expected Real Rate (r) if one is to ignore the cross product is:

Real Rate = Nominal (quoted) rate of return – Expected Inflation Rate

Entering in our variables, we see that:

Real Rate = 4.5% – 2.1%

Real Rate = 2.4%

- 2-8. Real risk free rate: 4.8%
Rate of inflation: 3.1%
Expected rate of return: 4.8% + 3.1% = 7.9%

- 2-9. On this problem we are implicitly assuming the same inflation premium and that there are no tax differences.

20-year Treasury Bonds:

Yield: 5.1%

Liquidity premium: 0.0%

20-year corporate bonds:

Yield: 9.1%

Liquidity premium: 0.25%

Default-risk premium = 9.1% – 5.1% – 0.25% = 3.75%

- 2-10. Real risk-free interest rate = 4.9% – 2.1% – 0.3% = 2.5%

- 2-11. We are told that:

Real risk-free interest rate: 2.5%

Inflation rate: 2.0%

We have learned that $NI = RI + IP + DF + MP + LP$, where:

NI = Nominal interest rate

RI = Real- risk free interest rate

IP = Inflation premium

DF = default-risk premium

MP = maturity-risk premium

LP = Liquidity-risk premium

As there is no default-risk premium or liquidity-risk premium, the nominal interest rate will be a function of the other three variables.

0–1 year: $2.5\% + 0.05\% + 2.0\% = 4.55\%$

1–2 year: $2.5\% + 0.30\% + 2.0\% = 4.80\%$

2–3 year: $2.5\% + 0.60\% + 2.0\% = 5.10\%$

3–4 year: $2.5\% + 0.90\% + 2.0\% = 5.40\%$

2-12. We are told that:

Real risk-free interest rate: 3.0%

Inflation: 3.0%

Default risk premium: 1.5%

Liquidity risk premium: 0.02%

Furthermore, we have learned that $NI = RI + IP + DF + MP + LP$, where:

NI = Nominal interest rate

RI = Real- risk free interest rate

IP = Inflation premium

DF = default-risk premium

MP = maturity-risk premium

LP = Liquidity-risk premium

Using these inputs and this formula, we come up with the following nominal rates:

0–1 year: $3.0\% + 3.0\% + 1.5\% + 0.02\% + 0.07\% = 7.59\%$

1–2 year: $3.0\% + 3.0\% + 1.5\% + 0.02\% + 0.35\% = 7.87\%$

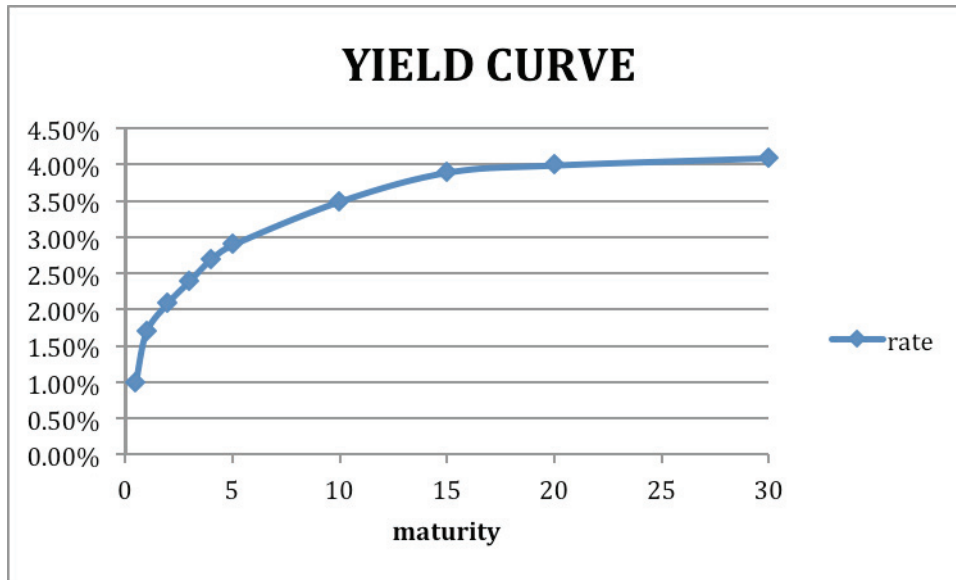
2–3 year: $3.0\% + 3.0\% + 1.5\% + 0.02\% + 0.70\% = 8.22\%$

3–4 year: $3.0\% + 3.0\% + 1.5\% + 0.02\% + 1.00\% = 8.52\%$

- 2-13. a. If you invest in the two-year security, you will have saved \$23,328 ($\$20,000 \times 1.08 \times 1.08$) by the end of the second year. Investing in the one-year security, you would have saved \$21,200 ($\$20,000 \times 1.06$) by the end of the first year. To do as well as you would with the first choice, you would have to earn \$2,128 in interest in the second year ($\$23,328 - \$21,200$). That means you would have to earn 10 percent ($\$2,128/\$21,200$) on the investment bought in the second year, if you want to be as well off in the second year as you would be from buying the two-year security. Thus, you would invest in the one-year security paying 6 percent only if you believed you could earn at least 10 percent in the second year on a security issued at the beginning of the second year. The foregoing logic is based on the expectations theory of term structure of interest rates.

- b. If you require an 11 percent rate on the second one-year investment, then the expectations theory is not fully explaining the term structure of interest rates. The expectations theory suggests you should accept 10 percent in year two. Thus, you are requiring a liquidity premium on the second-year investment to compensate for the uncertainty of the future interest rates in year two.

2-14.



Unbiased expectation theory:

- This theory proposes that the slope of the yield curve is based solely on expected future rates. The rise in the yield curve over the next five years is based on expectations by investors that prevailing interest rates in the market will rise.

Liquidity preference theory:

- This theory buys into the idea that investors have a preference toward more liquid investments, and that borrowers like to lock in interest rates so that they don't suffer if interest rates go up and the debt has to be refinanced at a higher interest rates.
- Therefore, any yield curve is a combination of expected future rates and a "liquidity premium" for longer investment. Thus, we cannot say what the shape of the yield curve means; an upward-sloping yield curve is consistent with expectations for rising, falling, or unchanged future short rates.

SOLUTION TO MINI CASE

Real risk-free interest rate	0.63
+	+
Inflation premium	2.33
+	+
Default-risk premium	1.28
+	+
Maturity-risk premium	2.47
+	+
Liquidity-risk premium	0.04
=	=
Nominal interest rate	6.75

CHAPTER 3

Understanding Financial Statements and Cash Flows

CHAPTER ORIENTATION

In this chapter, we review the contents and meaning of a firm's income statement and balance sheet. We also look very carefully at how to compute a firm's cash flows.

CHAPTER OUTLINE

I. The Income Statement

- A. The **income statement**, or **profit and loss statement**, reports the results from operating the business for a period of time, such as a year.
 - 1. The income statement begins with sales or revenue, from which we subtract the **cost of goods sold** (the cost of producing or acquiring the product or service to be sold) to yield **gross profits**. Next, **operating expenses** are deducted to determine **operating income** (also called **operating profits** or **earnings before interest and taxes** or **EBIT**),
 - 2. Operating income results from the following important activities:
 - a. **Sales:** Selling the product.
 - b. **Cost of good sold:** The cost of producing or acquiring the goods or services sold.
 - c. **Operating expenses:** The expenses incurred in marketing and distributing the product or service to the customer, along with administrative operating expenses.
 - 3. **Earnings before taxes**, or **taxable income**, is found by deducting the interest expense paid on the firm's debt.
 - 4. The **net income**, or **earnings available to common stockholders** represents income that may be reinvested in the firm or distributed to its owners—provided, of course, the cash is available to do so.

- B. Income Statement Illustrated: The Home Depot, Inc.
 - 1. **Earnings per share** is net income divided by the number of common stock shares outstanding.
 - 2. Investors also want to know the amount of dividends a firm pays for each share outstanding, or the **dividends per share**.
- C. Home Depot's Common-Sized Income Statement
 - 1. A **common-sized income statement** expresses a firm's expenses and profits as a percentage of its sales.
 - 2. **Profit margins** reflect the level of the firm's profits relative to its sales. Examples include the gross profit margin (gross profit divided by sales), operating profit margin (operating income divided by sales), and the net profit margin (net income , sales).
 - 3. **Gross profit margin is** gross profit divided by net sales. It is a ratio denoting the gross profit earned by the firm as a percentage of its net sales.
 - 4. **Operating profit margin is** operating income divided by sales. This ratio serves as an overall measure of the company's operating effectiveness.
 - 5. **Net profit margin is** net income divided by sales. It measures the net income of the firm as a percent of sales.
 - 6. **Fixed costs** remain constant, regardless of any change in a firm's activity.
 - 7. **Variable costs** change in proportion to changes in a firm's activity.
 - 8. **Semivariable costs** are composed of a mixture of fixed and variable components.

II. The Balance Sheet

The balance sheet provides a snapshot of the firm's financial position at a specific point in time, presenting its asset holdings, liabilities, and owner-supplied capital.

- A. Types of Assets
 - 1. **Current assets** (or **gross working capital**)—consisting primarily of **cash**, marketable securities, **accounts receivable**, **inventories**, and prepaid expenses, and **other current assets**.
 - 2. Long-term assets—**fixed assets** include equipment, buildings, and land.
 - a. With a depreciable asset, the original cost of the asset is allocated as an expense in the income statement over the asset's expected useful life and is shown as a **depreciation expense** in the income statement.
 - b. The sum of all depreciation taken over the life of the asset to date is shown as **accumulated depreciation** in the balance sheet.
 - c. Accumulated depreciation is subtracted each year from the **gross fixed assets** (the original cost of a firm's fixed assets) to determine **net fixed assets**.

3. Other long-term assets—all assets not otherwise included in the firm's current assets or fixed assets, such as patents, long-term investments in securities, and goodwill.

B. Types of Financing

1. **Debt** consists of such sources as credit extended from suppliers or a loan from a bank.
 - a. Short-term debt
 - i. Accounts payable
 - ii. Accrued expenses
 - iii. Short-term notes
 - b. Long-term debt—loans from banks or other sources longer than 12 months, such as **mortgages**
2. **Equity** includes the stockholders' investment in the firm and the cumulative profits retained in the business up to the date of the balance sheet.
 - a. Amount company receives from selling stock to investors
 - b. Amount of a firm's **retained earnings**

C. Balance Sheet Illustrated: The Home Depot, Inc.

D. Working Capital

1. **Net working capital** is equal to a company's current assets *less* its current liabilities.

$$\text{Net working capital} = \text{current asset} - \text{current liabilities}$$

E. The Balance Sheet and Income Statement as One Picture

1. By examining two balance sheets, one at the beginning of a year and one at the end of the year, along with the income statement for the year, we have a better picture of a firm's operations.

III. Measuring Cash Flows

A. Profit Versus Cash Flows

1. Profits and cash flows are not the same thing.
2. Without adequate cash flow, even a profitable business can go bankrupt.
3. An income statement is not a measure of cash flows because it is calculated on an **accrual basis** rather than a **cash basis**.

B. A Beginning Look: Determining Sources and Uses of Cash

1. Sources of Cash

- i. Decrease in an asset, such as selling inventories or collecting receivables
- ii. Increase in a liability or equity, such as borrowing funds or selling stock

2. Uses of Cash

- i. Increase in an asset, such as buying fixed assets or inventory
- ii. Decrease in a liability or equity, such as paying off a loan or buying back stock

C. Statement of Cash Flows

1. We can explain all the cash inflows and outflows of a business by looking at three activities, these being:

- i. *Generating cash flows from day-to-day business operations.* Cash flows from operations equals:

Net income

- Plus depreciation expense
- Less an increase in accounts receivable or plus a decrease in accounts receivable.
- Less an increase in inventories or plus a decrease in inventories.
- Less an increase in other current assets or plus a decrease in other current assets.
- Plus an increase in accounts payable and accrued liabilities or less a decrease in accounts payable and accrued liabilities

- ii. *Investing in fixed assets.* When a company purchases fixed assets, such as equipment or buildings, these expenditures are shown as an increase in *gross* fixed assets (not the increase in *net* fixed assets) in the balance sheet. Cash flows from investing activities are determined as follows:

+ increase in gross fixed assets (cash outflow)

or

- decrease in gross fixed assets and other long-term assets (cash inflow)

- iii. *Financing the business.* Financing a business involves (1) paying dividends to the owners; (2) increasing or decreasing short-term and long-term debt, which means borrowing more money (an increase in debt) or paying off debt (a decrease in debt); and (3) selling shares of stock (source of cash) or repurchasing stock (use of cash). A firm's ***cash flows from financing activities*** are equal to:

+ increase in interest-bearing debt (cash inflow) or - decrease in interest-bearing debt (cash outflow)

+ increase in common stock (cash inflow) or - decrease in common stock (cash outflow)

- dividend payments (cash outflow)

2. The basic format of a statement of cash flows is as follows:

Cash flows from operations	
+/-	cash flows from investing activities
+/-	cash flows from financing activities
=	change in cash
+	beginning cash
=	ending cash

D. Concluding Suggestions for Computing Cash Flows

E. Conclusions About Home Depot's Financial Position

III. GAAP and IFRS

GAAP is rule-based and sets out rules that accountants must follow when preparing financial statements. IFRS is principle-based and sets out general principles. IFRS leaves more room for discretion than GAAP does, permitting managers to exercise their own judgment when deciding what to report in their financial statements, as long as they follow the spirit of the standards.

IV. Income Taxes and Finance

A. Computing Taxable Income

1. **Taxable income** is basically determined as income less allowable exclusions and tax-deductible expenses.
2. Interest expense is a tax deductible expense; however, dividends paid by a corporation to its stockholders are not a tax deductible expense.

B. Computing the Taxes Owed

Corporate rate structure:

<u>Rate</u>			<u>Income</u>
15%	\$0	-	\$50,000
25%	\$50,001	-	\$75,000
34%	\$75,001	-	\$10,000,000
35%	over		\$10,000,000

There is an additional surtax of 5 percent for income between \$100,000 and \$335,000.

There is also an additional surtax of 3 percent on income between \$15 million and \$18.3 million.

IV. Accounting Malpractice and Limitations of Financial Statements

Accounting rules give managers discretion. Therefore what we see from financial statements may not exactly reflect the company's financial situation. Sometimes, managers may even break the rules, which results in accounting malpractice/accounting fraud.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 3-1. The balance sheet represents an enumeration of a firm's resources (assets) along with its liabilities and owners' equity at a given date. The income statement summarizes the net results of operation of a firm over a specified time interval. The income statement and the balance sheet are on an accrual basis, not a cash basis. However, by using both of these statements together, we can determine a firm's actual cash flows, and in the process understand where the cash came from and how it was used. This is vital information because a firm can possibly have positive profits but run out of cash. That is why business people say, "Cash is king."

- 3-2. Gross profit is sales less the cost of producing or acquiring the firm's product or service. Operating profits is the gross profits less the operating expenses, which consist of distributing the product or service to the customer (namely, marketing expenses) and any general and administrative expenses in operating the business. Net income is operating profits less financing costs (interest expenses and preferred stock dividends) and less income taxes.
- 3-3. Interest expense is the cost of borrowing money from a banker or another lender. There typically is a fixed interest rate so that the interest expense is computed as the interest rate times the amount borrowed. If we borrow \$500,000 at an interest rate of 12 percent, then our interest expense will be \$60,000.

While interest is paid for the use of debt capital, dividends are paid to the firm's stockholders. Preferred stock typically has a fixed dividend rate, so that the preferred stockholder gets a constant dividend each year. Common stockholders, on the other hand, usually receive dividends only if management decides to pay a dividend instead of reinvesting the firm's profits. However, typically once a dividend has been paid to common stockholders, management is reluctant to decrease it or pass up paying a dividend.
- 3-4. Once preferred shares are sold, dividends are paid or accrued each year based upon preferred dividends (i.e., the percentage of the preferred stock's par value paid in dividends) agreed to at the selling date. However, these dividends affect the income statement only. Common stock dividends, which may vary from year to year, also affect the income statement; however, the investment of common shareholders varies with the net addition to (or reduction from) retained earnings from year to year. The net addition to retained earnings equals the difference in the period's net income and common dividends paid. Thus, the common equity section of the balance sheet (par value of common stock, paid-in capital and retained earnings) varies from year to year due to changes in the retained earnings portion of the firm's common equity.
- 3-5. *Net working capital* is the firm's *gross* working capital (current assets) less its short-term debt. It represents a firm's investments in short-term assets less its short-term financing. As a business becomes larger, additional amounts of working capital will normally be required.
- 3-6. A firm could have positive cash flows but still be in trouble because it has negative cash flows from operations. The positive cash flows would then be the result of the firm reducing its investments in working capital or long-term assets. Such a situation means that the company is not earning a satisfactory rate of return on its investments. Another company could have very attractive rates of return on its assets but be growing so fast that the large investments in working capital and long-term assets result in negative cash flows. In this latter case, management is simply investing in the future. As quickly as the growth is reduced, positive cash flows will occur.
- 3-7. Examining only the income statement and the balance sheet fails to tell us how the firm is using its cash, which is a critical issue for any company.

- 3-8. GAAP is rule-based and sets out rules that accountants must follow when preparing financial statements. IFRS is principle-based and sets out general principles. IFRS allows for more discretion than GAAP does, permitting managers to exercise their own judgment when deciding what to report in their financial statements, as long as they follow the spirit of the standards.
- 3-9. Dividends are not considered to be an expense, but rather a return of capital to a company's owners.
- 3-10. Accounting rules give managers discretion. Therefore what we see from financial statements may not exactly reflect the company's financial situation.
- 3-11 through 3-13. There are no single answers to these questions, but rather an opportunity for a student to investigate the financial information for firms that may be of interest to them.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

3-1.

Earnings per share = net income ÷ number of shares
= \$280,000 net income ÷ 80,000 shares = \$3.50

3-2.

	<u>Dollar Value</u>	<u>% of Sales</u>
Sales	\$525,000	100.0%
Cost of goods sold	<u>200,000</u>	<u>38.1%</u>
Gross profits	\$325,000	61.9%
Operating expenses:		
General and administrative expenses	\$62,000	11.8%
Depreciation expenses	<u>8,000</u>	<u>1.5%</u>
Total operating expenses	<u>\$70,000</u>	<u>13.3%</u>
Operating income (earnings before interest and taxes)	\$255,000	48.6%
Interest expense	<u>12,000</u>	<u>2.3%</u>
Earnings before taxes (taxable income)	\$243,000	46.3%
Income taxes	<u>97,200</u>	<u>18.5%</u>
Net Income	<u>\$145,800</u>	<u>27.8%</u>

3-3.

ASSETS	
Cash	\$50,000
Account receivables	42,700
Inventories	40,000
Other current assets	<u>5,000</u>
Total current assets	\$137,700
Gross fixed assets	\$1,280,000
Accumulated depreciation	<u>(312,000)</u>
Net fixed assets	\$968,000
Other assets	<u>15,000</u>
Total assets	<u>\$1,120,700</u>

LIABILITIES (DEBT) AND EQUITY

Accounts payable	\$23,000
Short-term notes payable	<u>10,500</u>
Total current liabilities	\$33,500
Long-term debt	<u>\$200,000</u>
Total liabilities	\$233,500
Common equity:	
Common stock	\$490,000
Retained earnings	<u>397,200</u>
Total common equity	<u>\$887,200</u>
Total liabilities and equity	<u>\$1,120,700</u>

Retained earnings must be \$397,200 in order for debt and equity to equal total assets of \$1,120,700

Net working capital = current assets – current liabilities

$$= \$157,700 - \$33,500 = \$104,200$$

Debt ratio = total debt ÷ total assets

$$= \$233,500 \div \$1,120,700 = 20.8\%$$

3-4.

	<u>Dollar Value</u>	<u>% of Total Assets</u>
ASSETS		
Cash	\$30,000	2.6%
Account receivables	63,800	5.5%
Inventories	66,000	5.7%
Total current assets	\$159,800	13.8%
Gross fixed assets	\$1,061,000	91.5%
Accumulated depreciation	<u>(86,000)</u>	<u>-7.4%</u>
Net fixed assets	\$975,000	84.1%
Other assets	<u>25,000</u>	<u>2.2%</u>
Total assets	<u>\$1,159,800</u>	<u>100.0%</u>
LIABILITIES (DEBT) AND EQUITY		
Accounts payable	\$52,500	4.5%
Short-term notes payable	<u>11,000</u>	<u>0.9%</u>
Total current liabilities	\$63,500	5.5%
Long-term debt	<u>\$210,000</u>	<u>18.1%</u>
Total liabilities	\$273,500	23.6%
Common equity:		
Common stock	\$480,000	41.4%
Retained earnings	<u>406,300</u>	<u>35.0%</u>
Total common equity	<u>\$886,300</u>	<u>76.4%</u>
Total liabilities and equity	<u>\$1,159,800</u>	<u>100.0%</u>

Retained earnings = total assets – total debt – common stock
 $= \$1,159,800 - \$273,500 - \$480,000 = \$406,300$

3-5. Belmond, Inc.

Balance Sheet

ASSETS

Cash	\$ 16,550
Accounts receivable	9,600
Inventory	<u>6,500</u>
Total current assets	\$ 32,650
Buildings and equipment	122,000
Accumulated Depreciation	<u>34,000</u>
Net buildings and equipment	\$ 88,000
Total assets	<u>\$120,650</u>

LIABILITIES AND EQUITY

Liabilities

Notes payable	\$ 600
Accounts payable	<u>4,800</u>
Total current liabilities	\$ 5,400
Long-term debt	<u>55,000</u>
Total liabilities	\$ 60,400

Equity

Common stock	\$ 45,000
Retained earnings	<u>15,250</u>
Total equity	\$ 60,250
Total liabilities and equity	<u>\$120,650</u>

Income Statement

Sales		\$ 12,800
Cost of goods sold		<u>5,750</u>
Gross profits		\$ 7,050
General & admin expense	\$ 850	
Depreciation expense	<u>500</u>	
Total operating expense		\$ 1,350
Operating income (EBIT)		\$ 5,700
Interest expense		<u>900</u>
Earnings before taxes		\$ 4,800
Taxes		<u>1,440</u>
Net income		<u>\$ 3,360</u>

3-6. Warner Company

Balance Sheet

ASSETS

Cash	\$ 225,000
Accounts receivables	153,000
Inventories	99,300
Prepaid expenses	<u>14,500</u>
Total current assets	\$ 491,800
Gross buildings & equipment	\$ 895,000
Accumulated depreciation	<u>263,000</u>
Net fixed assets	<u>632,000</u>
Total assets	<u><u>\$1,123,800</u></u>

LIABILITIES & EQUITY

Liabilities

Notes payable	\$ 75,000
Accounts payable	102,000
Taxes payable	53,000
Accrued expenses	<u>7,900</u>
Total current liabilities	\$ 237,900
Long-term debt	<u>334,000</u>
Total liabilities	\$ 571,900

Equity

Common stock	\$ 289,000
Retained earnings	<u>262,900</u>
Total equity	<u>\$ 551,900</u>
Total liabilities and equity	<u><u>\$1,123,800</u></u>

Income Statement

Sales	\$ 573,000
Cost of goods sold	<u>297,000</u>
Gross profits	\$ 276,000
General & admin. expense	\$ 79,000
Depreciation expense	<u>66,000</u>
Total operating expense	<u>\$ 145,000</u>
Operating income (EBIT)	\$ 131,000
Interest expense	<u>4,750</u>
Earnings before taxes	\$ 126,250
Taxes	<u>50,500</u>
Net income	<u><u>\$ 75,750</u></u>

- a. Net working capital = current assets – current debt
= \$491,800 - \$237,900 = \$253,900

Debt ratio = total debt ÷ total assets

$$= \$571,900 \div \$1,123,800 = 0.51 \text{ or } 51\%$$

- b. Common-sized income statement

Sales	\$573,000	100.0%
Cost of Goods sold	<u>297,000</u>	<u>51.8%</u>
Gross Profits	\$276,000	48.2%
General & Admin expenses	79,000	13.8%
Depreciation expense	<u>66,000</u>	<u>11.5%</u>
Total operating expense	<u>\$145,000</u>	<u>25.3%</u>
Operating income (EBIT)	\$131,000	22.9%
Interest expense	<u>4,750</u>	<u>0.8%</u>
Earnings before taxes	\$126,250	22.0%
Taxes (40%)	<u>50,500</u>	<u>8.8%</u>
Net Income	\$75,750	13.2%

Common-sized balance sheet

Cash	\$225,000	20.0%
Accounts receivable	153,000	13.6%
Inventory	99,300	8.8%
Prepaid expenses	14,500	1.3%
Total current assets	\$491,800	43.8%
Gross Buildings and equipment	\$895,000	79.6%
Accumulated Depreciation	<u>(263,000)</u>	<u>-23.4%</u>
Net fixed assets	<u>\$632,000</u>	<u>56.2%</u>
Total assets	\$1,123,800	100.0%
Accounts payable	102,000	9.1%
Accrued expenses	7,900	0.7%
Taxes payable	53,000	4.7%
Notes payable	<u>75,000</u>	<u>6.7%</u>
Total current liabilities	\$237,900	21.2%
Long-term debt	<u>334,000</u>	<u>29.7%</u>
Total Liabilities	\$571,900	50.9%
Common Stock	\$289,000	25.7%
Retained earnings	262,900	23.4%
Total equity	<u>\$551,900</u>	<u>49.1%</u>
Total liabilities and equity	\$1,123,800	100.0%

The common-sized income statement provides insightful information in terms of profits per sales dollars. These are numbers that managers watch closely on a

monthly basis, if not on a daily basis. A student is well advised to understand margins, whether she is in finance, marketing, or any business major.

The common-sized balance sheet shows how the firm's assets have been allocated and how the assets have been financed in terms of debt versus equity.

3.7

Income Statement:

	Dollar Value	Percentage of Sales
Sales	\$550,000	100.0%
Cost of goods sold	<u>(320,000)</u>	<u>(58.2%)</u>
Gross profits	\$230,000	41.8%
Operating expenses:		
Marketing and G&A expenses	(\$45,000)	(8.2%)
Depreciation expenses	<u>(38,000)</u>	<u>(6.9%)</u>
Total operating expenses	<u>(\$83,000)</u>	<u>(15.1%)</u>
Operating income (earnings before interest and taxes)	\$147,000	26.7%
Interest expense	<u>(26,000)</u>	<u>(4.7%)</u>
Earnings before taxes (taxable income)	\$121,000	22.0%
Income taxes	<u>(59,850)</u>	<u>(10.9%)</u>
Net Income	<u>\$61,150</u>	<u>11.1%</u>
Number of common shares outstanding	10,000	
Earnings per share (net income ÷ number of shares)	\$6.12	
Dividends paid to stockholders	\$15,000	
Dividends per share (total dividends ÷ number of shares)	\$1.50	

Balance Sheet:

ASSETS	Dollar Value	Percentage of Total Assets
Cash	\$119,500	10.8%
Account receivables	73,000	10.2%
Inventories	<u>47,000</u>	<u>6.6%</u>
Total current assets	\$239,500	33.6%
Gross fixed assets	\$648,000	90.9%
Accumulated depreciation	<u>(190,000)</u>	<u>-26.7%</u>
Net fixed assets	\$458,000	64.3%
Other assets	<u>15,000</u>	<u>2.1%</u>
Total assets	<u>\$712,500</u>	<u>100.0%</u>

LIABILITIES (DEBT) AND EQUITY

Accounts payable	\$65,000	9.1%
Short-term notes payable	<u>29,000</u>	<u>4.1%</u>
Total current liabilities	\$94,000	13.2%
Long-term debt	<u>\$360,000</u>	<u>50.5%</u>
Total liabilities	\$454,000	63.7%
Common equity:		
Common stock	\$120,000	16.8%
Retained earnings	<u>138,500</u>	<u>19.4%</u>
Total common equity	<u>\$258,500</u>	<u>36.3%</u>
Total debt and equity	<u>\$712,500</u>	<u>100%</u>

To determine cash, the following equation was used: Total debt and equity – all assets given in the problem except cash since it was not provided

$$= \$712,500 - \$593,000 = \$119,500$$

Net working capital = current assets – current liabilities

$$= \$239,500 - \$94,000 = \$145,500$$

Debt ratio = total debt ÷ total assets

$$= \$454,000 \div \$712,500 = 63.7\%$$

3-8. Statement of Cash Flows

Net Income*		\$33
Adjustments:		
Depreciation	\$12	
Increase in accounts receivable	(25)	
Increase in inventories	(30)	
Increase in account payable	<u>25</u>	<u>(\$18)</u>
Net Cash provided by operating activities		\$15
Cash Flows from Investing Activities		
Increase in gross fixed assets**		(\$35)
Cash Flows from Financing Activities		
Increase in common stock	\$20	
Dividends	<u>(15)</u>	
Net cash provided by financing activities		<u>\$5</u>
Decrease in Cash		(\$15)
Beginning Cash		<u>20</u>
Ending cash		\$5

* Net income = operating income – interest expense – depreciation expense – income taxes

**The change in gross fixed assets is equal to the change in net fixed assets (\$23) plus the depreciation expense for the year of \$12, resulting in a change in gross fixed assets of \$35.

- 3-9. Westlake Corporation generated a positive cash flow from operations (\$566), but even a greater amount was used to invest in fixed assets (\$1,064).
- 3-10. Change in Cash Flows

Note to Instructor: There was no “Beginning Cash” provided in this problem. Thus, you can only compute the change in cash flows

Cash Flows from Operating Activities

Net Income*	\$120	
Adjustments		
Depreciation	20	
Increase in accounts receivable	(65)	
Increase in inventories	(5)	
Increase in account payable	40	
Increase in accrued expenses	<u>15</u>	
Net Cash provided by operating activities		\$125

Cash Flows from Investing Activities

Increase in gross fixed assets	(55)
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Cash Flows from Financing Activities

Increase in common stock	\$27	
Increase in bank debt	48	
Dividends	<u>(25)</u>	
Net cash provided by financing activities		<u>\$50</u>
Increase in cash		\$120
Beginning cash		<u>20</u>
Ending cash		\$140

* Net income = operating income – interest expense – depreciation expense – income taxes

- 3-11. The Maness Corporation experienced a decrease in cash of \$1,880. This decrease was largely the result of the large investment (\$1,500) in fixed assets, followed by payments to the firm's investors and lenders in the amount of \$350. Finally, the company had a small negative cash flow from operations of \$30.

3-12. Abrahams Manufacturing Company

Statement of Cash Flows

Cash Flows from Operating Activities

Net Income*	\$34,000	
Adjustments		
Depreciation	26,000	
Increase in accounts receivable	(6,000)	
Decrease in inventory	12,000	
Increase in account payable	5,000	
Decrease in accrued liabilities	<u>(5,000)</u>	
Net Cash provided by operating activities		\$66,000
Cash Flows from Investing Activities		(73,000)

Cash Flows from Financing Activities

Decrease in mortgage payable	(70,000)	
Increase in preferred stock	120,000	
Preferred stock dividends	(10,000)	
Common stock dividends*	<u>(22,000)</u>	
Net cash provided by financing activities		<u>\$18,000</u>
Net increase in cash		\$11,000
Beginning cash		<u>89,000</u>
Ending cash		\$100,000

*Net income is equal to the earnings available to common stockholders (\$24,000) plus the amount of preferred stock dividends (\$10,000).

3-13.

Operations activities:

Net income		\$129,000
Depreciation expense	\$17,000	
Increase in accounts receivable	(69,000)	
Increase in inventories	(7,000)	
Increase in accounts payable	<u>43,000</u>	<u>(\$16,000)</u>
Cash flows from operating activities		\$113,000

Investment activities:

Increase in gross fixed assets		(54,000)
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Financing activities:

Increase in short-term notes payable	\$15,000	
Increase in long-term debt	53,000	
Issued new common stock	25,000	
Dividends paid to shareholders	<u>(29,000)</u>	
Cash flows from financing activities		<u>\$64,000</u>
Change in cash and cash equivalents		\$123,000
Beginning cash		<u>250,000</u>
Ending cash		<u>\$373,000</u>

3-14. Pamplin, Inc.

a. Net working capital = current assets – current debt

$$= \$1,200 - 300 = \$900$$

Debt ratio = total debt /total assets

$$= \$900/\$2,600 = 0.346 \text{ or } 34.6\%$$

b. Common-sized income statement

Sales	\$1,450	100.0%
Cost of goods sold	<u>850</u>	<u>58.6%</u>
Gross profit	\$600	41.4%
Operating expenses	40	2.8%
Depreciation	<u>200</u>	<u>13.8%</u>
Operating income	\$360	24.8%
Interest expense	<u>64</u>	<u>4.4%</u>
Net income before taxes	\$296	20.4%
Taxes (40%)	<u>118</u>	<u>8.1%</u>
Net income	<u>\$178</u>	<u>12.3%</u>

Common-sized balance sheet

Assets:

Cash	\$150	5.8%
Accounts Receivable	425	16.3%
Inventory	625	24.0%
Current assets	\$1,200	46.2%
Plant and equipment	\$2,600	100.0%
Less: accumulated depreciation	(1,200)	-46.2%
Net plant and equipment	\$1,400	53.8%
Total assets	\$2,600	100.0%

Liabilities and Equity:

Accounts payable	\$150	5.8%
Notes payable--current (9%)	150	5.8%
Current liabilities	\$300	11.5%
Bonds	600	23.1%
Owners' equity		
Common stock	\$900	34.6%
Retained earnings	800	30.8%
Total owners' equity	\$1,700	65.4%
Total liabilities and owners' equity	\$2,600	100.0%

Statement of Cash Flows

Cash Flows from Operating Activities

Net Income	\$178	
Adjustments		
Depreciation	200	
Decrease in accounts receivable	25	
Increase in inventory	(75)	
Decrease in account payable	(50)	
Net Cash provided by operating activities		\$278

Cash Flows from Investing Activities

Increase in plant and equipment	(400)
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Cash Flows from Financing Activities

Increase in notes payable	\$150	
Dividends (see note)	(78)	
Net cash provided by financing activities		\$72

Net decrease in cash	(\$50)
Cash, January 1, 2012	<u>200</u>
Cash, December 31, 2012	\$150

Note: The dividends were computed by comparing net income to the change in retained earnings. Net income was \$178, but retained earnings increased only by \$100; thus the balance was distributed in the form of dividends.

3-15. T.P. Jarmon

a. Net working capital = current assets – current debt

$$= \$138,300 - 75,000 = \$63,300$$

Debt ratio = total debt /total assets

$$= \$225,000/\$408,300 = 0.551 \text{ or } 55.1\%$$

b.

Statement of Cash Flows

Cash flows from Operating Activities

Net Income	\$42,900	
Adjustments		
Depreciation	30,000	
Increase in marketable securities	(200)	
Increase in accounts receivable	9,000	
Prepaid expenses	100	
Increase in inventories (less A/P)	(24,000)	
Decrease in accruals	<u>(1,000)</u>	
Net Cash provided by operating activities		\$56,800

Cash Flows from Investing Activities

Increase in gross plant and equipment	(14,000)
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Cash Flows from Financing Activities

Decrease in notes payable	(\$2,000)	
Decrease in long-term debt	(\$10,000)	
Dividends	<u>(31,800)</u>	
Net cash provided by financing activities		(\$43,800)

Net decrease in cash	(\$1,000)
Cash, January 1, 2012	<u>15,000</u>
Cash, December 31, 2012	\$14,000

c.

Changes in the balance sheet:

Cash	(\$1,000)
Marketable Securities	\$200
Receivables	(\$9,000)
Inventory	\$33,000
Prepaid expenses	(\$100)
Total current assets	\$23,100
Net fixed assets	(\$16,000)
Total assets	\$7,100

Accounts payable	\$9,000
Accruals	(\$1,000)
Notes payable	(\$2,000)
Total current liabilities	\$6,000
Long-term debt	(\$10,000)
Common stock	\$11,100
Total liabilities and equity	\$7,100

The changes in the balance sheet give us a quick glance at many of the activities that result in sources and uses of cash. For the most part, the increases (decreases) in assets are cash outflows (inflows), while the increases (decreases) in debt and equity are inflows (outflows).

3-16. Waugh Corporation

Sales	\$ 3,000,000
Cost of Goods Sold and Operating Expenses	<u>(2,100,000)</u>
Operating Income	\$ 900,000
Other Taxable Income and Expenses:	
Interest Expense	<u>(400,000)</u>
Total Taxable Income	\$500,000

Tax Computation:

Tax rates	Income	Taxes
15%	\$ 50,000	\$7,500
25%	25,000	6,250
34%	<u>425,000</u>	<u>144,500</u>
	\$500,000	\$158,250
5% surtax for income between \$100,000 and \$335,000		<u>11,750</u>
Tax Liability		\$170,000

3-17. Menielle, Inc.

Sales		\$ 5,000,000
Cost of Goods Sold		(2,000,000)
Gross Profits		\$ 3,000,000
Operating Expenses		<u>(1,000,000)</u>
Operating Income		\$ 2,000,000
Other Taxable Income and Expenses:		
Interest Income	\$20,000	
Interest Expense	<u>(100,000)</u>	<u>(80,000)</u>
Total Taxable Income		\$1,920,000

Tax Computation

Tax rates	Income	Taxes
15%	\$50,000	\$7,500
25%	25,000	6,250
34%	<u>1,845,000</u>	<u>627,300</u>
	\$1,920,000	\$641,050
5% surtax for income between \$100,000 and \$335,000		<u>11,750</u>
Tax Liability		\$652,800

3-18. Sanderson, Inc.

Sales		\$ 3,000,000
Cost of Goods Sold		<u>(2,000,000)</u>
Gross Profit		\$ 1,000,000
Operating Expenses		
Cash operating expenses		(400,000)
Depreciation		<u>(100,000)</u>
Operating Income		\$ 500,000
Other Taxable Income and Expenses:		
Interest Expense		<u>(150,000)</u>
Total Taxable Income		\$350,000

Tax Computation

Tax rates	Income	Taxes
15%	50,000	\$7,500
25%	25,000	6,250
34%	<u>275,000</u>	<u>93,500</u>
	\$350,000	\$107,250
5% surtax for income between \$100,000 and \$335,000		<u>11,750</u>
Tax Liability		\$119,000

SOLUTION TO MINI CASE

- a. In measuring profit margins, we have three levels of profits that can be meaningfully compared to sales: Gross profit margin, operating profit margin, and net profit margin. These comparisons are shown below:

Comparison of profit margins between 2011 and 2012

<u>Time Warner</u>				
	2009	2010	2009	2010
Sales	\$25,388	\$26,888	100.0%	100.0%
Cost of goods sold	14,235	15,023	56.1%	55.9%
Gross profits	\$11,153	\$11,865	43.9%	44.1%
Selling, general, and administrative expenses	6,073	6,126	23.9%	22.8%
Depreciation and amortization	280	264	1.1%	1.0%
Other operating expenses	330	47	1.3%	0.2%
Total operating expenses	\$6,683	\$6,437	26.3%	23.9%
Operating income	\$4,470	\$5,428	17.6%	20.2%
Interest expense	1,166	1,178	4.6%	4.4%
Nonoperating income (expenses)	(67)	(331)	-0.3%	-1.2%
Earnings before tax	\$3,237	\$3,919	12.8%	14.6%
Income taxes	1,153	1,348	4.5%	5.0%
Net income (loss)	\$2,084	\$2,571	8.2%	9.6%

<u>Walt Disney</u>				
	2009	2010	2009	2010
Sales	\$36,149	\$38,063	100.0%	100.0%
Cost of goods sold	28,821	29,624	79.7%	77.8%
Gross profits	\$7,328	\$8,439	20.3%	22.2%
Selling, general, and administrative expenses	2,123	1,983	5.9%	5.2%
Operating income	\$5,205	\$6,456	14.4%	17.0%
Interest expense	466	409	1.3%	1.1%
Nonoperating income (expenses)	919	580	2.5%	1.5%
Earnings before tax	\$5,658	\$6,627	15.7%	17.4%
Income taxes	2,049	2,314	5.7%	6.1%
Net income (loss)	\$3,609	\$4,313	10.0%	11.3%

For Time Warner, all margins (gross, operating, and net) improved from 2009 to 2010. The margins, along with the percentage increases, in the margins are summarized follows;

	2009	2010	Percentage Change
Gross profit margin	43.9%	44.1%	0.4%
Operating profit margin	17.6%	20.2%	14.7%
Net profit margin	8.2%	9.6%	16.5%

Note: When computing the percentage changes in margins, we are not simply taking the change in the margins, but rather we are calculating the percentage change. For example, the increase in the percentage change in the gross profit margins was 0.4 percent, computed as $(44.1\% - 43.9\%) / 43.9\%$.

In comparing the percentage changes, we see that a 0.4-percent change in gross profit margins led to a 14.7-percent change in operating profit margins, which in turn resulted in a 16.5-percent change in the net profit margins. The increasing margins were attributable to lower cost of goods sold and decreases in operating expenses per dollar of sales.

Like Time Warner, all margins improved for Walt Disney. The margins, along with the percentage increases, were as follows;

	2009	2010	Percentage Change
Gross profit margin	20.3%	22.2%	9.4%
Operating profit margin	14.4%	17.0%	17.8%
Net profit margin	10.0%	11.3%	13.5%

Thus, the 9.4-percent increase in Disney's gross profit margins resulted in a 17.8-percent increase in the operating profit margins, but a smaller increase of 13.5-percent increase in the net profit margins.

So both firms experienced improving margins in 2010 over 2009.

b. Comparison of time Warner and Walt Disney's profit margins

	Time Warner		Walt Disney	
	2009	2010	2009	2010
Gross profit margin	43.9%	44.1%	20.3%	22.2%
Operating profit margin	17.6%	20.2%	14.4%	17.0%
Net profit margin	8.2%	9.6%	10.0%	11.3%

A comparison of profit margins between the two companies is very insightful. Time Warner's gross profit margins are over twice those of Walt Disney, which indicates that Time Warner's cost of goods sold per dollar of sales are much smaller than the case for Walt Disney. But by the time we subtract the operating expenses, the operating profit margins are much closer, but still higher for Time Warner. Then when we come to net profit margin, Walt Disney has an advantage. Chapter 4 will help us understand how these results can occur.

c. Comparison of the balance sheets by size and makeup

- (1) Both firms are approximately the same size when it comes to total assets. Furthermore, the relative make-up of the assets is fairly similar.
- (2) Time Warner has sold over \$150 billion in common stock, compared to less than \$30 billion by Walt Disney.
- (3) Based on retained earnings, we see that Time Warner has about \$96 billion in accumulated losses over the life of the business, while Walt Disney has accumulated profits of close to \$35 billion.
- (4) Time Warner relies more heavily on debt financing with a debt ratio of about 50 percent compared to approximately 43 percent for Walt Disney.
- (5) When sales are compared to assets, we see that Walt Disney does a better job in generating sales per dollar of assets invested. As shown in the table below, Time Warner produces about \$0.39 of sales per dollar of assets compared to Walt Disney generating about \$0.56 of sales per dollar of assets. Clearly Walt Disney is using its assets more efficiently than Time Warner.

(6)

	<u>Time Warner</u>		<u>Walt Disney</u>	
	<u>2009</u>	<u>2010</u>	<u>2009</u>	<u>2010</u>
Sales	\$25,388	\$26,888	\$36,149	\$38,063
<u>Total assets</u>	<u>66,059</u>	<u>66,524</u>	<u>463,117</u>	<u>69,206</u>
Sales-to-assets	0.38	0.40	0.57	0.55

SOLUTIONS TO APPENDIX 3A PROBLEMS

3A-1.

Free Cash Flows:

Operating income	\$215
Depreciation expense	20
Income taxes	<u>(45)</u>
After-tax cash flows from operations	\$190
Increase in current assets	(\$135)
Increase in accounts payable	<u>48</u>
Increase in net operating working capital	(\$87)
Increase in gross fixed assets	<u>(55)</u>
Free Cash Flows	\$48

Financing Cash Flows:

Interest expense	(\$50)
Increase in common stock	27
Dividend	<u>(25)</u>
Financing Cash Flows	(\$48)

3A-2. The Bates Corporation had two sources of positive cash flows that contributed to its distributing money to the investors. It had positive cash flows from operations, and the firm was being seriously downsized by reducing its fixed assets. The only negative cash flow occurred by it increasing its working capital. The end result was a large payout to investors.

3A-3. Abrahams Manufacturing Company

Free Cash Flows:

After-tax cash flows from operations	
Operating income (EBIT)	\$54,000
Depreciation expense	26,000
Tax expense	<u>(16,000)</u>
After-tax cash flows from operations	\$64,000
Change in net operating working capital	
Increase in current assets	(\$5,000)
Change in non-interest bearing current liabilities	<u>0</u>
Increase in net operating working capital	(\$5,000)
Purchase of fixed assets	<u>(73,000)</u>
Free Cash Flows:	(\$14,000)

Financing Cash Flows:

Interest expense	(\$4,000)
Repayment of long-term debt	(70,000)
Increase in preferred stock	120,000
Preferred stock dividends	(10,000)
Common stock dividends	<u>(22,000)</u>
Financing cash flows	\$14,000

The firm generated positive cash flows from operations, which were more than used to invest in additional working capital and fixed assets. This resulted in negative free cash flows, which had to be covered by acquiring more money from preferred stockholders.

3A-4. Pamplin, Inc.

Step 1: Determine the after-tax cash flows from operations

Operating income (EBIT)	\$360
Plus depreciation	200
Less income tax expense	<u>(118)</u>
After-tax cash flows from operations	<u>\$442</u>

Step 2: Calculate the change in the net working capital

	<u>December 31, 2011</u>	<u>December 31, 2012</u>	<u>Changes</u>
Current assets	\$1,200	\$1,200	\$0
Accounts payable	<u>200</u>	<u>150</u>	<u>(50)</u>
Increase in net working capital	<u>\$1,000</u>	<u>\$1,050</u>	<u>(\$50)</u>

Step 3: Compute the change in fixed and other assets

Increase in gross fixed assets	(\$400)
Change in other assets	<u>0</u>
Increase in gross fixed and other assets	<u>(\$400)</u>

Step 4: Wrapping it up

After-tax cash flows from operations	\$442
Less investments:	
Increase in net working capital	(50)
Increase in gross fixed and other assets	<u>(400)</u>
Free cash flows	<u>(\$8)</u>

Financing Cash Flows

Interest paid to lenders	(\$64)
Common stock dividends	(78)
Increase in notes payable	150
Increase in common stock	0
Repurchased common stock (treasury stock)	<u>0</u>
Cash flows distributed to investors	<u>\$8</u>

Note: The dividends were computed by comparing net income to the change in retained earnings. Net income was \$178, but retained earnings increased only by \$100; thus the balance was distributed in the form of dividends.

CHAPTER 4

Evaluating a Firm's Financial Performance

CHAPTER ORIENTATION

Financial analysis can be defined as the process of assessing the financial condition of a firm. The principal analytical tool of the financial analyst is the financial ratio. In this chapter, we provide a set of key financial ratios and a discussion of their effective use.

CHAPTER OUTLINE

I The Purpose of Financial Analysis

Financial ratios help us identify some of the financial strengths and weaknesses of a company.

II. Measuring Key Financial Relationships

The ratios give us a way of making meaningful comparisons of a firm's financial data at different points in time and with other firms.

A. Question 1: How Liquid Is the Firm—Can It Pay Its Bills?

1. The **liquidity** of a business is defined as its ability to meet maturing debt obligations. That is does or will the firm have the resources to pay the creditors when the debt comes due?
2. There are two ways to approach the liquidity question.
 - a. We can look at the firm's assets that are relatively liquid in nature and compare them to the amount of the debt coming due in the near term.
 - b. We can look at how quickly the firm's liquid assets are being converted into cash.

B. Question 2: Are the Firm's Managers Generating Adequate Operating Profits from the Company's Assets?

1. We want to know if the profits are sufficient relative to the assets being invested.

2. We have several choices as to how we measure profits: gross profits, operating profits, or net income. Gross profits are not acceptable because it overlooks important information such as marketing and distribution expenses. Net income includes the unwanted effects of the firm's financing policies. This leaves operating profits as our best choice in measuring the firm's operating profitability. Thus, the appropriate measure is the operating return on assets (OROA):

$$\text{OROA} = \frac{\text{operating profits}}{\text{total assets}}$$

C. Question 3: How Is The Firm Financing Its Assets?

Here we are concerned with the mix of debt and equity capital the firm is using. Two primary ratios used to answer this question are the debt ratio and times interest earned. The debt ratio is the proportion of total debt to total assets. Times interest earned compares operating income to interest expense for a crude measure of the firm's capacity to service its debt.

D. Question 4: Are the Firm's Managers Providing a Good Return on the Capital Provided by the Shareholders?

1. We want to know if the earnings available to the firm's owners or common equity investors are attractive when compared to the returns of owners of similar companies in the same industry.

$$2. \text{ Return on equity (ROE)} = \frac{\text{net income}}{\text{common stock} + \text{retained earnings}}$$

3. The effect of using debt on net income: This example shows how, through the use of debt, firms can affect their return on equity.
4. Return on equity is a function of:
 - a. the operating return on assets less the interest rate paid, and
 - b. the amount of debt used in the capital structure relative to the equity.

E. Question 5: Are the Firm's Managers Creating Shareholder Value?

1. We want to know if management is creating or destroying shareholder value.
2. We use two approaches to answer this question.
 - a. We examine the market-value ratios: Price/Earnings (PE) and Price/Book ratios.
 - b. We estimate the value being created for shareholders using the Economic Value Added (EVATM).

IV. Limitations of Ratio Analysis

This list warns of the many pitfalls that may be encountered in computing and interpreting financial ratios. Ratio users should be aware of these concerns prior to making decisions based solely on ratio analysis.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 4-1. In learning about ratios, we could simply study the different types or categories of ratios. These categories have conventionally been classified as follows:

Liquidity ratios are used to measure the ability of a firm to pay its bills on time. Example ratios include the current and acid-test ratio.

Efficiency ratios reflect how effectively the firm has utilized its assets to generate sales. Examples of this type of ratio include accounts receivable turnover, inventory turnover, fixed asset turnover, and total asset turnover.

Leverage ratios are used to measure the extent to which a firm has financed its assets with outside (non-owner) sources of funds. Example ratios include the debt ratio, long-term debt-to-total-capitalization ratio, and times interest earned ratio.

Profitability ratios serve as overall measures of the effectiveness of the firm's management relative to sales and/or to investment. Examples of profitability ratios include the net profit margin, return on total assets, operating profit margin, operating return on assets, and return on common equity.

Instead, we have chosen to cluster the ratios around important questions that may be addressed to some extent by certain ratios. These questions, along with the related ratios may be stated as follows:

1. How liquid is the firm?
 - Current ratio
 - Quick ratio
 - Accounts receivable turnover (average collection period)
 - Inventory turnover
2. Is management generating adequate operating profits on the firm's assets?
 - Operating return on assets
 - Operating profit margin
 - Gross profit margin
 - Asset turnover ratios, such as for total assets, accounts receivable, inventory, and fixed assets
3. How is the firm financing its assets?
 - Debt to total assets or debt to equity
 - Times interest earned
4. Are the owners (stockholders) receiving an adequate return on *their* investment?
 - Return on common equity

5. Is the management team creating shareholder value?

Price/Earnings

Price/Book

Economic Value Added

In answering questions 2–4, we can see the linkage between operating activities and financing activities as they influence return on common equity.

4-2. The two sources of standards or norms used in performing ratio analysis consist of similar ratios for the firm being analyzed over a number of past operating periods, and similar ratios for firms which are in the same general industry or have similar product mix characteristics.

4-3. The financial analyst can obtain norms from a variety of sources. Two of the most well known are the Dunn & Bradstreet industry ratios and Robert Morris Associates guide to industry ratios. Industry norms often do not come from “representative” samples, and it is very difficult to categorize firms into industry groups. In addition, the industry norm is an average ratio which may not represent a desirable standard. Thus, industry averages only provide a “rough guide” to a firm’s financial health.

4-4. Limitations of financial ratios include:

1. It is sometimes difficult to identify the industry category to which a firm belongs when the firm engages in multiple lines of business.
2. Published peer group or industry averages are only approximations and provide the user with general guidelines rather than scientifically determined averages of the ratios of all, or even a representative sample, of the firms within an industry.
3. Accounting practices differ widely among firms and can lead to differences in computed ratios.
4. Financial ratios can be too high or too low. For example, a current ratio that exceeds the industry norm may signal the presence of excess liquidity, which results in a lowering of overall profits in relation to the firm’s investment in assets. On the other hand, a current ratio that falls below the norm may indicate (1) the possibility that the firm has inadequate liquidity and may at some future date be unable to pay its bills on time, or (2) the firm is managing accounts receivables and inventories more efficiently than other similar firms.
5. An industry average is not necessarily a desirable target ratio or norm. There is nothing magical about an industry norm.
6. Many firms experience seasonality in their operations. Thus, balance sheet entries and their corresponding ratios will vary with the time of year when the statements are prepared.

4-5. Liquidity is the ability to repay short-term debt. We measure liquidity by comparing the firm’s liquid assets—cash or assets that will be turned into cash in the operating cycle—to the amount of short-term debt outstanding, which is the measurement provided by the current ratio and the quick or acid-test ratio. We can also measure liquidity by

computing how quickly accounts receivables turn over (how long it takes to collect them on average) and how quickly inventories turn over. The more quickly these assets can be turned over, the more liquid the firm is.

- 4-6. Operating return on assets is the amount of operating income produced relative to \$1 of assets invested (total assets), while operating profit margin is the amount of operating income per \$1 of sales. The first ratio measures the profitability on the firm's assets, while the latter measures the profitability on the sales.

- 4-7. We can compute operating return on assets (OROA) as:

$$\begin{array}{ccc} \text{Operating} & & \text{Operating Income} \\ \text{Return on Assets.} & = & \frac{\text{Total Assets}}{\text{Total Assets}} \end{array}$$

or as:

$$\begin{array}{ccc} \text{Operating} & & \text{Operating} \quad \times \quad \text{Total Asset} \\ \text{Return on Assets} & = & \text{Profit Margin} \quad \text{Turnover} \end{array}$$

Thus, we see that OROA is a function of how well we manage the income statement, as measured by the operating profit margin, and how well we manage the balance sheet (the firm's assets, as measured by the asset turnover ratio).

- 4-8. Gross profit margin measures a firm's pricing decisions and its ability to keep its cost of goods sold per dollar of sales. Operating profit margin is likewise a function of pricing and cost of goods sold, but also the amount of operating expenses (marketing expenses and general and administrative expense) for every dollar of sales. Net profit margin builds on the above relationships, but then includes the firm's financing costs, such as interest expense. Thus, the gross profit margin measures the pricing decisions and the ability to acquire or produce its product cheaply. The operating profit margin then adds the cost of distributing the product to the customer. Finally, the net profit margin adds the firm's financing decisions to the operating performance.

- 4-9. The price/earnings (P/E) ratio indicates how much investors are willing to pay for \$1 of reported earnings, and is computed as follows:

$$\text{Price/earnings ratio} = \frac{\text{price per share}}{\text{earnings per share}}$$

The price/earnings ratio will be higher for companies that investors think have strong growth prospects with low risk.

The price/book ratio compares the market value of a share of stock to the book value per share of the firm's reported equity in the balance sheet, calculated as follows:

$$\text{Price/book ratio} = \frac{\text{price per share}}{\text{equity book value per share}}$$

Given that the book value per share is an accounting number that reflects historical costs, we can roughly think of it as the investors' original price they paid for their shares. So, a

ratio greater than one indicates that investors believe the firm is more valuable than what they originally paid for the stock. In like manner, a ratio less than one suggests that investors do not believe the stock is worth what they originally paid. the firm for its growth prospects relative to its riskiness.

- 4-10. Return on equity is equal to net income divided by the total equity. But knowing how to compute return on equity is not the same as understanding what decisions drive return on equity. It helps to know that return on equity is driven by the spread between operating return on assets and the interest rate paid on the firm's debt. The greater the OROA compared to the interest rate, the higher the return on equity will be. And if OROA is higher (lower) than the interest rate, the more debt the firm uses, the higher (lower) the return on equity will be.
- 4-11. Economic value added (EVA[®]), as developed by the consulting firm Stern Stewart & Co., is an attempt to measure a firm's *economic* profit rather than *accounting* profit in a given year. Economic profits assign a cost to the equity capital (the opportunity cost of the funds provided by the shareholders) in addition to the interest cost on the firm's debt; many accountants only recognize the interest expense as a financing cost. EVA[®] is computed as follows:

$$\text{EVA} = (r - k) \times C$$

where r = the firm's return on invested capital

k = the total cost of all capital, both debt and equity

C = amount of capital (total assets) invested in the firm

That is, the value created by management is determined by the amount the firm earns on its invested capital relative to the cost of these funds—both debt and equity—and the amount of capital invested in the firm.

- 4-12. There is no single answer.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

- 4-1. Brashear's target current ratio is 2.0. Letting X represent the cost of the additional inventory financed with the short-term note. We solve for X as follows:

$$2 = (\$2,145,000 + X) / (\$858,000 + X)$$

$$X = \$429,000$$

- 4-2. Operating Income = $0.12 \times \$65,000,000 = 7,800,000$

Net Income:

Operating Income 7,800,000

Minus: Interest expense – $(0.06 \times 20,000,000) = 1,200,000$

$$\text{Taxes: } [0.3 \times (7,800,000 - 1,200,000)] = \underline{1,980,000}$$

$$\text{Net Income} \quad \quad \quad 4,620,000$$

$$\begin{aligned} \text{operating} \\ \text{return} &= \frac{\text{operating income}}{\text{total assets}} = \frac{\$7,800,000}{\$42,000,000} = 0.186 \text{ or } 18.6\% \\ \text{on assets} \end{aligned}$$

$$\begin{aligned} \text{return on} \\ \text{equity} &= \frac{\text{net income}}{\text{common equity}} = \frac{\$4,600,000}{\$22,000,000} = 0.21 \text{ or } 21\% \end{aligned}$$

4-3. a.

Income Statement:

Net sales	\$400,000
Cost of goods sold	<u>112,000</u>
Gross profit	\$288,000
Operating expenses	<u>130,000</u>
Operating income	\$158,000
Interest expense	<u>16,788</u>
Income before taxes	\$141,212
Taxes	<u>48,012</u>
Net income	\$ 93,200

$$\text{b.} \quad \text{operating profit margin} = \frac{\text{operating income}}{\text{sales}} = \frac{\$158,000}{\$400,000} = 0.395 \text{ or } 39.5\%$$

$$\text{c.} \quad \text{Times Interest Earned} = \frac{\text{operating income}}{\text{interest}} = \frac{\$158,000}{\$16,788} = 9.4\text{X}$$

4-4. To calculate the price to book ratio, we would need to determine the market price per share as well as the balance sheet book value. The market price is derived as follows:

$$\text{Earnings per share} = \frac{\text{Earnings}}{50,000 \text{ shares}} = \$3 ; \text{ Earnings} = \$150,000$$

$$\text{Price/ Earnings} = \frac{\text{Price}}{\$3} = 12.25 ; \text{ Market Price per share} = \$36.75$$

$$\text{Book values per share} = \frac{\text{Equity Book Value}}{\text{Number of shares}} = \frac{\$750,500}{50,000 \text{ shares}} = \$15.01$$

$$\frac{\text{Price}}{\text{Book}} = \frac{\$36.75}{\$15.01} = 2.45$$

This ratio indicates that the shareholders believe that the company's shares are worth more than twice their historical cost value on the balance sheet.

- 4-5. Mitchem's present current ratio of 2.5 to 1 in conjunction with its \$2.5 million investment in current assets indicates that its current liabilities are presently \$1 million. Letting x represent the additional borrowing against the firm's line of credit (which also equals the addition to current assets), we can solve for that level of x that forces the firm's current ratio down to 2 to 1, i.e.,

$$2 = (\$2.5 \text{ million} + x) / (\$1. \text{ million} + x)$$

$$\text{or } x = \$0.5 \text{ million or } \$500,000$$

- 4-6. Instructor's Note: This is a very rudimentary "getting started" exercise. It requires no analysis beyond looking up the appropriate formula and plugging in the corresponding figures.

$$\text{current ratio} = \frac{\text{current assets}}{\text{current liabilities}} = \frac{\$3,500}{\$2,000} = 1.75X$$

$$\text{Times interest earned} = \frac{\text{operating income}}{\text{interest}} = \frac{\$1,700}{\$367} = 4.63X$$

$$\text{Inventory turnover} = \frac{\text{cost of goods sold}}{\text{inventory}} = \frac{\$3,300}{\$1,000} = 3.3X$$

$$\text{Total asset turnover} = \frac{\text{sales}}{\text{total assets}} = \frac{\$8,000}{\$8,000} = 1X$$

$$\text{operating profit margin} = \frac{\text{operating income}}{\text{sales}} = \frac{\$1,700}{\$8,000} = 0.21 \text{ or } 21\%$$

$$\text{operating return on assets} = \frac{\text{operating income}}{\text{total assets}} = \frac{\$1,700}{\$8,000} = 0.21 \text{ or } 21\%$$

$$\text{Debt ratio} = \frac{\text{total debt}}{\text{total assets}} = \frac{\$4,000}{\$8,000} = 0.50 \text{ or } 50\%$$

$$\text{Average collection period} = \frac{\text{accounts receivable}}{\text{credit sales} / 365} = \frac{\$2,000}{\$8,000 / 365} = 91 \text{ days}$$

$$\text{Fixed-asset Turnover} = \frac{\text{net sales}}{\text{fixed assets}} = \frac{\$8,000}{\$4,500} = 1.78X$$

$$\text{return on equity} = \frac{\text{net income}}{\text{common equity}} = \frac{\$800}{\$4,000} = 0.20 \text{ or } 20\%$$

4-7. a. Total Assets Turnover = $\frac{\text{sales}}{\text{total assets}} = \frac{\$10\text{m}}{\$5\text{m}} = 2\text{x}$

b. $3.5 = \frac{\text{sales}}{\$5\text{m}}$

Sales = \$17.5m

Thus, the needed sales growth is \$7.5 million (\$17.5m - \$10m) or an increase of 75 percent:

$$\frac{\$7.5\text{m}}{\$10\text{m}} = 75\%$$

c. For last year,

$$\begin{aligned} \text{operating return on assets} &= \text{operating profit margin} \times \text{total asset turnover} \\ &= 10\% \times 2.0 = 20\% \end{aligned}$$

If sales grow by 75%, then for next year-end assuming a 10% operating profit margin:

$$\begin{aligned} \text{operating return on assets} &= \text{operating profit margin} \times \text{total asset turnover} \\ &= 10\% \times 3.5 = 35\% \end{aligned}$$

4-8. a. Average Collection Period (ACP) = $\frac{\text{Accounts Receivable}}{\text{Credit Sales}/365}$

$$\text{ACP} = \frac{\$562,500}{0.75 \times \$9\text{m}/365}$$

$$\text{ACP} = 30 \text{ days}$$

Note that the average collection period is based on credit sales, which are 75 percent of total firm sales.

b. Average collection period = 20 = $\frac{\text{Accounts Receivable}}{0.75 \times \$9\text{m}/365}$

Solving for accounts receivable:

$$\text{Accounts receivable} = \$369,863$$

Thus, Brenmar would reduce its accounts receivable by

$$\$562,500 - \$369,863 = \$192,637.$$

$$\begin{aligned} \text{c. Inventory Turnover} &= \frac{\text{Cost of Goods Sold}}{\text{Inventories}} \\ 9 &= \frac{0.70 \times \text{Sales}}{\text{Inventories}} \\ \text{Inventories} &= \frac{0.70 \times \$9\text{m}}{9} = \$700,000 \end{aligned}$$

4-9. a.

<u>RATIO</u>	<u>2012</u>	<u>2013</u>	<u>Industry Norm</u>	<u>Evaluation</u>
<u>Liquidity:</u>				
Current Ratio	6.0x	4.0x	5.0x	Poor
Acid-test (Quick) Ratio	3.25x	1.92x	3.0x	Poor
Average Collection Period	137 days	107 days	90 days	Poor
Inventory Turnover	1.27x	1.36x	2.2x	Poor
<u>Operating profitability:</u>				
Operating Return on Assets	10.4%	13.8%	15.0% ^a	Poor
Operating Profit Margin	20.8%	24.8%	20.0%	Satis.
Total Asset Turnover	.5x	.56x	.75x	Poor
Average Collection Period	137 days	107 days	90 days	Poor
Inventory Turnover	1.27x	1.36x	2.2x	Poor
Fixed Asset Turnover	1.0x	1.04x	1.00x	Satis.
<u>Financing:</u>				
Debt Ratio	33%	34.6%	33%	Satis.
Times Interest Earned	5.0x	5.63x	7.0x	Satis.
<u>Rate of return on common stockholders' investment:</u>				
Return on Common Equity	7.5%	10.5%	9.0%	Satis.

b. Regarding the firm's liquidity, the current and acid-test (quick) ratios are both well below the industry averages and have decreased considerably from the prior year. Also, the average collection period and inventory turnover are well below the industry averages, which suggests that accounts receivable and inventories are not of equal quality of these assets in other firms in the industry. So, we may reasonably conclude that Pamplin is less liquid than the average company in its industry.

c. Operating profitability

In evaluating Pamplin's operating profitability relative to the average firm in the industry, we must first determine the operating return on assets (OROA) both for Pamplin and the industry. From the information given, this computation may be made as follows:

Operating return on assets	=	Operating profit margin	×	Total asset turn over
Industry:		20%	×	0.75 = 15%
Pamplin 2012:		20.8%	×	0.50 = 10.4%
Pamplin 2013:		24.8%	×	0.56 = 13.9%

Thus, given the low operating return on assets for Pamplin relative to the industry, we must conclude that management is not doing an adequate job of generating operating profits on the firm's assets. However, they did improve between 2012 and 2013. The problem lies not with the operating profit margin, which addresses the operating costs and expenses relative to sales. Instead, the problem arises from Pamplin's management not using the firm's assets efficiently, as indicated by the low asset turnover ratios. Here the problem occurs in managing accounts receivable and inventories, where we see the low turnover ratios. The firm does appear to be using the fixed assets reasonably well—note the satisfactory fixed assets turnover.

d. Financing decisions

A balance-sheet perspective:

The debt ratio for Pamplin in 2013 is around 35 percent, an increase from 33 percent in 2012; that is, they finance slightly more than one-third of their assets with debt and a little less than two-thirds with common equity. Also, the average firm in the industry uses about the same amount of debt per dollar of assets as Pamplin.

An income-statement perspective:

Pamplin's times interest earned is below the industry norm—5.0 and 5.63 in 2012 and 2013, respectively, compared to 7.0 for the industry average. In thinking about why, we should remember that a company's times interest earned is affected by (1) the level of the firm's operating profitability (EBIT), (2) the amount of debt used, and (3) the interest rate. (Items 2 and 3 determine the amount of interest paid by the company.) Here is what we know about Pamplin:

1. The firm's operating profitability is below average, but improving. Thus, we would expect this fact to contribute to a lower, but also improving, times interest earned. The evidence is consistent with this thought.
2. Pamplin uses about the same amount of debt as the average firm, which should mean that its times interest earned, all else equal, would be about the same as for the average firm. Thus, Pamplin's low times interest earned is not the consequence of using more debt.
3. We do not have any information about Pamplin's interest rate. So we cannot make any observation about the effect of the interest rate. But we know if Pamplin is paying a higher interest rate than its competitor, such a situation would also be contributing to the problem.

- e. The return on common equity

Pamplin has improved its return on common equity from 7.5 percent in 2012 to 10.5 percent in 2013, compared to an industry norm of 9 percent. The sharp improvement has come from a significant increase in the firm's operating return on assets and a modest increase in the use of debt financing. It is also possible that the higher return on equity comes from Pamplin paying a lower interest rate on its debt, but we do not have enough information to know for certain. Nevertheless, Pamplin has enhanced the returns to its owners, but with a touch of additional financial risk (slightly higher debt ratio) in the process.

- 4-10. a. Salco's total asset turnover, operating profit margin, and operating return on assets.

$$\begin{aligned}
 \text{Total Asset Turnover} &= \frac{\text{Sales}}{\text{Total Assets}} \\
 &= \frac{\$4,500,000}{\$2,000,000} \\
 &= 2.25 \text{ times} \\
 \text{Operating Profit Margin} &= \frac{\text{Operating Income}}{\text{Sales}} \\
 &= \frac{\$500,000}{\$4,500,000} \\
 &= 11.11\% \\
 \text{Operating return on assets} &= \frac{\text{Operating Income}}{\text{Total Assets}} \\
 &= \frac{\$500,000}{\$2,000,000} \\
 &= 25\% \\
 \text{or} &= \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \\
 &= 0.1111 \times 2.25 = 25\%
 \end{aligned}$$

- b. The new operating return on assets for Salco after the plant renovation:

$$\begin{aligned}
 \text{Operating return on assets} &= \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \\
 &= 0.13 \times \frac{\$4,500,000}{\$3,000,000} \\
 &= 0.13 \times 1.5 = 19.5\%
 \end{aligned}$$

- c. Return earned on the common stockholders' investment:

Post-Renovation Analysis:

$$\begin{aligned} \frac{\text{Return on common equity}}{\text{equity}} &= \frac{\text{Net Income Available to Common}}{\text{Common Equity}} \\ &= \frac{\$217,500}{\$1,000,000 + \$500,000} \\ &= 14.5\% \end{aligned}$$

Net Income Available to Common following the renovation was calculated as follows:

Operating Income ($0.13 \times \$4.5\text{m}$)	\$ 585,000
Less: Interest (\$100,000 + \$50,000)	<u>(150,000)</u>
Earnings Before Taxes	435,000
Less: Taxes (50%)	<u>(217,500)</u>
Net Income Available to Common	\$ <u>217,500</u>

Pre-renovation Analysis:

The pre-renovation rate of return on common equity (ROCE) is calculated as follows:

$$\text{ROCE} = \frac{\$200,000}{\$1,000,000} = 20\%$$

Comparative Analysis:

A comparison of the two rates of return would argue that the renovation not be undertaken. However, since investments in fixed assets generally produce cash flows over many years, it is not appropriate to base decisions about their acquisition on a single year's ratios. There are additional problems with this approach to fixed asset decision making which we will discover when we discuss capital budgeting in a later chapter.

Instructor's Note: To help convince those students who simply cannot accept the fact that the renovation may be worthwhile even though the return on common equity falls in the first year, we note that the existing plant is recorded on the firm's books at original cost less accounting depreciation. This, if in a period of rising replacement costs, means that the return on common equity of 20 percent without renovation may actually overstate the true return earned on a more realistic "replacement cost" common equity base. In addition, the issue is probably one of when to renovate (this year or next) rather than whether or not to renovate. That is, the existing facility may require renovation in the next two years to continue to operate. These considerations simply cannot be incorporated in the ratio analysis performed here. We find this a very useful point to make at this juncture of the course since industry practice still

frequently involves use of rules of thumb and ratio guides for the analysis of capital expenditures.

4-11. T.P. Jarmon

- a. See the accompanying table.
- b. The most important ratios to consider in evaluating the firm's credit request relate to its liquidity and use of financial leverage. However, the credit analyst can also evaluate the firm's profitability ratios as a general indication as to how effective the firm's management has been in managing the resources available to it. This latter analysis would be useful in evaluating the prospects for a long and fruitful relationship with the new client.
- c. The answer to question *c* can be found in Chapter 3, Problem 3-8.
- d. Two potential problems emerge from a comparison of Jarmon's ratios with the industry norms. First, Jarmon has a rather large investment in inventories as reflected in both the inventory turnover ratio and an analysis of the current and acid-test ratios. The current ratio indicates a satisfactory liquidity position, while the acid-test ratio is below par. Since these two liquidity ratios differ only through the inclusion or exclusion of inventories, this finding points toward a larger than normal investment in inventories (given the level of the firm's sales and hence its costs of goods sold).

The second area of concern from the analysis relates to the firm's use of financial leverage. Although the firm's debt ratio is only slightly above the industry norm, we can observe from the balance sheet that the firm is relying more on short-term debt and less on long-term debt—a fact that would bother the banker. The firm's current ratio would reflect this higher than average reliance on short-term debt were it not for the fact that the firm has a higher than average investment in inventories.

Finally, we note that the firm's total asset turnover is above average which leads to an operating return on assets ratio which is above the industry average. This above average total asset turnover is primarily a result of the above average turnover of fixed assets, however. As we noted earlier, the firm has a substantial inventory investment relative to sales.

NOTE: This firm is profitable and with the judicious use of loan covenants (restrictions) may become a valued client to the bank. At this point, it may be useful to introduce the various kinds of loan restrictions the bank would want to place in the line of credit agreement.

Ratio	Formula	Calculation	Industry Average	Evaluation
Current Ratio	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	$\frac{\$138,300}{\$75,000} = 1.84$	1.8	Satis.
Acid-Test Ratio	$\frac{\text{Current Assets}-\text{Inventory}}{\text{Current Liabilities}}$	$\frac{\$138,300 - \$84,000}{\$75,000} = 0.72$	0.9	Poor
Debt Ratio	$\frac{\text{Total Debt}}{\text{Total Assets}}$	$\frac{\$225,000}{\$408,300} = 0.55$	0.5	Satis.
Times Interest Earned	$\frac{\text{Net Operating Income}}{\text{Interest Expense}}$	$\frac{\$80,000}{\$10,000} = 8$	10	Poor
Average Collection Period	$\frac{\text{Accounts Receivable}}{\text{Sales Per Day}}$	$\frac{\$33,000}{\$600,000/365} = 20.1 \text{ days}$	20 days	Satis.
Inventory Turnover	$\frac{\text{Cost of Goods Sold}}{\text{Inventory}}$	$\frac{\$460,000}{\$84,000} = 5.48$	7	Poor
Operating Return on Assets	$\frac{\text{Operating Income}}{\text{Total Assets}}$	$\frac{\$80,000}{\$408,000} = 0.196$ or 19.6%	16.8%	Good
Operating Profit Margin	$\frac{\text{Operating Income}}{\text{Sales}}$	$\frac{\$80,000}{\$600,000} = 0.133$ or 13.3%	14%	Satis.

Ratio	Formula	Calculation	Industry Average	Evalu- tion
Gross Profit Margin	$\frac{\text{Gross Profit}}{\text{Sales}}$	$\frac{\$140,000}{\$600,000} = .233$ or 23.3%	25%	Satis.
Total Asset Turnover	$\frac{\text{Sales}}{\text{Total Assets}}$	$\frac{\$600,000}{\$408,300} = 1.47$	1.2	Good
Fixed Asset Turnover	$\frac{\text{Sales}}{\text{Net Fixed Assets}}$	$\frac{\$600,000}{\$270,000} = 2.22$	1.8	Good
Return on Equity	$\frac{\text{Earnings Availableto Common}}{\text{Common Investment}}$	$\frac{\$42,900}{\$183,300} = 0.234$ or 23.4%	12%	Good

4-12 Stegemoller

$$\text{EVA} = (12\% - 14\%) \times \$100 \text{ million} = (\$2 \text{ million})$$

Thus, the firm has a negative economic profit of \$2 million, which suggests that \$2 million of shareholder value has been destroyed. The loss of shareholder value occurs in spite of the fact that the firm is earning a return on its investments above the average firm in the industry. In other words, a firm can look good compared to industry norms, while still destroying firm value.

4-13. This problem gives the students the opportunity to explore how to access industry norms. There is no specific answer to the assignment.

4-14 a. $\text{Price per share} = \text{earnings per share} \times \text{price/earnings ratio} = \$1.35 \times 16.29 = \$21.99$

b. $\text{Price/book ratio} = \text{price per share} \div \text{book value per share} = \$21.99 \div \$9.58 = 2.30\text{X}$

4.15 a. $\text{Debt ratio} = \text{total debt} \div \text{total assets} = \$42 \text{ million} \div \$63 \text{ million} = 0.6667 \text{ or } 66.67\%$

b. $\text{Times interest earned} = \$21 \text{ million} \div \$6 \text{ million} = 3.5\text{X}$

c. If interest expense increased to \$9 million, the firm's time interest earned would fall to 2.3X from 3.5X. This change means that the firm has a great chance of not being able to cover its interest expense in a downturn. Thus, the key is management's confidence that the firm's operating income will not decline significantly in an economic downturn.

4.16 a. $\text{EVA} = (0.14 - 0.12) \times \$240 \text{ million} = \$4.8 \text{ million}$

b. EVA is a measure of the value the firm has created for its shareholders during a given time period. It relies on the concept of economic profits, rather than accounting profits, since the latter fails to recognize the owners' required rate of return on their investment.

4-17.

a. The financial ratios for Seward compared to the industry are as follows:

	<u>Seward</u>	<u>Industry</u>
Current ratio	2.50	3.0
Acid-test ratio	1.38	1.5
Days in receivables	48.67	40.0
Days in inventories	117.32	70.2
Operating return on assets	15.2%	12.5%

Operating profit margin	11.1%	8.0%
Total asset turnover	1.36	1.6
Fixed asset turnover	3.46	3.1
Debt ratio	36.4%	33%
Times interest earned	8.33	6.0
Return on equity	15.0%	11.0%

b. Interpretation

1. Seward, Inc. is definitely less liquid than the average firm in its industry. Both the current ratio and acid-test ratio are lower, indicating that Seward has fewer liquid assets relative to the company's maturing obligations (current liabilities) than the industry. Also, both the accounts receivable and inventory move slower through the working-capital cycle than is true for the average firm in the industry.
2. Management is performing better than the industry in terms of earning profits on the firm's assets—15.2 percent operating return on assets compared to 12.5 percent for the industry. The reason for the higher return on assets comes from the higher operating profit margin, 11.1 percent for Seward versus 8 percent for the industry. Thus, the company is keeping its costs and expenses lower per dollar of sales. On the other hand, Seward is less efficient at managing its assets, as shown by the lower total asset turnover, 1.36X for Seward as compared to 1.6X for the industry. This lower turnover is attributable to the slower collection of receivables and more days in inventory.
3. The firm uses slightly more debt (higher debt ratio) than the average company in the industry, which suggests a bit more financial risk for Seward, but higher returns on equity than average. Also, Seward covers its interest more times than the industry on average. Two factors affect the times interest earned: (1) the level of operating profits and (2) the amount of debt. Seward has a higher operating return on assets, which drives the times interest earned up, but uses more debt which results in more interest expense and a lower times interest earned ratio. The net result in Seward's case is a higher times interest earned; that is, the higher operating return on assets raises the times interest earned more than the greater amount of debt lowers it.
4. Seward provides a higher return on equity than the industry, which results from having (1) a higher operating return on assets, and (2) a greater amount of debt financing.

4-18.

Current ratio	1.24
Acid-test ratio	0.85
Times interest earned	8.13
Inventory turnover	1.80
Total asset turnover	0.40
Operating profit margin	31.0%
Days in receivables	52.14
Operating return on assets	12.4%
Debt ratio	0.52
Return on equity	16.3%
Fixed asset turnover	0.63

SOLUTION TO MINI CASE

a. Financial analysis

Financial ratios	2012	2013
Current ratio	2.65	2.50
Acid-test ratio	1.54	1.50
Days in receivables	44.8	61.8
Days in inventories	59.2	79.1
Operating return on assets	18.0%	10.2%
Operating profit margin	14.7%	9.6%
Total asset turnover	1.2	1.1
Fixed asset turnover	1.9	2.0
Debt ratio	0.41	0.44
Times interest earned	4.2	1.9
Return on equity	14.8%	6.3%

Analysis of the income statements:

			Common-Sized Income Statements		% Changes in Sales and Expenses
	2012	2013	2012	2013	
Sales	\$5,700	\$5,400	100.0%	100.0%	−5.3%
Cost of goods sold	(3,700)	(3,600)	−64.9%	−66.7%	−2.7%
Gross profits	\$2,000	\$1,800	35.1%	33.3%	−10.0%
Operating expenses:					
Selling and G&A expenses	\$(820)	\$(780)	−14.4%	−14.4%	−4.9%
Depreciation expenses	(340)	(500)	−6.0%	−9.3%	47.1%
Total operating expenses	\$(1,160)	\$(1,280)	−20.4%	−23.7%	10.3%
Operating income (earnings before interest and taxes)	\$840	\$520	14.7%	9.6%	−38.1%
Interest expense	(200)	(275)	−3.5%	−5.1%	
Earnings before taxes	\$640	\$245	11.2%	4.5%	
Income taxes	(230)	(65)	−4.0%	−1.2%	
Net Income	\$410	\$180	7.2%	3.3%	

Analysis of balance sheets:

			Common-Sized Balance sheets		Balance Sheet Changes
	2012	2013	2012	2013	
Cash	\$300	\$495	6.4%	9.7%	\$195
Accounts receivable	700	915	15.0%	17.9%	215
Inventories	600	780	12.8%	15.3%	180
Other current assets	<u>125</u>	<u>160</u>	<u>2.7%</u>	<u>3.1%</u>	<u>35</u>
Total current assets	\$1,725	\$2,350	36.9%	46.1%	\$625
Gross fixed assets	\$4,650	\$4,950	99.5%	97.1%	300
Accumulated depreciation	<u>(1,700)</u>	<u>(2,200)</u>	<u>-36.4%</u>	<u>-43.1%</u>	<u>(500)</u>
Net fixed assets	<u>\$2,950</u>	<u>\$2,750</u>	<u>63.1%</u>	<u>53.9%</u>	<u>\$(200)</u>
Total assets	<u>\$4,675</u>	<u>\$5,100</u>	<u>100.0%</u>	<u>100.0%</u>	<u>\$425</u>
LIABILITIES (DEBT) AND EQUITY					
Accounts payable	\$400	\$640	8.6%	12.5%	\$ 240
Short-term notes payable	<u>250</u>	<u>300</u>	<u>5.3%</u>	<u>5.9%</u>	<u>50</u>
Total current liabilities	\$650	\$940	13.9%	18.4%	\$290
Long-term debt	<u>1,250</u>	<u>1,325</u>	<u>26.7%</u>	<u>26.0%</u>	<u>75</u>
Total liabilities	\$1,900	\$2,265	40.6%	44.4%	\$365
Common equity:					
Common stock (par & paid in capital)	\$1,100	\$1,100	23.5%	21.6%	\$0
Retained earnings	<u>1,675</u>	<u>1,735</u>	<u>35.8%</u>	<u>34.0%</u>	<u>60</u>
Total common equity	<u>\$2,775</u>	<u>\$2,835</u>	<u>59.4%</u>	<u>55.6%</u>	<u>\$ 60</u>
Total liabilities and equity	<u>\$4,675</u>	<u>\$5,100</u>	<u>100.0%</u>	<u>100.0%</u>	<u>\$425</u>

Computing price/earnings and market/book ratios:

Earnings per share	\$2.73	\$1.20
Dividends per share	\$0.80	\$0.80
Price/earnings ratio	13.17	15.00
Book value per share	\$18.50	\$18.90
Market/book ratio	1.95	0.95

Computing EVA:

Operating return on assets	18.0%	10.2%
Cost of capital	10.5%	10.5%
Return above cost of capital	7.5%	-0.3%
Total assets	\$4,675	\$5,100
EVA	\$349.1	\$(15.5)

- b. Some of the conclusions would be as follows:
1. The firm's cash increased \$195 thousand and from 6.4 percent to 9.7 percent of total assets.
 2. The current and acid-test ratios indicate little in the way of changing liquidity; however, the days in receivables and inventories show that customers have slowed down payments and inventories are moving much slower, resulting in decreased liquidity and requiring larger investments in receivables and inventories.
 3. Management is being successful at having the company's suppliers increase the financing of the business, where accounts payable increased from 8.6 percent to 12.5 percent of its total financing sources.
 4. The operating return on assets fell sharply from 18 percent to 10.2 percent!
 - (a) The primary drivers for the decline can be observed in the income statement. Looking at the common-sized income statement, we see that the 5.3 percent decline in sales was followed by the firm's gross profit margins going from 35.1 percent to 33.3 percent (a 10-percent decrease) and the operating profit margin falling from 14.7 percent to 9.6 percent, or a 38.1-percent decline. The firm could not quickly adjust its cost of goods sold and depreciation expenses in proportion to the decrease in sales—a common experience in a downturn.
 - (b) A secondary contributing factor to the lower operating return on assets came from not managing the firm's assets as efficiently, with the total asset turnover going from 1.2 to 1.1. This decline was the result of the less efficient management of accounts receivable and inventories, as shown by the increasing days in receivables and in inventories. It is also apparent in the common-sized balance sheet, where we see the investment in current assets increasing from 36.9 percent to 46.1 percent of total assets. The increase in current assets in turn decreased the operating return on assets because of the larger investments without an offsetting increase in operating income.
 5. G&S's debt ratio increased slightly from 41 percent to 44 percent. However, the firm's ability to service its debt declined dramatically, with the times interest earned going from 4.2 to 1.9. The decrease in the coverage ratio is all about the decrease in operating profits.
 6. G&S's return on equity decreased because the operating return on assets decreased. There is always a direct relationship between return on assets and return on equity.
 7. While G&S's stock price fell by half, the price/earnings ratio actually increased slightly, indicating that the stockholders did not decrease the price dollar-for-dollar with the decrease in earnings. However, the market-to-book ratio dropped by over half (1.95 to 0.95) to the point that the firm's market value is below the equity book value.
 8. The firm's EVA went from \$349 thousand in 2012 to a negative \$16 thousand in 2013. In other words, the company created shareholder value in 2012 but destroyed value in 2013.

- c. Randall's bonuses would be determined are shown below. (The numbers are expressed in \$ thousands, except for the number of shares.)

	<u>2012</u>	<u>2013</u>
EVA (\$thousands)	\$349.1	\$ (15.5)
Percentage share of EVA	1%	1%
Amount of bonus (\$thousands)	\$3.491	\$0
Cash bonus percentage	50%	50%
Stock bonus percentage	50%	−50%
Cash bonus (\$thousands)	\$1.746	\$0
Stock bonus (\$thousands)	\$1.746	\$0
Stock price	\$36.00	\$18
Number of shares to be received	48.5	0

Thus, Randall would receive a bonus equal to 10 percent of the firm's EVA, or \$3,490.10, in 2012 and nothing in 2013 when the EVA is negative. Half of the 2012 bonus would be in cash and half in stock. Since the price of the stock in 2012 was \$36, Randall would receive 48.5 shares (48.5 shares = \$1,746 stock bonus ÷ \$36 stock price).

d. Recommendations for management:

1. **Monitor the firm's cash balances to determine if too much cash is being held.**
2. **Focus on managing the firm's receivables and inventories. This action would lower the firm's investments in these assets, which would increase the operating return on assets.**
3. **Reassess the company's sales and marketing strategy to see how the firm might recover the lost sales.**
4. **Find a way to reduce costs and operating expenses. While the selling and general and administrative expenses decreased in proportion with the sales declines, the cost of goods sold did not.**
5. **Monitor any increases in investments in fixed assets. Gross fixed assets continued to increase in spite of the sales decline.**

CHAPTER 5

The Time Value of Money

CHAPTER ORIENTATION

In this chapter, the concept of the time value of money is introduced; that is, a dollar today is worth more than a dollar received a year from now. If we are to compare projects and financial strategies logically, we must either move all dollar flows back to the present or out to some common future date.

CHAPTER OUTLINE

I. Compound Interest, Future, and Present Value

Compound interest results when the interest paid on the investment during the first period is added to the principal so that during the second period the interest is earned on the original principal plus the interest earned during the first period.

A. Using Timelines to Visualize Cash Flows

Mathematically, the future value of an investment if compounded annually at a rate of r for n years will be

$$FV_n = PV (1 + r)^n$$

where n = the number of years during which the compounding occurs

r = the annual interest (or discount) rate

PV = the present value or original amount invested at the beginning of the first period

FV_n = the future value of the investment at the end of n years

B. Techniques for Moving Money Through Time

1. The future value of an investment can be increased either by increasing the number of years we let it compound or by compounding it at a higher rate.

2. If the compounded period is less than one year, the future value of an investment

$$\text{can be determined as follows: } FV_n = PV \left(1 + \frac{r}{m} \right)^{mn}$$

where m = the number of times compounding occurs during the year

C. Two Additional Types of Time Value of Money Problems

D. Applying Compounding to Things Other Than Money

E. Present Value

1. Determining the present value, that is, the value in today's dollars of a sum of money to be received in the future, involves nothing other than inverse compounding. The differences in these techniques are simply different points of view.
2. Mathematically, the present value of a sum of money to be received in the future can be determined by the following equation:

$$PV = FV_n \left(\frac{1}{(1 + r)^n} \right)$$

where n = the number of years until payment will be received,

r = the opportunity rate or discount rate

PV = the present value of the future sum of money

FV_n = the future value of the investment at the end of n years

3. The present value of a future sum of money is inversely related to both the number of years until the payment will be received and the opportunity rate.

II. Annuities

An annuity is a series of equal dollar payments for a specified number of years. Because annuities occur frequently in finance—for example, bond interest payments—we treat them specially.

A. Compound Annuities

A compound annuity involves depositing or investing an equal sum of money at the end of each year for a certain number of years and allowing it to grow.

1. This can be done by using our compounding equation and compounding each one of the individual deposits to the future or by using the following compound annuity equation:

$$FV_n = PMT \left(\sum_{t=0}^{n-1} (1 + r)^t \right) = PMT \left[\frac{(1 + r)^n - 1}{r} \right]$$

where PMT	=	the annuity value deposited at the end of each year
r	=	the annual interest (or discount) rate
n	=	the number of years for which the annuity will last
FV _n	=	the future value of the annuity at the end of the nth year

B. Present Value of an Annuity

Pension funds, insurance obligations, and interest received from bonds all involve annuities. To compare these financial instruments, we would like to know the present value of each of these annuities.

1. This can be done by using our present value equation and discounting each one of the individual cash flows back to the present or by using the following present value of an annuity equation:

$$PV = PMT \left(\sum_{t=1}^n \frac{1}{(1+r)^t} \right) = PMT \left[\frac{1 - \frac{1}{(1+r)^n}}{r} \right]$$

where PMT	=	the annuity withdrawn at the end of each year
r	=	the annual interest or discount rate
PV	=	the present value of the future annuity
n	=	the number of years for which the annuity will last

C. Annuities Due

Because of the time-consuming nature of compounding an annuity,

$$FV_n = PMT \left[\frac{(1+r)^n - 1}{r} \right] (1+r)$$

D. Amortized Loans

This procedure of solving for PMT, the annuity value when r, n, and PV are known, is also the procedure used to determine what payments are associated with paying off a loan in equal installments. Loans paid off in this way, in periodic payments, are called amortized loans. Here again, we know three of the four values in the annuity equation and are solving for a value of PMT, the annual annuity.

III. Making Interest Rates Comparable

$$\text{EAR} = \left(1 + \frac{\text{quoted rate}}{m}\right)^m - 1$$

A. Finding Present and Future Values with Nonannual Periods

$$\text{FV}_n = \text{PV} \left(1 + \frac{r}{m}\right)^{m \cdot n}$$

IV. The Present Value of an Uneven Stream and Perpetuities

A perpetuity is an annuity that continues forever; that is, every year from now on, this investment pays the same dollar amount.

A. Perpetuities

An example of a perpetuity is preferred stock which yields a constant dollar dividend infinitely.

B. The following equation can be used to determine the present value of a perpetuity:

$$\text{PV} = \frac{\text{pp}}{r}$$

where PV = the present value of the perpetuity

pp = the constant dollar amount provided by the perpetuity

r = the annual interest or discount rate

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 5-1. The concept of time value of money is a recognition that a dollar received today is worth more than a dollar received a year from now, or at any future date. It exists because there are investment opportunities on money; that is, we can place our dollar received today in a savings account and one year from now have more than a dollar.
- 5-2. Compounding and discounting are inverse processes of each other. In compounding, money is moved forward in time, while in discounting, money is moved back in time. This can be shown mathematically in the compounding equation:

$$FV_n = PV (1 + r)^n$$

We can derive the discounting equation by multiplying each side of this equation

by $\frac{1}{(1 + r)^n}$ and we get:

$$PV = FV_n \frac{1}{(1 + r)^n}$$

- 5-3. We know that $FV_n = PV(1 + r)^n$

Thus, an increase in r will increase FV_n , and a decrease in n will decrease FV_n .

- 5-4. Bank C, which compounds continuously, pays the highest interest. This occurs because, while all banks pay the same interest, 5percent, bank C compounds the 5 percent continuously. Continuous compounding allows interest to be earned more frequently than any other compounding period.
- 5-5. An annuity is a series of equal dollar payments for a specified number of years. Examples of annuities include mortgage payments, interest payments on bonds, fixed lease payments, and any fixed contractual payment. A perpetuity is an annuity that continues forever; that is, every year from now on this investment pays the same dollar amount. The difference between an annuity and a perpetuity is that a perpetuity has no termination date, whereas an annuity does.
- 5-6. This problem involves a comparison of three websites, all of which are very good.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

5-1. a. $FV_n = PV (1 + r)^n$
 $FV_{10} = \$5,000(1 + 0.10)^{10}$
 $FV_{10} = \$5,000 (2.594)$
 $FV_{10} = \$12,970$

Or:

N = 10
 I/Y = 10
 PV = -5,000
 PMT = 0
CPT FV = \$12,969

b. $FV_n = PV (1 + r)^n$
 $FV_7 = \$8,000 (1 + 0.08)^7$
 $FV_7 = \$8,000 (1.714)$
 $FV_7 = \$13,712$

Or:

N = 7
 I/Y = 8
 PV = -8,000
 PMT = 0
CPT FV = \$13,711

$$\begin{aligned}
 \text{c. } FV_{12} &= PV (1 + r)^n \\
 FV_{12} &= \$775 (1 + 0.12)^{12} \\
 FV_{12} &= \$775 (3.896) \\
 FV_{12} &= \$3,019.40
 \end{aligned}$$

Or:

$$\begin{aligned}
 N &= 12 \\
 I/Y &= 12 \\
 PV &= -775 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$3,019}
 \end{aligned}$$

$$\begin{aligned}
 \text{d. } N &= 5 \\
 I/Y &= 5 \\
 PV &= -21,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$26,802.}
 \end{aligned}$$

$$\begin{aligned}
 \text{5-2. } I/Y &= 5 \\
 PV &= -500,000 \\
 PMT &= 0 \\
 FV &= 1,039.50 \\
 \text{CPT N} &= \mathbf{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{b. } I/Y &= 9 \\
 PV &= -35.0 \\
 PMT &= 0 \\
 FV &= 53.87 \\
 \text{CPT N} &= \mathbf{5}
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } I/Y &= 20 \\
 PV &= -100.0 \\
 PMT &= 0 \\
 FV &= 298.60 \\
 \text{CPT N} &= \mathbf{6}
 \end{aligned}$$

d.

I/Y	=	2
PV	=	-53.0
PMT	=	0
FV	=	78.76
CPT N	=	20

5-3. a.

N	=	12
CPT I/Y	=	12
PV	=	-500
PMT	=	0
FV	=	1,948

b.

N	=	7
CPT I/Y	=	4.999
PV	=	-300
PMT	=	0
FV	=	422.10

c.

N	=	20
CPT I/Y	=	9
PV	=	-50
PMT	=	0
FV	=	280.20

d.

N	=	5
CPT I/Y	=	20
PV	=	-200
PMT	=	0
FV	=	497.60

5-4. a.

N	=	10
I/Y	=	10
CPT PV	=	-308.43
PMT	=	0
FV	=	800

b.

N	=	5
I/Y	=	5
CPT PV	=	-235.06
PMT	=	0
FV	=	300

c.

N	=	8
I/Y	=	3
CPT PV	=	-789
PMT	=	0
FV	=	1,000

d.

N	=	8
I/Y	=	20
CPT PV	=	-233
PMT	=	0
FV	=	1,000

5-5. a.

FV_n	=	$PV (1 + r)^n$
compounded for 1 year		
FV_1	=	$\$10,000 (1 + 0.06)^1$
FV_1	=	$\$10,000 (1.06)$
FV_1	=	$\$10,600$

Or:

N	=	1
I/Y	=	6
PV	=	-10,000
PMT	=	0
CPT FV	=	\$10,600

compounded for 5 years

FV_5	=	$\$10,000 (1 + 0.06)^5$
FV_5	=	$\$10,000 (1.338)$
FV_5	=	$\$13,380$

Or:

$$\begin{aligned}
 N &= 5 \\
 I/Y &= 6 \\
 PV &= -10,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$13,382}
 \end{aligned}$$

compounded for 15 years

$$\begin{aligned}
 FV_{15} &= \$10,000 (1 + 0.06)^{15} \\
 FV_{15} &= \$10,000 (2.397) \\
 FV_{15} &= \$23,970
 \end{aligned}$$

Or:

$$\begin{aligned}
 N &= 15 \\
 I/Y &= 6 \\
 PV &= -10,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$23,966}
 \end{aligned}$$

b. $FV_n = PV (1 + r)^n$
 compounded for 1 year at 8%

$$\begin{aligned}
 FV_1 &= \$10,000 (1 + 0.08)^1 \\
 FV_1 &= \$10,000 (1.080) \\
 FV_1 &= \$10,800
 \end{aligned}$$

Or:

$$\begin{aligned}
 N &= 1 \\
 I/Y &= 8 \\
 PV &= -10,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$10,800}
 \end{aligned}$$

compounded for 5 years at 8%

$$\begin{aligned}
 FV_5 &= \$10,000 (1 + 0.08)^5 \\
 FV_5 &= \$10,000 (1.469) \\
 FV_5 &= \$14,690
 \end{aligned}$$

Or:

$$\begin{aligned} N &= 5 \\ I/Y &= 8 \\ PV &= -10,000 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{\$14,693} \end{aligned}$$

compounded for 15 years at 8%

$$\begin{aligned} FV_{15} &= \$10,000 (1 + 0.08)^{15} \\ FV_{15} &= \$10,000 (3.172) \\ FV_{15} &= \$31,720 \end{aligned}$$

Or:

$$\begin{aligned} N &= 15 \\ I/Y &= 8 \\ PV &= -10,000 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{\$31,722} \end{aligned}$$

compounded for 1 year at 10%

$$\begin{aligned} FV_1 &= \$10,000 (1 + 0.1)^1 \\ FV_1 &= \$10,000 (1 + 1.100) \\ FV_1 &= \$11,000 \end{aligned}$$

Or:

$$\begin{aligned} N &= 1 \\ I/Y &= 10 \\ PV &= -10,000 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{\$11,000} \end{aligned}$$

compounded for 5 years at 10%

$$\begin{aligned} FV_5 &= \$10,000 (1 + 0.1)^5 \\ FV_5 &= \$10,000 (1.611) \\ FV_5 &= \$16,110 \end{aligned}$$

Or:

$$\begin{aligned}
 N &= 5 \\
 I/Y &= 10 \\
 PV &= -10,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$16,105}
 \end{aligned}$$

compounded for 15 years at 10%

$$\begin{aligned}
 FV_{15} &= \$10,000 (1 + 0.1)^{15} \\
 FV_{15} &= \$10,000 (4.177) \\
 FV_{15} &= \$41,770
 \end{aligned}$$

Or:

$$\begin{aligned}
 N &= 15 \\
 I/Y &= 10 \\
 PV &= -10,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$41,772}
 \end{aligned}$$

- c. There is a positive relationship between both the interest rate used to compound a present sum and the number of years for which the compounding continues and the future value of that sum.

5-6. a.

$$\begin{aligned}
 N &= 35 \\
 I/Y &= 4 \\
 PMT &= 0 \\
 FV &= 2,000,000 \\
 \text{CPT PV} &= \mathbf{-\$506,831}
 \end{aligned}$$

b.

$$\begin{aligned}
 N &= 35 \\
 I/Y &= 14 \\
 PMT &= 0 \\
 FV &= 2,000,000 \\
 \text{CPT PV} &= \mathbf{-\$20,387}
 \end{aligned}$$

5-7. Year 1:

$$FV_n = PV (1 + r)^n$$

$$FV_1 = 15,000 (1 + 0.2)^1$$

$$FV_1 = 15,000 (1.200)$$

$$FV_1 = 18,000 \text{ books}$$

OR:

$$N = 1$$

$$I/Y = 20$$

$$PV = -15,000$$

$$PMT = 0$$

$$\text{CPT FV} = \mathbf{18,000 \text{ books}}$$

Year 2:

$$FV_n = PV (1 + r)^n$$

$$FV_2 = 15,000 (1 + 0.2)^2$$

$$FV_2 = 15,000 (1.440)$$

$$FV_2 = 21,600 \text{ books}$$

OR:

$$N = 2$$

$$I/Y = 20$$

$$PV = -15,000$$

$$PMT = 0$$

$$\text{CPT FV} = \mathbf{21,600 \text{ books}}$$

Year 3:

$$FV_n = PV (1 + r)^n$$

$$FV_3 = 15,000 (1.20)^3$$

$$FV_3 = 15,000 (1.728)$$

$$FV_3 = 25,920 \text{ books}$$

OR:

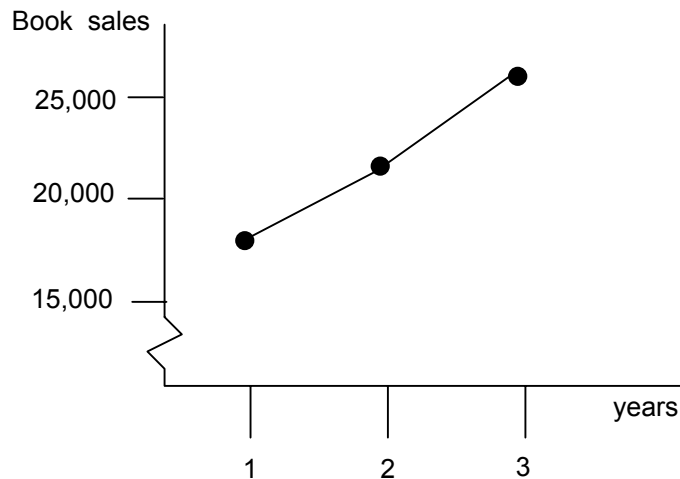
$$N = 3$$

$$I/Y = 20$$

$$PV = -15,000$$

$$PMT = 0$$

$$\text{CPT FV} = \mathbf{25,920 \text{ books}}$$



The sales trend graph is not linear because this is a compound growth trend. Just as compound interest occurs when interest paid on the investment during the first period is added to the principal of the second period, interest is earned on the new sum. Book sales growth was compounded; thus, the first year the growth was 20 percent of 15,000 books, the second year 20 percent of 18,000 books, and the third year 20 percent of 21,600 books.

$$\begin{aligned}
 5-8. \quad FV_n &= PV(1+r)^n \\
 FV_1 &= 47(1+0.12)^1 \\
 FV_1 &= 47(1.12) \\
 FV_1 &= 52.6 \text{ Home Runs in 2010}
 \end{aligned}$$

OR:

$$\begin{aligned}
 N &= 1 \\
 I/Y &= 12 \\
 PV &= -47 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{52.6 \text{ home runs}}
 \end{aligned}$$

$$\begin{aligned}
 FV_2 &= 47(1+0.12)^2 \\
 FV_2 &= 47(1.21) \\
 FV_2 &= 58.96 \text{ Home Runs in 2011}
 \end{aligned}$$

OR:

$$\begin{aligned} N &= 2 \\ I/Y &= 12 \\ PV &= -47 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{58.96 \text{ home runs}} \end{aligned}$$

$$\begin{aligned} FV_3 &= 47(1 + 0.12)^3 \\ FV_3 &= 47(1.331) \\ FV_3 &= 66.03 \text{ Home Runs in 2012.} \end{aligned}$$

OR:

$$\begin{aligned} N &= 3 \\ I/Y &= 12 \\ PV &= -47 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{66.03 \text{ home runs}} \end{aligned}$$

$$\begin{aligned} FV_3 &= 47(1 + 0.12)^4 \\ FV_4 &= 47(1.464) \\ FV_4 &= 73.96 \text{ Home Runs in 2013.} \end{aligned}$$

OR:

$$\begin{aligned} N &= 4 \\ I/Y &= 12 \\ PV &= -47 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{73.96 \text{ home runs}} \end{aligned}$$

$$\begin{aligned} FV_5 &= 47(1 + 0.12)^5 \\ FV_5 &= 47(1.611) \\ FV_5 &= 82.83 \text{ Home Runs in 2014.} \end{aligned}$$

OR:

$$\begin{aligned} N &= 5 \\ I/Y &= 12 \\ PV &= -47 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{82.83 \text{ home runs}} \end{aligned}$$

5-9.

N	=	10
CPT I/Y	=	8.0%
PV	=	-500
PMT	=	0
FV	=	1,079.50

5-10.

N	=	5
CPT I/Y	=	22.0%
PV	=	-10,000
PMT	=	0
FV	=	27,027

5-11. The present value of \$10,000 in 12 years at 11 percent is:

N	=	12
I/Y	=	11
CPT PV	=	2,858
PMT	=	0
FV	=	-10,000

The present value of \$25,000 in 25 years at 11% is:

N	=	25
I/Y	=	11
CPT PV	=	1,840
PMT	=	0
FV	=	-1,840

5-12.

N	=	50
CPT I/Y	=	28.47%
PV	=	-0.12
PMT	=	0
FV	=	33,000

5-13. What will the car cost in the future?

$$\begin{aligned}
 N &= 6 \\
 I/Y &= 3 \\
 PV &= -15,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{17,910.78 \text{ dollars}}
 \end{aligned}$$

How much must Bart put in an account today in order to have \$17,910.78 in 6 years?

$$\begin{aligned}
 N &= 6 \\
 I/Y &= 7.5 \\
 \text{CPT PV} &= \mathbf{-11,605.50 \text{ dollars}} \\
 PMT &= 0 \\
 FV &= 17,910.78
 \end{aligned}$$

5-14.

$$\begin{aligned}
 N &= 45 \\
 I/Y &= 8.75 \\
 PV &= 0 \\
 \text{CPT PMT} &= \mathbf{-2,054.81 \text{ dollars}} \\
 FV &= 1,000,000
 \end{aligned}$$

5-15.

$$\begin{aligned}
 N &= 200 \\
 I/Y &= 3.98 \\
 PV &= -12,345 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$30,300,773}
 \end{aligned}$$

5-16.

$$\begin{aligned}
 N &= 7 \\
 \text{CPT I/Y} &= \mathbf{15\%} \\
 PV &= -4,510 \\
 PMT &= 0 \\
 FV &= 12,000
 \end{aligned}$$

$$\begin{array}{llll}
 5-17. & \text{CPT N} & = & 45 \\
 & \text{I/Y} & = & 4.5\% \\
 & \text{PV} & = & -45,530 \\
 & \text{PMT} & = & 0 \\
 & \text{FV} & = & 330,000
 \end{array}$$

$$\begin{array}{llll}
 5-18. & \text{N} & = & 28 \\
 & \text{I/Y} & = & 7\% \\
 & \text{CPT PV} & = & -60,000. \\
 & \text{PMT} & = & 0 \\
 & \text{FV} & = & 398,930
 \end{array}$$

5-19. Selma Step 1: Determine how much she will have after 10 years:

$$\begin{array}{ll}
 \text{N} = & 10 \\
 \text{I} = & 8 \\
 \text{PV} = & 0 \\
 \text{PMT} = & -2,000 \\
 \text{CPT FV} = & 28,973
 \end{array}$$

Selma Step 2: Determine how much the \$28,973 she has at the end of year 10 will grow to over the next 25 years

$$\begin{array}{ll}
 \text{N} = & 25 \\
 \text{I} = & 8 \\
 \text{PV} = & -28,973 \\
 \text{PMT} = & 0 \\
 \text{CPT FV} = & 198,421
 \end{array}$$

Patty: Determine how much her deposit of \$2,000 at the end of each year for 25 years will grow to

$$\begin{array}{ll}
 \text{N} = & 25 \\
 \text{I} = & 8 \\
 \text{PV} = & 0 \\
 \text{PMT} = & -2,000 \\
 \text{CPT FV} = & 146,212
 \end{array}$$

- 5-20. a. N = 10
 I/Y = 5
 PV = 0
 PMT = -500
 CPT FV = **6,289**
- b. N = 5
 I/Y = 10
 PV = 0
 PMT = -100
 CPT FV = **610.51**
- c. N = 7
 I/Y = 7
 PV = 0
 PMT = -35
 CPT FV = **302.89**
- d. N = 3
 I/Y = 2
 PV = 0
 PMT = -25
 CPT FV = **76.51**
- 5-21. a. N = 10
 I/Y = 7
 CPT PV = **17,559**
 PMT = -2,500
 FV = 0
- b. N = 3
 I/Y = 3
 CPT PV = -198
 PMT = 70
 FV = 0

$$\begin{array}{rcl}
 \text{c.} \quad N & = & 7 \\
 I/Y & = & 6 \\
 \text{CPT PV} & = & \mathbf{-1,563.06} \\
 \text{PMT} & = & 280 \\
 \text{FV} & = & 0
 \end{array}$$

$$\begin{array}{rcl}
 \text{d.} \quad N & = & 10 \\
 I/Y & = & 10 \\
 \text{CPT PV} & = & \mathbf{-3,072.28} \\
 \text{PMT} & = & 500 \\
 \text{FV} & = & 0
 \end{array}$$

5-22. Annuity A:

$$\begin{array}{rcl}
 N & = & 12 \\
 I/Y & = & 11 \\
 \text{CPT PV} & = & \mathbf{-\$55,185} \\
 \text{PMT} & = & -8,500 \\
 \text{FV} & = & 0
 \end{array}$$

Since the cost of this annuity is \$50,000 and its present value is \$55,182, given an 11 percent opportunity cost, this annuity has value and should be accepted.

Annuity B:

$$\begin{array}{rcl}
 N & = & 25 \\
 I/Y & = & 11 \\
 \text{CPT PV} & = & \mathbf{-\$58,952} \\
 \text{PMT} & = & -7,000 \\
 \text{FV} & = & 0
 \end{array}$$

Since the cost of this annuity is \$60,000 and its present value is only \$58,954, given an 11 percent opportunity cost, this annuity should not be accepted.

Annuity C:

$$\begin{array}{rcl}
 N & = & 20 \\
 I/Y & = & 11 \\
 \text{CPT PV} & = & \mathbf{-\$63,707} \\
 \text{PMT} & = & -8,000 \\
 \text{FV} & = & 0
 \end{array}$$

Since the cost of this annuity is \$70,000 and its present value is only \$63,704, given an 11 percent opportunity cost, this annuity should not be accepted.

5-23.

N	=	25
I/Y	=	9
PV	=	60,000
CPT PMT=		-\$6,108.38
FV	=	0

5-24.

N	=	15
I/Y	=	6
PV	=	0
CPT PMT=		-\$644.44
FV	=	15,000

5-25.

N	=	10
I/Y	=	5
PV	=	-100,000
PMT	=	0
CPT FV =		\$162,889

How much must be invested annually to accumulate \$162,889?

N	=	10
I/Y	=	10
PV	=	0
CPT PMT=		-\$10,221
FV	=	\$162,889

5-26.

N	=	10
I/Y	=	9
PV	=	0
CPT PMT=		-\$658,200.90
FV	=	10,000,000

$$\begin{array}{llll} 5-27. & N & = & 10 \\ & I/Y & = & 10 \\ & PV & = & -40,000 \\ & \textbf{CPT PMT} & = & \textbf{\$6,510} \\ & FV & = & 0 \end{array}$$

$$\begin{array}{llll} 5-28. & N & = & 5 \\ & \textbf{CPT I/Y} & = & \textbf{19.86\%} \\ & PV & = & -30,000 \\ & PMT & = & 10,000 \\ & FV & = & 0 \end{array}$$

$$\begin{array}{llll} 5-29. & N & = & 5 \\ & I/Y & = & 12 \\ & PV & = & -25,000 \\ & \textbf{CPT PMT} & = & \textbf{\$6,935} \\ & FV & = & 0 \end{array}$$

$$\begin{array}{llll} 5-30. & N & = & 5 \\ & I/Y & = & 12 \\ & PV & = & 0 \\ & \textbf{CPT PMT} & = & \textbf{\$3,148} \\ & FV & = & -20,000 \end{array}$$

$$\begin{array}{llll} 5-31. & N & = & 20 \\ & I/Y & = & 15 \\ & PV & = & -100,000 \\ & \textbf{CPT PMT} & = & \textbf{15,976} \\ & FV & = & 0 \end{array}$$

$$\begin{array}{llll} 5-32. & N & = & 30 \\ & I/Y & = & 10 \\ & PV & = & -150,000 \\ & \textbf{CPT PMT} & = & \textbf{15,912} \\ & FV & = & 0 \end{array}$$

5-33.

$$\begin{aligned}
 \text{rate (r)} &= 8\% \\
 \text{number of periods (n)} &= 7 \\
 \text{payment (PMT)} &= \$0 \\
 \text{present value (PV)} &= \$900 \\
 \text{type (0 = at end of period)} &= 0 \\
 \\
 \text{Future value} &= \$1,542.44
 \end{aligned}$$

Excel formula: = FV(rate,number of periods,payment,present value,type)

Notice that present value (\$500) took on a negative value.

5-34.

$$\begin{aligned}
 \text{number of periods (n)} &= 20 \\
 \text{payment (PMT)} &= \$0 \\
 \text{present value (PV)} &= \$30,000 \\
 \text{future value (FV)} &= \$250,000 \\
 \text{type (0 = at end of period)} &= 0 \\
 \\
 \text{guess} &= \\
 \\
 \text{r} &= 11.18\%
 \end{aligned}$$

Excel formula: = RATE(number of periods,payment,present value,future value,type,guess)

Notice that present value (\$30,000) took on a negative value.

5-35. First, we must calculate what Mr. Burns will need in 20 years. Once we know how much he will need, we can then calculate how much he needs to deposit each year in order to come up with that amount (note: once you calculate the present value, you must multiply your answer, in this case $-\$4.192$ billion times $(1 + r)$ because this is an annuity due):

$$\begin{aligned}
 N &= 10 \\
 I/Y &= 20 \\
 \text{CPT PV} &= -4.1925 \text{ billion} \times 1.20 = -5.031 \text{ billion dollars} \\
 \text{PMT} &= 1 \text{ billion dollars} \\
 \text{FV} &= 0
 \end{aligned}$$

Next, we will determine how much Mr. Burns needs to deposit each year for 20 years to reach this goal of accumulating \$5.031 billion at the end of the 20 years:

$$\begin{aligned}
 N &= 20 \\
 I/Y &= 20 \\
 PV &= 0 \\
 \text{CPT PMT} &= \text{-26.9 million dollars} \\
 FV &= 5.031 \text{ billion}
 \end{aligned}$$

- 5-36. What's the \$100,000 worth in 25 years (keep in mind that Homer invested the money five years ago, and we want to know what it will be worth in 20 years)?

$$\begin{aligned}
 N &= 25 \\
 I/Y &= 7.5 \\
 PV &= -100,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \text{609,833.96 dollars}
 \end{aligned}$$

Now we determine what the additional \$1,500 per year will grow to (note that since Homer will be making these investments at the beginning of each year for 20 years we have an annuity due, thus, once you calculate the present value, you must multiply your answer, in this case \$64,957.02 times $(1 + r)$):

$$\begin{aligned}
 N &= 20 \\
 I/Y &= 7.5 \\
 PV &= 0 \\
 PMT &= -1,500 \\
 \text{CPT FV} &= \text{64,957.02} \times 1.075 = \text{69,828.80 dollars}
 \end{aligned}$$

Finally, we must add the two values together:

$$\$609,833.96 + \$69,828.80 = \$679,662.76$$

5-37.

$$\begin{aligned}
 N &= 20 \\
 \text{CPT I/Y} &= 13.00 \\
 PV &= -21,074.25 \\
 PMT &= 3000 \\
 FV &= 0
 \end{aligned}$$

$$\begin{aligned}
 5-38. \quad N &= 5 \\
 I/Y &= 6 \\
 PV &= -5,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$6,691}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad FV_n &= PV \left(1 + \frac{r}{m} \right)^{mn} \\
 FV_5 &= \$5,000 \left(1 + \frac{0.06}{2} \right)^{2 \times 5} \\
 FV_5 &= \$5,000 (1 + 0.03)^{10} \\
 FV_5 &= \$5,000 (1.344) \\
 FV_5 &= \$6,720
 \end{aligned}$$

Or:

Using a financial calculator where you can change the number of times compounding occurs per year, you can solve this problem in one of two ways.

One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to first make $P/Y = 2$

$$\begin{aligned}
 N &= 5 \times 2 = 10 \\
 I/Y &= 6 \\
 PV &= -5,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \$6,720
 \end{aligned}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$\begin{aligned}
 N &= 5 \times 2 = 10 \\
 I/Y &= 6/2 \\
 PV &= -24 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$6,720}
 \end{aligned}$$

Now solving for bimonthly compounding (six times per year):

$$\begin{aligned} FV_n &= PV \left(1 + \frac{r}{m} \right)^{mn} \\ FV_5 &= \$5,000 \left(1 + \frac{0.06}{6} \right)^{6(5)} \\ FV_5 &= \$5,000 (1 + 0.01)^{30} \\ FV_5 &= \$5,000 (1.348) \\ FV_5 &= \$6,740 \end{aligned}$$

Using a financial calculator where you can change the number of times compounding occurs per year, you can solve this problem in one of two ways.

One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to first make $P/Y = 6$

$$\begin{aligned} N &= 5 \times 6 = 30 \\ I/Y &= 6 \\ PV &= -5,000 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{\$6,739} \end{aligned}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$\begin{aligned} N &= 5 \times 6 = 30 \\ I/Y &= 6/6 \\ PV &= -5,000 \\ PMT &= 0 \\ \text{CPT FV} &= \mathbf{\$6,739} \end{aligned}$$

$$\begin{aligned} \text{c. } FV_n &= PV (1 + r)^n \\ FV_5 &= \$5,000 (1 + 0.12)^5 \\ FV_5 &= \$5,000 (1.762) \\ FV_5 &= \$8,810 \end{aligned}$$

Or:

$$\begin{aligned}
 N &= 5 \\
 I/Y &= 12 \\
 PV &= -5,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$8,812}
 \end{aligned}$$

$$FV_5 = PV \left(1 + \frac{r}{m} \right)^{mn}$$

$$FV_5 = \$5,000 \left(1 + \frac{0.12}{2} \right)^{2 \times 5}$$

$$FV_5 = \$5,000 (1 + 0.06)^{10}$$

$$FV_5 = \$5,000 (1.791)$$

$$FV_5 = \$8,955$$

Or:

Using a financial calculator where you can change the number of times compounding occurs per year, you can solve this problem in one of two ways.

One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to first make $P/Y = 2$

$$\begin{aligned}
 N &= 5 \times 2 = 10 \\
 I/Y &= 12 \\
 PV &= -5,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$8,954}
 \end{aligned}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$\begin{aligned}
 N &= 5 \times 2 = 10 \\
 I/Y &= 12/2 \\
 PV &= -24 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{\$8,954}
 \end{aligned}$$

Now solving for bimonthly compounding (six times per year):

$$FV_5 = PV \left(1 + \frac{r}{m} \right)^{mn}$$

$$FV_5 = \$5,000 \left(1 + \frac{0.12}{6} \right)^{6(5)}$$

$$FV_5 = \$5,000 (1 + 0.02)^{30}$$

$$FV_5 = \$5,000 (1.811)$$

$$FV_5 = \$9,055$$

Using a financial calculator where you can change the number of times compounding occurs per year, you can solve this problem in one of two ways.

One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to first make $P/Y = 6$

$$N = 5 \times 6 = 30$$

$$I/Y = 12$$

$$PV = -5,000$$

$$PMT = 0$$

$$\mathbf{CPT\ FV = \$9,057}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$N = 5 \times 6 = 30$$

$$I/Y = 12/6$$

$$PV = -5,000$$

$$PMT = 0$$

$$\mathbf{CPT\ FV = \$9,057}$$

d. $FV_n = PV (1 + r)^n$

$$FV_{12} = \$5,000 (1 + 0.06)^{12}$$

$$FV_{12} = \$5,000 (2.012)$$

$$FV_{12} = \$10,060$$

Or:

$$N = 12$$

$$I/Y = 6$$

$$PV = -5,000$$

$$PMT = 0$$

$$\text{CPT FV} = \$10,061$$

- e. An increase in the stated interest rate will increase the future value of a given sum. Likewise, an increase in the length of the holding period will increase the future value of a given sum.

5-39. One dollar at 12.0 percent compounded monthly for one year

$$FV_n = PV (1 + r)^n$$

$$FV_{12} = \$1(1 + 0.01)^{12}$$

$$= \$1(1.127)$$

$$= \$1.127$$

Using a financial calculator where you can change the number of times compounding occurs per year, you can solve this problem in one of two ways.

One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to first make $P/Y = 12$

$$N = 1 \times 12 = 12$$

$$I/Y = 12$$

$$PV = -1$$

$$PMT = 0$$

$$\text{CPT FV} = \$1.1268$$

OR if you don't want to use P/Y button (that is, set P/Y=1)

$$N = 1 \times 12 = 12$$

$$I/Y = 12/12$$

$$PV = -1$$

$$PMT = 0$$

$$\mathbf{CPT\ FV = \$1.1268}$$

One dollar at 13.0 percent compounded annually for one year

$$FV_n = PV (1 + r)^n$$

$$FV_1 = \$1(1 + 0.13)^1$$

$$= \$1(1.13)$$

$$= \$1.13$$

OR

$$N = 1$$

$$I/Y = 13$$

$$PV = -1$$

$$PMT = 0$$

$$\mathbf{CPT\ FV = \$1.13}$$

The loan at 12 percent compounded monthly is more attractive.

- 5-40. Using a financial calculator where you can change the number of times compounding occurs per year, you can solve this problem in one of two ways.

One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to first make $P/Y = 2$

$$\mathbf{CPT\ N = 18\ and\ since\ P/Y = 2,\ there\ are\ two\ periods\ per\ year,\ so}$$

$$N = 9\ years$$

$$I/Y = 16$$

$$PV = -1$$

$$PMT = 0$$

$$FV = 4$$

OR if you don't want to use P/Y button (that is, set P/Y = 1)

CPT N	=	18 and since the interest rate is expressed in semi-annual terms, there are two periods per year, so N = 9 years
I/Y	=	16/2
PV	=	-1
PMT	=	0
FV	=	4

- 5-41. Two things to keep in mind when you're working this problem: first, you'll have to convert the annual rate of 8 percent into a monthly rate by dividing it by 12, and second, you'll have to convert the number of periods into months by multiplying 25 times 12 for a total of 300 months.

Excel formula: = PMT(rate, number of periods, present value, future value, type)

rate (r)	=	8%/12
number of periods (n)	=	300
present value (PV)	=	\$300,000
future value (FV)	=	\$0
type (0 = at end of period)	=	0
monthly mortgage payment	=	(\$2,315.45)

Notice that monthly payments take on a negative value because you pay them.

You can also use Excel to calculate the interest and principal portion of any loan amortization payment. You can do this using the following Excel functions:

<u>Calculation:</u>		<u>Formula:</u>
Interest portion of payment	=	IPMT(rate, period, number of periods, present value, future value, type)
Principal portion of payment	=	PPMT(rate, period, number of periods, present value, future value, type)

where period refers to the number of an individual periodic payment.

Thus, if you would like to determine how much of the 48th monthly payment went toward interest and principal you would solve as follows:

Interest portion of payment 48:	(\$1,884.37)
The principal portion of payment 48:	(\$431.08)

- 5-42. Since this problem involves monthly payments we must first divide the annual interest rate by 12 to convert it to monthly terms. Then, N becomes the number of months or compounding periods,

$$\begin{aligned}
 N &= 60 \\
 I/Y &= 6.2/12 \\
 PV &= -25,000 \\
 \text{CPT PMT} &= \mathbf{485.65 \text{ dollars}} \\
 FV &= 0
 \end{aligned}$$

OR: If you're using a Texas Instruments BAII-Plus calculator you can solve this problem by using the P/Y function and make $P/Y = 12$:

$$\begin{aligned}
 N &= 5 \times 12 = 60 \\
 I/Y &= 6.2 \\
 PV &= -25,000 \\
 \text{CPT PMT} &= \mathbf{485.65} \\
 FV &= 0
 \end{aligned}$$

- 5-43. Since this problem involves monthly payments there are two ways to solve it:

One way to solve this problem, if you're using a Texas Instruments BAII-Plus calculator, is to first make $P/Y = 12$

$$\begin{aligned}
 N &= 36 \\
 \text{CPT I/Y} &= \mathbf{11.62} \\
 PV &= -999 \\
 PMT &= 33 \\
 FV &= 0
 \end{aligned}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$\begin{aligned}
 N &= 36 \\
 \text{CPT I/Y} &= \mathbf{0.9683 \times 12 = 11.62\%} \text{ (remember, we just calculated the} \\
 &\quad \text{monthly interest rate because n was expressed in months, so to calculate} \\
 &\quad \text{the annual rate we multiply it times 12)} \\
 PV &= -999 \\
 PMT &= 33 \\
 FV &= 0
 \end{aligned}$$

- 5-44. First, what will be the monthly payments if Suzie goes for the 4.9 percent financing? Since this problem involves monthly payments there are two ways to solve it:

One way to solve this problem, if you're using a Texas Instruments BAII-Plus calculator, is to first make $P/Y = 12$

$$\begin{array}{rcl} N & = & 60 \\ I/Y & = & 4.9 \\ PV & = & -25,000 \\ \text{CPT PMT} & = & \mathbf{\$470.64} \\ FV & = & 0 \end{array}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$\begin{array}{rcl} N & = & 60 \\ I/Y & = & 4.9/12 \\ PV & = & -25,000 \\ \text{CPT PMT} & = & \mathbf{\$470.64} \\ FV & = & 0 \end{array}$$

Now, calculate how much the monthly payments would be if Suzie took the \$1,000 cash back and reduced the amount owed from \$25,000 to \$24,000. Again, since this problem involves monthly payments there are two ways to solve it:

One way to solve this problem, if you're using a Texas Instruments BAII-Plus calculator, is to first make $P/Y = 12$

$$\begin{array}{rcl} N & = & 60 \\ I/Y & = & 6.9 \\ PV & = & -24,000 \\ \text{CPT PMT} & = & \mathbf{\$474.10} \\ FV & = & 0 \end{array}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$\begin{array}{rcl} N & = & 60 \\ I/Y & = & 6.9/12 \\ PV & = & -24,000 \\ \text{CPT PMT} & = & \mathbf{\$470.10} \\ FV & = & 0 \end{array}$$

- 5-45. Since this problem involves quarterly payments there are two ways to solve it:

One way to solve this problem, if you're using a Texas Instruments BAII-Plus calculator, is to first make $P/Y = 4$

$$\begin{array}{rcl} N & = & 16 \\ I/Y & = & 6.4\% \\ PV & = & 0 \\ PMT & = & -1,000 \\ \text{CPT FV} & = & \mathbf{\$18,071.11} \end{array}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$\begin{array}{rcl} N & = & 16 \\ I/Y & = & 6.4/4 \\ PV & = & 0 \\ PMT & = & -1,000 \\ \text{CPT FV} & = & \mathbf{\$18,071.11} \end{array}$$

- 5-46. Since this problem involves monthly payments there are two ways to solve it:

One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to first make $P/Y = 12$

$$\begin{array}{rcl} \text{CPT N} & = & \mathbf{41.49 \text{ (rounded up to 42 months)}} \\ I/Y & = & 12.9 \\ PV & = & -5000 \\ PMT & = & 150 \\ FV & = & 0 \end{array}$$

OR if you don't want to use P/Y button (that is, set $P/Y = 1$)

$$\begin{array}{rcl} \text{CPT N} & = & \mathbf{41.49 \text{ (rounded up to 42 months)}} \\ I/Y & = & 12.9/12 \\ PV & = & -5000 \\ PMT & = & 150 \\ FV & = & 0 \end{array}$$

- 5-47. a. Since this problem begins using annual payments, make sure your calculator is set to $P/Y = 1$.

$$\begin{array}{rcl} N & = & 12 \\ \text{CPT I/Y} & = & \mathbf{8.37\%} \\ PV & = & -160,000 \\ PMT & = & 0 \\ FV & = & 420,000 \end{array}$$

- b. Again, since this problem begins using annual payments, make sure your calculator is set to $P/Y = 1$

$$\begin{aligned} N &= 10 \\ \text{CPT I/Y} &= \mathbf{11.6123\%} \\ PV &= -140,000 \\ PMT &= 0 \\ FV &= 420,000 \end{aligned}$$

- c. Since this problem involves monthly payments there are two ways to solve it. One way to solve this problem, if you're using a Texas Instruments BAII-Plus calculator, is to use the $P/Y =$ function and make $P/Y = 12$. Then, N becomes the number of months or compounding periods:

$$\begin{aligned} N &= 120 \\ I/Y &= 6 \\ PV &= -140,000 \\ \text{CPT PMT} &= \mathbf{-\$1,008.57} \\ FV &= 420,000 \end{aligned}$$

OR if you don't want to use P/Y button (that is, set $P/Y = 1$)

$$\begin{aligned} N &= 120 \\ I/Y &= 6 / 12 \\ PV &= -140,000 \\ \text{CPT PMT} &= \mathbf{-\$1,008.57} \\ FV &= 420,000 \end{aligned}$$

- d. Since this problem involves monthly payments there are two ways to solve it. One way to solve this problem, if you're using a Texas Instruments BAII-Plus calculator, is to use the $P/Y =$ function and make $P/Y = 12$. Then, N becomes the number of months or compounding periods:

Also, since Professor ME will be depositing both the \$140,000 (immediately) and \$500 (monthly), they must have the same sign,

$$\begin{aligned} N &= 120 \\ \text{CPT I/Y} &= \mathbf{8.48\%} \\ PV &= -140,000 \\ PMT &= -500 \\ FV &= 420,000 \end{aligned}$$

OR if you don't want to use P/Y button (that is, set P/Y=1)

$$\begin{aligned}
 N &= 120 \\
 \text{CPT I/Y} &= 0.7069\% \times 12 = 8.48\% \\
 PV &= -140,000 \\
 PMT &= -500 \\
 FV &= 420,000
 \end{aligned}$$

5-48. Investment A

$$\begin{aligned}
 N &= 5 \\
 I/Y &= 20 \\
 \text{CPT PV} &= -29,906 \\
 PMT &= 10,000 \\
 FV &= 0
 \end{aligned}$$

Investment B

Step 1: First, discount the annuity back to the beginning of year 5, which is the end of year 4. Then, discount this equivalent sum to present.

Step 1:

$$\begin{aligned}
 N &= 6 \\
 I/Y &= 20 \\
 \text{CPT PV} &= -33,255 \\
 PMT &= 10,000 \\
 FV &= 0
 \end{aligned}$$

Step 2:

$$\begin{aligned}
 N &= 4 \\
 I/Y &= 20 \\
 \text{CPT PV} &= 16,037 \\
 PMT &= 0 \\
 FV &= -33,255
 \end{aligned}$$

Investment C

$$\begin{aligned}
 PV &= FV_n \left(\frac{1}{(1 + r)^n} \right) \\
 &= \$10,000 \left(\frac{1}{(1 + 0.20)^1} \right) + \$50,000 \left(\frac{1}{(1 + 0.20)^6} \right) \\
 &\quad + \$10,000 \left(\frac{1}{(1 + 0.20)^{10}} \right) \\
 &= \$10,000(.833) + \$50,000(.335) + \$10,000(.162) \\
 &= \$8,330 + \$16,750 + \$1,620 \\
 &= \$26,700
 \end{aligned}$$

OR: Simply calculate the present value of all three single cash flows and then add them together:

N	=	1
I/Y	=	20
CPT PV	=	8,333
PMT	=	0
FV	=	10,000
N	=	6
I/Y	=	20
CPT PV	=	-16,745
PMT	=	0
FV	=	50,000
N	=	10
I/Y	=	20
CPT PV	=	-1,615
PMT	=	0
FV	=	10.000

Then add all the present values together: $\$8,333 + \$16,745 + \$1,615 = \$26,693$

$$5-49. \quad PV = FV_n \left(\frac{1}{(1 + r)^n} \right)$$

$$PV = \$1,000 \left(\frac{1}{(1 + .10)^7} \right)$$

$$PV = \$1,000(.513)$$

$$PV = \$513$$

OR:

$$N = 7$$

$$I/Y = 10$$

$$\text{CPT PV} = -513$$

$$PMT = 0$$

$$FV = 1,000$$

$$5-50. \quad a. \quad PV = \frac{PP}{r}$$

$$PV = \frac{\$300}{0.08}$$

$$PV = \$3,750$$

$$b. \quad PV = \frac{PP}{r}$$

$$PV = \frac{\$1,000}{0.12}$$

$$PV = \$8,333.33$$

$$c. \quad PV = \frac{PP}{r}$$

$$PV = \frac{\$100}{0.09}$$

$$PV = \$1,111.11$$

$$d. \quad PV = \frac{PP}{r}$$

$$PV = \frac{\$95}{0.05}$$

$$PV = \$1,900$$

5-51. Step 1 (First, discount the annuity back to the beginning of year 11, which is the end of year 10.):

$$\begin{aligned} N &= 5 \\ I/Y &= 6 \\ \text{CPT PV} &= -42,124 \\ PMT &= 10,000 \\ FV &= 0 \end{aligned}$$

Step 2 (Then, discount this equivalent sum to present.):

$$\begin{aligned} N &= 10 \\ I/Y &= 6 \\ \text{CPT PV} &= 23,522 \\ PMT &= 0 \\ FV &= -42,124 \end{aligned}$$

Step 3 (Then, determine the present value of the \$20,000 withdrawal at the end of year 15):

$$\begin{aligned} N &= 15 \\ I/Y &= 6 \\ \text{CPT PV} &= 8,345 \\ PMT &= 0 \\ FV &= -20,000 \end{aligned}$$

Step 4: (Add the present values together):

Thus, you would have to deposit \$23,473 + \$8,345 or \$31,818 today.

$$\begin{aligned} 5-52. \quad a. \quad N &= 15 \\ I/Y &= 7 \\ PV &= 0 \\ \text{CPT PMT} &= \$1,990 \\ FV &= -50,000 \\ b. \quad N &= 15 \\ I/Y &= 7 \\ \text{CPT PV} &= 18,122 \\ PMT &= 0 \\ FV &= -50,000 \end{aligned}$$

- c. The contribution of the \$10,000 deposit toward the \$50,000 goal is

$$\begin{aligned}
 N &= 10 \\
 I/Y &= 7 \\
 PV &= -10,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{19,672}
 \end{aligned}$$

Thus, only \$30,328 need be accumulated by annual deposit.

$$\begin{aligned}
 N &= 15 \\
 I/Y &= 7 \\
 PV &= 0 \\
 \text{CPT PMT} &= \mathbf{\$1,207} \\
 FV &= -30,328
 \end{aligned}$$

- 5-53. This problem can be subdivided into (1) the compound value of the \$100,000 in the savings account, (2) the compound value of the \$300,000 in stocks, (3) the additional savings due to depositing \$10,000 per year in the savings account for 10 years, and (4) the additional savings due to depositing \$10,000 per year in the savings account at the end of years 6–10. (Note the \$20,000 deposited in years 6–10 is covered in parts 3 and 4.)

$$\begin{aligned}
 (1) \quad N &= 10 \\
 I/Y &= 7 \\
 PV &= -100,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{196,715}
 \end{aligned}$$

$$\begin{aligned}
 (2) \quad N &= 10 \\
 I/Y &= 12 \\
 PV &= -300,000 \\
 PMT &= 0 \\
 \text{CPT FV} &= \mathbf{931,754}
 \end{aligned}$$

$$\begin{aligned}
 (3) \quad &\text{Compound annuity of \$10,000, 10 years} \\
 N &= 10 \\
 I/Y &= 7 \\
 PV &= 0 \\
 PMT &= -10,000 \\
 \text{CPT FV} &= \mathbf{138,164}
 \end{aligned}$$

(4) Compound annuity of \$10,000 (years 6–10)

$$\begin{aligned} N &= 5 \\ I/Y &= 7 \\ PV &= 0 \\ PMT &= -10,000 \\ \text{CPT FV} &= \mathbf{57,507} \end{aligned}$$

At the end of ten years, you will have $\$196,715 + \$931,754 + \$138,164 + \$57,507 = \$1,324,140$.

$$\begin{aligned} N &= 20 \\ I/Y &= 10 \\ PV &= -1,324,140 \\ \text{CPT PMT} &= \mathbf{155,533} \\ FV &= 0 \end{aligned}$$

5-54. This is an annuity due problem:

At 10%:

$$\begin{aligned} N &= 20 \\ I/Y &= 10 \\ \text{CPT PV} &= \mathbf{425,678 \times 1.1 = 468,246} \\ PMT &= -50,000 \\ FV &= 0 \end{aligned}$$

At 20%:

$$\begin{aligned} N &= 20 \\ I/Y &= 20 \\ \text{CPT PV} &= \mathbf{243,479 \times 1.2 = 292,175} \\ PMT &= -50,000 \\ FV &= 0 \end{aligned}$$

5-55. a. Future value of \$300 deposited every three months at 9 percent compounded quarterly

$$\begin{aligned} N &= 35 \times 4 = 140 \\ I/Y &= 9.0/4 = 2.25 \\ PV &= 0 \\ PMT &= -300 \\ \text{CPT FV} &= \mathbf{\$287,138} \end{aligned}$$

- b. Future value of \$20,000 invested for 15 years at 9% compounded quarterly

$$\begin{aligned} N &= 15 \times 4 = 60 \\ I/Y &= 9.0/4 = 2.25 \\ PV &= -20,000 \\ PMT &= 0 \\ \text{CPT FV} &= \$76,003 \end{aligned}$$

Adding the answers in parts a and b together we get: \$363,140

- 5-56. At retirement, Milhouse wants: \$300,000 for a boat and an annuity of \$80,000 per year for 15 years at 6 percent. First, calculate the PV of the annuity (which is how much he will need to withdraw \$80,000 each year), then add \$300,000:

$$\begin{aligned} N &= 50 \\ I/Y &= 6\% \\ \text{CPT PV} &= -\$1,260,948 \\ PMT &= \$80,000 \\ FV &= 0 \end{aligned}$$

Now add the \$300,000 he wants to buy a boat to the \$1,260,948, and at the end of 43 years he will need to have \$1,560,948

Next, determine how much he needs to deposit at the end of each year for 43 years at 9 percent in order to accumulate \$1,560,948:

$$\begin{aligned} N &= 43 \\ I/Y &= 9 \\ PV &= 0 \\ \text{CPT PMT} &= -\$3,540.80 \\ FV &= 1,560,948 \end{aligned}$$

- 5-57. Solution: Determine the present value of the annuity and the single cash flow at the end of year 6, then add them together (note: the calculator sign change, flows have been entered as negative values and, as a result, the calculated solution comes out as a positive number – this is explained in the book)

Step 1: PV of the Annuity

$$\begin{aligned} N &= 6 \\ I &= 8 \\ PMT &= -80,000 \\ FV &= 0 \\ \text{CPT PV} &= 369,830.37 \end{aligned}$$

Step 2: Determine the PV of the \$100,000 at the end of year 6

$$\begin{aligned} N &= 6 \\ I &= 8 \\ PMT &= 0 \\ FV &= -100,000 \\ CPT PV &= 63,016.96 \end{aligned}$$

Step 3: Add the present values together: $\$369,830.37 + \$63,016.96 = \$432,847.33$

5-58. Step 1: PV of annuity due

$$\begin{aligned} N &= 6 \\ I &= 8 \\ PMT &= -80,000 \\ FV &= 0 \\ CPT PV &= 369,830.37 \times (1 + 0.08) = 399,416.80 \end{aligned}$$

Step 2: Determine the PV of the \$100,000 at the end of year 6

$$\begin{aligned} N &= 6 \\ I &= 8 \\ PMT &= 0 \\ FV &= -100,000 \\ CPT PV &= 63,016.96 \end{aligned}$$

Step 3: Add the present values together: $\$399,416.80 + \$63,016.96 = \$462,433.76$.

5-59 Step 1: Determine how much of the loan will be paid off by the final \$500,000 payment.

$$\begin{aligned} N &= 5 \times 12 = 60 \\ I &= 7/12 \\ PMT &= 0 \\ FV &= -500,000 \\ CPT PV &= 352,703 \end{aligned}$$

Step 2: Determine how much of the loan must be paid off by the monthly payments

$$\$2,000,000 - \$352,703 = \$1,647,298$$

Step 3: Determine the monthly payments needed to pay off the \$1,643,507 (the portion of the loan not paid off by the final balloon payment).

$$N = 5 \times 12 = 60$$

$$I = 7/12$$

$$PV = 1,647,298$$

$$FV = 0$$

$$\text{CPT PMT} = -32,618$$

5-60. a. $N = 387$

$$I/Y = 6$$

$$PV = -24$$

$$\text{PMT} = 0$$

$$\text{CPT FV} = \mathbf{149.136 \text{ billion dollars}}$$

b. One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to first **make P/Y = 12**

$$N = 387 \times 12 = 4,644$$

$$I/Y = 6$$

$$PV = -24$$

$$\text{PMT} = 0$$

$$\text{CPT FV} = \mathbf{275.044 \text{ billion dollars}}$$

OR if you don't want to use P/Y button (that is, set P/Y=1)

$$N = 387 \times 12 = 4,644$$

$$I/Y = 6/12 = 0.5$$

$$PV = -24$$

$$\text{PMT} = 0$$

$$\text{CPT FV} = \mathbf{275.044 \text{ billion dollars}}$$

c. $N = 10$

$$I/Y = 10$$

$$\text{CPT PV} = \mathbf{-23.13 \text{ billion dollars}}$$

$$\text{PMT} = 0$$

$$FV = 60 \text{ billion}$$

- d. N = 10
 CPT I/Y = **14.87%**
 PV = -15 billion
 PMT = 0
 FV = 60 billion
- e. N = 40
 I/Y = 7
 PV = -28 billion
 CPT PMT = **2.10 billion dollars**
 FV = 0

SOLUTION TO MINI CASE

- a. Discounting is the inverse of compounding. We really have only one formula to move a single cash flow through time. In some instances, we are interested in bringing that cash flow back to the present (finding its present value) when we already know the future value. In other cases, we are merely solving for the future value where we know the present value.
- b. The present value of an annuity factor is actually derived from the present value factor. This can be seen by examining the value of each. The present value factor gives values of

$$\frac{1}{(1 + r)^n}$$

for various values of i and n , while the present value of an annuity factor gives values of

$$\left(\sum_{t=1}^n \frac{1}{(1 + r)^t} \right)$$

for various values of r and n . Thus, the value in the present value of annuity for an n -year annuity for any discount rate r is merely the sum of the first n values of the present value factor.

- c.
- | | | | |
|-----|----------------|---|-----------------|
| (1) | N | = | 10 |
| | I/Y | = | 8 |
| | PV | = | -5,000 |
| | PMT | = | 0 |
| | CPT FV | = | \$10,795 |
| | | | |
| (2) | CPT N | = | 15 |
| | I/Y | = | 10 |
| | PV | = | -400 |
| | PMT | = | 0 |
| | FV | = | \$1,671 |
| | | | |
| (3) | N | = | 10 |
| | CPT I/Y | = | 15 |
| | PV | = | -1,000 |
| | PMT | = | 0 |
| | FV | = | \$4,046 |

- d. One way to solve this problem if you're using a Texas Instruments BAII-Plus calculator is to use the $P/Y =$ function and make $P/Y = 2$. Then, N becomes the number of months or compounding periods:

$$\begin{array}{rcl} N & = & 10 \\ I/Y & = & 10 \\ PV & = & -1,000 \\ PMT & = & 0 \\ \text{CPT FV} & = & \mathbf{1,629} \end{array}$$

OR if you don't want to use P/Y button (that is, set $P/Y=1$)

$$\begin{array}{rcl} N & = & 10 \\ I/Y & = & 10/2 \\ PV & = & -1,000 \\ PMT & = & 0 \\ \text{CPT FV} & = & \mathbf{1,629} \end{array}$$

- e. An annuity due is an annuity in which the payments occur at the beginning of each period as opposed to occurring at the end of each period, which is when the payment occurs in an ordinary annuity.

f.

$$\begin{array}{rcl} N & = & 7 \\ I/Y & = & 10 \\ \text{CPT PV} & = & -4,868 \\ PMT & = & 1,000 \\ FV & = & 0 \end{array}$$

PV(annuity due)

$$\begin{array}{rcl} N & = & 7 \\ I/Y & = & 10 \\ \text{CPT PV} & = & -4,868 \times 1.1 = \mathbf{5,355} \\ PMT & = & 1,000 \\ FV & = & 0 \end{array}$$

g.

N	=	7
I/Y	=	10
PV	=	0
PMT	=	-1,000
CPT FV	=	9,487

FV_n(annuity due)

N	=	7
I/Y	=	10
PV	=	0
PMT	=	-1,000
CPT FV	=	9,487 × 1.1 = 10,436

h.

N	=	25
I/Y	=	10
PV	=	-100,000
CPT PMT	=	11,017
FV	=	0

i.

PV	=	$\frac{PP}{r}$
	=	$\frac{\$1,000}{0.08}$
	=	\$12,500

j. Step 1 (First, discount the annuity back to the beginning of year 10, which is the end of year 9.):

N	=	10
I/Y	=	10
CPT PV	=	-6,144.57
PMT	=	1,000
FV	=	0

Step 2 (Then, discount this equivalent sum to present.):

N	=	9
I/Y	=	10
CPT PV	=	2,605
PMT	=	0
FV	=	-6,144.57

- k. Step 1 (First, discount the perpetuity back to the beginning of year 10, which is the end of year 9.):

$$= \frac{\$1,000}{0.10} = \$10,000$$

Step 2 (Then, discount this equivalent sum to present.):

$$N = 9$$

$$I/Y = 10$$

$$\mathbf{CPT\ PV = 4,241}$$

$$PMT = 0$$

$$FV = -10,000$$

CHAPTER 6

The Meaning and Measurement of Risk and Return

CHAPTER ORIENTATION

In this chapter, we examine the factors that determine rates of return (discount rates) in the capital markets. We are particularly interested in the relationship between risk and rates of return. We look at risk both in terms of the riskiness of an individual security and that of a portfolio of securities.

CHAPTER OUTLINE

I. Expected Return Defined and Measured

- A. The expected benefits or returns to be received from an investment come in the form of the cash flows the investment generates.
- B. The rate of return earned from an investment can be calculated as the ratio of the dollar gain divided by the amount of the investment at the beginning of the period. We can formalize these calculations as follows:

Holding-period dollar gain

$$\begin{aligned} \text{Holding-period} \\ \text{dollar gain} &= \text{Price}_{\text{end of period}} + \text{cash distribution (dividend)} - \text{Price}_{\text{beginning of period}} \\ &= \frac{\text{Price}_{\text{end of period}} - \text{Price}_{\text{beginning of period}}}{\text{Price}_{\text{beginning of period}}} \end{aligned}$$

And for the holding-period *rate of return*

$$\begin{aligned} \text{Rate of} \\ \text{return, } r &= \frac{\text{dollar gain}}{\text{Price}_{\text{beginning of period}}} \\ &= \frac{\text{Price}_{\text{end of period}} + \text{dividend} - \text{Price}_{\text{begin of period}}}{P_{\text{begin of } P}} \end{aligned}$$

- C. In an uncertain world, we must use expected cash flows, $\overline{CF}$, for computing expected gains and rates of return. We compute an expected cash flow as follows:

$$\overline{CF} = P(CF_1)CF_1 + P(CF_2)CF_2 + \cdots + P(CF_n)CF_n$$

where n = the number of possible states of the economy
 CF_i = the cash flow in the i th state of the economy
 $P(CF_i)$ = the probability of the i th cash flow

II. Risk Defined and Measured

- A. Risk can be defined as the possible variation in cash flow about an expected cash flow.
 B. Statistically, risk may be measured by the standard deviation about the expected cash flow.

III. Rates of Return: The Investors' Experience

- A. Data have been compiled by Ibbotson and Associates on the actual returns for various portfolios of securities from 1926–1998.
 B. The following portfolios, plus the inflation rate, were studied:
1. Common stocks of large firms
 2. Common stocks of small firms
 3. Corporate bonds
 4. Intermediate U.S. government bonds
 5. U.S. Treasury bills
 6. Inflation rate
- C. From studying the average returns and standard deviations of the above portfolios, we learn that investors historically have received greater returns for greater risk taking.
 D. The only portfolio with returns consistently exceeding the inflation rate has been common stocks.

IV. Risk and Diversification

- A. The market rewards diversification. We can lower risk without sacrificing expected return, and/or we can increase expected return without having to assume more risk.
 B. Total variability can be divided into:
1. The variability of returns unique to the security (diversifiable or unsystematic risk)
 2. The risk related to market movements (nondiversifiable or systematic risk)
- C. By diversifying, the investor can eliminate the “unique” security risk. The systematic risk, however, cannot be diversified away.
 D. Measuring Market Risk
1. The **characteristic line** tells us the average movement in a firm's stock price in response to a movement in the general market, such as the S&P 500 Index. The slope of the characteristic line, which has come to be called **beta**, is a measure of a

stock's systematic or market risk. The slope of the line is merely the ratio of the “rise” of the line relative to the “run” of the line.

2. If a security's beta equals one, a 10 percent increase (decrease) in market returns will produce on average a 10 percent increase (decrease) in security returns.
3. A security having a higher beta is more volatile and thus more risky than a security having a lower beta value.

- E. A portfolio's beta is equal to the average of the betas of the stocks in the portfolio.
- F. Diversifying among different kinds of assets is called asset allocation. Compared to diversification within the different asset classes, the benefits received are far greater through effective asset allocation.
- G. Asset allocation between stocks and bonds clearly affects the expected returns of the portfolios, as does how long you hold the portfolio. The more bonds in your portfolio and the longer you hold the portfolio, the less will be the variability of returns.

V. The Investor's Required Rate of Return

- A. The required rate of return is the minimum rate necessary to compensate an investor for accepting the risk he or she associates with the purchase and ownership of an asset.
- B. Two factors determine the required rate of return for the investor:
 1. The risk-free rate of interest which recognizes the time value of money.
 2. The risk premium which considers the riskiness (variability of returns) of the asset and the investor's attitude toward risk.
- C. Capital asset pricing model--CAPM

1. The required rate of return for a given security can be expressed as

$$\text{Required rate} = \text{risk-free rate} + \text{beta} \times (\text{market return} - \text{risk-free rate})$$

2. Security market line

- a. Graphically illustrates the CAPM.
- b. Designates the risk-return trade-off existing in the market, where risk is defined in terms of beta according to the CAPM equation.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 6-1. a. The investor's required rate of return is the minimum rate of return necessary to attract an investor to purchase or hold a security.
- b. Risk is the potential variability in returns on an investment. Thus, the greater the uncertainty as to the exact outcome, the greater is the risk. Risk may be measured in terms of the standard deviation or by the variance term, which is simply the standard deviation squared.
- c. A large standard deviation of the returns indicates greater riskiness associated with an investment. However, whether the standard deviation is large relative to the returns has to be examined with respect to other investment opportunities. Alternatively, probability analysis is a meaningful approach to capture greater understanding of the significance of a standard deviation figure. However, we have chosen not to incorporate such an analysis into our explanation of the valuation process.
- 6-2. a. Unique risk is the variability in a firm's stock price that is associated with the specific firm and not the result of some broader influence. An employee strike is an example of a company-unique influence.
- b. Systematic risk is the variability in a firm's stock price that is the result of general influences within the industry or resulting from overall market or economic influences. A general change in interest rates charged by banks is an example of systematic risk.
- 6-3. Beta indicates the responsiveness of a security's return to changes in the market returns. Beta is multiplied by the market risk premium and added to the risk-free rate of return to calculate a required rate of return.
- 6-4. The security market line is a graphical representation of the risk-return trade-off that exists in the market. The line indicates the minimum acceptable rate of return for investors given the level of risk. Since the security market line results from actual market transactions, the relationship not only represents the risk-return preferences of investors in the market but also represents the investors' available opportunity set.
- 6-5. The beta for a portfolio is equal to the weighted average of the individual stock betas, weighted by the percentage invested in each stock.
- 6-6. If a stock has a great amount of variability about its characteristic line (the graph of the stock's returns against the market's returns), then it has a high amount of unsystematic or company-unique risk. If, however, the stock's returns closely follow the market movements, then there is little unsystematic risk.

6-7. Data have been compiled by Ibbotson and Associates on the actual returns for the following portfolios of securities, plus the inflation rate, from 1926–2011.

1. Common stocks of large firms
2. Common stocks for small firms
3. Corporate bonds
4. Intermediate U.S. government bonds
5. U.S. Treasury bills

Investors historically have received greater returns for greater risk-taking with the exception of the U.S. government bonds. Also, the only portfolio with returns consistently exceeding the inflation rate has been common stocks.

6-8. Through diversification, we can potentially accomplish one of two results: (1) We can decrease the variability in returns without lowering the expected rate of return of the portfolio, or (2) we can increase the expected rate of return without increasing the variability in returns. The extent of these effects is in part determined by the types of assets in the portfolio. For instance, diversification has greater effect when investing in different types of assets, such as government securities and stocks, rather than just investing in different stocks.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

6-1

(A) PROBABILITY P(r)	(B) RETURN (r)	EXPECTED RETURN $\bar{r}$ (A) x (B)	WEIGHTED DEVIATION $(r - \bar{r})^2 P(r)$
0.10	-10%	-1%	52.90%
0.20	5	1	12.80
0.30	10	3	2.70
0.40	25	10	57.60
		$\bar{r} = 13\%$	$\sigma^2 = 126.00\%$ $\sigma = 11.22\%$

From our studies in statistics, we know that if the distribution of returns were normal, then Universal could expect a return of 13 percent between 1.78 percent ($13\% - 11.22\%$) and 24.22 percent ($13\% + 11.22\%$). However, it is apparent from the probabilities that the distribution is not normal.

6-2

Kaifu:

$$\text{Average return} = \frac{4\% + 6\% + 0\% + 2\%}{4} = 3\%$$

$$\text{Standard deviation} = \sqrt{\frac{[(4\% - 3\%)^2 + (6\% - 3\%)^2 + (0\% - 3\%)^2 + (2\% - 3\%)^2]}{4 - 1}} = 2.58\%$$

Market:

$$\text{Average return: } \frac{2\% + 3\% + 1\% - 1\%}{4} = 1.25\%$$

$$\text{Standard deviation} = \sqrt{\frac{[(2\% - 1.25\%)^2 + (3\% - 1.25\%)^2 + (1\% - 1.25\%)^2 + (-1\% - 1.25\%)^2]}{4 - 1}} = 1.71\%$$

6-3.

(A) Probability	(B) Return	(A) x (B) Expected Return	Weighted Deviation
$P(r_i)$	(r_i)	$\bar{r}$	$(r_i - \bar{r})^2 P(r_i)$
0.15	6%	0.90%	2.22
0.30	9	2.70	0.22
0.40	10	4.00	0.01
0.15	15	<u>2.25</u>	<u>3.98</u>
		$\bar{r} = 9.85\%$	$\sigma^2 = 6.43\%$
			$\sigma = 2.54\%$

6-4

Investment A:

(A) Probability	(B) Return	(A) x (B) Expected Return	Weighted Deviation
$P(r_i)$	(r_i)	$\bar{r}$	$(r_i - \bar{r})^2 P(r_i)$
0.3	11%	3.3%	4.8%
0.4	15	6.0	0.0
0.3	19	<u>5.7</u>	<u>4.8</u>
		$\bar{r} = 15.0\%$	$\sigma^2 = 9.6\%$
			$\sigma = 3.10\%$

Investment B

(A) Probability	(B) Return	(A) x (B) Expected Return	Weighted Deviation
$P(r_i)$	(r_i)	$\bar{r}$	$(r_i - \bar{r})^2 P(r_i)$
0.2	-5%	-1.0%	41.472%
0.3	6	1.8	3.468
0.3	14	4.2	6.348
0.2	22	<u>4.4</u>	<u>31.752</u>
		$\bar{r} = 9.4\%$	$\sigma^2 = 83.04\%$
			$\sigma = 9.11\%$

Investment A is better. It has a higher expected return with less risk.

6-5.

Probabilities	Returns	Prop. × Return
0.40	7%	2.80%
0.25	4%	1.00%
0.15	18%	2.70%
0.20	10%	2.00%
Expected return		8.50%

Deviations	Deviations Squared	Probability	Prob. × Deviation
-1.50%	0.02%	0.40	0.0090%
-4.50%	0.20%	0.25	0.0506%
9.50%	0.90%	0.15	0.1354%
1.50%	0.02%	0.20	0.0045%
			0.1995%
Standard Deviation			4.47%

6-6. This problem has the student experience a site that extends his (her) knowledge about risk and return. The student's answer will vary, depending on the information entered. It should be a fun exercise that lets the student see the practical aspects of this chapter.

6-7. This problem has the student experience a site that extends his (her) knowledge about risk and return. The student's answer will vary, depending on the information entered. It should be a fun exercise that lets the student see the practical aspects of this chapter.

6-8. This problem has the student experience a site that extends his (her) knowledge about risk and return. The student's answer will vary, depending on the information entered. It should be a fun exercise that lets the student see the practical aspects of this chapter.

6-9

TIME	STOCK PRICE	HOLDING-PERIOD RETURN
1	\$10	
2	13	$(\$13 \div \$10) - 1 = 30.0\%$
3	11	$(\$11 \div \$13) - 1 = -15.4\%$
4	15	$(\$15 \div \$11) - 1 = 36.4\%$

6-10. a.

Time	Jazman		Solomon	
	Price	Return	Price	Return
1	\$9		\$27	
2	11	22.22%	28	3.70%
3	10	−9.09	32	14.29
4	13	30.00	29	−9.38

- b. A holding-period return indicates the rate of return you would earn if you bought a security at the beginning of a time period and sold it at the end of the period, such as the end of the month or year.

6-11.

a.

Month	Zemin		Market	
	r_t	$(r_t - \bar{r})^2$	r_t	$(r_t - \bar{r})^2$
1	6.00%	18.75%	4.00%	6.25%
2	3.00	1.77	2.00	0.25
3	−1.00	7.13	1.00	0.25
4	−3.00	21.81	−2.00	12.25
5	5.00	11.09	2.00	0.25
6	0.00	2.79	2.00	0.25
Sum	10.00	63.34	9.00	19.50
Average monthly return (Sum ÷ 6)		1.67%		1.5%
Annualized average returns		20.00%		18.00%
Variance (Sum ÷ 5)		12.67%		3.90%
Standard deviation		3.56%		1.97%

- b. Required rate of return = Risk-free rate + (Market return − Risk-free rate) × Beta

$$= 4\% + [(18\% - 4\%) \times 1.54] = 25.6\%$$

- c. Zemin's historical return of 20 percent is below what we would consider a fair return of 25.6 percent, given the stock's high systematic risk.

6-12. Holding Period Gain = $(12 \times \$25.68) - (12 \times \$24.22) = \$17.52$
Holding Period Return = $\$17.52 \div (12 \times \$24.22) = 6\%$

6-13. This problem has the student experience a site that extends his (her) knowledge about risk and return. The student's answer will vary, depending on the information entered. It should be a fun exercise that lets the student see the practical aspects of this chapter.

6-14.

a.

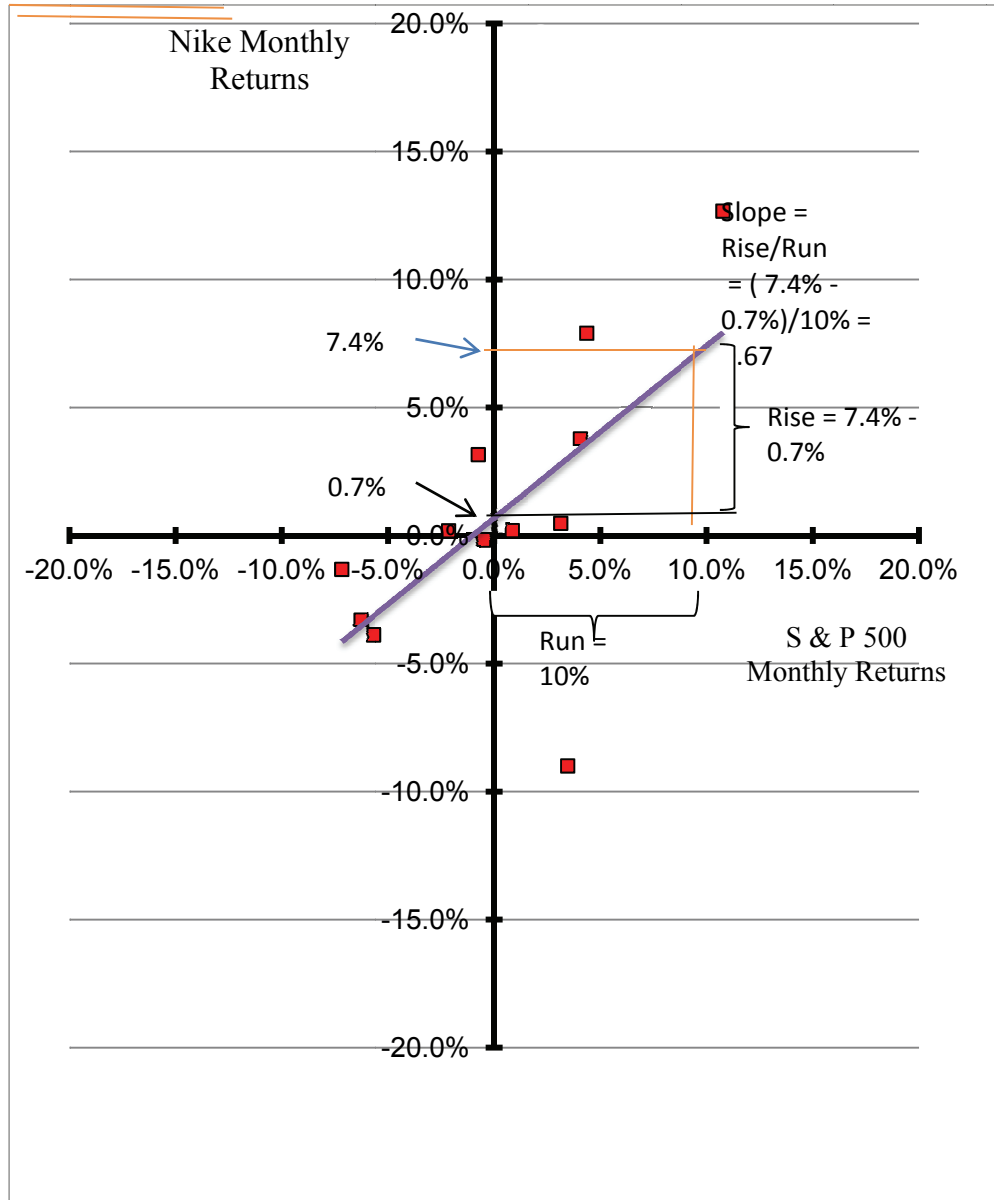
<u>Month</u>	<u>Nike</u>		<u>S&P 500 Index</u>	
	Prices	Returns	Prices	Returns
Jun-11	\$89.98		\$1,320.64	
Jul-11	90.15	0.2%	1,292.28	−2.1%
Aug-11	86.65	−3.9%	1,218.89	−5.7%
Sep-11	85.51	−1.3%	1,131.42	−7.2%
Oct-11	96.35	12.7%	1,253.30	10.8%
Nov-11	96.18	−0.2%	1,246.96	−0.5%
Dec-11	96.37	0.2%	1,257.60	0.9%
Jan-12	103.99	7.9%	1,312.41	4.4%
Feb-12	107.92	3.8%	1,365.68	4.1%
Mar-12	108.44	0.5%	1,408.47	3.1%
Apr-12	111.87	3.2%	1,397.91	−0.7%
May-12	108.18	−3.3%	1,310.33	−6.3%
Jun-12	98.45	−9.0%	1,355.69	3.5%

b.

Average Returns	0.89%	0.34%
Standard deviation	5.62%	5.23%

c.

Using the Excel function, $\text{Slope} = \text{linesst}(\text{Nike returns}:\text{S\&P returns})$, we find that the slope of the characteristic line to be 0.67 and the intercept is 0.7%.



- d. Nike's returns are positively correlated to the S&P 500 returns with the characteristic line having a slope of 0.67, which suggests that the systematic risk for HP is less than the general market. Moreover, the variability of returns around the characteristic line reflects the unsystematic risk for Nike's stock.

6-15.

Stock A: $5\% + 0.75 (12\% - 5\%) = 10.3\%$ Stock B: $5\% + 0.90 (12\% - 5\%) = 11.3\%$ Stock C: $5\% + 1.40 (12\% - 5\%) = 14.8\%$

6-16.

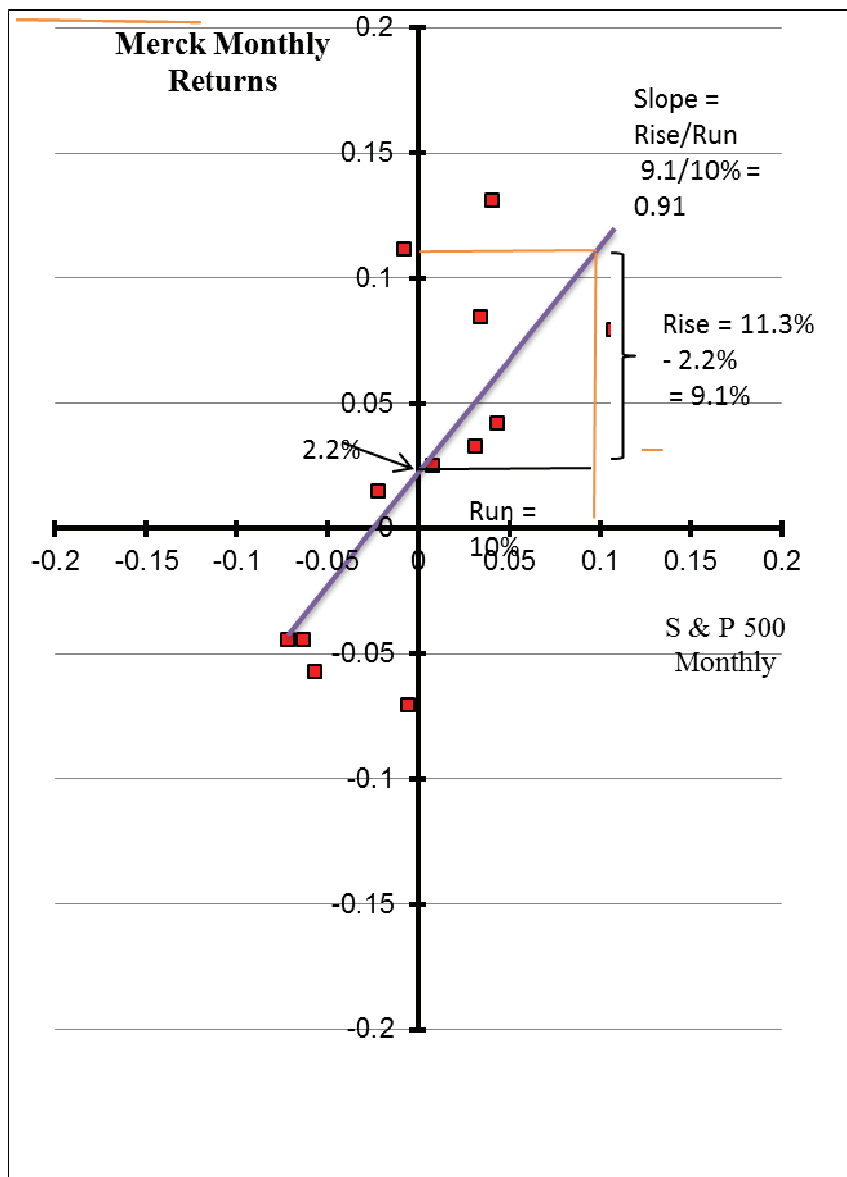
a.

Month	<u>Merck</u>		<u>S&P 500 Index</u>	
	Prices	Returns	Prices	Returns
Jun-11	\$32.27		\$1,320.64	
Jul-11	32.75	1.5%	1,292.28	-2.1%
Aug-11	30.87	-5.7%	1,218.89	-5.7%
Sep-11	29.49	-4.5%	1,131.42	-7.2%
Oct-11	31.83	7.9%	1,253.30	10.8%
Nov-11	29.59	-7.0%	1,246.96	-0.5%
Dec-11	30.33	2.5%	1,257.60	0.9%
Jan-12	31.6	4.2%	1,312.41	4.4%
Feb-12	35.74	13.1%	1,365.68	4.1%
Mar-12	36.9	3.2%	1,408.47	3.1%
Apr-12	41.02	11.2%	1,397.91	-0.7%
May-12	39.19	-4.5%	1,310.33	-6.3%
Jun-12	42.5	8.4%	1,355.69	3.5%

b.

Average Returns	2.53%	0.34%
Standard deviation	6.83%	5.23%

c.



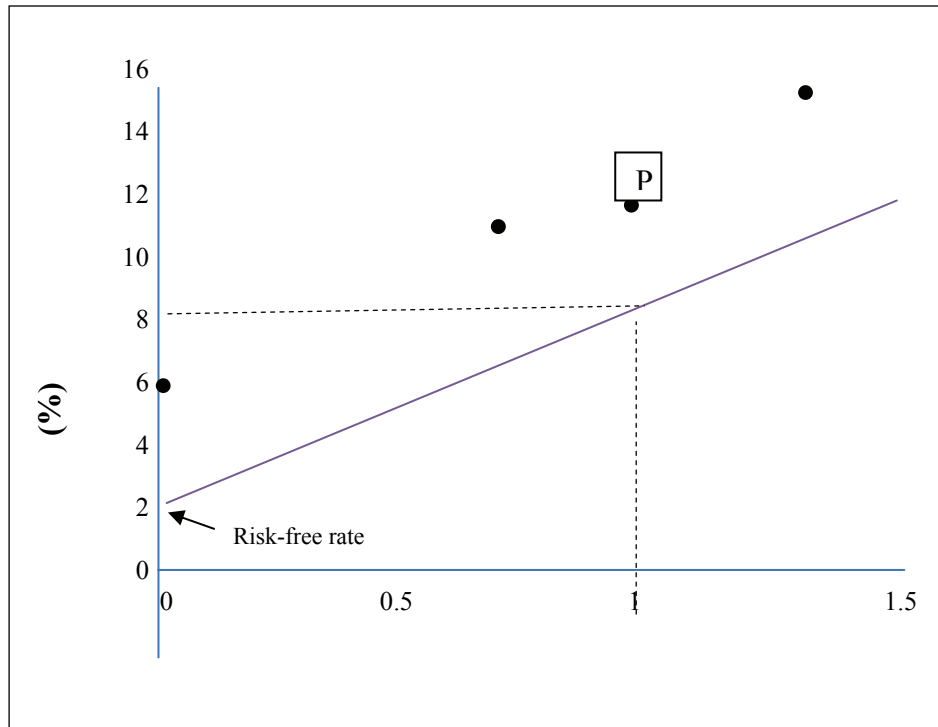
d.

Slope: =linest(Merck returns:S&P returns) = 0.91 Vertical intercept: 2.2%

6-17.

- a. Portfolio expected return:
 $(0.4 \times 12\%) + (0.25 \times 11\%) + (0.35 \times 15\%) = 12.8\%$
- Portfolio beta:
 $(0.4 \times 1.0) + (0.25 \times 0.75) + (0.35 \times 1.3) = 1.04$

b.



$$\begin{aligned}
 \text{6-18. a. } \left(\begin{array}{c} \text{Required rate} \\ \text{of return} \end{array} \right) &= \left(\begin{array}{c} \text{Risk-free} \\ \text{rate} \end{array} \right) + \text{Beta} \left(\begin{array}{c} \text{Market risk} \\ \text{premium} \end{array} \right) \\
 &= 2\% + 1.2 (11\% - 2\%) \\
 &= 13.2\%
 \end{aligned}$$

b. The 13.2 percent “fair rate” compensates the investor for the time value of money and for assuming risk. However, only nondiversifiable risk is being considered, which is appropriate.

6-19. Eye-balling the characteristic line for the problem, the rise relative to the run is about 0.5. That is, when the S&P 500 return is 8 percent, Aram’s expected return would be about four percent. Thus, the beta is also approximately 0.5 ($4 \div 8$).

6-20.

$$\text{Risk-Free Rate} + \left[\left(\frac{\text{Expected Market Return} - \text{Risk-Free Rate}}{\text{Beta}} \right) \times \text{Beta} \right] =$$

$$A \quad 2.75\% + [(12\% - 2.75\%) \times 1.50] = 16.63\%$$

$$A \quad 2.75\% + [(12\% - 2.75\%) \times 0.90] = 11.08\%$$

$$A \quad 2.75\% + [(12\% - 2.75\%) \times 0.70] = 9.23\%$$

$$A \quad 2.75\% + [(12\% - 2.75\%) \times 1.15] = 13.39\%$$

6-21.

$$\begin{aligned} &= + [(\text{Market Return} - \text{Risk-Free Rate}) \times \text{Beta}] \\ &= 3\% + [(11.5\% - 3\%) \times 0.86] \\ &= 9.31\% \end{aligned}$$

6-22. If the expected market return is 12.8 percent and the risk premium is 4.3 percent, the riskless rate of return is 8.5 percent (12.8% – 4.3%). Therefore;

$$\text{Tasaco} = 3.5\% + [(9.3\% - 8.5\%) \times 0.864] = 11.54\%$$

$$\text{LBM} = 3.5\% + [(9.3\% - 8.5\%) \times 0.693] = 9.94\%$$

$$\text{Exxos} = 3.5\% + [(9.3\% - 8.5\%) \times 0.575] = 8.85\%$$

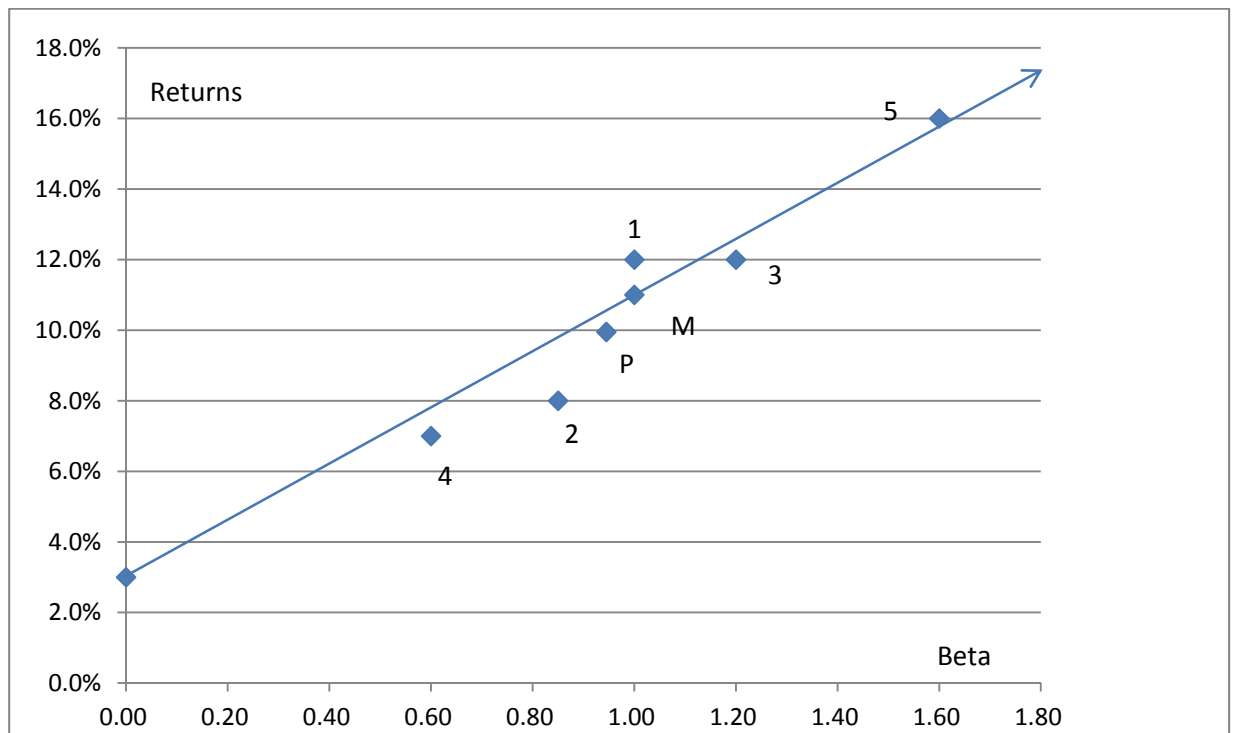
6-23. a. The portfolio expected return, $\bar{k}_p$, equals a weighted average of the individual stock's expected returns.

$$\begin{aligned} \bar{r}_p &= (0.20)(12\%) + (0.30)(8\%) + (0.15)(12\%) + (0.25)(7\%) + \\ &\quad (0.10)(16\%) \\ &= 10\% \end{aligned}$$

b. The portfolio beta, β_p , equals a weighted average of the individual stock betas

$$\begin{aligned} \beta_p &= (0.20)(1.00) + (0.30)(0.85) + (0.15)(1.20) + (0.25)(0.60) + \\ &\quad (0.10)(1.60) \\ &= 0.95 \end{aligned}$$

c. Plot the security market line and the individual stocks.



- d. A “winner” may be defined as a stock that falls above the security market line, which means these stocks are expected to earn a return exceeding what should be expected given their beta or systematic risk. In the above graph, these stocks include 1 and 5. “Losers” would be those stocks falling below the security market line, which are represented by stocks 2, 3, and 4. The five-stock portfolio is slightly below the security market line as well.
- e. Our results are less than certain because we have problems estimating the security market line with certainty. For instance, we have difficulty in specifying the market portfolio

6-24. Portfolio Beta = $(0.38 \times 1.5) + (0.15 \times 1.44) + (0.27 \times 1.15) + (0.20 \times 1.2) = 1.34$

SOLUTION TO MINI CASE

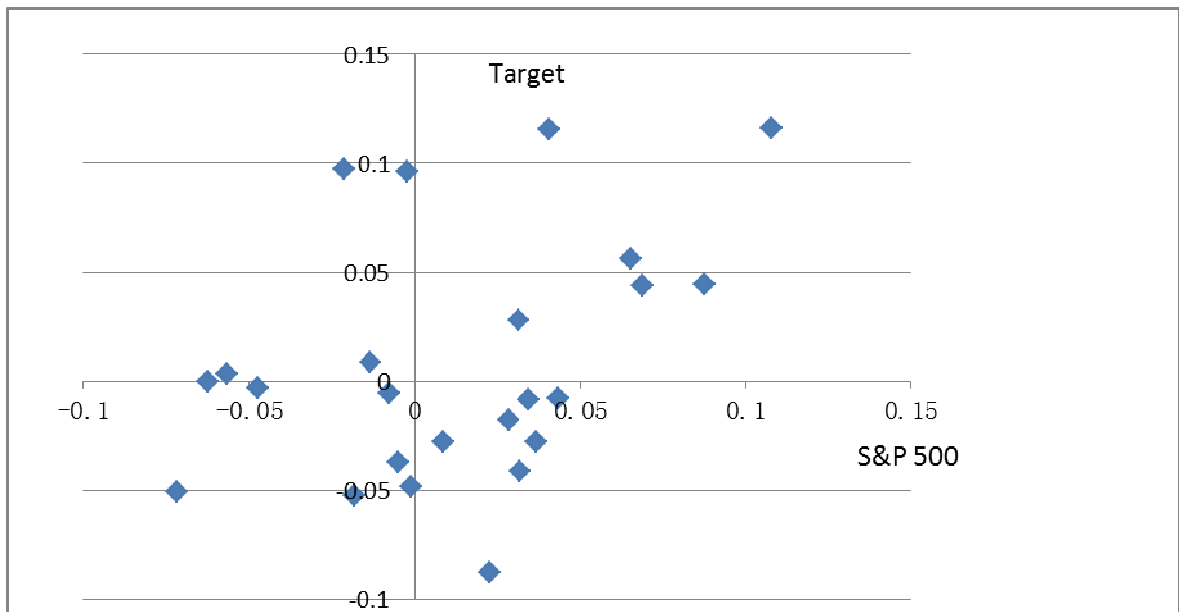
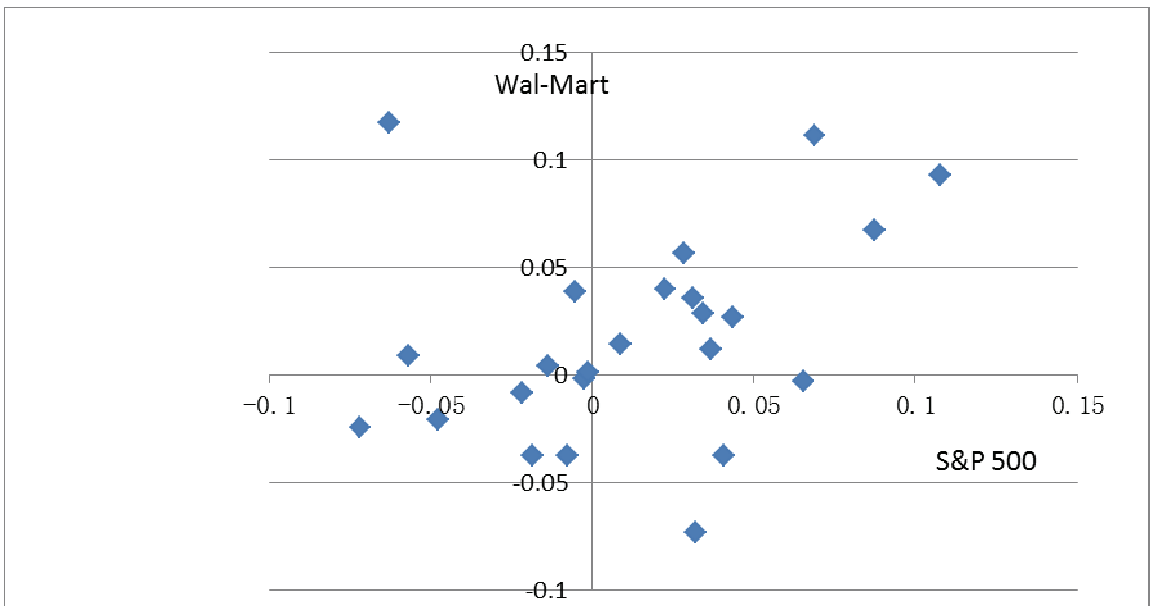
a.

Month	<u>S&P 500</u>		<u>Wal-Mart</u>		<u>Target</u>	
	<u>Price</u>	<u>Rt</u>	<u>Price</u>	<u>Rt</u>	<u>Price</u>	<u>Rt</u>
2010						
June	\$1,030.71		\$46.07		\$49.17	
July	1,101.60	6.88%	51.19	11.11%	51.32	4.37%
August	1,049.33	-4.74%	50.14	-2.05%	51.16	-0.31%
September	1,141.20	8.76%	53.52	6.74%	53.44	4.46%
October	1,183.26	3.69%	54.17	1.21%	51.94	-2.81%
November	1,180.55	-0.23%	54.09	-0.15%	56.94	9.63%
December	1,257.64	6.53%	53.93	-0.30%	60.13	5.60%
2011						
January	1,286.12	2.26%	56.07	3.97%	54.83	-8.81%
February	1,327.22	3.20%	51.98	-7.29%	52.55	-4.16%
March	1,325.83	-0.10%	52.05	0.13%	50.01	-4.83%
April	1,363.61	2.85%	54.98	5.63%	49.10	-1.82%
May	1,345.20	-1.35%	55.22	0.44%	49.53	0.88%
June	1,320.64	-1.83%	53.14	-3.77%	46.91	-5.29%
July	1,292.28	-2.15%	52.71	-0.81%	51.49	9.76%
August	1,218.89	-5.68%	53.19	0.91%	51.67	0.35%
September	1,131.42	-7.18%	51.90	-2.43%	49.04	-5.09%
October	1,253.30	10.77%	56.72	9.29%	54.75	11.64%
November	1,246.96	-0.51%	58.90	3.84%	52.70	-3.74%
December	1,257.60	0.85%	59.76	1.46%	51.22	-2.81%
2012						
January	1,312.41	4.36%	61.36	2.68%	50.81	-0.80%
February	1,365.68	4.06%	59.08	-3.72%	56.69	11.57%
March	1,408.47	3.13%	61.20	3.59%	58.27	2.79%
April	1,397.91	-0.75%	58.91	-3.74%	57.94	-0.57%
May	1,310.33	-6.27%	65.82	11.73%	57.91	-0.05%
June	1,355.69	3.46%	67.70	2.86%	57.40	-0.88%

b.

Average return	1.25%	1.72%	0.79%
Standard deviation	4.65%	4.77%	5.63%

c.

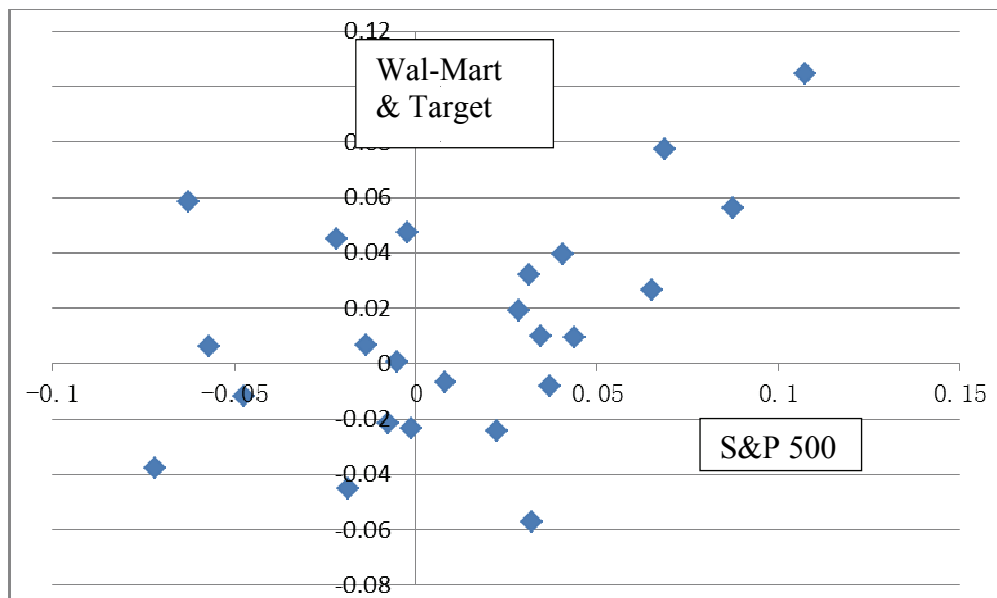


d. The returns for Wal-Mart and Target are certainly positively related to the market returns, but with a lot of noise, which represents the unsystematic or diversifiable risk.

e. Wal-Mart & Target Combined Returns

	<u>1/2 Wal-Mart</u>	<u>1/2 Target</u>	<u>Average</u>
2010			
July	5.56%	2.19%	7.74%
August	-1.03%	-0.16%	-1.18%
September	3.37%	2.23%	5.60%
October	0.61%	-1.40%	-0.80%
November	-0.07%	4.81%	4.74%
December	-0.15%	2.80%	2.65%
2011			
January	1.98%	-4.41%	-2.42%
February	-3.65%	-2.08%	-5.73%
March	0.07%	-2.42%	-2.35%
April	2.81%	-0.91%	1.90%
May	0.22%	0.44%	0.66%
June	-1.88%	-2.64%	-4.53%
July	-0.40%	4.88%	4.48%
August	0.46%	0.17%	0.63%
September	-1.21%	-2.54%	-3.76%
October	4.64%	5.82%	10.47%
November	1.92%	-1.87%	0.05%
December	0.73%	-1.40%	-0.67%
2012			
January	1.34%	-0.40%	0.94%
February	-1.86%	5.79%	3.93%
March	1.79%	1.39%	3.19%
April	-1.87%	-0.28%	-2.15%
May	5.86%	-0.03%	5.84%
June	1.43%	-0.44%	0.99%
Average			1.26%
Std Dev			3.98%

f.



g.

	<u>Annualized</u>	<u>Monthly</u>
2010		
July	3.71%	0.31%
August	3.82%	0.32%
September	3.35%	0.28%
October	3.40%	0.28%
November	3.66%	0.31%
December	3.95%	0.33%
2011		
January	4.18%	0.35%
February	4.37%	0.36%
March	4.24%	0.35%
April	4.27%	0.36%
May	4.14%	0.35%
June	3.83%	0.32%
July	4.12%	0.34%
August	3.72%	0.31%
September	3.10%	0.26%
October	2.51%	0.21%
November	2.73%	0.23%
December	2.82%	0.24%
2012		
January	2.67%	0.22%
February	2.65%	0.22%
March	2.80%	0.23%
April	3.00%	0.25%
May	2.76%	0.23%
June	2.13%	0.18%

Average return	0.28%
Standard deviation	0.06%

h. Wal-Mart, Target & Bonds Combined Return

	<u>1/3 Wal-Mart</u>	<u>1/3 Target</u>	<u>1/3 Bonds</u>	<u>Sum</u>
2010				
July	3.70%	1.46%	0.10%	5.27%
August	−0.68%	−0.10%	0.11%	−0.68%
September	2.25%	1.49%	0.09%	3.83%
October	0.40%	−0.94%	0.09%	−0.44%
November	−0.05%	3.21%	0.10%	3.26%
December	−0.10%	1.87%	0.11%	1.88%
2011				
January	1.32%	−2.94%	0.12%	−1.50%
February	−2.43%	−1.39%	0.12%	−3.70%
March	0.04%	−1.61%	0.12%	−1.45%
April	1.88%	−0.61%	0.12%	1.39%
May	0.15%	0.29%	0.12%	0.55%
June	−1.26%	−1.76%	0.11%	−2.91%
July	−0.27%	3.25%	0.11%	3.10%
August	0.30%	0.12%	0.10%	0.52%
September	−0.81%	−1.70%	0.09%	−2.42%
October	3.10%	3.88%	0.07%	7.05%
November	1.28%	−1.25%	0.08%	0.11%
December	0.49%	−0.94%	0.08%	−0.37%
2012				
January	0.89%	−0.27%	0.07%	0.70%
February	−1.24%	3.86%	0.07%	2.69%
March	1.20%	0.93%	0.08%	2.20%
April	−1.25%	−0.19%	0.08%	−1.35%
May	3.91%	−0.02%	0.08%	3.97%
June	0.95%	−0.29%	0.06%	0.72%
Average return	0.93%			
Standard deviation	2.65%			

i.	Avg Returns	Std Deviation
Government bonds	0.28%	0.06%
Wal-Mart, Target, & govt. bonds	0.93%	2.65%
S&P 500 Index	1.25%	4.65%
Wal-Mart	1.72%	4.77%
Target	0.79%	5.63%
Wal-Mart & Target	1.26%	3.98%

j.	Average Return	Standard Deviation	Beta
Wal-Mart	1.72%	4.77%	0.45
Target	0.79%	5.63%	0.60

If our data are representative of the rates of returns an investor would receive and the variation of these returns, an investor would have a higher expected rate of return with less total risk (standard deviation) and systematic risk (beta).

k.

Wal-Mart

Risk free rate	3.0%
Market return	10.0%
Beta	0.45
Required rate=	6.2%

Target

Risk-free rate	3.0%
Market return	10.0%
Beta	0.60
Required rate	7.2%

CHAPTER 7

The Valuation and Characteristics of Bonds

CHAPTER ORIENTATION

This chapter introduces the concepts that underlie asset valuation. We are specifically concerned with bonds. We also look at the concept of the bondholder's expected rate of return on an investment.

CHAPTER OUTLINE

- I. Types of bonds
 - A. Debentures: unsecured long-term debt.
 - B. Subordinated debentures: bonds that have a lower claim on assets in the event of liquidation than do other senior debt holders.
 - C. Mortgage bonds: bonds secured by a lien on specific assets of the firm, such as real estate.
 - D. Eurobonds: bonds issued in a country different from the one in whose currency the bond is denominated; for instance, a bond issued in Europe or Asia that pays interest and principal in U.S. dollars.
 - E. Convertible bonds: Bonds that can be converted into common stock at a pre-specified price per share.
- II. Terminology and characteristics of bonds
 - A. A bond is a long-term promissory note that promises to pay the bondholder a predetermined, fixed amount of interest each year until maturity. At maturity, the principal will be paid to the bondholder.
 - B. In the case of a firm's insolvency, a bondholder has a priority of claim to the firm's assets before the preferred and common stockholders. Also, bondholders must be paid interest due them before dividends can be distributed to the stockholders.

- C. A bond's par value is the amount that will be repaid by the firm when the bond matures, usually \$1,000.
- D. The contractual agreement of the bond specifies a coupon interest rate that is expressed either as a percent of the par value or as a flat amount of interest which the borrowing firm promises to pay the bondholder each year. For example: A \$1,000 par value bond specifying a coupon interest rate of nine percent is equivalent to an annual interest payment of \$90.
 - 1. When the investor receives a fixed interest rate, the bonds are called fixed-rate bonds.
 - 2. Sometimes a company will issue bonds at a substantial discount from their \$1,000 face value with a zero or very low coupon, thus the name zero-coupon bonds.
- E. The bond has a maturity date, at which time the borrowing firm is committed to repay the loan principal.
- F. A convertible bond allows the investor to exchange the bond for a predetermined number of the firm's shares of common stock.
- G. A bond is callable or redeemable when it provides the firm with the right to pay off the bond at some time before its maturity date. These bonds frequently have a call protection period which prevents the firm from calling the bond for a pre-specified time period.
- H. An indenture (or trust deed) is the legal agreement between the firm issuing the bonds and the bond trustee who represents the bondholders. It provides the specific terms of the bond agreement such as the rights and responsibilities of both parties.
- I. Bond ratings
 - 1. Bond ratings are simply judgments about the future risk potential of the bond in question. Bond ratings are extremely important in that a firm's bond rating tells much about the cost of funds and the firm's access to the debt market.
 - 2. Three primary rating agencies exist—Moody's, Standard & Poor's, and Fitch Investor Services.
 - 3. A junk bond is high-risk debt with *ratings of BB or below* by Moody's and Standard & Poor's. The lower the rating, the higher the chance of default

III. Definitions of value

- A. Book value is the value of an asset shown on a firm's balance sheet which is determined by its historical cost rather than its current worth.
- B. Liquidation value is the amount that could be realized if an asset is sold individually and not as part of a going concern.
- C. Market value is the observed value of an asset in the marketplace where buyers and sellers negotiate an acceptable price for the asset.
- D. Intrinsic value is the value based upon the expected cash flows from the investment, the riskiness of the asset, and the investor's required rate of return. It is the value in the eyes of the investor and is the same as the present value of expected future cash flows to be received from the investment.

IV. Valuation: An Overview

- A. Value is a function of three elements:
 - 1. The amount and timing of the asset's expected cash flow
 - 2. The riskiness of these cash flows
 - 3. The investors' required rate of return for undertaking the investment
- B. Expected cash flows are used in measuring the returns from an investment.

V. Valuation: The Basic Process

The value of an asset is found by computing the present value of all the future cash flows expected to be received from the asset. Expressed as a general present value equation, the value of an asset is found as follows:

$$V = \frac{\$C_1}{(1+r)^1} + \frac{\$C_2}{(1+r)^2} + \cdots + \frac{\$C_n}{(1+r)^n}$$

- where C_t = the cash flow to be received at time t
- V = the intrinsic value or present value of an asset producing expected future cash flows, C_t , in years 1 through N
- r = the investor's required rate of return
- n = the number of periods

VI. Bond Valuation

- A. The value of a bond is simply the present value of the future interest payments and maturity value discounted at the bondholder's required rate of return. This may be expressed as:

$$V_b = \frac{\$I_1}{(1+r_b)^1} + \frac{\$I_2}{(1+r_b)^2} + \cdots + \frac{\$I_n}{(1+r_b)^n} + \frac{\$M}{(1+r_b)^n}$$

where I_t = the dollar interest to be received in each payment

M = the par value of the bond at maturity

r_b = the required rate of return for the bondholder

n = the number of periods to maturity

In other words, we are discounting the expected future cash flows to the present at the appropriate discount rate (required rate of return).

- B. If interest payments are received semiannually (as with most bonds) the valuation equation becomes:

$$V_b = \frac{\$I_1 / 2}{\left(1 + \frac{r_b}{2}\right)^1} + \frac{\$I_2 / 2}{\left(1 + \frac{r_b}{2}\right)^2} + \cdots + \frac{\$I_{2n} / 2}{\left(1 + \frac{r_b}{2}\right)^{2n}} + \frac{\$M}{\left(1 + \frac{r_b}{2}\right)^{2n}}$$

VII. Bond Yields

- A. Yield to maturity

1. The yield to maturity is the rate of return the investor will earn if the bond is held to maturity, provided, of course, that the company issuing the bond does not default on the payments.
2. We compute the yield to maturity by finding the discount rate that gets the present value of the future interest payments and principal payment just equal to the bond's current market price.

- B. Current yield

1. The current yield on a bond is the ratio of the annual interest payment of the bond's current market price.
2. The current yield is not an accurate measure of the bondholder's expected rate of return from holding the bond to maturity.

VIII. Bond Value: Three Important Relationships

A. First relationship

A decrease in interest rates (required rates of return) will cause the value of a bond to increase; an interest rate increase will cause a decrease in value. The change in value caused by changing interest rates is called interest rate risk.

B. Second relationship

1. If the bondholder's required rate of return (current interest rate) equals the coupon interest rate, the bond will sell at par, or maturity value.
2. If the current interest rate exceeds the bond's coupon rate, the bond will sell below par value or at a "discount."
3. If the current interest rate is less than the bond's coupon rate, the bond will sell above par value or at a "premium."

C. Third relationship

A bondholder owning a long-term bond is exposed to greater interest rate risk than when owning a short-term bond.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 7-1. The term debenture applies to any unsecured long-term debt. Because these bonds are unsecured, the earning ability of the issuing corporation is of great concern to the bondholder. They are also viewed as being more risky than secured bonds and, as a result, must provide investors with a higher yield than secured bonds provide. Often the issuing firm attempts to provide some protection to the holder through the prohibition of any additional encumbrance of assets. This prohibits the future issuance of secured long-term debt that would further tie up the firm's assets and leave the bondholders less protected. To the issuing firm, the major advantage of debentures is that no property has to be secured by them. This allows the firm to issue debt and still preserve some future borrowing power.

A mortgage bond is a bond secured by a lien on real property. Typically, the value of the real property is greater than that of the mortgage bonds issued. This provides the mortgage bondholders with a margin of safety in the event the market value of the secured property declines. In the case of foreclosure, the trustees have the power to sell the secured property and use the proceeds to pay the bondholders. In the event that the proceeds from this sale do not cover the bonds, the bondholders become general creditors, similar to debenture bondholders, for the unpaid portion of the debt.

- 7-2. a. Eurobonds are not so much a different type of security as they are securities, in this case bonds, issued in a country different from the one in whose currency the bond is denominated. For example, a bond that is issued in Europe or in Asia by an American company and that pays interest and principal to the lender in U.S. dollars would be considered a Eurobond. Thus, even if the bond is not issued in Europe, it merely needs to be sold in a country different from the one in whose currency it is denominated to be considered a Eurobond.
- b. Zero and very low coupon bonds allow the issuing firm to issue bonds at a substantial discount from their \$1,000 face value with a zero or very low coupon. The investor receives a large part (or all on the zero coupon bond) of the return from the appreciation of the bond at maturity.
- c. Junk bonds refer to any bond with a rating of BB or below. The major participants in this market are new firms that do not have an established record of performance. Many junk bonds have been issued to finance corporate buyouts.

- 7-3. In the case of insolvency, claims of debt in general, including bonds, are honored before those of both common stock and preferred stock. However, different types of debt may also have a hierarchy among themselves as to the order of their claim on assets.

Bonds also have a claim on income that comes ahead of common and preferred stock. If interest on bonds is not paid, the bond trustees can classify the firm insolvent and force it into bankruptcy. Thus, the bondholder's claim on income is more likely to be honored than that of common and preferred stockholders, whose dividends are paid at the discretion of the firm's management.

- 7-4. a. The par value is the amount stated on the face of the bond. This value does not change and, therefore, is completely independent of the market value. However, the market value may change with changing economic conditions and changes within the firm.
- b. The coupon interest rate is the rate of interest that is contractually specified in the bond indenture. As such, this rate is constant throughout the life of the bond. The coupon interest rate indicates to the investor the amount of interest to be received in each payment period. On the other hand, the investor's required interest rate is equivalent to the bond's current yield to maturity, which changes with the bond's changing market price. This rate may be altered as economic conditions change and/or the investor's attitude toward the risk-return trade-off is altered.
- 7-5. Ratings involve a judgment about the future risk potential of the bond. Although they deal with expectations, several historical factors seem to play a significant role in their determination. Bond ratings are favorably affected by (1) a greater reliance on equity, and not debt, in financing the firm, (2) profitable operations, (3) a low variability in past earnings, (4) large firm size, and (5) little use of subordinated debt. In turn, the rating a bond receives affects the rate of return demanded on the bond by the investors. The poorer the bond rating, the higher the rate of return demanded in the capital markets.
- For the financial manager, bond ratings are extremely important. They provide an indicator of default risk that in turn affects the rate of return that must be paid on borrowed funds.
- 7-6. Book value is the asset's historical value and is represented on the balance sheet as cost minus depreciation. Liquidation value is the dollar sum that could be realized if the asset were sold individually and not as part of a going concern. Market value is the observed value for an asset in the marketplace where buyers and sellers negotiate a mutually acceptable price. Intrinsic value is the present value of the asset's expected future cash flows discounted at an appropriate discount rate.
- 7-7. The intrinsic value of a security is equal to the present value of cash flows to be received by the investor. Hence, the terms value and present value are synonymous.
- 7-8. The first two factors affecting asset value (the asset characteristics) are the asset's expected returns and the riskiness of these returns. The third consideration is the investor's required rate of return. The required rate of return reflects the investor's risk-return preference.
- 7-9. The relationship is inverse. As the required rate of return increases, the value of the security decreases, and a decrease in the required rate of return results in a price increase.
- 7-10. The expected rate of return is the rate of return that may be expected from purchasing a security at the prevailing market price. Thus, the expected rate of return is the rate that equates future cash flows with the actual selling price of the security in the market, which is also called the yield to maturity.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

7-1.

$$\text{Value (V}_b\text{)} = \sum_{t=1}^{20} \frac{\$80}{(1.04)^t} + \frac{\$1,000}{(1.04)^{20}}$$

Using a financial calculator, we find the value of the bond to be \$1,105.94:

20	N			
7	I/Y			
80	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-1,105.94

If you pay more for the bond, your required rate of return will not be satisfied. In other words, by paying an amount for the bond that exceeds \$1,105.94, the expected rate of return for the bond is less than the required rate of return. If you have the opportunity to pay less for the bond, the expected rate of return exceeds the 7 percent required rate of return.

7-2

If interest is paid semiannually:

$$\text{Value (V}_b\text{)} = \sum_{t=1}^{14} \frac{\$20}{(1.025)^t} + \frac{\$1,000}{(1.025)^{14}}$$

The value of the bond would be \$941.55:

14	N			
2.5	I/Y			
20	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-941.55

If interest is paid annually:

$$\text{Value } (V_b) = \sum_{t=1}^7 \frac{\$40}{(1.05)^t} + \frac{\$1,000}{(1.05)^7}$$

The value of the bond would be \$942.14

7	N		
5	I/Y		
40	PMT		
1,000	FV		
CPT	PV	→	ANSWER -942.14

7-3.

$$\text{a. } \$875 = \sum_{t=1}^{20} \frac{\$70}{(1 + r_b)^t} + \frac{\$1,000}{(1 + r_b)^{20}}$$

20	N		
875	+/-	PV	
70	PMT		
1,000	FV		
CPT	I/Y	→	ANSWER 8.30

$$\begin{aligned} \text{b. } \text{Value } (V_b) &= \sum_{t=1}^{20} \frac{\$70}{(1 + .10)^t} + \frac{\$1,000}{(1 + .10)^{20}} \\ &= \$744.59 \end{aligned}$$

20	N		
10	I/Y		
70	PMT		
1,000	FV		
CPT	PV	→	ANSWER -744.59

c. You should sell the bond.

7.4.

$$\text{Value } (V_b) = \sum_{t=1}^{14} \frac{\$50}{(1.07)^t} + \frac{\$1,000}{(1 + .07)^{14}}$$

The value of the bond is \$825.09.

14	N			
7	I/Y			
50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-825.09

7-5. a.
$$\text{Value } (V_b) = \sum_{t=1}^{10} \frac{\$60}{(1 + .08)^t} + \frac{\$1,000}{(1 + .08)^{10}}$$

The value of the bond was \$865.80:

10	N			
8	I/Y			
60	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-865.80

b. If the investor also receives \$60 interest, then:

$$\$865.80 = \frac{\$60}{(1 + r_b)^1} + \frac{\$1,060}{(1 + r_b)^1}$$

And the expected rate of return would be 22.43%

1	N			
865.80	+/-	PV		
60	PMT			
1,000	FV			
CPT	I/Y	→	ANSWER	22.43

7-6. If the interest is paid semiannually:

$$\text{Value (V}_b) = \sum_{t=1}^{16} \frac{\$30}{(1.02)^t} + \frac{\$1,000}{(1.02)^{16}}$$

The value of the bond is \$1,135.78

16	N		
2	I/Y		
30	PMT		
1,000	FV		
CPT	PV	→	ANSWER -1,135.78

If interest is paid annually:

$$\text{Value (V}_b) = \sum_{t=1}^8 \frac{\$60}{(1.04)^t} + \frac{\$1,000}{(1.04)^8}$$

The value of the bond is \$1,134.65:

8	N		
4	I/Y		
60	PMT		
1,000	FV		
CPT	PV	→	ANSWER -1,134.65

7-7.

a. Series A:

$$\text{Value (V}_b) = \sum_{t=1}^{12} \frac{\$55}{(1.04)^{12}} + \frac{\$1,000}{(1.04)^{12}}$$

$$\text{Value (V}_b) = \sum_{t=1}^{12} \frac{\$55}{(1.07)^{12}} + \frac{\$1,000}{(1.07)^{12}}$$

$$\text{Value (V}_b) = \sum_{t=1}^{12} \frac{\$55}{(1.10)^{12}} + \frac{\$1,000}{(1.10)^{12}}$$

12	N				
	I/Y	=	4	7	10
55	PMT		↓	↓	↓
1,000	FV				
CPT	PV	→ANSWER	-1,140.78	-880.86	-693.38

Series B

$$\text{Value (V}_b) = \frac{\$55}{(1.04)^1} + \frac{\$1,000}{(1.04)^1}$$

$$\text{Value (V}_b) = \frac{\$55}{(1.07)^1} + \frac{\$1,000}{(1.07)^1}$$

$$\text{Value (V}_b) = \frac{\$55}{(1.10)^1} + \frac{\$1,000}{(1.10)^1}$$

1	N				
	I/Y	=	4	7	10
55	PMT		↓	↓	↓
1,000	FV				
CPT	PV	→ANSWER	-1,014.42	-985.98	-959.09

- b. Longer-term bondholders are locked into a particular interest rate for a longer period of time and are therefore exposed to more interest rate risk

$$7-8. \quad \$945 = \sum_{t=1}^{20} \frac{\$60}{(1 + r_b)^t} + \frac{\$1,000}{(1 + r_b)^{20}}$$

20	N			
945	+/-	PV		
60	PMT			
1,000	FV			
CPT	I/Y	→	ANSWER	6.50 semiannual rate
			$(1.065^2 - 1)$	13.42 annual rate

7-9. a.
$$\$1,085 = \sum_{t=1}^{15} \frac{\$55}{(1 + r_b)^t} + \frac{\$1,000}{(1 + r_b)^{15}}$$

15	N	
1085	+/-	PV
55	PMT	
1,000	FV	
CPT	I/Y	→ ANSWER 4.70

b.
$$V_b = \sum_{t=1}^{15} \frac{\$55}{(1.07)^t} + \frac{\$1,000}{(1.07)^{15}}$$

15	N	
7	I/Y	
55	PMT	
1,000	FV	
CPT	PV	→ ANSWER -863.38

- c. Since the expected rate of return, 4.7 percent, is less than your required rate of return of 7 percent, the bond is not an acceptable investment. This fact is also evident because the market price, \$1,085, exceeds the value of the security to the investor of \$863.38.

7-10. a.

Value	
Par Value	\$1,000.00
Coupon	\$70
Required Rate of Return	7%
Years to Maturity	15
<u>Market Value</u>	<u>\$1,000</u>

b.

Value at Alternative Rates of Return	
Required Rate of Return	9%
<u>Market Value</u>	<u>\$838.79</u>
Required Rate of Return	5%
<u>Market Value</u>	<u>\$1,207.59</u>

- c. As required rates of return change, the price of the bond changes, which is the result of "interest-rate risk". Thus, the greater the investor's required rate of return, the greater will be his/her discount on the bond. Conversely, the less his/her required rate of return below that of the coupon rate, the greater the premium will be.

d. Value at Alternative Maturity Dates

Years to Maturity	5
Required Rate of Return	7%
<u>Market Value</u>	<u>\$1,000.00</u>
Required Rate of Return	9%
<u>Market Value</u>	<u>\$922.21</u>
Required Rate of Return	5%
<u>Market Value</u>	<u>\$1086.59</u>

- e. The longer the maturity of the bond, the greater the interest rate risk the investor is exposed to, resulting in greater premiums and discounts.

7-11. a. Value

Par Value	\$1,000.00
Coupon	\$30
Required Rate of Return	4%
Years to Maturity	20
<u>Market Value</u>	<u>\$864.10</u>

b. Value at Alternative Rates of Return

Required Rate of Return	7%
<u>Market Value</u>	<u>\$576.24</u>
Required Rate of Return	2%
<u>Market Value</u>	<u>\$1,163.51</u>

- c. As required rates of return change, the price of the bond changes, which is the result of "interest-rate risk". Thus, the greater the investor's required rate of return, the greater will be his/her discount on the bond. Conversely, the less his/her required rate of return below that of the coupon rate, the greater the premium will be.

d. Value at Alternative Maturity Dates

Years to Maturity	10
Required Rate of Return	4%
<u>Market Value</u>	<u>\$918.89</u>
Required Rate of Return	7%
<u>Market Value</u>	<u>\$719.06</u>
Required Rate of Return	2%
<u>Market Value</u>	<u>\$1,089.83</u>

- e. The longer the maturity of the bond, the greater the interest rate risk the investor is exposed to, resulting in greater premiums and discounts.

$$7-12. \quad V_b = FV_n \left(\frac{1}{(1+r)^n} \right)$$

$$V_b = \$1,000 \left(\frac{1}{(1+.06)^7} \right)$$

7	N			
6	I/Y			
0	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-665.06

7.13

a.

Bond A value at 6% compounded at semiannually for 3 years

$$= \$30 \left(\sum_{t=1}^{3 \times 2} \frac{1}{\left(1 + \frac{.06}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.06}{2}\right)^{3 \times 2}} \right) +$$

$$= \$30 \left(\sum_{t=1}^6 \frac{1}{(1+.03)^t} \right) + \$1,000 \left(\frac{1}{(1+.03)^6} \right)$$

6	N			
3	I/Y			
30	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-1,000.00

Bond B value at 6% compounded at semiannually for 7 years

$$= \$30 \left(\sum_{t=1}^{7 \times 2} \frac{1}{\left(1 + \frac{.06}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.06}{2}\right)^{7 \times 2}} \right) +$$

$$= \$30 \left(\sum_{t=1}^{14} \frac{1}{(1 + .03)^t} \right) + \$1,000 \left(\frac{1}{(1 + .03)^{14}} \right)$$

14	N		
3	I/Y		
30	PMT		
1,000	FV		
CPT	PV	→	ANSWER -1,000.00

Bond C value at 6% compounded at semiannually for 20 years

$$= \$30 \left(\sum_{t=1}^{20 \times 2} \frac{1}{\left(1 + \frac{.06}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.06}{2}\right)^{20 \times 2}} \right)$$

$$= \$30 \left(\sum_{t=1}^{20 \times 2} \frac{1}{(1 + .03)^t} \right) + \$1,000 \left(\frac{1}{(1 + .03)^{40}} \right)$$

40	N		
3	I/Y		
30	PMT		
1,000	FV		
CPT	PV	→	ANSWER -1,000.00

b.

Bond A value at 3% compounded at semiannually for 3 years

$$= \$30 \left(\sum_{t=1}^{3 \times 2} \frac{1}{\left(1 + \frac{.03}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.03}{2}\right)^{3 \times 2}} \right) +$$

$$= \$30 \left(\sum_{t=1}^6 \frac{1}{(1 + .015)^t} \right) + \$1,000 \left(\frac{1}{(1 + .015)^6} \right)$$

6	N		
1.5	I/Y		
30	PMT		
1,000	FV		
CPT	PV	→	ANSWER -1,085.46

Bond B value at 3% compounded at semiannually for 7 years

$$= \$30 \left(\sum_{t=1}^{7 \times 2} \frac{1}{\left(1 + \frac{.03}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.03}{2}\right)^{7 \times 2}} \right) +$$

$$= \$30 \left(\sum_{t=1}^{14} \frac{1}{(1 + .015)^t} \right) + \$1,000 \left(\frac{1}{(1 + .015)^{14}} \right)$$

14	N		
1.5	I/Y		
30	PMT		
1,000	FV		
CPT	PV	→	ANSWER -1,188.15

Bond C value at 3% compounded at semiannually for 20 years

$$= \$30 \left(\sum_{t=1}^{20 \times 2} \frac{1}{\left(1 + \frac{.03}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.03}{2}\right)^{20 \times 2}} \right) +$$

$$= \$30 \left(\sum_{t=1}^{40} \frac{1}{(1 + .015)^t} \right) + \$1,000 \left(\frac{1}{(1 + .015)^{40}} \right)$$

40	N			
1.5	I/Y			
30	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-1,448.74

c.

Bond A value at 9% compounded at semiannually for 3 years

$$= \$30 \left(\sum_{t=1}^{3 \times 2} \frac{1}{\left(1 + \frac{.09}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.09}{2}\right)^{3 \times 2}} \right) +$$

$$= \$30 \left(\sum_{t=1}^6 \frac{1}{(1 + .045)^t} \right) + \$1,000 \left(\frac{1}{(1 + .045)^6} \right)$$

6	N			
4.5	I/Y			
30	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-922.63

Bond B value at 3% compounded at semiannually for 7 years

$$= \$30 \left(\sum_{t=1}^{7 \times 2} \frac{1}{\left(1 + \frac{.09}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.09}{2}\right)^{7 \times 2}} \right) +$$

$$= \$30 \left(\sum_{t=1}^{14} \frac{1}{(1 + .045)^t} \right) + \$1,000 \left(\frac{1}{(1 + .045)^{14}} \right)$$

14	N			
4.5	I/Y			
30	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-846.66

Bond C value at 9% compounded at semiannually for 20 years

$$= \$30 \left(\sum_{t=1}^{20 \times 2} \frac{1}{\left(1 + \frac{.09}{2}\right)^t} \right) + \$1,000 \left(\frac{1}{\left(1 + \frac{.09}{2}\right)^{20 \times 2}} \right) +$$

$$= \$30 \left(\sum_{t=1}^{40} \frac{1}{(1 + .045)^t} \right) + \$1,000 \left(\frac{1}{(1 + .045)^{40}} \right)$$

40	N			
4.5	I/Y			
30	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-723.98

- d. First, if the market discount rate and the bonds coupon rate are identical, then the bond's value will be equal to its principal value, in this case \$1,000. Second, when interest rates change, bonds with longer to maturity change more in value than do bonds with shorter maturities.

7-14.	Coupon rate	6.5%
	Number of years	5
	Required rate of return	4.3%
	Par value	\$1,000
	Value	\$1,097.12

If an investor pays more than \$1,097, she will receive less than her required rate of return. If she pays less, she will receive more than her required rate of return.

7-15.	<u>Annual</u>	<u>Semi Annual</u>
Interest payment	\$67.50	\$33.75
Number of years	5	10
Par value	\$1,000	\$1,000
Required rate of return	5.0%	2.5%
Value	\$1,075.77	1,076.58

- 7-16 Finding the bond's yield to maturity, the expected rate of return, is based on the following equation:

$$\$1,045 = \sum_{t=1}^{150} \frac{\$70}{(1 + r_b)^t} + \frac{\$1,000}{(1 + r_b)^{150}}$$

Using a financial calculator, we find the yield to maturity to be 6.52 percent:

15	N		
1045	+/-	PV	
70	PMT		
1,000	FV		
CPT	I/Y	→	ANSWER 6.52

- 7-17.

$$\$900 = \sum_{t=1}^{20} \frac{\$30}{(1 + r_b/2)^t} + \frac{\$1,000}{(1 + r_b/2)^{20}}$$

20	N		
900	+/-	PV	
30	PMT		
1,000	FV		
CPT	I/Y	→	ANSWER 3.72 semi-annual rate 7.57 annual rate

The semi-annual rate of 3.72 percent is equivalent to 7.57 percent $(1.0372^2 - 1)$ compounded annually.

7-18.

$$\$1,100 = \sum_{t=1}^5 \frac{\$50}{(1 + r_b)^t} + \frac{\$1,000}{(1 + r_b)^5}$$

5	N	
1,100	+/-	PV
50	PMT	
1,000	FV	
CPT	I/Y	→ ANSWER 2.83 annual rate

7-19. Market value \$1,371
 Coupon interest rate 9.15%
 Number of years 21
 Par value \$1,000

Yield to maturity 6.00%
 Current yield 6.67%

7-20. Market value \$1,076
 Coupon interest rate 5.5%
 Number of years 5
 Par value \$1,000

Expected rate of return 3.8%
 Current yield 5.1%

$$7-21. \quad \$1,150 = \sum_{t=1}^{12} \frac{\$70}{(1 + r_b)^t} + \frac{\$1,000}{(1 + r_b)^{12}}$$

12	N	
1150	+/-	PV
70	PMT	
1,000	FV	
CPT	I/Y	→ ANSWER 5.28 annual rate

7-22.

$$\$900 = \sum_{t=1}^{10} \frac{\$30}{(1 + \bar{r}_b/2)^t} + \frac{\$1,000}{(1 + \bar{r}_b/2)^{10}}$$

10	N		
900	+/-	PV	
30	PMT		
1,000	FV		
CPT	I/Y	→	ANSWER 4.25 semiannual rate 8.68 annual rate $(1.0425^2 - 1)$

7-23.

$$\begin{aligned} \text{Current yield} &= \text{annual interest} \div \text{current price} = (\$35 \times 2) \div \$780 \\ &= 0.0897 = 8.97\% \end{aligned}$$

7-24.

$$\$700 = \sum_{t=1}^8 \frac{\$30}{(1 + \bar{r}_b)^t} + \frac{\$700}{(1 + \bar{r}_b)^7}$$

16	N		
700	+/-	PV	
30	PMT		
1,000	FV		
CPT	I/Y	→	ANSWER 5.96 semiannual rate 12.28 annual rate $(1.0596^2 - 1)$

7-25.

$$\$820 = \sum_{t=1}^{14} \frac{\$30}{(1 + \bar{r}_b)^t} + \frac{\$1,000}{(1 + \bar{r}_b)^{14}}$$

14	N		
820	+/-	PV	
30	PMT		
1,000	FV		
CPT	I/Y	→	ANSWER 4.79 semiannual rate 9.82 annual rate $(1.0479^2 - 1)$

7-26.

$$\$900 = \sum_{t=1}^{10} \frac{\$60}{(1 + \bar{r}_b)^t} + \frac{\$1,000}{(1 + \bar{r}_b)^{10}}$$

10	N	
900	+/-	PV
60	PMT	
1,000	FV	
CPT	I/Y	→ ANSWER 7.45 annual rate

7-27.

$$\$1,100 = \sum_{t=1}^{14} \frac{\$40}{(1 + \bar{r}_b)^t} + \frac{\$1,000}{(1 + \bar{r}_b)^{14}}$$

14	N	
1,100	+/-	PV
40	PMT	
1,000	FV	
CPT	I/Y	→ ANSWER 3.11 semiannual rate 6.31 annual rate $(1.0311^2 - 1)$

SOLUTION TO MINI CASE

a. Microsoft Bond Value (V_b) = $\sum_{t=1}^{30} \frac{\$52.50}{(1 + .06)^i} + \frac{\$1,000}{(1 + .06)^{30}}$

30	N			
6	I/Y			
52.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-896.76

GE Capital Bond Value (V_b) = $\sum_{t=1}^{10} \frac{\$42.50}{(1 + .08)^i} + \frac{\$1,000}{(1 + .08)^{10}}$

10	N			
8	I/Y			
42.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-748.37

Morgan Stanley Bond Value (V_b) = $\sum_{t=1}^5 \frac{\$47.50}{(1 + .10)^i} + \frac{\$1,000}{(1 + .10)^5}$

5	N			
10	I/Y			
47.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-800.98

- b. To compute the expected rate of return for each bond, use a financial calculator to solve the following equation:

Microsoft:

$$\$1,100.00 = \sum_{t=1}^{30} \frac{\$52.50}{(1 + \bar{r}_b)^t} + \frac{\$1,000}{(1 + \bar{r}_b)^{30}}$$

30	N		
1,100	+/-	PV	
52.50	PMT		
1,000	FV		
CPT	I/Y	→	ANSWER 4.63

GE Capital:

$$\$1,030 = \sum_{t=1}^{10} \frac{\$42.50}{(1 + \bar{r}_b)^t} + \frac{\$1,000}{(1 + \bar{r}_b)^{10}}$$

10	N		
1030	+/-	PV	
42.50	PMT		
1,000	FV		
CPT	I/Y	→	ANSWER 3.88

Morgan Stanley:

$$\$1,015.00 = \sum_{t=1}^5 \frac{\$47.50}{(1 + \bar{r}_b)^t} + \frac{\$1,000}{(1 + \bar{r}_b)^5}$$

5	N		
1015	+/-	PV	
47.50	PMT		
1,000	FV		
CPT	I/Y		ANSWER 4.41

$$\text{c.(1) Microsoft Value (V}_b) = \sum_{t=1}^{30} \frac{\$52.50}{(1 + .08)^t} + \frac{\$1,000}{(1 + .08)^{30}}$$

30	N			
8	I/Y			
52.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-690.41

$$\text{GE Capital Value (V}_b) = \sum_{t=1}^{10} \frac{\$42.50}{(1 + .10)^t} + \frac{\$1,000}{(1 + .10)^{10}}$$

10	N			
10	I/Y			
42.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-646.69

$$\begin{array}{l} \text{Morgan Stanley} \\ \text{Value} \end{array} (\text{V}_b) = \sum_{t=1}^5 \frac{\$47.50}{(1 + .12)^t} + \frac{\$1,000}{(1 + .12)^5}$$

5	N			
12	I/Y			
47.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-738.65

$$c.(2) \quad \text{Microsoft Value } (V_b) = \sum_{t=1}^{30} \frac{\$52.50}{(1+.04)^t} + \frac{\$1,000}{(1+.04)^{30}}$$

30	N			
4	I/Y			
52.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	- 1,216.15

$$\text{GE Capital Value } (V_b) = \sum_{t=1}^{10} \frac{\$42.50}{(1+.06)^t} + \frac{\$1,000}{(1+.06)^{10}}$$

10	N			
6	I/Y			
42.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	- 871.20

$$\text{Morgan Stanley Value } (V_b) = \sum_{t=1}^5 \frac{\$47.50}{(1+.08)^t} + \frac{\$1,000}{(1+.08)^5}$$

5	N			
8	I/Y			
47.50	PMT			
1,000	FV			
CPT	PV	→	ANSWER	-870.24

- d. As the interest rates rise and fall, we see the different effects on bond prices depending on the length of time to maturity and whether the investor's required rate of return is above or below the coupon interest rate. If the investor's required rate of return is above the coupon interest rate, the bond will sell at a discount (below par value), but if the investor's required rate of return is below the coupon interest rate, the bond will sell at a price above its par value (premium).
- e. All three bonds have a lower expected rate of return than your required rate of return. So we would not buy any of them.

CHAPTER 8

The Valuation and Characteristics of Stock

CHAPTER ORIENTATION

This chapter continues the introduction of concepts underlying asset valuation begun in Chapter 7. We are specifically concerned with valuing preferred stock and common stock. We also look at the concept of a stockholder's expected rate of return on an investment.

CHAPTER OUTLINE

I. Preferred Stock

A. The Characteristics of Preferred Stock

1. Owners of preferred stock receive dividends instead of interest.
2. Most preferred stocks are perpetuities (nonmaturing).
3. Multiple classes, each having different characteristics, can be issued.
4. Preferred stock has priority over common stock with regard to claims on assets in the case of bankruptcy.
5. Most preferred stock carries a cumulative feature that requires all past unpaid preferred stock dividends to be paid before any common stock dividends are declared.
6. Preferred stock may contain other protective provisions.
7. Preferred stock contains provisions to convert to a predetermined number of shares of common stock.
8. Retirement features for preferred stock are frequently included.
 - a. Callable preferred refers to a feature which allows preferred stock to be called or retired, like a bond.
 - b. A sinking fund provision requires the firm periodically to set aside an amount of money for the retirement of its preferred stock.

II. Valuing Preferred Stock (V_{ps}):

The value of a preferred stock equals the present value of all future dividends. If the stock is nonmaturing, where dividends are expected in equal amount each year in perpetuity, the value may be calculated as follows:

$$\text{Value}_{ps} = \frac{\text{annual dividend}}{\text{required rate of return}} = \frac{D}{r_{ps}}$$

III. Common Stock

A. The Characteristics of Common Stock

1. As owners of the corporation, common shareholders have the right to the residual income and assets after bondholders and preferred stockholders have been paid.
2. Common stock shareholders are generally the only security holders with the right to elect the board of directors.
3. Preemptive rights entitle the common shareholder to maintain a proportionate share of ownership in the firm.
4. Common stock shareholders' liability as owners of the corporation is limited to the amount of their investment.
5. Common stock's value is equal to the present value of all future cash flows expected to be received by the stockholder.

IV. Valuing Common Stock

A. Using the Dividend Valuation Model

1. Company growth occurs either by:
 - a. The infusion of new capital.
 - b. The retention of earnings, which we call internal growth. The internal growth rate of a firm equals:

$$\text{Return on equity} \times \left(\frac{\text{Percentage of earnings}}{\text{retained within the firm}} \right)$$

2. Although the bondholder and preferred stockholder are promised a specific amount each year, the dividend for common stock is based on the profitability of the firm and the management's decision either to pay dividends or retain profits for reinvestment.
3. The common dividend typically increases along with the growth in corporate earnings.
4. The earnings growth of a firm should be reflected in a higher price for the firm's stock.

5. In finding the value of a common stock (V_{CS}), we should discount all future expected dividends (D_1, D_2, D_3, D_∞) to the present at the required rate of return for the stockholder (r_{CS}). That is:

$$V_{CS} = \frac{D_1}{(1+r_{CS})^1} + \frac{D_2}{(1+r_{CS})^2} + \dots + \frac{D_\infty}{(1+r_{CS})^\infty}$$

6. If we assume that the amount of dividend is increasing by a constant growth rate each year; that is, the dividend in year t , D_t , equals:

$$D_t = D_0 (1 + g)^t$$

where g = the growth rate

D_0 = the most recent dividend payment

If the growth rate, g , is the same each year and is less than the required rate of return, r_{CS} , the valuation equation for common stock can be reduced to

$$V_{CS} = \frac{D_1}{r_{CS} - g} = \frac{D_0 (1 + g)}{r_{CS} - g}$$

V. The Expected Rate of Return of Stockholders

- A. The shareholder's expected rate of return is of great interest to financial managers because it tells about the investor's expectations.
- B. Preferred stockholder's expected rate of return

If we know the market price of a preferred stock and the amount of the dividends to be received, the expected rate of return from the investment can be determined as follows:

$$\text{Preferred stock expected rate of return} = \frac{\text{annual dividend}}{\text{market price of the stock}}$$

or

$$\bar{r}_{ps} = \frac{D}{P_{ps}}$$

C. Common stockholder's expected rate of return

1. The expected rate of return for common stock can be calculated from the valuation equations discussed earlier.
2. Assuming that dividends are increasing at a constant annual growth rate (g), we can show that the expected rate of return for common stock, $\bar{r}_{CS}$ is

$$\begin{aligned} &\text{Common stock expected rate of return} \\ &= \left(\frac{\text{dividend in year 1}}{\text{market price}} \right) + \left(\frac{\text{growth}}{\text{rate}} \right) \end{aligned}$$

or

$$\bar{r}_{cs} = \frac{D_1}{P_{cs}} + g$$

Since dividend ÷ price is the “dividend yield,” the

$$\text{Expected rate of return} = \left(\text{dividend yield} \right) + \left(\text{growth rate} \right)$$

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 8-1. Preferred stock is many times referred to as a hybrid security. This is because preferred stock has many characteristics of both common stock and bonds. It has characteristics of common stock: no fixed maturity date, the nonpayment of dividends does not force bankruptcy, and the nondeductibility of dividends for tax purposes. But it is like bonds because the dividends are fixed in amount like interest payments. From the point of view of the preferred stock shareholder, this is not the most delightful combination. On one hand, the dividends are limited as with bonds, but the security of forced payment by the threat of bankruptcy is not there. Thus, from the point of view of the investor, the worst features of common stock and bonds are combined.
- 8-2. To a certain extent, preferred stock dividends can be thought of as a liability. The major difference between preferred dividends in arrears and normal liabilities is that nonpayment of them cannot force the firm into bankruptcy. However, since the goal of the firm is shareholder wealth maximization, which involves getting money to the shareholders (dividends), preferred arrearages do provide an effective block for the goal of the firm.
- 8-3. A cumulative feature requires all past unpaid preferred stock dividends be paid before any common stock dividends are declared. A stockholder would like preferred stock to have a cumulative dividend feature because without it there would be no reason why preferred stock dividends would not be omitted or passed when common stock dividends were passed. Since preferred stock does not have the dividend enforcement power of interest from bonds, the cumulative feature is necessary to protect the rights of preferred stockholders.
- Other protective features serve generally to allow for voting rights in the event of nonpayment of dividends, or they restrict the payment of common stock dividend if sinking-fund payments are not met or if the firm is in financial difficulty. In effect, the protective features included with preferred stock are similar to the restrictive provisions included with long-term debt.
- 8-4. Convertibility allows a preferred stockholder to convert or exchange preferred stock for shares of common stock at a predetermined exchange rate. This option gives preferred stockholders more freedom in investment decisions by allowing them to convert into common stock at their discretion.

Preferred stock may be callable by the issuer so that in the event interest rates decline and cheaper funding becomes available, then the stock may be called and new securities may be issued at a lower cost. To agree to the call feature, the investor will require a slightly higher rate of return.

- 8-5. Both values are based on future cash flows to be received by stockholders. Preferred stock typically has a predetermined constant dividend. For common stock, the dividend is based on the profitability of the firm and on management's decision to pay dividends or to retain the profits for reinvestment purposes. Thus, the growth of future dividends is a prime distinguishing feature of common stock.
- 8-6. The expected rate of return is the rate of return that may be expected from purchasing a security at the prevailing market price. Thus, the expected rate of return is the rate that equates future cash flows with the actual selling price of the security in the market.
- 8-7. The expected rate of return is the discount rate that equates the present value of future expected cash flows with the value of the security.
- 8-8. The two types of return include dividend income and capital gains. The dividend income for common stockholders differs from preferred stockholders in that no specified dividend amount is to be received. However, the common stockholders are permitted to participate in the growth of the company. As a result of this growth, their second source of return, that of price appreciation, results.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

$$8-1. \quad \text{Value}(V_{ps}) = \frac{0.16 \times \$100}{0.12}$$

$$= \frac{\$16}{0.12}$$

$$= \$133.33$$

$$8-2. \quad \text{Value}(V_{ps}) = \frac{\text{dividend}}{\text{required rate of return}} + \frac{\$2.75}{0.09} = \$30.56$$

$$8-3. \quad \text{Value}(V_{ps}) = \frac{\text{dividend rate} \times \text{par value}}{\text{required rate of return}}$$

$$= \frac{0.14 \times \$100}{0.12}$$

$$= \frac{\$14}{0.12}$$

$$= \$116.67$$

$$8-4. \quad \text{a.} \quad \begin{array}{l} \text{Expected rate} \\ \text{of return} \end{array} = \frac{\text{dividend}}{\text{market price}} = \frac{\$3.60}{\$33.00} = 10.91\%$$

$$\text{b.} \quad \text{Value}(V_{ps}) = \frac{\text{dividend}}{\text{required rate of return}} = \frac{\$3.60}{0.10} = \$36$$

c. The investor's required rate of return (10 percent) is less than the expected rate of return for the investment (10.91 percent). Also, the value of the stock to the investor (\$36) exceeds the existing market price (\$33). So buy the stock.

$$8-5. \quad \text{Value}(V_{ps}) = \frac{\text{dividend}}{\text{required rate of return}} = \frac{\$6}{0.12} = \$50 \text{ per share}$$

8-6. TFC Capital:

$$\text{Value}(V_{ps}) = \frac{\text{dividend}}{\text{required rate of return}} = \frac{\$2.69}{0.12} = \$22.42 \text{ per share}$$

TAYC Capital:

$$\text{Value } (V_{ps}) = \frac{\text{dividend}}{\text{required rate of return}} = \frac{\$2.44}{0.12} = \$20.33 \text{ per share}$$

$$8-7. \quad \text{Value } (V_{ps}) = \frac{\text{dividend}}{\text{required rate of return}} = \frac{\$2.31}{0.12} = \$19.25 \text{ per share}$$

$$\begin{aligned} 8-8 \quad \text{Value } (V_{cs}) &= \frac{\text{last year dividend}(1 + \text{growth rate})}{\text{required rate of return} - \text{growth rate}} \\ &= \frac{\$1.32(1.07)}{0.11 - 0.07} \\ &= \$35.31 \end{aligned}$$

$$8-9. \quad \text{Growth rate} = \text{return on equity} \times \text{retention rate}$$

Thus:

$$\begin{aligned} \text{Retention rate} &= \frac{\text{growth rate}}{\text{return on equity}} \\ &= \frac{0.07}{0.12} = 0.58 \text{ or } 58\% \end{aligned}$$

$$\begin{aligned} 8-10. \quad a. \quad \text{Growth rate} &= \text{return on equity} \times \text{retention rate} \\ &= 0.115 \times 0.55 = 0.0633 \text{ or } 6.335 \end{aligned}$$

$$\begin{aligned} b. \quad \text{Expected rate of return} &= \frac{\text{Dividend}}{\text{Selling Price}} + \text{growth rate} \\ &= \frac{\$3.25(1 + 0.0633)}{\$40} + 0.0633 = 0.1496 \text{ or } 14.96\% \end{aligned}$$

c. Since the stock has an expected rate of return of 14.96 percent, which is greater than your 13 percent required rate of return, you should invest.

$$\begin{aligned} 8-11. \quad \text{Value } (V_{cs}) &= \frac{\text{Last Year Dividend}(1 + \text{Growth Rate})}{(\text{Required Rate} - \text{Growth Rate})} \\ \$32.50 &= \frac{\$1 + \text{growth rate}}{0.12 - \text{growth rate}} \end{aligned}$$

Solving for the growth rate, g :

$$\$32.50(0.12 - g) = \$1 + g,$$

$$\$3.90 - \$32.50g = \$1 + g$$

$$\$2.90 = \$33.50g$$

$$g = 0.0866 \text{ or } 8.66\%$$

$$8-12. \text{ Value } (V_{CS}) = \frac{\text{Dividend in Year 1}}{(1 + \text{Required Rate})} + \frac{\text{Price in Year 1}}{(1 + \text{Required Rate})}$$

$$\$50 = \frac{\$6}{(1 + 0.15)} + \frac{P_1}{(1 + 0.15)}$$

Rearranging and solving for P_1 :

$$P_1 = \$50 (1.15) - \$6$$

$$P_1 = \$51.50$$

The stock would have to increase \$1.50 (\$51.50 – \$50) or 3 percent (\$1.50/\$50) to earn a 15 percent rate of return.

$$\begin{aligned} 8-13. \text{ Value } (V_{CS}) &= \frac{\text{last year dividend } (1 + \text{growth rate})}{\text{required rate of return} - \text{growth rate}} \\ &= \frac{\$3.50(1 + 0.05)}{0.20 - 0.05} \\ &= \$24.50 \end{aligned}$$

$$\begin{aligned} 8-14. \text{ Growth rate} &= \text{return on equity} \times \text{retention rate} \\ &= (18\%) (40\%) = 7.2\% \end{aligned}$$

$$\begin{aligned} 8-15. \text{ Value } (V_{CS}) &= \frac{\text{Dividend in Year 1}}{(1 + \text{Required Rate})} + \frac{\text{Price in year 1}}{(1 + \text{Required Rate})} \\ &= \frac{\$1.85}{(1.11)} + \frac{\$42.50}{(1.11)} \\ &= \$39.96 \end{aligned}$$

$$\begin{aligned} 8-16. \text{ a. Expected rate of return} &= \frac{\text{dividend in year 1}}{\text{market price}} + \text{growth rate} \\ &= \frac{\$1.32(1.08)}{\$23.50} + 0.08 = 0.1407 \\ &= 14.07\% \end{aligned}$$

$$\begin{aligned}
 \text{b. Investor's Value} &= \frac{\text{last year dividend} (1 + \text{growth rate})}{\text{required rate of return} - \text{growth rate}} \\
 &= \frac{\$1.32(1.08)}{0.105 - 0.08} \\
 &= \$57.02
 \end{aligned}$$

c. Yes, the expected rate of return is greater than your required rate of return (14 percent versus 10.5 percent). Also, your value of the stock (\$57.02) is larger than the current market price (\$23.50).

$$\begin{aligned}
 8-17. \text{ growth rate} &= \text{return on equity} \times \text{earnings retention rate} \\
 &= 0.16\% \times 0.6 = 9.6\% \text{ growth rate}
 \end{aligned}$$

$$8-18. \text{ Expected rate of return} = \frac{\text{dividend in year 1}}{\text{market price}} + \text{growth rate}$$

$$10\% = \frac{\$0.70}{\$34.14} + \text{growth rate}$$

Rearranging and solving for the growth rate, g :

$$g = 10\% - \frac{\$0.70}{\$34.14} = 8\%$$

$$8-19. \text{ Expected rate of return} = \frac{\text{dividend in year 1}}{\text{market price}} + \text{growth rate}$$

where dividend in year 1 = dividend last year $\times$ (1 + growth rate)

$$= \$1.10 \times (1.04) = \$1.14$$

So the expected rate of return would be:

$$\frac{\$1.14}{\$64.91} + 4.0\% = 5.8\%$$

$$8-20 \text{ a. Expected return} = \frac{\text{dividend}}{\text{market price}} = \frac{\$3.25}{\$38.50} = 0.0844 = 8.44\%$$

b. Given your 8 percent required rate of return, the stock is worth \$40.62 to you

$$\text{Value} = \frac{\text{dividend}}{\text{required rate of return}} = \frac{\$3.25}{0.08} = \$40.63$$

Since the expected rate of return (8.44 percent) is greater than your required rate of return (8 percent) or since the current market price, (\$38.50) is less than \$40.63, the stock is undervalued and you should buy.

8-21.

	A	B
Annual dividend	\$4.50	\$4.25
Market Price	\$35.00	\$36.00
Expected return	$\$4.50/\$35 = 12.86\%$	$\$4.25/\$36 = 11.81\%$

You would choose stock A, which has an expected rare of return greater than your required rate of return—12.86 percent versus 12 percent. On the other hand, stock B's expected rate of return does not meet your required rate of return.

8-22. Expected Rate of Return

$$\text{Expected return} = \frac{\text{dividend}}{\text{market; price}} = \frac{\$1.95}{\$42.16} = \text{or } 0.0463, \text{ or } 4.63\%$$

8-23. a. $\text{Expected return} = \frac{\text{dividend}}{\text{market; price}} = \frac{\$3.40}{\$40} = 0.085 = 8.5\%$

b. Given your 8 percent required rate of return, the stock is worth \$42.50 to you

$$\text{Value} = \frac{\text{dividend}}{\text{required rate of return}} = \frac{\$3.40}{0.08} = \$42.50$$

Since the expected rate of return (8.5 percent) is greater than your required rate of return (8 percent) or since the current market price, (\$40) is less than \$42.50, the stock is undervalued and you should buy.

8-24.

	Kristen	Titus
Annual Dividend	\$2.00	\$3.25
Market Price	\$23.00	\$31.00
Expected Return	$\$2/\$23 = 8.7\%$	$\$3.25/\$31 = 10.5\%$

You should choose Titus stock. It has a greater expected return than your required rate of return—10.48 percent versus 9 percent. On the other hand, Kristen stock's expected rate of return does not meet your required rate of return.

8-25

$$\text{Expected return} = \frac{\text{dividend}}{\text{market price}} = \frac{\$1.55}{\$22.00} = 0.0704 \text{ or } 7\%$$

$$\text{Value} = \frac{\text{dividend}}{\text{required rate of return}} = \frac{\$1.55}{9\%} = \$17.22$$

This stock is worth \$17.22 to you (less than the market price of \$221), so you should not buy the stock.

8-26.

$$\text{Expected return} = \frac{\text{dividend}}{\text{market price}} = \frac{\$5.25}{\$40.00} = 0.1312 \text{ or } 13.12\%$$

8-27.

$$\text{Expected return} = \frac{\text{dividend}}{\text{market price}} = \frac{\$2.33}{\$36.72} = 0.0635 \text{ or } 6.4\%$$

You should not purchase this stock because the expected rate of return of 6.35 percent is less than your required rate of return of 8 percent.

8-28

$$\begin{aligned} \text{a. Expected rate of return } (\bar{r}_{cs}) &= \frac{\text{dividend in year1}}{\text{market price}} + \text{growth rate} \\ &= \frac{\$2.50}{\$23.00} + 0.105 = 0.2137 \\ &= 21.37\% \end{aligned}$$

$$\text{b. Value, } V_{cs} = \frac{\$2.50}{0.17 - 0.105} = \$38.46$$

The expected rate of return exceeds your required rate of return, which means that the value of the security to you is greater than the current market price. Thus, you should buy the stock.

$$\begin{aligned} \text{8-29. a. Expected rate of return} &= \frac{\text{dividend in year1}}{\text{market price}} + \text{growth rate} \\ &= \frac{\$2.00}{\$22.50} + 0.10 = 0.1889 \\ &= 18.9\% \end{aligned}$$

$$\text{b. Value, } V_{cs} = \frac{\$2.00}{0.17 - 0.10} = \$28.57$$

Yes, purchase the stock. The expected return is greater than your required rate of return. Also, the stock is selling for only \$22.50, while it is worth \$28.57 to you.

8-30.

$$\begin{aligned}
 \text{Expected rate of return} &= \frac{\text{last year dividend (1 + growth rate)}}{\text{market price}} + \text{Growth Rate} \\
 &= \frac{2.94(1.095)}{\$32.84} + 0.095 = 0.193 \\
 &= 19.3\%
 \end{aligned}$$

8-31. If the expected rate of return is represented by $\bar{r}_{cs}$:

$$\begin{aligned}
 \text{Current Price} &= \frac{\text{Dividend in year 1}}{(1 + \bar{r}_{cs})} + \frac{\text{Price in year 1}}{(1 + \bar{r}_{cs})} \\
 &= \frac{\text{Dividend in Year 1} + \text{Price in Year 1}}{\text{Current Price}} - 1 \\
 &= \frac{\$2.84 + \$48.00}{\$43.00} - 1 = 0.1823 \\
 &= 18.23\%
 \end{aligned}$$

8-32.

$$\begin{aligned}
 \text{Expected return} &= \frac{\text{last year dividend (1 + growth rate)}}{\text{market price}} + \text{growth rate} \\
 \text{Expected return} &= \frac{\$3(1.07)}{\$30} + 0.07 = 0.177 \text{ or } 17.7\%
 \end{aligned}$$

8-33. Expected rate of return

$$\begin{aligned}
 &= \frac{\text{last year dividend (1 + growth rate)}}{\text{market price}} + \text{Growth Rate} \\
 \text{Expected return} &= \frac{1.45(1.12)}{\$42.65} + 0.12 = 0.1581 \text{ or } 15.81\%
 \end{aligned}$$

SOLUTION TO MINI CASE

- a. Value of each investment based on your required rate of return:

Bank of America bonds:

5	N			
5	I/Y			
63.50	PMT			
1000	FV			
CPT	PV	→	ANSWER	-1,058.45

Southwest Bancorp Preferred Stock:

$$\text{Value, } V_{ps} = \sum_{t=1}^{\infty} \frac{\$2.63}{(1+0.08)^t}$$

However, since the dividend is a constant amount each year with no maturity date (infinity), the equation can be reduced to

$$\begin{aligned} \text{Value, } V_{ps} &= \frac{\text{dividend}}{\text{required rate of return}} \\ &= \frac{\$2.63}{0.08} \\ &= \$32.88 \end{aligned}$$

Emerson Electric Common Stock:

Step 1: Estimate growth rate

Company's earnings have increased from \$2.23 to \$3.30 in five years. What annual compound growth rate would cause an investment to increase in five years?

Using a TIBAI Plus we can solve for the growth rate by determining I/Y:

5	N		
2.23	+/-	PV	
0	PMT		
3.30	FV		
CPT	I/Y	→	ANSWER 8.15

Thus, earnings have been growing at an 8.15 percent rate.

Step 2: Solve for Value

$$\text{Value, } V_{CS} = \sum_{t=1}^{\infty} \frac{\$1.60(1+0.0815)^t}{(1+0.12)^t}$$

If the percent growth rate (g) is assumed constant, the equation may be reduced to

$$\begin{aligned} \text{Value, } V_{CS} &= \frac{\text{dividend at year end}}{\text{required rate of return} - \text{growth rate}} \\ &= \frac{D_1}{k_{cs} - g} \\ &= \frac{\$1.60(1+0.0815)}{0.12 - 0.0815} \\ &= \frac{\$1.73}{0.0385} \\ &= \$44.99 \end{aligned}$$

	<u>Your Value</u>	<u>Selling Price</u>
Bond	\$1,058.45	\$1,020.00
Preferred Stock	32.88	26.25
Common Stock	44.99	52.00

You would consider buying the bonds and preferred stock. They are selling for a price lower than the value of investment based on your required rate of return. The common stock, on the other hand, is selling for more than your investment value

c. Emerson Electric common stock:

Revised growth rate (g) = $8.15\% + 1\% = 9.15\%$

$$\begin{aligned}
 \text{Value, } V_{CS} &= \frac{\text{dividend at year end}}{\text{required rate of return} - \text{growth rate}} \\
 &= \frac{\$1.60(1 + 0.0915)}{0.12 - 0.0915} \\
 &= \frac{\$1.75}{0.0285} \\
 &= \$61.36
 \end{aligned}$$

	<u>Your Value</u>	<u>Selling Price</u>
Common Stock	\$61.36	\$52.00

You would now choose to buy the Emerson Electric stock because it now is selling at a price that is lower than the investment value based on your required rate of return.

d. The rate of return you would be indifferent with is also the security's expected rate of return.

e. Bank of America bond expected rate of return:

$$\$1,020 = \sum_{t=1}^{12} \frac{\$63.50}{(1 + r_b)^t} + \frac{\$1,000}{(1 + r_b)^{12}}$$

5	N		
1020	+/-	PV	
63.50	PMT		
1000	FV		
CPT	I/Y	→	ANSWER 5.88

Expected rate of return = 6.11%

Southwest Bank Corp. preferred stock expected rate of return:

$$\text{Market price, } P_{ps} = \frac{\text{dividend}}{\text{expected rate of return}}$$

$$\$26.25 = \frac{\$2.63}{\text{expected rate of return}}$$

$$\text{Solving for expected rate of return} = \frac{\$2.63}{\$26.25} = 10\%$$

Emerson Electric common stock expected rate of return:

$$\text{Market price, } p_{cs} = \frac{\text{dividend at year end}}{\text{required rate of return} - \text{growth rate}}$$

$$\$52.00 = \frac{\$1.60(1 + 0.0815)}{\bar{r} - 0.0815}$$

$$\begin{aligned} \bar{r} &= \frac{1.73}{\$52.00} + 0.0815 \\ &= 11.5\% \end{aligned}$$

CHAPTER 9

The Cost of Capital

CHAPTER ORIENTATION

In Chapters 7 and 8, we considered the valuation of debt and equity instruments. The concepts advanced there serve as a foundation for determining the required rate of return for the firm and for specific investment projects. The objective in this chapter is to determine the required rate of return to be used in evaluating investment projects.

CHAPTER OUTLINE

I. The Cost of Capital: Key Definitions and Concepts

A. Defining the cost of capital:

1. The rate that must be earned in order to satisfy the required rate of return of the firm's investors.
2. The rate of return on investments at which the price of a firm's common stock will remain unchanged.

B. Type of investors and the cost of capital.

1. Each source of capital used by the firm (debt, preferred stock, and common stock) should be incorporated into the cost of capital, with the relative importance of a particular source being based on the percentage of the financing provided by each source.
2. Using the cost of a single source of capital as the hurdle rate is tempting to management. For example, this is particularly true when an investment is financed entirely by debt. However, doing so is a mistake in logic and can cause problems.

II. Determining the Costs of the Individual Sources of capital

- ##### **A. General economic conditions.** These include the demand for and supply of capital within the economy and the level of expected inflation. These are reflected in the riskless rate of return.

- B. Market conditions. The security may not be readily marketable when the investor wants to sell; or even if a continuous demand for the security does exist, the price may vary significantly.
- C. A firm's operating and financing decisions. Risk also results from the decisions made within the company. This risk is generally divided into two classes:
 - 1. Business risk is the variability in returns on assets and is affected by the company's investment decisions.
 - 2. Financial risk is the increased variability in returns to the common stockholders as a result of using debt and preferred stock.
- D. In summary, as the level of risk rises, a larger risk premium must be earned to satisfy a firm's investors.

III. The Weighted Average Cost of Capital.

A firm's weighted cost of capital is a function of (1) the individual costs of capital and (2) the capital structure mix.

A. Determining individual costs of capital.

1. The before-tax cost of debt is found by solving for k_d in

$$NP_d = \sum_{t=1}^n \frac{\$I_t}{(1+k_d)^t} + \frac{\$M}{(1+k_d)^n}$$

where NP_d = the market price of the debt, less flotation costs,

$\$I_t$ = the annual dollar interest paid to the investor each year,

$\$M$ = the maturity value of the debt,

k_d = before-tax cost of the debt (before-tax required rate of return on debt)

n = the number of years to maturity.

The after-tax cost of debt equals:

$$k_d(1 - T)$$

2. Cost of preferred stock (required rate of return on preferred stock), k_{ps} , equals the dividend yield based upon the net price (market price less flotation costs) or

$$k_{ps} = \frac{\text{dividend}}{\text{net price}} = \frac{D}{NP_{ps}}$$

3. Cost of Common Stock. We use two measurement techniques to obtain estimates of the required rate of return on common stock.
 - a. dividend-growth model
 - b. capital asset pricing model

4. Dividend-growth model

- a. Cost of internally generated common equity, k_{CS}

$$k_{CS} = \frac{\text{dividend in year 1}}{\text{market price}} + \left(\frac{\text{annual growth}}{\text{in dividends}} \right)$$

$$k_{CS} = \frac{D_1}{P_0} + g$$

- b. Cost of new common stock, k_{NCS}

$$k_{NCS} = \frac{D_1}{NP_{CS}} + g$$

where NP_{CS} = the market price of the common stock less flotation costs incurred in issuing new shares.

5. Capital asset pricing model

$$k_{CS} = k_{rf} + \beta(k_m - k_{rf})$$

where k_{CS} = the cost of common stock

k_{rf} = the risk-free rate

β = beta, measure of the stock's systematic risk

k_m = the expected rate of return on the market

6. It is important to notice that the major difference between the equations presented here and the equations from Chapter 5 is that the firm must recognize the flotation costs incurred in issuing the security.

- B. Selection of weights. The individual costs of capital will be different for each source of capital in the firm's capital structure. To use the cost of capital in investment analyses, we must compute a weighted or overall cost of capital.

1. It will be assumed that the company's current financial mix resulting from the financing of previous investments is relatively stable and that these weights will closely approximate future financing patterns.
2. In computing weights, we can either use the current market values of the firm's securities or the book values as shown in the balance sheet. Since we will be issuing new securities at their current market value, and not at book (historical) values, we should use the market value of the securities in calculating our weights.

IV. Calculating Divisional Costs of Capital

- A. PepsiCo calculates the divisional cost of capital for its snack, beverage, and restaurant organizations by first finding peer-group firms for each division and using their average betas, after adjusting for differences in financial leverage, to compute the division's cost of equity. They also use accounting betas in estimating the cost of equity. They then

compute the cost of debt for each division. Finally, they calculate a weighted cost of capital for each division.

B. PepsiCo's WACC basic computation

$$k_O = k_{CS} \left(\frac{E}{D+E} \right) + k_D [1 - T] \left(\frac{D}{D+E} \right)$$

where:

k_O = the weighted average cost of capital

k_{CS} = the cost of equity capital

k_D = the before-tax cost of debt capital

T = the marginal tax rate

$E/(D+E)$ = percentage of financing from equity

$D/(D+E)$ = percentage of financing from debt

C. Calculating the cost of equity

Based on capital assets pricing model:

$$k_{CS} = k_{rf} + \beta (k_m - k_{rf})$$

where:

k_{CS} = the cost of common stock

k_{rf} = the risk-free rate

β = beta, measure of the stock's systematic risk

k_m = the expected rate of return on the market

Betas for each division are estimated by calculating an average unlevered beta from a group of divisional peers.

The average beta for each division's peer group is unlevered and then re-levered using that division's target debt-to-equity ratio.

D. Calculating the cost of debt

The after-tax cost of debt is equal to:

$$k_D (1 - T)$$

where:

k_D = before-tax cost of debt

T = marginal tax rate

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 9- 1. The cost of capital is the rate of return that the firm must earn on its investments in order to satisfy the required rates of return of all the firm's sources of financing (including creditors who loan the firm money and owners who purchase shares of stock in the company). This rate is a function of the required rates of return for all the firm's sources of financing, the corporation's tax rate, and the flotation costs incurred in issuing new securities. Therefore, the cost of capital determines the rate of return that must be achieved on the company's investments so as to earn the target return of the firm's investors. Furthermore, the cost of capital is also the rate of return that will leave the price of the common stock unchanged.
- 9-2. There are two important issues raised by the Exxon Mobil story. The first relates to the determination of an appropriate cost of capital for acquiring XTO Energy, which is primarily a natural gas producer whereas Exxon Mobil is a fully integrated oil and gas firm. Specifically, should the cost of capital used to value Exxon Mobil be used to value the acquisition? Although the issues raised here are more advanced than the chapter material, we could at least raise the question as to when a company's cost of capital is appropriate for valuing another company. The guiding principle is always one of whether the acquisition target is "like" the acquiring firm. That is, are the risks of the proposed acquisition similar to that of the acquirer?
- The second issue raised in this question relates to the notion of a divisional versus companywide cost of capital. The example in the text lays out the argument for computing a divisional cost of capital for a firm such as Exxon Mobil since the firm's investments are in such diverse (albeit related) endeavors. The objective here is to raise the issue of differences in the risk of investing in each of Exxon Mobil's divisions and how this should get reflected in the discount rates used to evaluate those investments.
- 9- 3. Two objectives may be given for determining a company's cost of capital:
- a. The financial objective of management is to maximize the shareholders' wealth. We can increase the value of the common stock by lowering the firm's cost of capital. All else remaining the same, as the cost of capital is decreased, the value of the firm is increased.
 - b. The cost of capital is used as the minimum acceptable rate of return for capital investments. The value of the firm is maximized by accepting all projects where the net present value is positive when discounted at the firm's cost of capital.
- 9- 4. All types of capital, including debt, preferred stock, and common stock, should be incorporated into the cost of capital computation, with the relative importance of a particular source being based upon the percentage of financing to be provided.
- 9- 5. The effect of taxes on the firm's cost of capital is observed in computing the cost of debt. Since interest is a tax-deductible expense, the use of debt indirectly decreases the firm's taxes. Therefore, since we have computed the internal rate of return on an after-tax basis, we also compute the cost of debt on an after-tax basis. In completing a security offering,

investment bankers and other involved individuals receive a commission for their services. As a result, the amount of capital net of these flotation costs is less than the funds invested by the individual purchasing the security. Consequently, the firm must earn more than the investors' required rate of return to compensate for this leakage of capital.

- 9- 6. a. Equity capital can be raised either by retaining profits within the firm or by issuing new common stock. Either route represents funds invested by the common stockholder. The first avenue simply indicates that the common stockholder permits management to retain capital that could be remitted to these investors.
- b. Even though a new stock issue does not result from retaining internal common equity, these funds should not be reinvested unless management can reasonably expect to satisfy the investors' required rate of return. In essence, even though no explicit out-of-pocket cost results from retaining the capital, the cost in measuring a firm's cost of capital is actually the opportunity cost associated with these funds for the investor.
- c. The two popular methods for computing the cost of equity capital include (1) the dividend-growth model, and (2) the capital asset pricing model. The first approach finds the rate of return that equates the present value of future dividends, assuming a constant growth rate, with the current market price of the security. The CAPM finds the appropriate required rate of return, given the firm's systematic risk.
- 9- 7. We would need to calculate a cost of capital or required rate of return for each project with risk that is different from that of the firm as a whole. The suggested method described in the chapter relies on the CAPM for this purpose.

SOLUTIONS TO

END-OF-CHAPTER STUDY PROBLEMS

The following notations are used in this group of problems:

k_{ps}	=	the cost of preferred stock.
k_{CS}	=	the cost of internally generated common funds
k_{nCS}	=	the cost of new common stock.
g	=	the growth rate.
k_d	=	the before-tax cost of debt.
T	=	the marginal tax rate.
D_t	=	dollar dividend per share, where D_0 is the most recently paid dividend and D_1 is the forthcoming dividend.
P_0	=	the value (present value) of a security.
NP_0	=	the value of a security less any flotation costs incurred in issuing the security.

9-1.

Terms	Definitions
Financial policy	The target mix of sources of funds that the firm uses when raising new money to invest in the firm
Cost of capital	A weighted average of the required rates of return of the firm's sources of capital (after adjusting for flotation costs and tax considerations)
Opportunity cost	The costs of making a choice measured in terms of the next best alternative that must be forgone
Transaction costs	The expenses that a firm incurs when raising funds by issuing a particular type of security

[illegible]

$$\text{\$1,068.75} = \sum_{t=1}^{10} \frac{\text{\$110}}{(1+k_d)^t} + \frac{\text{\$1,000}}{(1+k_d)^{10}}$$

$$k_d = 9.89\%$$

$$\text{After-tax cost of debt} = k_d(1 - T)$$

$$\text{After-tax cost of debt} = 9.9\%(1 - 0.34) = 6.53\%$$

$$\begin{aligned}
 \text{b. } k_{ncs} &= \frac{D_1}{NP_0} + g \\
 &= \frac{\$1.80(1+0.07)}{\$27.50(1-0.05)} + 0.07 \\
 &= 0.1437 = 14.37\%
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } k_{cs} &= \frac{D_1}{P_0} + g \\
 &= \frac{\$3.50}{\$43} + 0.07 \\
 &= 0.1514 = 15.14\%
 \end{aligned}$$

$$\begin{aligned}
 \text{d. } k_{ps} &= \frac{D}{NP_0} = \frac{0.09 \times (\$150)}{\$175(1-0.12)} \\
 &= \frac{\$13.50}{\$154} \\
 &= 0.0877 = 8.77\%
 \end{aligned}$$

$$\begin{aligned}
 \text{e. } \text{After-tax cost of debt} &= k_d(1 - T) \\
 &= 12\% (1 - 0.34) \\
 &= 7.92\%
 \end{aligned}$$

$$\begin{aligned}
 9-3. \quad k_{ncs} &= \frac{D_1}{NP_0} + g \\
 k_{ncs} &= \frac{\$1.45(1+0.06)}{\$27(1-0.06)} + 0.06 = 0.1206 = 12.06\%
 \end{aligned}$$

$$9-4. \quad \$958 (1 - 0.11) = \$852.62 = \text{the net price (value less flotation costs).}$$

$$\$852.62 = \sum_{t=1}^{15} \frac{\$70}{(1+k_d)^t} + \frac{\$1,000}{(1+k_d)^{15}}$$

$$k_d = 8.81\%$$

$$\begin{aligned}
 \text{After-tax cost of debt} &= 8.82\% (1 - 0.18) = 7.22\%
 \end{aligned}$$

$$9-5. \quad k_{ps} = \frac{D}{NP_0} = \frac{\$3.00}{\$32.50} = 9.23\%$$

$$9-6. \quad NP_0 = \sum_{t=1}^n \frac{\$I_t}{(1+k_d)^t} + \frac{\$M}{(1+k_d)^n}$$

$$\$945 = \sum_{t=1}^{15} \frac{\$120}{(1+k_d)^t} + \frac{\$1,000}{(1+k_d)^{15}}$$

Since the net price on the bonds, \$945, is less than the \$1,000 par value, the before-tax cost of the debt must be greater than the 12 percent coupon interest rate (\$120 ÷ \$1,000).

$$k_d = 12.85\%$$

$$\text{After-tax cost of debt} = k_d(1 - T) = 12.85\%(1 - 0.34) = 8.48\%$$

9-7. Cost of preferred stock (k_{ps})

$$= \frac{\text{Dividend}}{\text{Net Price}} = \frac{D}{NP_0}$$

$$= \frac{14\% \times \$100}{\$98} = \frac{\$14}{\$98}$$

$$= 14.29\%$$

$$9-8. \quad k_{cs} = \frac{D_1}{P_0} + g$$

$$= \frac{\$0.70(1+0.15)}{\$23.80} + 0.15$$

$$= 0.1838 = 18.38\%$$

9-9. If the firm pays out 50 percent of its earnings in dividends, its recent earnings must have been \$8 (\$4 dividend divided by 0.5).

Thus, earnings increased from \$5 to \$8 in five years. Using Appendix C and looking for a table value of 0.625 (\$5/\$8), the annual growth rate is approximately 10 percent.

- a. Cost of internal common funds (k_{CS}):

$$\begin{aligned}
 k_{CS} &= \left(\frac{D_1}{P_0} \right) + g \\
 &= \frac{\$4(1+0.10)}{\$58} + 0.10 = \frac{\$4.40}{\$58} + 0.10 \\
 &= 0.1759 = 17.59\%
 \end{aligned}$$

- b. Cost of external common (new common) stock, k_{NCS}

$$\begin{aligned}
 k_{NCS} &= \left(\frac{D_1}{NP_0} \right) + g \\
 &= \frac{\$4.40}{\$58(1-0.08)} + 0.10 \\
 &= \frac{\$4.40}{\$53.36} + 0.10 \\
 &= 0.1825 = 18.25\%
 \end{aligned}$$

- 9-10. a. Clearview has estimated its cost of equity to be 15 percent and wants to know what rate of growth in dividends investors must be expecting if the firm's dividend per share is expected to be \$5.00 next year. The dividend growth model for estimating the required rate of return of a firm's investors is as follows:

$$k_{cs} = \frac{D_1}{P_{cs}} + g$$

Substituting for what we know in this equation we get the following:

$$k_{cs} = \frac{D_1}{P_{cs}} + g = \frac{\$5.00}{\$50.00} + g = 0.15$$

Solving for "g" we get an estimated growth rate of 5 percent.

- b. The capital asset pricing model can also be used to estimate investor required rates of return and is the following:

$$k_{cs} = r_f + \beta(r_m - r_f)$$

Substituting for what we know in the above equation, we get the following:

$$k_{cs} = r_f + \beta(r_m - r_f) = 0.03 + \beta(0.06) = 0.15$$

Solving for β we get 2.0. Is this reasonable? Beta values in excess of 1.5 are not very common but they do exist.

- 9-11. a. The before-tax cost of debt is found by solving for the yield to maturity on a bond that pays \$100 in interest annually for 10 years and repays the face value of \$1,000 at the end of year 10 where the bond is selling for \$921.50 today. This yield is 11.36 percent.

The after-tax cost of debt adjusted for a 34 percent tax rate is found to be 7.5 percent as follows:

$$11.36\%(1 - 0.34) = 7.5\%$$

$$b. \quad k_{ps} = \frac{D}{NP_0} = \frac{\$8}{\$100 - 9} = 8.79\%$$

$$c. \quad k_{cs} = \frac{D_1}{P_0} + g = \frac{\$9.80}{\$75} + 0 = 13.07\%$$

$$d. \quad k_{cs} = \frac{D_1}{NP_0} + g = \frac{\$2.80(1 + .08)}{\$53 - 6} + 0.08 = 0.1443 \text{ or } 14.43\%$$

$$\begin{aligned} 9-12. \quad a. \quad \text{Price } (P_0) &= \sum_{t=1}^{10} \frac{\$140}{(1 + 0.09)^t} + \frac{\$1,000}{(1 + 0.09)^{10}} \\ &= \$140(6.418) + \$1000(0.422) \\ &= \$1,320.52 \end{aligned}$$

$$\begin{aligned} b. \quad NP_0 &= \$1,320.52(1 - 0.105) \\ &= 1,181.87 \end{aligned}$$

$$c. \quad \text{Number of Bonds} = \frac{\$500,000}{\$1,181.87} = 423 \text{ Bonds}$$

d. Cost of debt:

$$\$1,181.87 = \sum_{t=1}^{10} \frac{\$140}{(1 + k_d)^t} + \frac{\$1,000}{(1 + k_d)^{10}}$$

$$k_d = 10.92\%$$

$$\begin{aligned} \text{After-tax} \\ \text{cost of debt} &= 10.92\%(1 - 0.34) = 7.21\% \end{aligned}$$

$$9-13. \quad a. \quad i. \quad \text{Price } (P_0) = \sum_{t=1}^{10} \frac{\$80}{(1 + 0.09)^t} + \frac{\$1,000}{(1 + 0.09)^{10}}$$

$$= \$935.82$$

$$ii. \quad NP_0 = \$935.82(1 - 0.105)$$

$$= \$837.56$$

$$iii. \quad \text{Number of Bonds} = \frac{\$500,000}{\$837.56}$$

$$= 597 \text{ Bonds}$$

iv. Cost of debt:

$$\$837.56 = \sum_{t=1}^{10} \frac{\$80}{(1+k_d)^t} + \frac{\$1,000}{(1+k_d)^{10}}$$

$$k_d = 10.73\%$$

$$\begin{array}{l} \text{After-tax} \\ \text{cost of debt} \end{array} = 10.73\%(1 - 0.34) = 7.08\%$$

- b. There is a very slight decrease in the cost of debt because the flotation costs associated with the higher coupon (and higher price) bond in Problem 9-10 are higher.

9-14. The formula for the firm's weighted average cost of capital (WACC) is the following:

$$k_{wacc} = k_d(1 - T_c) \times w_d + k_{cs} \times w_{cs}$$

In this problem we are told that the WACC (i.e., k_{wacc}) is equal to 9.2 percent, the cost of debt (after tax) is 6 percent, and the cost of equity is 10 percent. We do not know the capital structure weights, (i.e., w_d and w_e). However, we know that the two weights must sum to 1 or 100 percent so the weight for equity is equal to one minus the weight associated with debt. With this in mind, we can substitute into the WACC formula as follows:

$$k_{wacc} = 0.06 \times w_d + 0.10 \times (1 - w_d) = 0.092$$

Solving for w_d we get 0.20 or 20 percent which means that w_{cs} is 0.8 or 80 percent.

9-15. a.

Given:

Cash	\$ 540,000		
Accounts Receivable	4,580,000		
Inventories	7,400,000	Long-term Debt	\$12,590,000
Net Property, Plant & Equipment	18,955,000	Common Equity	18,885,000
Total Assets	<u>\$31,475,000</u>		<u>\$31,475,000</u>
Cost of debt financing	8%		
Cost of equity	15%		
Tax rate	34%		
Market to book ratio	1.00		

Solution:

				Market Value
Component	Proportion	After-tax Cost	Product	Balance Sheet
Long-term Debt	40%	5.28%	2.11200%	\$ 12,590,000
Common Equity	60%	15.00%	<u>9.00000%</u>	<u>18,885,000</u>
			<u>11.11200%</u>	<u>\$ 31,475,000</u>

b.

Given:

Cash	\$ 540,000		
Accounts Receivable	4,580,000		
Inventories	7,400,000	Long-term Debt	\$12,590,000
Net Property, Plant & Equipment	<u>18,955,000</u>	Common Equity	<u>18,885,000</u>
Total Assets	<u>\$31,475,000</u>		<u>\$31,475,000</u>

Cost of debt financing	8%
Cost of equity	13%
Tax rate	34%
Market to book ratio	1.50

Solution:

				Market Value
Component	Proportion	After-tax Cost	Product	Balance Sheet
Long-term Debt	30.77%	5.28%	1.62%	\$ 12,590,000
Common Equity	69.23%	13.00%	<u>9.00%</u>	<u>28,327,500</u>
			<u>10.62%</u>	<u>\$ 40,917,500</u>

9-16. Carion Corporation—Weighted Cost of Capital

	Capital Structure	Weights	Individual Costs	Weighted Costs
Bonds	\$1,083	0.2152	5.5%	1.18%
Preferred stock	268	0.0533	13.5%	0.72%
Common stock	<u>3,681</u>	<u>0.7315</u>	18.0%	<u>13.17%</u>
	<u>\$50,032</u>	1.0000		15.07%

9-17. Given:

Cash	\$ 2,010,000		
Accounts receivable	4,580,000		
Inventories	1,540,000	Long-term debt	\$ 8,141,000
Net property, plant, and equipment	<u>32,575,000</u>	Common equity	<u>\$32,564,000</u>
Total assets	<u>\$40,705,000</u>	Total debt and equity	<u>\$40,705,000</u>
Cost of debt financing	8%		
Cost of equity	18%		
Tax rate	35%		
Market-to-book ratio	2.50		

- a. What does ABBC's capital structure look like? Note that because the market-to-book ratio (market value of equity to book value of equity) is 2.5, the market value of the firm's equity is $2.5 \times \$32,564$, or \$81,410,000. The market value of debt is assumed to equal its book value. Thus,

Component	Market Value Balance Sheet	Proportion	After-Tax Cost	Product
Long-term debt	\$ 8,141,000	9.9%	4.88%	0.44%
Common equity	<u>81,410,000</u>	91%	18.00%	<u>16.38%</u>
	<u>\$89,551,000</u>			<u>16.82%</u>

- b. What is ABBC's weighted average cost of capital? Based on the above calculations, the answer is 16.8.
- c. If ABBC's stock price were to rise such that it sold at 3.5 times book value and the cost of equity fell to 15 percent, what would the firm's weighted average cost of capital be (assuming the cost of debt and tax rate do not change)?

Cost of debt financing	8%
Cost of equity	18%
Tax rate	35%
Market-to-book ratio	3.50

Component	Market Value Balance Sheet	Proportion	After-Tax Cost	Product
Long-term debt	\$ 8,141,000	7%	5.20%	0.36%
Common equity	<u>113,974,000</u>	93%	15.00%	<u>13.95%</u>
	<u>\$122,115,000</u>			<u>14.31%</u>

- 9-18. Projects A, B, and C offer rates of return that exceed the firm's 12 percent cost of capital and are therefore acceptable projects. The rationale here relates to the meaning of the cost of capital (or weighted average cost of capital) for the firm. Specifically, the weighted average cost of capital (WACC) represents the weighted average cost of its financing. The firm needs to earn its WACC on each dollar of capital it uses in order to satisfy the firm's capital sources (debt and equity). As long as the firm earns at least the WACC on each dollar invested, then the firm's suppliers of capital can be paid and they will be happy. If the firm earns more than the WACC, then the excess, by definition, goes to the firm's common stockholders. Higher-than-required rates of return on investment (i.e., as with projects A, B, and C, which earn more than 12 percent) will result in stockholders' bidding up the price of the firm's common stock because the firm is providing excess returns to the common stockholders at the current stock price.
- 9-19. This problem provides the basis for discussing some of the difficult issues that arise in evaluating the cost of capital for a multi-division firm.
- a. Pete runs the high-risk exploration division of the company and is likely to be hurt by the use of risk-based divisional costs of capital. He argues that the firm should simply pursue its most promising investment opportunities regardless of other considerations. In essence he argues for ignoring risk considerations. If his advice is followed, we would expect to see the firm invest excessively in high-risk ventures that generally promise the highest returns.
 - b. Donna's situation is exactly the opposite of Pete's. Here she finds her division fighting for funds to invest in lower return (but lower risk) projects that will produce wealth (albeit at a slower and safer pace).
 - c. This is where "the rubber meets the road" for using divisional costs of capital to calculate economic profit or Economic Value Added. Compared to Donna, Pete must earn a higher return just to meet his capital cost requirement. Is this fair? Yes, it is. To require Pete to meet a higher standard to deploy capital in his exploration activities is completely consistent with asking him to earn more on the capital he has already invested.

9-20.

Given:

	Manufacturing Division	Distribution Division
Equity beta	1.6	1.1
Tax rate	35.0%	35.0%
Cost of debt	8.0%	8.0%
Debt ratio	40.0%	40.0%
Risk-free rate	4.8%	
Market risk premium	7.3%	

a.

Manufacturing Division After-Tax			
Component	Proportion	Cost	Product
Debt	40.0%	5.20%	2.0800%
Equity	60.0%	8.80%	5.2800%
Divisional WACC			<u>7.3600%</u>

Distribution Division After-Tax			
Component	Proportion	Cost	Product
Debt	40.0%	5.20%	2.0800%
Equity	60.0%	7.55%	4.5300%
Divisional WACC			<u>6.6100%</u>

- b. The investment in the distribution division is definitely preferred assuming all else is the same between the two investments (i.e., the size of the investment). In the Manufacturing division, a 12 percent project returns a near zero NPV whereas in the Distribution division the project is a positive NPV investment. We cannot know the size of the NPV but if both projects are of roughly equal dollar size, the distribution project would be preferred.

9-21.

	E&P Division	Pipeline Division
Equity Beta	1.7	0.8
Tax rate	35%	35%
Cost of debt	9%	5.5%
Debt ratio	10%	40%
Risk-free rate of interest	4.8%	
Market risk premium	7.3%	

a.

Exploration and Development Division			
Component	Proportion	After-Tax Cost	Product
Debt	10%	5.9%	0.6%
Equity	90%	17.2%	15.5%
WACC			16.1%
Pipeline Division			
Component	Proportion	After-Tax Cost	Product
Debt	40%	3.6%	1.4%
Equity	60%	10.6%	6.4%
WACC			7.8%

- b. The dramatic difference in the two divisional costs of capital underscores the importance of analyzing the capital costs corresponding to divisions of very different risk. An investment in the Pipeline division that earned 10 percent would be a good one, but in the E&P division such a rate of return would be unacceptable.

SOLUTIONS TO MINI CASES

- 9-1. This mini case raises some of the very practical considerations that are faced by firms as they attempt to estimate the cost of capital they should use in evaluating their investment decisions. Specifically, the mix of financing sources actually used often deviates substantially from the firm's target financing mix. When this occurs it is very tempting to simply look at the out-of-pocket costs of the financing source(s) used as the appropriate cost of capital for the project. The problem with this, of course, is that if the firm maintains a target capital structure mix, issuing debt one period often signals that the firm's next capital need will require that the firm rebalance the capital structure using equity. So, using the cost of the actual mix of capital used would result in very low costs of capital in years where debt is used and very high costs when equity is used. To avoid this problem, firms typically use their target capital structure mix when computing a cost of capital for the firm and, when new investments are comparable in risk to the firm, use the target mix computation to estimate the cost of capital for a new investment. Calculations are found below:

Total capital raised	\$ 70.00	million
Retained earnings	\$ 20.00	million

Bond information

Face value	\$ 1,000.00
Maturity	16
Coupon	8%
Price	\$ 1,035.00
Flotation cost/bond	\$ 30.00

Stock information

Dividend	\$ 2.50
Growth rate	6%
Price	\$ 35.00
Flotation cost/share	\$ 2.00

Target capital structure

Debt	40%
Equity	60%

a.	Yield to maturity	7.61%
b.	Cost of debt	5.24%
c.	Required rate on common stock	13.57%
	Cost of new common stock	14.03%

d.

	\$ Capital (millions)	% Weight	After- Tax Cost	Product
Debt	50	0.71	5.24%	3.74%
Equity	20	0.29	13.57%	3.88%
	70			7.62%

e.

	\$ Capital (millions)	% Weight	After- Tax Cost	Product
Debt	28.00	0.40	5.24%	2.10%
Equity (New Stock)	22.00	0.31	14.03%	4.41%
Equity (Retained Earnings)	20.00	0.29	13.57%	3.88%
Total Capital	70.00	1.00		10.38%

- f. If the CFO wishes to use the actual financing mix then 7.62 percent “appears” to be the cost of capital. However, this isn’t quite correct. The reason is that we have computed the costs of debt and equity using the firm’s current market prices for bonds and the firm’s common stock. If the firm were to have 71 percent debt capital and 29 percent equity (rather than the firm’s targets of 40 percent and 60 percent, respectively), then the costs of both debt and equity would probably be much higher than the estimates used here. For this reason, the estimate in part e. is probably closer to the actual cost of capital for the firm, for it more nearly matches the firm’s target capital structure mix. Thus, the 10.38 percent cost of capital estimate is a better estimate of the firm’s true cost of capital than is the 7.62 percent estimate.

9-2.

- a. Given the diversity of the different divisions of Exxon Mobil (XOM), it seems obvious that the firm should compute different divisional costs of capital. The reason for this relates to the fact that using a single (average) cost of capital for all the divisions will result in over-investing in risky divisions (that should use a higher cost of capital) and under-investing in less risky divisions (that should compare their investments to a lower cost of capital).

So, why do some firms choose to use only one cost of capital? There is no one answer to this question, but a couple of possibilities come to mind. First, it is sometimes difficult to come up with good cost estimates for a firm’s specific divisions. This is particularly difficult where there are no firms that operate in only that specific type of business (i.e., “pure-play” firms). When computing a divisional cost of capital, the firm may resort to looking at comparable firms that do business in the division’s primary business. If there are none, then estimating the divisional cost of capital becomes much more difficult.

A second, and more subtle, argument for not computing divisional costs of capital relates to the internal politics of making a distinction between operating divisions. The idea here is that divisional managers compete with one another for the

allocation of scarce corporate funds that can be reinvested in their divisions. Consequently, the division heads may be successful in lobbying for a lower cost of capital in order to gain access to more capital. If the firm uses a single cost of capital, this removes the cost of capital from the realm of politics and focuses the energies of the division heads on defending their estimates of future cash flows. This is not an argument that students should be expected to come up with from reading the text. However, it makes a nice discussion point within the class. For example, one might simply ask the class whether the head of each division would prefer to have a high or low cost of capital for their division.

- b. The response to this question is discussed in Section 9.4, where the problem of estimating a firm's divisional cost of capital is discussed.

CHAPTER 10

Capital-Budgeting Techniques and Practice

CHAPTER ORIENTATION

Capital budgeting involves the decision-making process with respect to investment in fixed assets; specifically, it involves measuring the incremental cash flows associated with investment proposals, then evaluating the attractiveness of these cash flows relative to the project's costs. This chapter focuses on the various decision criteria. It also examines how to deal with complications in the capital budgeting process, including mutually exclusive projects and capital rationing.

CHAPTER OUTLINE

I. Capital-Budgeting Decision Criteria

A. The payback period method

1. The payback period of an investment tells the number of years required to recover the initial investment. The payback period is calculated by adding up the cash flows until they are equal to the initial fixed investment.
2. Although this measure does, in fact, deal with cash flows and is easy to calculate and understand, it ignores any cash flows that occur after the payback period and does not consider the time value of money within the payback period.
3. To deal with the criticism that the payback period ignores the time value of money some firms use the discounted payback period. The discounted payback period method is similar to the traditional payback period except that it uses discounted net cash flows rather than actual undiscounted net cash flows in calculating the payback period.
4. The discounted payback period is defined as the number of years needed to recover the initial cash outlay from the discounted net cash flows.

B. Present-value methods

1. The net present value of an investment project is the present value of the cash inflows less the present value of the cash outflows. By assigning negative values to cash outflows, it becomes

$$NPV = \sum_{t=1}^n \frac{FCF_t}{(1+k)^t} - IO$$

where FCF_t = the annual free cash flow in time period t (this can take on either positive or negative values)

k = the required rate of return or appropriate discount rate or cost of capital

IO = the initial cash outlay

n = the project's expected life

- a. The acceptance criteria are:

accept if $NPV \geq 0$

reject if $NPV < 0$

- b. The advantage of this approach is that it takes the time value of money into consideration in addition to dealing with cash flows.

2. The profitability index is the ratio of the present value of the expected future net cash flows to the initial cash outlay, or

$$\text{profitability index} = \frac{\sum_{t=1}^n \frac{FCF_t}{(1+k)^t}}{IO}$$

- a. The acceptance criteria are:

accept if $PI \geq 1.0$

reject if $PI < 1.0$

- b. The advantages of this method are the same as those for the net present value.
- c. Either of these present-value methods will give the same accept-reject decisions to a project.

- C. The internal rate of return is the discount rate that equates the present value of the project's future net cash flows with the project's initial outlay. Thus, the internal rate of return is represented by IRR in the equation below:

$$IO = \sum_{t=1}^n \frac{FCF_t}{(1+IRR)^t}$$

1. The acceptance-rejection criteria are:

accept if $IRR \geq$ required rate of return

reject if $IRR <$ required rate of return

The required rate of return is often taken to be the firm's cost of capital.

2. The advantages of this method are that it deals with cash flows and recognizes the time value of money; however, the procedure is rather complicated and time consuming.
 3. One disadvantage is that the IRR implicitly assumes cash flows received over the project's life can be reinvested at the IRR .
- D. The $MIRR$ is similar to the IRR except it relies on the assumption that all free cash flows over the life of the project are reinvested at the required rate of return until the termination of the project. Thus, to calculate the $MIRR$, we:

Step 1: Determine the present value of the project's free cash *outflows*. We do this by discounting all the free cash *outflows*, back to the present at the required rate of return. If the initial outlay is the only free cash *outflow*, then the initial outlay is the present value of the free cash *outflows*.

Step 2: Determine the present value of the project's free cash *inflows*. Take all the annual free cash *inflows* and find their future value at the end of the project's life, compounded forward at the required rate of return. We will call this the project's *terminal value*, or TV .

Step 3: Calculate the $MIRR$. The $MIRR$ is the discount rate that equates the present value of the free cash *outflows* with the present value of the project's terminal value.

1. The modified internal rate of return is defined as the value of $MIRR$ in the following equation:

$$PV_{\text{outflows}} = \frac{TV_{\text{inflows}}}{(1 + MIRR)^n} \quad (10-4)$$

Where PV_{outflows} = the present value of the project's free cash *outflows*

TV_{inflows} = the project's terminal value, calculated by taking all the annual free cash *inflows* and find their future value at the end of the project's life, compounded forward at the required rate of return

n = the project's expected life

$MIRR$ = the project's modified internal rate of return

- E. The easiest way to understand the relationship between the IRR and the NPV is to view it graphically through the use of a net present value profile. A net present value profile is simply a graph showing how a project's NPV changes as the discount rate changes. From the net present value profile you can easily see how a project's NPV varies inversely with the discount rate, and you can also see how sensitive the project is to your selection of the discount rate.

II. Capital Rationing

- A. Capital rationing is the situation in which a budget ceiling or constraint is placed upon the amount of funds that can be invested during a time period.
- B. Theoretically, a firm should never reject a project that yields more than the required rate of return. Although there are circumstances that may create complicated situations, in general, an investment policy limited by capital rationing is less than optimal.

III. Ranking Mutually Exclusive Projects

Mutually exclusive projects: Although the *IRR* and the present-value methods will, in general, give consistent accept-reject decisions, they may not rank projects identically. This becomes important in the case of mutually exclusive projects.

- A. A project is mutually exclusive if acceptance of it precludes the acceptance of one or more possible projects. Then, in this case, the project's relative ranking becomes important.
- B. Ranking conflicts come as a result of the different assumptions about the reinvestment rate of funds released from the proposals.
- C. Thus, when conflicting ranking of mutually exclusive projects results from the different reinvestment assumptions, the decision boils down to which assumption is best.
- D. In general, the net present value method is considered to be theoretically superior.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

10-1. Capital-budgeting decisions involve investments requiring rather large cash outlays at the beginning of the life of the project and commit the firm to a particular course of action over a relatively long time horizon. As such, they are both costly and difficult to reverse because: (1) their large cost and (2) the fact that they involve fixed assets which cannot be liquidated easily.

10-2. The criticisms of using the payback period as a capital-budgeting technique are:

- 1. It ignores the timing of the flows that occur during the payback period.
- 2. It ignores all flows occurring after the payback period.

The advantages associated with the payback period are:

- 1. It deals with cash flows rather than accounting profits and, therefore, focuses on the true timing of the project's benefits and costs.
- 2. It is easy to calculate and understand.
- 3. It can be used as a rough screening device, eliminating projects whose returns do not materialize until later years.

These final two advantages are the major reasons why it is used frequently.

- 10-3. Yes. The payback period eliminates projects whose returns do not materialize until later years, thus, emphasizing the earliest returns, which in a country experiencing frequent expropriations, would certainly have the most amount of uncertainty. In this case, the payback period could be used as a rough screening device to filter out those riskier projects, which have long lives.
- 10-4. The three discounted cash flow capital budgeting criteria are the net present value, the profitability index, and the internal rate of return. The net present value method gives an absolute dollar value for a project by taking the present value of the benefits and subtracting the present value of the costs. The profitability index compares these benefits and costs through division and comes up with a measure of the project's relative value—a benefit/cost ratio. On the other hand, the internal rate of return tells us the rate of return that the project earns. In the capital-budgeting area, these methods generally give us the same accept-reject decision on projects but many times rank them differently. As such, they have the same general advantages and disadvantages, although the calculations associated with the internal rate of return method can become quite tedious. The advantages associated with these discounted cash flow methods are:
1. They deal with cash flows rather than accounting profits.
 2. They recognize the time value of money.
 3. They are consistent with the firm's goal of shareholder wealth maximization.
- 10-5. Mutually exclusive projects involve two or more projects where the acceptance of one project will necessarily mean the rejection of the other project. This usually occurs when the set of projects perform essentially the same task. Relating this to our discounted cash flow criteria, it means that not all projects with positive NPVs, profitability indexes greater than 1.0, and IRRs greater than the required rate of return, will be accepted. Moreover, since our discounted cash flow criteria do not always yield the same ranking of projects, one criterion may indicate that the mutually exclusive project A should be accepted while another criterion may indicate that the mutually exclusive project B should be accepted.
- 10-6. There are three principal reasons for imposing a capital-rationing constraint. First, the management may feel that market conditions are temporarily adverse. In the early and mid-seventies, this reason was fairly common, because interest rates were at an all-time high and stock prices were at a depressed level. The second reason is a manpower shortage; that is, there is shortage of qualified managers to direct new projects. The final reason involves intangible considerations. For example, the management may simply fear debt, avoiding interest payments at any cost. Or the common stock issuance may be limited in order to allow the current owners to either maintain strict voting control over the company or to maintain a stable dividend policy.

Whether or not this is a rational move depends upon the extent of the rationing. If it is minor and noncontinuing, then the firm's share price will probably not suffer to any great extent. However, it should be emphasized that capital rationing and rejection of projects with positive net present values is contrary to the firm's goal of maximization of shareholders' wealth.

- 10-7. When two mutually exclusive projects of unequal size are compared, the firm should select the project or set of projects with the largest net present value, whether there is capital rationing or not.
- 10-8. The time disparity problem and the conflicting rankings that accompany it result from the differing reinvestment assumptions made by the net present value and internal rate of return decision criteria. The net present value criterion assumes that cash flows over the life of the project can be reinvested at the required rate of return; the internal rate of return implicitly assumes that the cash flows over the life of the project can be reinvested at the internal rate of return.
- 10-9. The problem of incomparability of projects with different lives is not directly a result of the projects having different lives but of the fact that future profitable investment proposals are being affected by the decision currently being made. Again the key is: "Does the investment decision being made today affect future profitable investment proposals?" If so, the projects are not comparable. While the most theoretically proper approach is to make assumptions as to investment opportunities in the future, in most cases this method is probably too difficult to be of any value. Thus, the most common method used to deal with this problem is the creation of a replacement chain to equalize life spans. In effect, the reinvestment opportunities in the future are assumed to be similar to the current ones.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

- 10-1. a. N = 8
 CPT I/Y = 7
 PV = -10,000
 PMT = 0
 FV = \$17,182
- b. N = 10
 CPT I/Y = 17
 PV = -10,000
 PMT = 0
 FV = \$48,077

c. N = 20
 CPT I/Y = **13**
 PV = -10,000
 PMT = 0
 FV = \$114,943

d. N = 3
 CPT I/Y = **11**
 PV = -10,000
 PMT = 0
 FV = \$13,680

10-2. a. N = 10
 CPT I/Y = **15**
 PV = -10,000
 PMT = 1,993
 FV = 0

b. N = 20
 CPT I/Y = **20**
 PV = -10,000
 PMT = 2,054
 FV = 0

c. N = 12
 CPT I/Y = **6**
 PV = -10,000
 PMT = 1,193
 FV = 0

d. N = 5
 CPT I/Y = **13**
 PV = -10,000
 PMT = 2,843
 FV = 0

10-3. a. **Calculator Solution (using a Texas Instruments BA-II Plus):**

<u>Data and Key Input</u>	<u>Display</u>
CF; -10,000; ENTER	CF0 = -10,000
↓; 2,000; ENTER	C01 = 2,000.00
↓; 1; ENTER	F01 = 1.00
↓; 5,000; ENTER	C02 = 5,000.00
↓; 1; ENTER	F02 = 1.00
↓; 8,000; ENTER	C03 = 8,000.00
↓; 1; ENTER	F03 = 1.00
IRR; CPT	IRR = 18.7875

Trial and Error Solution:

Try different discount rates, and the one that makes the present value of the free cash inflows equal to the initial outlay, that is makes the *NPV* equal to zero, is the *IRR*.

$$\$10,000 = \frac{\$2,000}{(1 + IRR)^1} + \frac{\$5,000}{(1 + IRR)^2} + \frac{\$8,000}{(1 + IRR)^3}$$

Try 18%

$$\begin{aligned} \$10,000 &= \$2,000(0.847) + \$5,000 (0.718) + \$8,000 (0.609) \\ &= \$1,694 + \$3,590 + \$4,872 \\ &= \$10,156 \end{aligned}$$

Try 19%

$$\begin{aligned} \$10,000 &= \$2,000 (0.840) + \$5,000 (0.706) + \$8,000 (0.593) \\ &= \$1,680 + \$3,530 + \$4,744 \\ &= \$9,954 \end{aligned}$$

Thus, *IRR* = approximately 19%

b. **Calculator Solution (using a Texas Instruments BA-II Plus):**

<u>Data and Key Input</u>	<u>Display</u>
CF; -10,000; ENTER	CF0 = -10,000
↓; 8,000; ENTER	C01 = 8,000.00
↓; 1; ENTER	F01 = 1.00
↓; 5,000; ENTER	C02 = 5,000.00
↓; 1; ENTER	F02 = 1.00
↓; 2,000; ENTER	C03 = 2,000.00
↓; 1; ENTER	F03 = 1.00
IRR; CPT	IRR = 30.20

Trial and Error Solution:

Try different discount rates, and the one that makes the present value of the free cash inflows equal to the initial outlay, that is makes the *NPV* equal to zero, is the *IRR*.

$$\$10,000 = \frac{\$8,000}{(1 + IRR)^1} + \frac{\$5,000}{(1 + IRR)^2} + \frac{\$2,000}{(1 + IRR)^3}$$

Try 30%

$$\begin{aligned} \$10,000 &= \$8,000 (0.769) + \$5,000 (0.592) + \$2,000 (0.455) \\ &= \$6,152 + \$2,960 + \$910 \\ &= \$10,022 \end{aligned}$$

Try 31%

$$\begin{aligned} \$10,000 &= \$8,000 (0.763) + \$5,000 (0.583) + \$2,000 (0.445) \\ &= \$6,104 + \$2,915 + \$890 \\ &= \$9,909 \end{aligned}$$

Thus, *IRR* = approximately 30%

c. **Calculator Solution (using a Texas Instruments BA-II Plus):**

<u>Data and Key Input</u>	<u>Display</u>
CF; -10,000; ENTER	CF0 = -10,000
↓; 2,000; ENTER	C01 = 2,000.00
↓; 5; ENTER	F01 = 5.00
↓; 5,000; ENTER	C02 = 5,000.00
↓; 1; ENTER	F02 = 1.00
IRR; CPT	IRR = 11.1977

Trial and Error Solution:

Try different discount rates, and the one that makes the present value of the free cash inflows equal to the initial outlay, that is makes the *NPV* equal to zero, is the *IRR*.

$$\$10,000 = \sum_{t=1}^5 \frac{\$2,000}{(1+IRR)^t} + \frac{\$5,000}{(1+IRR)^6}$$

Try 11%

$$\begin{aligned} \$10,000 &= \$2,000 (3.696) + \$5,000 (0.535) \\ &= \$7,392 + \$2,675 \\ &= \$10,067 \end{aligned}$$

Try 12%

$$\begin{aligned} \$10,000 &= \$2,000 (3.605) + \$5,000 (0.507) \\ &= \$7,210 + \$2,535 \\ &= \$9,745 \end{aligned}$$

Thus, *IRR* = approximately 11%

$$\begin{aligned} 10-4. \quad a. \quad NPV &= \sum_{t=1}^6 \frac{\$450,000}{(1+0.09)^t} - \$1,950,000 \\ &= \$450,000 (4.486) - \$1,950,000 \\ &= \$2,018,700 - \$1,950,000 = \$68,700 \end{aligned}$$

$$\begin{aligned} b. \quad PI &= \frac{\$2,018,700}{\$1,950,000} \\ &= 1.0352 \end{aligned}$$

c.

$$\begin{aligned} N &= 6 \\ \text{CPT I/Y} &= \mathbf{10.1725\%} \\ PV &= -1,950,000 \\ PMT &= 450,000 \\ FV &= 0 \end{aligned}$$

d. Yes, the project should be accepted.

10-5. a. Payback Period = \$80,000/\$20,000 = 4 years

b.

$$\begin{aligned} NPV &= \sum_{t=1}^6 \frac{\$20,000}{(1+0.10)^t} - \$80,000 \\ &= \$20,000 (4.355) - \$80,000 \\ &= \$87,100 - \$80,000 = \$7,100 \end{aligned}$$

c.

$$\begin{aligned} PI &= \frac{\$87,100}{\$80,000} \\ &= 1.0888 \end{aligned}$$

d.

$$\begin{aligned} N &= 6 \\ \text{CPT I/Y} &= \mathbf{12.97\%} \\ PV &= -80,000 \\ PMT &= 20,000 \\ FV &= 0 \end{aligned}$$

10-6.

$$\begin{aligned} NPV_A &= \sum_{t=1}^6 \frac{\$12,000}{(1+0.12)^t} - \$50,000 \\ &= \$12,000 (4.111) - \$50,000 \\ &= \$49,332 - \$50,000 = -\$668 \end{aligned}$$

$$\begin{aligned} NPV_B &= \sum_{t=1}^6 \frac{\$13,000}{(1+0.12)^t} - \$70,000 \\ &= \$13,000 (4.111) - \$70,000 \\ &= \$53,443 - \$70,000 = -\$16,557 \end{aligned}$$

$$\begin{aligned} PI_A &= \frac{\$49,332}{\$50,000} \\ &= 0.9866 \end{aligned}$$

$$\begin{aligned} \text{PI}_B &= \frac{\$53,443}{\$70,000} \\ &= 0.7635 \end{aligned}$$

$$\begin{aligned} N &= 6 \\ \text{CPT I/Y} &= 11.53\% = IRR_A \\ PV &= -50,000 \\ PMT &= 12,000 \\ FV &= 0 \end{aligned}$$

$$\begin{aligned} N &= 6 \\ \text{CPT I/Y} &= 3.18\% = IRR_A \\ PV &= -70,000 \\ PMT &= 13,000 \\ FV &= 0 \end{aligned}$$

Neither project should be accepted.

- 10-7. Project A:
 Payback Period = 2 years + \$100/\$200 = 2.5 years
 Project B:
 Payback Period = 2 years + \$2,000/\$3,000 = 2.67 years
 Project C:
 Payback Period = 3 years + \$1,000/\$2,000 = 3.5 years

Projects A and B should be accepted using the payback period criteria.

$$\begin{aligned} 10-8. \quad NPV_{9\%} &= \sum_{t=1}^8 \frac{\$1,000,000}{(1+0.09)^t} - \$5,000,000 \\ &= \$1,000,000 (5.535) - \$5,000,000 \\ &= \$5,535,000 - \$5,000,000 = \$535,000 \end{aligned}$$

$$\begin{aligned}
 NPV_{11\%} &= \sum_{t=1}^8 \frac{\$1,000,000}{(1+0.11)^t} - \$5,000,000 \\
 &= \$1,000,000 (5.146) - \$5,000,000 \\
 &= \$5,146,000 - \$5,000,000 = \$146,000 \\
 \\
 NPV_{13\%} &= \sum_{t=1}^8 \frac{\$1,000,000}{(1+0.13)^t} - \$5,000,000 \\
 &= \$1,000,000 (4.799) - \$5,000,000 \\
 &= \$4,799,000 - \$5,000,000 = -\$201,000 \\
 \\
 NPV_{15\%} &= \sum_{t=1}^8 \frac{\$1,000,000}{(1+0.15)^t} - \$5,000,000 \\
 &= \$1,000,000 (4.487) - \$5,000,000 \\
 &= \$4,487,000 - \$5,000,000 = -\$513,000
 \end{aligned}$$

10-9. Project A:

Calculator Solution (using a Texas Instruments BA-II Plus):

<u>Data and Key Input</u>	<u>Display</u>
CF; -50,000; ENTER	CF0 = -50,000
↓; 10,000; ENTER	C01 = 10,000.00
↓; 1; ENTER	F01 = 1.00
↓; 15,000; ENTER	C02 = 15,000.00
↓; 1; ENTER	F02 = 1.00
↓; 20,000; ENTER	C03 = 20,000.00
↓; 1; ENTER	F03 = 1.00
↓; 25,000; ENTER	C04 = 25,000.00
↓; 1; ENTER	F04 = 1.00
↓; 30,000; ENTER	C05 = 30,000.00
↓; 1; ENTER	F06 = 1.00
IRR; CPT	IRR = 23.29

Trial and Error Solution:

Try different discount rates, and the one that makes the present value of the free cash inflows equal to the initial outlay, that is makes the *NPV* equal to zero, is the *IRR*.

$$\begin{aligned} \$50,000 &= \frac{\$10,000}{(1 + IRR_A)^1} + \frac{\$15,000}{(1 + IRR_A)^2} + \frac{\$20,000}{(1 + IRR_A)^3} \\ &\quad + \frac{\$25,000}{(1 + IRR_A)^4} + \frac{\$30,000}{(1 + IRR_A)^5} \end{aligned}$$

Try 23%

$$\begin{aligned} \$50,000 &= \$10,000(0.813) + \$15,000(0.661) + \$20,000(0.537) \\ &\quad + \$25,000(0.437) + \$30,000(0.355) \\ &= \$8,130 + \$9,915 + \$10,740 + \$10,925 + \$10,650 \\ &= \$50,360 \end{aligned}$$

Try 24%

$$\begin{aligned} \$50,000 &= \$10,000(0.806) + \$15,000(0.650) + \$20,000(0.524) \\ &\quad + \$25,000(0.423) + \$30,000(0.341) \\ &= \$8,060 + \$9,750 + \$10,480 + \$10,575 + \$10,230 \\ &= \$49,095 \end{aligned}$$

Thus, *IRR* = just over 23%

Project B: Calculator Solution (using a Texas Instruments BA-II Plus):

<u>Data and Key Input</u>	<u>Display</u>
CF; -100,000; ENTER	CF0 = -100,000
↓; 125,000; ENTER	C01 = 125,000.00
↓; 1; ENTER	F01 = 1.00
↓; 25,000; ENTER	C02 = 25,000.00
↓; 4; ENTER	F02 = 4.00
<i>IRR</i> ; CPT	<i>IRR</i> = 60.2162

Project C: Calculator Solution (using a Texas Instruments BA-II Plus):

<u>Data and Key Input</u>	<u>Display</u>
CF; -450,000; ENTER	CF0 = -450,000
↓; 200,000; ENTER	C01 = 200,000.00
↓; 3; ENTER	F01 = 3.00
IRR; CPT	IRR = 15.8885

10-10. a.
$$NPV = \sum_{t=1}^{10} \frac{\$18,000}{(1+0.10)^t} - \$100,000$$

$$= \$18,000(6.145) - \$100,000$$

$$= \$110,610 - \$100,000$$

$$= \$10,610$$

b.
$$NPV = \sum_{t=1}^{10} \frac{\$18,000}{(1+0.15)^t} - \$100,000$$

$$= \$18,000(5.019) - \$100,000$$

$$= \$90,342 - \$100,000$$

$$= -\$9,658$$

c. If the required rate of return is 10 percent, the project is acceptable as in part a.

d.
$$N = 10$$

$$\text{CPT I/Y} = 12.42\% = IRR_A$$

$$PV = -100,000$$

$$PMT = 18,000$$

$$FV = 0$$

10-11. Using a discount rate of 11 percent, we come up with the following *NPV* calculations.

<i>NPV</i> of Project								
Years	0	1	2	3	4	5	6	7
Cash Flow (Millions \$)	-250.00	50.00	50.00	50.00	50.00	50.00	75.00	75.00
Discount Rate	1.00	1.11	1.23	1.37	1.52	1.69	1.87	2.08
Discounted Cash Flow	-250.00	45.05	40.58	36.56	32.94	29.67	40.10	36.12
<i>NPV</i> (Sum of Discounted Cash Flows)			11.02					

At a required rate of 11 percent, the project has an *NPV* of \$11.02 million.

However, at a discount rate of 9.5 percent, the project would have a much different *NPV*.

<i>NPV</i> of Project								
Years	0	1	2	3	4	5	6	7
Cash Flow (Millions \$)	-250.00	50.00	50.00	50.00	50.00	50.00	75.00	75.00
Discount Rate	1.000	1.095	1.199	1.313	1.438	1.574	1.724	1.888
Discounted Cash Flow	-250.00	45.66	41.70	38.08	34.78	31.76	43.51	39.73
<i>NPV</i> (Sum of Discounted Cash Flows)			25.23					

We can see here that at a required rate of 9.5 percent, the project had an *NPV* of \$25.23 million. By subtracting 11.02 million from 25.23 million, we can see that the project lost \$14.21 million in surplus value due to the change in interest rate.

10-12. Calculator Solution (using a Texas Instruments BA-II Plus):

<u>Data and Key Input</u>	<u>Display</u>
CF; -927,917; ENTER	CF0 = -927,917.00
↓; 200,000; ENTER	C01 = 200,000.00
↓; 1; ENTER	F01 = 1.00
↓; 300,000; ENTER	C02 = 300,000.00
↓; 2; ENTER	F02 = 2.00
↓; 200,000; ENTER	C03 = 200,000.00
↓; 2; ENTER	F03 = 2.00
↓; 160,000; ENTER	C04 = 160,000.00
↓; 1; ENTER	F04 = 1.00
IRR; CPT	IRR = 13.00

Trial and Error Solution:

Try different discount rates, and the one that makes the present value of the free cash inflows equal to the initial outlay, that is, makes the *NPV* equal to zero, is the *IRR*.

<u>Discount Rate Guesses</u>	<u><i>NPV</i></u>
10%	\$78,332.
15%	-\$46,947.
13%	\$0

Thus, 13 percent is the project's *IRR*.

10-13. **Calculator Solution (using a Texas Instruments BA-II Plus):**

<u>Data and Key Input</u>	<u>Display</u>
CF0; -60,000; ENTER	CF0 = -60,000
↓; 20,000; ENTER	C01 = 20,000.00
↓; 2; ENTER	F01 = 2.00
↓; 10,000; ENTER	C02 = 10,000.00
↓; 2; ENTER	F02 = 2.00
↓; 30,000; ENTER	C03 = 30,000.00
↓; 2; ENTER	F03 = 2.00
NPV; 10; ENTER	I = 10
↓; CPT	NPV = 24,615.88

10-14. **Calculator Solution (using a Texas Instruments BA-II Plus):**

<u>Data and Key Input</u>	<u>Display</u>
CF0; -70,000; ENTER	CF0 = -70,000
↓; 30,000; ENTER	C01 = 30,000.00
↓; 3; ENTER	F01 = 3.00
↓; -30,000; ENTER	C02 = -30,000.00
↓; 1; ENTER	F02 = 1.00
↓; 30,000; ENTER	C03 = 30,000.00
↓; 2; ENTER	F03 = 2.00
NPV; 10; ENTER	I = 10
↓; CPT	NPV = 19,677.01

10-15. Step 1: Determine the TV_{inflows} and the PV_{outflows} :

$$PV_{\text{outflows}} = \frac{TV_{\text{inflows}}}{(1 + \text{MIRR})^n}$$

$$PV_{\text{outflows}} = 50,000 + 25,000 \frac{1}{(1 + 0.10)^4} = \$67,075$$

$$TV_{\text{inflows}} = \$25,000 (1 + 0.10)^5 + \$25,000 (1 + 0.10)^4 + \$25,000 (1 + 0.10)^3 + \$25,000 (1 + 0.10)^2 + \$25,000 (1 + 0.10)^1 + \$25,000 = 162,640$$

Step 2: Determine the *MIRR*

$$N = 6$$

$$\text{CPT I/Y} = 15.91\%$$

$$PV = -67,075$$

$$\text{PMT} = 0$$

$$FV = 162,640$$

10-16. PV_{inflows} :

$$I/Y = 10\%$$

$$\text{CPT PV} = -43,553$$

$$\text{PMT} = 10,000$$

$$\text{FV} = 0$$

$$PV_{\text{inflows}} \div PV_{\text{outflows}} = \$43,553 \div \$55,000 = 0.7919$$

The project should be rejected, and the NPV will be negative because the present value of the inflows is less than the present value of the outflows.

10-17. Initial Outlay = 150,000,000

Required rate of return = 12

Cash flows:

<i>Year</i>	<i>Cash flows</i>	<i>Discounted Cash flows</i>	<i>Cumulative Cash flows</i>
1	90,000,000	\$80,357,142.86	\$80,357,142.86
2	70,000,000	\$55,803,571.43	\$136,160,714.29
3	90,000,000	\$64,060,222.30	\$200,220,936.59
4	100,000,000	\$63,551,807.84	\$263,772,744.43

$$\text{Discounted Payback Period} = 2 + (\$150,000,000 - \$136,160,714) / \$64,060,222 \text{ years}$$

$$= 2 + \$13,839,286 / \$64,060,222 \text{ years}$$

$$= 2.216 \text{ years}$$

10-18. Initial Outlay = 50,000

Required rate of return = 10

Cash flows:

<i>Year</i>	<i>Cash flows</i>	<i>Discounted Cash flows</i>	<i>Cumulative Cash flows</i>
1	20,000	\$18,181.82	\$18,181.82
2	20,000	\$16,528.93	\$34,710.74
3	20,000	\$15,026.30	\$49,737.04
4	20,000	\$13,660.27	\$63,397.31

$$\text{Discounted Payback Period} = 3 + (\$50,000 - \$49,737) / \$13,660$$

$$= 3 + \$263 / \$13,660$$

$$= 3.0193 \text{ years}$$

10-19.

Years	0	1	2	3	4	5	6
Cash Flow (Thousands \$)	-100.00	30.00	35.00	25.00	25.00	30.00	20.00
Discounted Cash Flow	-100.00	27.03	28.41	18.28	16.47	17.80	10.69
Required Payback	-100.00	-72.97	-44.57	-26.29	-9.82		

Each year's cash flows are divided by $(1 + \text{the discount rate})$ taken to the power of the current year. Thus, payback will be accomplished during Year 5. Though it is unspecified during exactly what part of year 5 the cash inflows will occur, a division of the remaining 9.82 thousand dollars by the 17.80 thousand dollars of discounted cash yields a discounted payback period of roughly 4.55 years.

10-20. $N = 10$
 CPT I/Y = 17.52
 $PV = -800,000$
 $PMT = 175,000$
 $FV = 0$

10-21. $N = 20$
 CPT I/Y = 8.80
 $PV = 0$
 $PMT = -200$
 $FV = 10,000$

10-22. Step 1: Determine the Initial Outlay. To do this we need only determine how much cash flow will be paid back after 2.5 years, since 2.5 is the payback period. After two years, \$1,200 million will be paid back, and in year 3, \$300 million will be paid back. Thus after half of year 3, \$1,200 million plus $\frac{1}{2}$ of \$300 million (or \$150 million) will be paid back. That amounts to a total of \$1,350 million for the initial outlay.

Step 2: Determine the *IRR* (numbers entered in millions).

<u>Data and Key Input</u>	<u>Display</u>
CF; -1,350; ENTER	CF0 = -1,350.00
↓; 800; ENTER	C01 = 800.00
↓; 1; ENTER	F01 = 1.00
↓; 400; ENTER	C02 = 400.00
↓; 1; ENTER	F02 = 1.00
↓; 300; ENTER	C03 = 300.00
↓; 1; ENTER	F03 = 1.00
↓; 500; ENTER	C04 = 500.00
↓; 1; ENTER	F04 = 1.00
<i>IRR</i> ; CPT	<i>IRR</i> = 20.41

10-23.

Initial Outlay = 100,000

Discount rate = 10%

Cash flows:

<i>Year</i>	<i>Cash Flows</i>	<i>Discounted Cash flows</i>	<i>Cumulative Cash flows</i>
1	20,000	\$18,181.82	\$18,181.82
2	60,000	\$49,586.78	\$67,768.60
3	70,000	\$52,592.04	\$120,360.63
4	50,000	\$34,150.67	\$154,511.30
5	40,000	\$24,836.85	\$179,348.16

$$\begin{aligned}
 \text{Discounted Payback Period} &= 2 + (\$100,000 - \$67,769)/\$52,592 \\
 &= 2 + \$32,231/\$52,592 \\
 &= 2.6128 \text{ years}
 \end{aligned}$$

10-24. **Solution (using a Texas Instruments BA-II Plus):**

Cash flows entered in millions of dollars

<u>Data and Key Input</u>	<u>Display</u>
CF; -7; ENTER	CF0 = -7.00
↓; 3; ENTER	C01 = 3.00
↓; 1; ENTER	F01 = 1.00
↓; 4; ENTER	C02 = 4.00
↓; 1; ENTER	F02 = 1.00
↓; 2; ENTER	C03 = 2.00
↓; 3; ENTER	F03 = 3.00
IRR; CPT	IRR = 14.53

10-25. Step 1: Determine the TV_{inflows} and the PV_{outflows} :

$$PV_{\text{outflows}} = \frac{TV_{\text{inflows}}}{(1 + MIRR)^n}$$

$$PV_{\text{outflows}} = 400,000 + 200,000 \frac{1}{(1 + 0.12)^7} = \$490,470$$

$$TV_{\text{inflows}} = \$150,000 (1 + 0.12)^6 + \$15,000 (1 + 0.10)^5 + \$150,000 (1 + 0.10)^4 + \$150,000 (1 + 0.10)^3 + \$150,000 (1 + 0.10)^2 = \$1,195,352$$

Step 2: Determine the $MIRR$

$$N = 7$$

$$\text{CPT I/Y} = 13.57\%$$

$$PV = -490,470$$

$$\text{PMT} = 0$$

$$\text{FV} = 1,195,352$$

$$\begin{aligned}
 10-26. (a) \quad PV_{\text{outflows}} &= \frac{TV_{\text{inflows}}}{(1 + MIRR)^n} \\
 \$8,000,000 &= \frac{\$2,000,000(FVIFA_{10\%, 8 \text{ years}})}{(1 + MIRR)^8} \\
 \$8,000,000 &= \frac{\$2,000,000(11.436)}{(1 + MIRR)^8} \\
 \$8,000,000 &= \frac{\$22,872,000}{(1 + MIRR)^8} \\
 MIRR &= 14.0320\%
 \end{aligned}$$

$$\text{b) } \$8,000,000 = \frac{\$2,000,000(FVIFA_{12\%, 8 \text{ years}})}{(1 + MIRR)^8}$$

$$\$8,000,000 = \frac{\$2,000,000(12.300)}{(1 + MIRR)^8}$$

$$\$8,000,000 = \frac{\$24,600,000}{(1 + MIRR)^8}$$

$$MIRR = 15.0749\%$$

$$\text{c) } \$8,000,000 = \frac{\$2,000,000(FVIFA_{14\%, 8 \text{ years}})}{(1 + MIRR)^8}$$

$$\$8,000,000 = \frac{\$2,000,000(13.233)}{(1 + MIRR)^8}$$

$$\$8,000,000 = \frac{\$26,466,000}{(1 + MIRR)^8}$$

$$MIRR = 16.1312\%$$

10-27. a.

<u>Project</u>	<u>Cost</u>	<u>Profitability Index</u>	<u>Present Value of Future Cash Flows</u>	<u>NPV</u>
A	\$4,000,000	1.18	\$4,720,000	\$ 720,000
B	3,000,000	1.08	3,240,000	240,000
C	5,000,000	1.33	6,650,000	1,650,000
D	6,000,000	1.31	7,860,000	1,860,000
E	4,000,000	1.19	4,760,000	760,000
F	6,000,000	1.20	7,200,000	1,200,000
G	4,000,000	1.18	4,720,000	720,000

Combinations with Total Costs Below \$12,000,000

<u>Projects</u>	<u>Costs</u>	<u>NPV</u>
A&B	\$ 7,000,000	\$ 960,000
A&C	9,000,000	2,370,000
A&D	10,000,000	2,580,000
A&E	8,000,000	1,480,000
A&F	10,000,000	1,920,000
A&G	8,000,000	1,440,000
B&C	8,000,000	1,890,000
B&D	9,000,000	2,100,000
B&E	7,000,000	1,000,000
B&F	9,000,000	1,440,000
B&G	7,000,000	960,000
C&D	11,000,000	3,510,000
C&E	9,000,000	2,410,000
C&F	11,000,000	2,850,000
C&G	9,000,000	2,370,000
D&E	10,000,000	2,620,000
D&F	12,000,000	3,060,000
D&G	10,000,000	2,580,000
E&F	10,000,000	1,960,000
E&G	8,000,000	1,480,000
F&G	10,000,000	1,920,000
A&B&C	12,000,000	2,610,000
A&B&E	11,000,000	1,720,000
A&B&G	11,000,000	1,680,000
A&E&G	12,000,000	2,200,000
B&C&E	12,000,000	2,650,000
B&C&G	12,000,000	2,610,000

Thus, projects C&D should be selected under strict capital rationing as they provide the combination of projects with the highest net present value.

- b. Because capital rationing forces the rejection of profitable projects, it is not an optimal strategy.

10-28. Take the set of projects that maximizes *NPV* given the production facility constraints. Thus, Projects C and D should be taken because together use 100 percent of the production facilities and have a combined *NPV* of \$110.

10-29. Calculator Solution (using a Texas Instruments BA-II Plus):

Project A:

<u>Data and Key Input</u>	<u>Display</u>
CF0; -100,000; ENTER	CF0 = -100,000
↓; 32,000; ENTER	C01 = 32,000.00
↓; 5; ENTER	F01 = 5.00
NPV; 10; ENTER	I = 10
↓; CPT	NPV = 25,096

Project B:

<u>Data and Key Input</u>	<u>Display</u>
CF0; -100,000; ENTER	CF0 = -100,000
↓; 0; ENTER	C01 = 0.00
↓; 4; ENTER	F01 = 4.00
↓; 220,000; ENTER	C02 = 220,000.00
↓; 1; ENTER	F02 = 1.00
NPV; 10; ENTER	I = 10
↓; CPT	NPV = 36,603

Choose project B because it has the highest *NPV*.

$$\begin{aligned}
 10-30. \text{ a. } NPV_A &= \frac{\$700}{(1 + 0.10)^1} - \$500 \\
 &= \$636.30 - \$500 \\
 &= \$136.30 \\
 NPV_B &= \frac{\$6,000}{(1 + 0.10)^1} - \$5,000 \\
 &= \$5,455 - \$5,000 \\
 &= \$455 \\
 \text{b. } PI_A &= \frac{\$636.30}{\$500.00} \\
 &= 1.2726 \\
 PI_B &= \frac{\$5,455}{\$5,000} \\
 &= 1.0910
 \end{aligned}$$

c.

$$\begin{aligned} N &= 1 \\ \text{CPT I/Y} &= 40.0\% \\ PV &= -500 \\ PMT &= 0 \\ FV &= 700 \end{aligned}$$

$$\text{Thus, } IRR_A = 40\%$$

$$\begin{aligned} N &= 1 \\ \text{CPT I/Y} &= 20.0\% \\ PV &= -5,000 \\ PMT &= 0 \\ FV &= 6,000 \end{aligned}$$

$$\text{Thus, } IRR_B = 20\%$$

- d. If there is no capital rationing, project B should be accepted because it has a larger net present value. If there is a capital constraint, the problem then focuses on what can be done with the additional \$4,500 freed up if project A is chosen. If Dorner Farms can earn more on project A, plus the project financed with the additional \$4,500, than it can on project B, then project A and the marginal project should be accepted.

- 10-31. a. Payback A = 3.2 years
Payback B = 4.5 years
B assumes even cash flow throughout year 5.

b.

$$\begin{aligned} NPV_A &= \sum_{t=1}^5 \frac{\$15,625}{(1+0.10)^t} - \$50,000 \\ &= \$15,625 (3.791) - \$50,000 \\ &= \$59,234 - \$50,000 \\ &= \$9,234 \\ NPV_B &= \frac{\$100,000}{(1+0.10)^5} - \$50,000 \\ &= \$100,000 (0.621) - \$50,000 \\ &= \$62,100 - \$50,000 \\ &= \$12,100 \end{aligned}$$

c. Project A:

$$N = 5$$

$$\text{CPT I/Y} = 16.99\%$$

$$PV = -50,000$$

$$PMT = 15,625$$

$$FV = 0$$

$$\text{Thus, } IRR_A = 16.99\%$$

Project B:

$$N = 5$$

$$\text{CPT I/Y} = 14.87\%$$

$$PV = -50,000$$

$$PMT = 0$$

$$FV = 100,000$$

$$\text{Thus, } IRR_B = 14.87\%$$

- d. The conflicting rankings are caused by the differing reinvestment assumptions made by the *NPV* and *IRR* decision criteria. The *NPV* criteria assumes that cash flows over the life of the project can be reinvested at the required rate of return or cost of capital, while the *IRR* criterion implicitly assumes that the cash flows over the life of the project can be reinvested at the internal rate of return.
- e. Project B should be taken because it has the largest *NPV*. The *NPV* criterion is preferred because it makes the most acceptable assumption for the wealth-maximizing firm.

10-32.

NPV Project 1									
Years	0	1	2	3	4	5	6	7	
Cash Flow (Thousands \$)	-1000.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	
Discount Rate	1.00	1.10	1.21	1.33	1.46	1.61	1.77	1.95	
Discounted Cash Flow	-1000.00	227.27	206.61	187.83	170.75	155.23	141.12	128.29	
(Continued)									
Years	8	9	10	11	12	13	14	15	16
Cash Flow (Thousands)	-750.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
Discount Rate	2.14	2.36	2.59	2.85	3.14	3.45	3.80	4.18	4.59
Discounted Cash Flow	-349.88	106.02	96.39	87.62	79.66	72.42	65.83	59.85	54.41
NPV (Sum of Discounted Cash Flows)			489.42						

It is worth noting the cash flow of year 8, which is a combination of an outflow of \$1,000,000 for the second remodeling and an inflow of the final \$250,000 from the first remodeling.

NPV Project 2									
Years	0	1	2	3	4	5	6	7	
Cash Flow (Thousands \$)	–1000.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	
Discount Rate	1.00	1.10	1.21	1.33	1.46	1.61	1.77	1.95	
Discounted Cash Flow	–1000.00	159.09	144.63	131.48	119.53	108.66	98.78	89.80	
(Continued)									
Years	8	9	10	11	12	13	14	15	16
Cash Flow (Thousands)	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00	175.00
Discount Rate	2.14	2.36	2.59	2.85	3.14	3.45	3.80	4.18	4.59
Discounted Cash Flow	81.64	74.22	67.47	61.34	55.76	50.69	46.08	41.89	38.09
NPV (Sum of Discounted Cash Flows)			369.15						

10-33. The first step is to calculate the *NPV* of the project. In doing so, we come up with the following *NPV* for Project 1.

NPV Project 1									
Years	0	1	2	3	4	5	6	7	8
Cash Flow (Thousands \$)	–50.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
Discount Rate	1.00	1.10	1.21	1.33	1.46	1.61	1.77	1.95	2.14
Discounted Cash Flow	–50.00	14.55	13.22	12.02	10.93	9.93	9.03	8.21	7.46
NPV (Sum of Discounted Cash Flows)			35.36						

With an *NPV* of \$35.36 thousand dollars, we then determine the level of an annuity cash flow that would produce the same *NPV* as the project:

$$\begin{aligned}
 N &= 8 \\
 I/Y &= 10 \\
 PV &= -35,360 \\
 \text{CPT PMT} &= \mathbf{6,628} \\
 FV &= 0
 \end{aligned}$$

The same process is then repeated for the second project.

NPV Project 2							
Years	0	1	2	3	4	5	6
Cash Flow (Thousands)	-78.00	23.00	23.00	23.00	23.00	23.00	23.00
Discount Rate	1.00	1.10	1.21	1.33	1.46	1.61	1.77
Discounted Cash Flow	-78.00	20.91	19.01	17.28	15.71	14.28	12.98
(Continued)							
Years	7	8	9	10	11		
Cash Flow (Thousands \$)	23.00	23.00	23.00	23.00	23.00		
Discount Rate	1.95	2.14	2.36	2.59	2.85		
Discounted Cash Flow	11.80	10.73	9.75	8.87	8.06		
NPV (Sum of Discounted Cash Flows)			71.39				

With an *NPV* of \$71.39 thousand dollars, we then determine the level of an annuity cash flow that would produce the same *NPV* as the project:

$$\begin{aligned}
 N &= 11 \\
 I/Y &= 10 \\
 PV &= -71,390 \\
 \mathbf{CPT\ PMT} &= \mathbf{10,991} \\
 FV &= 0
 \end{aligned}$$

Thus pick project 2.

SOLUTION TO MINI CASE

- a. Capital-budgeting decisions involve investments requiring rather large cash outlays at the beginning of the life of the project and commit the firm to a particular course of action over a relatively long time horizon. As such, they are both costly and difficult to reverse because of: (1) their large cost, and (2) the fact that they involve fixed assets, which cannot be liquidated easily.
- b. Axiom 5: “The Curse of Competitive Markets—Why It’s Hard to Find Exceptionally Profitable Projects” deals with the problems associated with finding profitable projects. When we introduced that axiom, we stated that exceptionally successful investments involve the reduction of competition by creating barriers to entry through either product differentiation or cost advantages. In effect, without barriers to entry, whenever extremely profitable projects are found, competition rushes in, driving prices and profits down unless there is some barrier to entry.

$$\text{c. Payback period}_A = 3 \text{ years} + \frac{20,000}{50,000} \text{ years} = 3.4 \text{ years}$$

$$\text{Payback Period}_B = \frac{110,000}{40,000} \text{ years} = 2.75 \text{ years}$$

Project B should be accepted, while project A should be rejected.

- d. The disadvantages of the payback period are: (1) it ignores the time value of money; (2) it ignores cash flows occurring after the payback period; and (3) the selection of the maximum acceptable payback period is arbitrary.

$$\begin{aligned} \text{e. } NPV_A &= \sum_{t=1}^n \frac{FCF_t}{(1+k)^t} - IO \\ &= \frac{\$20,000}{(1+0.12)^1} + \frac{\$30,000}{(1+0.12)^2} + \frac{\$40,000}{(1+0.12)^3} + \frac{\$50,000}{(1+0.12)^4} \\ &\quad + \frac{\$70,000}{(1+0.12)^5} - \$110,000 \\ &= \$17,857 + \$23,916 + \$28,471 + \$31,776 + \$39,720 - \$110,000 \\ &= \$141,740 - \$110,000 \\ &= \$31,740 \\ \\ NPV_B &= \sum_{t=1}^n \frac{\$40,000}{(1+0.12)^t} - \$110,000 \\ &= \$40,000(3.605) - \$110,000 \\ &= \$144,191 - \$110,000 \\ &= \$34,191 \end{aligned}$$

Both projects should be accepted.

- f. The net present value technique discounts all the benefits and costs in terms of cash flows back to the present and determines the difference. If the present value of the benefits outweighs the present value of the costs, the project is accepted; if not, it is rejected.

$$\begin{aligned}
 \text{g. } PI_A &= \frac{\left(\frac{\sum_{t=1}^n FCF_t}{(1+k)^t} \right)}{IO} \\
 &= \frac{\$141,740}{\$110,000} \\
 &= 1.2885 \\
 PI_B &= \frac{\$144,200}{\$110,000} \\
 &= 1.3109
 \end{aligned}$$

Both projects should be accepted

- h. The net present value and the profitability index always give the same accept-reject decision. When the present value of the benefits outweighs the present value of the costs, the profitability index is greater than one, and the net present value is positive. In that case, the project should be accepted. If the present value of the benefits is less than the present value of the costs, then the profitability index will be less than one; thus, the net present value will be negative, and the project will be rejected.
- i. For both projects A and B, all of the costs are already in present dollars and, as such, will not be affected by any change in the required rate of return or discount rate. All the benefits for these projects are in the future, and thus when there is a change in the required rate of return or discount rate, their present value will change. If the required rate of return increased, the present value of the benefits would decline which would in turn result in a decrease in both the net present value and the profitability index for each project.
- j. $IRR_A = 20.9698\%$
 $IRR_B = 23.9193\%$
- k. The required rate of return does not change the internal rate of return for a project, but it does affect whether a project is accepted or rejected. The required rate of return is the hurdle rate that the project's *IRR* must exceed in order to accept the project.
- l. The net present value assumes that all cash flows over the life of the project are reinvested at the required rate of return, while the internal rate of return implicitly assumes that all cash flows over the life of the project are reinvested over the remainder of the project's life at the *IRR*. The net present value method makes the most acceptable and conservative assumption and, thus, is preferred.

$$\text{m. } 1. \quad NPV_A = \frac{\$240,000}{(1 + 0.10)^1} - \$195,000$$

$$= \$218,182 - \$195,000$$

$$= \$23,182$$

$$NPV_B = \frac{\$1,650,000}{(1 + 0.10)^1} - \$1,200,000$$

$$= \$1,500,000 - \$1,200,000$$

$$= \$300,000$$

$$2. \quad PI_A = \frac{\$218,182}{\$195,000}$$

$$= 1.1188$$

$$PI_B = \frac{\$1,499,850}{\$1,200,000}$$

$$= 1.25$$

$$3. \quad \$195,000 = \$240,000 [PVIF_{IRR_A\%, 1 \text{ yr}}]$$

$$0.8125 = PVIF_{IRR_A\%, 1 \text{ yr}}$$

$$\text{Thus, } IRR_A = 23\%$$

$$\$1,200,000 = \$1,650,000 [PVIF_{IRR_B\%, 1 \text{ yr}}]$$

$$0.7273 = [PVIF_{IRR_B\%, 1 \text{ yr}}]$$

$$\text{Thus, } IRR_B = 38\%$$

4. If there is no capital rationing, project B should be accepted because it has a larger net present value. If there is a capital constraint, the problem then focuses on what can be done with the additional \$1,005,000 freed up if project A is chosen. If Caledonia can earn more on project A, plus the project financed with the additional \$1,005,000, than it can on project B, then project A and the marginal project should be accepted.

n.

$$1. \quad \text{Payback A} = 3.125 \text{ years}$$

$$\text{Payback B} = 4.5 \text{ years}$$

B assumes even cash flow throughout year 5.

$$\begin{aligned} 2. \quad NPV_A &= \sum_{t=1}^5 \frac{\$32,000}{(1 + 0.11)^t} - \$100,000 \\ &= \$32,000 (3.696) - \$100,000 \\ &= \$118,272 - \$100,000 \\ &= \$18,272 \end{aligned}$$

$$\begin{aligned} NPV_B &= \frac{\$200,000}{(1 + 0.11)^5} - \$100,000 \\ &= \$200,000 (0.593) - \$100,000 \\ &= \$118,600 - \$100,000 \\ &= \$18,600 \end{aligned}$$

$$3. \quad \$100,000 = \$32,000 [PVIFA_{IRR_A\%, 5 \text{ yrs}}]$$

$$3.125 = PVIFA_{IRR_A\%, 5 \text{ yrs}}$$

$$\text{Thus, } IRR_A = 18.03\%$$

$$\$100,000 = \$200,000 [PVIF_{IRR_B\%, 5 \text{ yrs}}]$$

$$0.50 = PVIF_{IRR_B\%, 5 \text{ yrs}}$$

Thus, IRR_B is just under 15 percent (14.87 percent).

4. The conflicting rankings are caused by the differing reinvestment assumptions made by the NPV and IRR decision criteria. The NPV criteria assume that cash flows over the life of the project can be reinvested at the required rate of return or cost of capital, while the IRR criterion implicitly assumes that the cash flows over the life of the project can be reinvested at the internal rate of return.
5. Project B should be taken because it has the largest NPV . The NPV criterion is preferred because it makes the most acceptable assumption for the wealth-maximizing firm.

CHAPTER 11

Cash Flows and Other Topics in Capital Budgeting

CHAPTER ORIENTATION

Capital budgeting involves the decision-making process with respect to investment in fixed assets; specifically, it involves measuring the incremental cash flows associated with investment proposals and evaluating the attractiveness of these cash flows relative to the project's cost. This chapter focuses on the estimation of those cash flows based on various decision criteria, and how to adjust for the riskiness of a given project or combination of projects.

CHAPTER OUTLINE

- I. What criteria should we use in the evaluation of alternative investment proposals?
 - A. Use cash flows rather than accounting profits, because cash flows allow us to analyze the time element of the flows correctly.
 - B. Examine cash flows on an after-tax basis, because they are the flows available to shareholders.
 - C. Include only the incremental cash flows resulting from the investment decision. Ignore all other flows.
- II. Measure cash flows. We are interested in measuring the incremental after-tax cash flows resulting from the investment proposal. In general, there will be three major sources of cash flows: initial outlays, differential cash flows over the project's life, and terminal cash flows.
 - A. Initial outlays include whatever cash flows are necessary to get the project in running order, for example:
 - 1. The installed cost of the asset
 - 2. In the case of a replacement proposal, the selling price of the old machine plus (or minus) any tax gain (or loss) offsetting the initial outlay

3. Any expense items (for example, training) necessary for the operation of the proposal
 4. Any other non-expense cash outlays required, such as increased working-capital needs
- B. Differential cash flows over the project's life include the incremental after-tax flows over the life of the project, for example:
1. Added revenue (less added selling expenses) for the proposal
 2. Any labor and/or material savings incurred
 3. Increases in overhead incurred
 4. These values are measured on an after-tax basis, thus allowing for the tax savings (or loss) from incremental increase (or decrease) in depreciation to be included.
 5. A word of warning not to include financing charges (such as interest or preferred stock dividends), for they are implicitly taken care of in the discounting process.
- C. Terminal cash flows include any incremental cash flows that result at the termination of the project, for example:
1. The project's salvage value plus (or minus) any taxable gains or losses associated with the project
 2. Any terminal cash flow needed, and perhaps disposal of obsolete equipment
 3. Recovery of any non-expense cash outlays associated with the project, such as recovery of increased working-capital needs associated with the proposal
- D. Measuring the cash flows.
- E. A project's free cash flows =
- $$\begin{aligned} & \text{project's change in operating cash flows} \\ & - \text{change in net working capital} \\ & - \text{change in capital spending} \end{aligned}$$
- F. If we rewrite this, inserting the calculations for the project's change in operating cash flows, we get:
- $$\begin{aligned} & \text{A project's free cash flows} = \\ & \text{Change in earnings before interest and taxes} \\ & - \text{change in taxes} \\ & + \text{change in depreciation} \\ & - \text{change in net working capital} \\ & - \text{change in capital spending} \end{aligned}$$

III. Options in Capital Budgeting.

Options in capital budgeting deal with the opportunity to modify the project. Three of the most common types of options that can add value to a capital budgeting project are: (1) the option to delay a project until the future cash flows are more favorable—this option is common when the firm has exclusive rights, perhaps a patent, to a product or technology; (2) the option to expand a project, perhaps in size or even to new products that would not have otherwise been feasible; and (3) the option to abandon a project if the future cash flows fall short of expectations.

IV. Risk and the investment decision

- A. Up to this point, we have treated the expected cash flows resulting from an investment proposal as being known with perfect certainty. We will now introduce risk.
- B. The riskiness of an investment project is defined as the variability of its cash flows from the expected cash flow.
- C. Incorporating risk into capital budgeting
 1. The use of the risk-adjusted discount rate is based on the concept that investors demand higher returns for more risky projects.
 - a. If the risk associated with the investment is greater than the risk involved in a typical endeavor, then the discount rate is adjusted upward to compensate for this risk.
 - b. The expected cash flows are then discounted back to the present at the risk-adjusted discount rate. Then the normal capital-budgeting criteria are applied, except in the case of the internal rate of return, in which case the hurdle rate to which the project's internal rate of return is compared now becomes the risk-adjusted discount rate.
 - c. Expressed mathematically, the net present value using the risk-adjusted discount rate becomes

$$NPV = \sum_{t=1}^n \frac{FCF_t}{(1+k^*)^t} - IO$$

where FCF_t = the annual free
 k^* = the risk-adjusted discount rate
 n = the project's expected life

D. Methods for measuring a project's systematic risk

1. Theoretically, we know that systematic risk is the “priced” risk, the risk that affects the stock's market price, and the appropriate risk with which to be concerned. However, if there are bankruptcy costs (which are assumed away by the CAPM), if there are undiversified shareholders who are concerned with more than just systematic risk, if there are factors that affect a security's price beyond what the CAPM suggests, or if we are unable to measure the project's systematic risk confidently, then the project's individual risk carries relevance. In general, a

project's individual risk is highly correlated with the project's systematic risk, making it a reasonable proxy to use.

2. In spite of problems in confidently measuring an individual firm's level of systematic risk, if the project appears to be a typical for the firm, then using the CAPM to determine the appropriate risk-return trade-offs, and judging the project against them may be a warranted approach.
3. If the project is not a typical project, we are without historical data and must either estimate the beta using accounting data or use the pure-play method for estimating beta.
 - a. Using historical accounting data to substitute for historical price data in estimating systematic risk: To estimate a project's beta using accounting data we need only run a time-series regression of the division's return on assets on the market index. The regression coefficient from this equation would be the project's accounting beta and serves as an approximation for the project's true beta.
 - b. The pure-play method for estimating a project's beta: The pure-play method attempts to find a publicly traded firm in the same industry as the capital-budgeting project. Once the proxy or pure-play firm is identified, its systematic risk is determined and then used as a proxy for the project's systematic risk.

E. Examining a project's risk through simulation

1. A simulation imitates the performance of the project being evaluated by randomly selecting observations from each of the distributions that affect the outcome of the project, combining those observations to determine the final output of the final project, and continuing with this process until a representative record of the project's probable outcome is assembled.
 - a. The firm's management then examines the resultant probability distribution, and if management believes enough of the distribution lies above the normal cutoff criterion, it will accept the project.
 - b. The use of a simulation approach to analyze investment proposals offers two major advantages:
 - (1). The financial managers are able to examine and base their decisions on the whole range of possible outcomes rather than just point estimates.
 - (2). They can undertake subsequent sensitivity analysis of the project.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 11-1. We focus on cash flows rather than accounting profits because these are the flows that the firm receives and can reinvest. Only by examining cash flows are we able to analyze the timing of the benefit or cost correctly. Also, we are only interested in these cash flows on an after-tax basis, as only those flows are available to the shareholder. In addition, it is only the incremental cash flows that interest us because, looking at the project from the point of the company as a whole, the incremental cash flows are the marginal benefits from the project and, as such, are the increased value to the firm from accepting the project.
- 11-2. Although depreciation is not a cash flow item, it does affect the level of the differential cash flows over the project's life because of its effect on taxes. Depreciation is an expense item, and the more depreciation incurred, the larger the expenses. Thus, accounting profits become lower, and in turn so do taxes, which are a cash flow item.
- 11-3. If a project requires an increased investment in working capital, the amount of this investment should be considered as part of the initial outlay associated with the project's acceptance. Since this investment in working capital is never "consumed," an offsetting inflow of the same size as the working capital's initial outlay will occur at the termination of the project, corresponding to the recapture of this working capital. In effect, only the time value of money associated with the working capital investment is lost.
- 11-4. When evaluating a capital-budgeting proposal, sunk costs are ignored. We are only interested in the incremental after-tax cash flows to the company as a whole. Regardless of the decision made on the investment at hand, the sunk costs will have already occurred, which means these are not incremental cash flows. Hence, they are irrelevant.
- 11-5. The payback period method is frequently used as a rough risk-screening device to eliminate projects whose returns do not materialize until later years. In this way, the earliest returns are emphasized, which, in all likelihood, have less uncertainty surrounding them.
- 11-6. Large restaurant chains are willing to introduce prototype restaurants with negative net present values because they are looking for winning combinations of food, ambiance, cost, and style. If the restaurant does not pan out, they simply do not build additional similar restaurants. If they come up with a winning combination, they can then build additional similar restaurants or franchise that winning combination. This is an example of the real option to expand.
- 11-7. The idea behind simulation is to imitate the performance of the project being evaluated. This is done by randomly selecting observations from each of the distributions that affect the outcome of the project, combining each of those observations and determining the final outcome of the project, and continuing with this process until a representative record of the project's probable outcome is assembled. In effect, the output from a simulation is a probability distribution of net present values or internal

rates of return for the project. The decision maker then bases his/her decision on the full range of possible outcomes.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

11-1. New Sales \$25,000,000

Less: Sales taken from existing product lines		$\underline{- 5,000,000}$
		\$20,000,000

- 11-2. a. The \$10 million spend on research and development should be considered a sunk cost and not be included in the analysis. Regardless of whether the project is accepted or rejected, that cash flow will stand.
- b. The \$3 million from the sale of the old equipment should be considered an inflow at $t = 0$ and should offset some of the initial outlay.
- c. The initial outlay would be \$19 million, and the annual free cash flow for years 1 through 10 would be \$5 million per year.

11-3.

- (a) Tax payments associated with the sale: for \$35,000

Recapture of depreciation
 $= (\$35,000 - \$15,000) (0.34) = \$6,800$

- (b) Tax payments associated with sale for \$25,000

Recapture of depreciation
 $= (\$25,000 - \$15,000) (0.34) = \$3,400$

- (c) No taxes, because the machine would have been sold for its book value.

- (d) Tax savings from sale below book value:

Tax savings
 $= (\$15,000 - \$12,000) (0.34) = \$1,020$

- 11-4. Change in net working capital equals the increase in accounts receivable and inventory less the increase in accounts payable $= \$18,000 + \$15,000 - \$24,000 = \$9,000$.

The change in taxes will be $\text{EBIT} \times \text{marginal tax rate} = \$475,000 \times 0.34 = \$161,500$.

A project's free cash flows =

$$\begin{aligned}
 & \text{Change in earnings before interest and taxes} \\
 & - \text{change in taxes} \\
 & + \text{change in depreciation} \\
 & - \text{change in net working capital} \\
 & - \text{change in capital spending} \\
 \\
 & = \$475,000 \\
 & - \$161,500 \\
 & + \$100,000 \\
 & - \$9,000 \\
 & \quad \$0 \\
 & = \underline{\$404,500}
 \end{aligned}$$

- 11-5. Change in net working capital equals the increase in accounts receivable and inventory less the increase in accounts payable = $\$30,000 + (-\$20,000) - \$15,000 = -\$5,000$.

The change in taxes will be $\text{EBIT} \times \text{marginal tax rate} = \$900,000 \times 0.34 = \$306,000$.

A project's free cash flows =

$$\begin{aligned}
 & \text{Change in earnings before interest and taxes} \\
 & - \text{change in taxes} \\
 & + \text{change in depreciation} \\
 & - \text{change in net working capital} \\
 & - \text{change in capital spending} \\
 \\
 & = \$900,000 \\
 & - \$306,000 \\
 & + \$300,000 \\
 & - (-\$5,000) \\
 & - \$0 \\
 & = \underline{\$899,000}
 \end{aligned}$$

- 11-6. Given this, the firm's net profit after tax can be calculated as:

Revenue	\$2,000,000
- Cash expenses	800,000
- Depreciation	<u>200,000</u>
= EBIT	\$1,000,000
- Taxes (34%)	<u>340,000</u>
= Net income	<u>\$660,000</u>

OCF Calculation: Pro Forma Approach

$$\begin{aligned}
 \text{Operating Cash Flows} &= \text{Change in Earnings Before Interest and Taxes} - \text{Change in Taxes} \\
 &\quad + \text{Change in Depreciation} \\
 &= \$1,000,000 - \$340,000 + \$200,000 = \$860,000
 \end{aligned}$$

Alternative OCF Calculation 1: Add Back Approach

$$\begin{aligned}\text{Operating Cash Flows} &= \text{Net income} + \text{Depreciation} \\ &= \$660,000 + \$200,000 = \$860,000\end{aligned}$$

Alternative OCF Method 2: Definitional Approach

$$\begin{aligned}\text{Operating Cash Flows} &= \text{Change in revenues} - \text{Change in cash expenses} - \text{Change in Taxes} \\ &= \$2,000,000 - \$800,000 - \$340,000 = \$860,000\end{aligned}$$

Alternative OCF Method 3: Depreciation Tax Shield Approach

$$\begin{aligned}\text{Operating Cash Flows} &= (\text{Revenues} - \text{cash expenses}) \times (1 - \text{tax rate}) + (\text{change in} \\ &\quad \text{depreciation} \times \text{tax rate}) \\ &= (\$2,000,000 - \$800,000) \times (1 - 0.34) + (\$200,000 \times 0.34) = \\ &\quad \$860,000\end{aligned}$$

You'll notice that interest payments are nowhere to be found, that's because we ignore them when we're calculating operating cash flows. You'll also notice that we end up with the same answer regardless of how we work the problem.

11-7.

(a) Initial Outlay

Outflows:

Purchase price	\$1,000,000
Increased Inventory	<u>50,000</u>
Net Initial Outlay	\$1,050,000

(b) Differential annual cash flows (years 1–9)

First, given this, the firm's net profit after tax can be calculated as:

Revenue	\$1,000,000
– Cash expenses	560,000
– Depreciation*	<u>100,000</u>
= EBIT	\$340,000
– Taxes (34%)	<u>115,600</u>
= Net income	<u>\$224,400</u>

A project's free cash flows =

- Change in earnings before interest and taxes
- change in taxes
- + change in depreciation
- change in net working capital
- change in capital spending

$$\begin{aligned}
 &= \$340,000 \\
 &- \$115,600 \\
 &+ \$100,000^* \\
 &- \$0 \\
 &- \$0 \\
 &= \underline{\underline{\$324,400}}
 \end{aligned}$$

*Annual Depreciation on the new machine is calculated by taking the purchase price (\$1,000,000) and adding in costs necessary to get the new machine in operating order (in this case \$0) and dividing by the expected life.

(c) Terminal Cash flow (year 10)

Inflows:

Free Cash flow in year 10	\$324,400
Recapture of working capital (inventory)	<u>50,000</u>
Total terminal cash flow	\$374,400

$$\begin{aligned}
 \text{(d)} \quad NPV &= \$324,400 \left[\frac{1 - \frac{1}{(1+0.10)^9}}{0.10} \right] + \$374,400 \left(\frac{1}{(1+0.10)^{10}} \right) - \$1,050,000 \\
 &= \$324,400 (5.759) + \$374,400 (0.386) - \$1,050,000 \\
 &= \$1,868,220 + \$144,518 - \$1,050,000 \\
 &= \$962,738
 \end{aligned}$$

11-8. (a) Initial Outlay

Outflows:

Purchase price	\$5,000,000
Increased Inventory	<u>1,000,000</u>
Net Initial Outlay	\$6,000,000

(b) Differential annual cash flows (years 1–4)

First, given this, the firm's net profit after tax can be calculated as:

Revenue	\$5,000,000
– Cash expenses	3,500,000
– Depreciation*	<u>1,000,000</u>
= EBIT	\$500,000
– Taxes (34%)	<u>170,000</u>
= Net income	<u>\$330,000</u>

A project's free cash flows =

Change in earnings before interest and taxes	
– change in taxes	
+ change in depreciation	
– change in net working capital	
– change in capital spending	
= \$500,000	
– \$170,000	
+ \$1,000,000*	
– \$0	
– \$0	
= <u>\$1,330,000</u>	

*Annual Depreciation on the new machine is calculated by taking the purchase price (\$1,000,000) and adding in costs necessary to get the new machine in operating order (\$0) and dividing by the expected life.

(c) Terminal Cash flow (year 10)

Inflows:

Free Cash flow in year 10	\$1,330,000
Recapture of working capital (inventory)	<u>1,000,000</u>
Total terminal cash flow	\$2,330,000

$$\begin{aligned}
 \text{(d)} \quad NPV &= \$1,330,000 \left[\frac{1 - \frac{1}{(1 + 0.10)^4}}{0.10} \right] (PVIFA_{10\%, 4 \text{ yr}}) + \\
 &\quad \$2,330,000 \left(\frac{1}{(1 + 0.10)^5} \right) - \$6,000,000 \\
 &= \$1,330,000 (3.170) + \$2,330,000 (0.621) - \$6,000,000 \\
 &= \$4,216,100 + \$1,446,930 - \$6,000,000 \\
 &= -\$336,970
 \end{aligned}$$

11-9. (a) Initial Outlay

Outflows:

Purchase price	\$100,000
Installation Fee	5,000
Increased Working Inventory	<u>5,000</u>
Net Initial Outlay	\$110,000

(b) Differential annual free cash flows (years 1–9)

A project's free cash flows =

- Change in earnings before interest and taxes
- change in taxes
- + change in depreciation
- change in net working capital
- change in capital spending

$$\begin{aligned}
 &= \$35,000 \\
 &- \$11,900 \\
 &+ \$10,500^* \\
 &- \$0 \\
 &- \$0 \\
 &= \underline{\$33,600}
 \end{aligned}$$

* Annual Depreciation on the new machine is calculated by taking the purchase price (\$100,000) and adding in costs necessary to get the new machine in operating order (the installation fee of \$5,000) and dividing by the expected life.

(c) Terminal Free Cash flow (year 10)

Inflows:

Free Cash flow in year 10	\$33,600
Recapture of working capital (inventory)	<u>5,000</u>
Total terminal cash flow	\$ 38,600

$$\begin{aligned}
 \text{(d) } NPV &= \$33,600 \left[\frac{1 - \frac{1}{(1+0.15)^9}}{0.15} \right] + \$38,600 \left(\frac{1}{(1+0.15)^{10}} \right) - \$110,000 \\
 &= \$33,600 (4.772) + \$38,600 (0.247) - \$110,000 \\
 &= \$160,339.20 + \$9,534.20 - \$110,000 \\
 &= \$59,873.40
 \end{aligned}$$

Yes, the $NPV > 0$.

11-10. (a) Initial Outlay

Outflows:

Purchase price	\$ 500,000
Installation Fee	5,000
Training Session Fee	25,000
Increased Inventory	<u>30,000</u>
Net Initial Outlay	\$560,000

(b) Differential annual free cash flows (years 1–9)

A project's free cash flows =

- Change in earnings before interest and taxes
- change in taxes
- + change in depreciation
- change in net working capital
- change in capital spending

$$\begin{aligned}
 &= \$150,000 \\
 &- \$51,000 \\
 &+ \$50,500 \\
 &- \$0 \\
 &- \$0 \\
 &= \underline{\$149,500}
 \end{aligned}$$

*Annual Depreciation on the new machine is calculated by taking the purchase price (\$500,000) and adding in costs necessary to get the new machine in operating order (the installation fee of \$5,000) and dividing by the expected life.

(c) Terminal Free Cash flow (year 10)

Inflows:

Free Cash flow in year 10	\$149,500
Recapture of working capital (inventory)	<u>30,000</u>
Total terminal cash flow	\$ 179,500

$$\begin{aligned}
 \text{(d) } NPV &= \$149,500 \left[\frac{1 - \frac{1}{(1+0.15)^9}}{0.15} \right] + \$179,500 \left(\frac{1}{(1+0.15)^{10}} \right) - \$560,000 \\
 &= \$149,500 (4.772) + \$179,500 (0.247) - \$560,000 \\
 &= \$713,414 + \$44,336.50 - \$560,000 \\
 &= \$197,750.50
 \end{aligned}$$

Yes, the $NPV > 0$.

11-11. (a) Initial Outlay

Outflows:

Purchase price	\$ 200,000
Installation Fee	5,000
Training Session Fee	5,000
Increased Inventory	<u>20,000</u>
Net Initial Outlay	\$230,000

(b) Differential annual cash flows (years 1–9)

A project's free cash flows =

- Change in earnings before interest and taxes
- change in taxes
- + change in depreciation
- change in net working capital
- change in capital spending

$$\begin{aligned}
 &= \$50,000 \\
 &- \$17,000 \\
 &+ \$20,500^* \\
 &- \$0 \\
 &- \$0 \\
 &= \underline{\$53,500}
 \end{aligned}$$

*Annual Depreciation on the new machine is calculated by taking the purchase price (\$200,000) and adding in costs necessary to get the new machine in operating order (the installation fee of \$5,000) and dividing by the expected life.

(c) Terminal Cash flow (year 10)

Inflows:

Free Cash flow in year 10	\$53,500
Recapture of working capital (inventory)	<u>20,000</u>
Total terminal cash flow	\$ 73,500

$$\begin{aligned}
 \text{(d) } NPV &= \$53,500 \left[\frac{1 - \frac{1}{(1+0.10)^9}}{0.10} \right] + \$73,500 \left(\frac{1}{(1+0.10)^{10}} \right) - \$230,000 \\
 &= \$53,500 (5.759) + \$73,500 (0.386) - \$230,000 \\
 &= \$308,106.50 + \$28,371 - \$230,000 \\
 &= \$106,477.50
 \end{aligned}$$

Yes, the $NPV > 0$.

11-12.

Equipment life, years	4
Equipment cost	\$140,000
Depreciation: rate = 25%	\$35,000
Sales revenues	\$112,000
– Basis $\times$ rate = depreciation	–\$35,000
– Operating costs (excl. deprec.)	<u>–\$68,000</u>
Operating income (EBIT)	\$9,000
– Taxes Rate = 35.0%	<u>–\$3,150</u>
EBIT(1 – T)	\$5,850
+ Depreciation	<u>\$35,000</u>
Cash flow, Year 1	<u>\$40,850</u>

11-13.

		t = 0	t = 1	t = 2	t = 3
Investment	k = 8%	(\$150,000)			
Opportunity cost		(\$155,000)			
Revenues			\$234,000	\$234,000	\$234,000
– Operating costs (excl. deprec.)			(\$82,000)	(\$82,000)	(\$82,000)
– Basis $\times$ rate = deprec. Rate = 33.33%			(\$50,000)	(\$50,000)	(\$50,000)
Operating income (EBIT)			\$102,000	\$102,000	\$102,000
– Taxes Rate = 30%			(\$30,600)	(\$30,600)	(\$30,600)
EBIT(1 – T)			\$71,400	\$71,400	\$71,400
+ Depreciation			\$50,000	\$50,000	\$50,000
Net Projected CFs		(\$165,000)	\$121,400	\$121,400	\$121,400
Present Value of Projected CFs		(\$165,000)	\$112,407.41	\$104,080.93	\$96,371.23
NPV	\$147,860				

4. Section I. Calculate the change in EBIT, Taxes, and Depreciation (this becomes an input in the calculation of Operating Cash Flow in Section II).

Year	0	1	2	3	4	5
Units Sold		70,000	120,000	120,000	80,000	70,000
Sale Price		\$300	\$300	\$300	\$300	\$250
Sales Revenue		\$21,000,000	\$36,000,000	\$36,000,000	\$24,000,000	\$17,500,000
Less: Variable Costs		9,800,000	16,800,000	16,800,000	11,200,000	9,800,000
Less: Fixed Costs		\$700,000	\$700,000	\$700,000	\$700,000	\$700,000
Equals: EBDIT		\$10,500,000	\$18,500,000	\$18,500,000	\$12,100,000	\$7,000,000
Less: Depreciation		\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000
Equals: EBIT		\$7,500,000	\$15,500,000	\$15,500,000	\$9,100,000	\$4,000,000
Taxes (@34%)		\$2,550,000	\$5,270,000	\$5,270,000	\$3,094,000	\$1,360,000

Section II. Calculate Operating Cash Flow (this becomes an input in the calculation of Free Cash Flow in Section IV).

Operating Cash Flow:

EBIT	\$7,500,000	\$15,500,000	\$15,500,000	\$9,100,000	\$4,000,000
Minus: Taxes	\$2,550,000	\$5,270,000	\$5,270,000	\$3,094,000	\$1,360,000
Plus: Depreciation	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000
Equals: Operating Cash Flow	\$7,950,000	\$13,230,000	\$13,230,000	\$9,006,000	\$5,640,000

Section III. Calculate the Net Working Capital (this becomes an input in the calculation of Free Cash Flows in Section IV)

Change in Net Working Capital:

Revenue:	\$21,000,000	\$36,000,000	\$36,000,000	\$24,000,000	\$17,500,000
Initial Working Capital Requirement	\$200,000				
Net Working Capital Needs:	\$2,100,000	\$3,600,000	\$3,600,000	\$2,400,000	\$1,750,000
Liquidation of Working Capital					\$1,750,000
Change in Working Capital:	\$200,000	\$1,900,000	\$1,500,000	(\$1,200,000)	(\$2,400,000)

Section IV. Calculate Free Cash Flow (using information calculated in Sections II and III, in addition to the Change in Capital Spending).

Free Cash Flow:

Operating Cash Flow	\$7,950,000	\$13,230,000	\$13,230,000	\$9,006,000	\$5,640,000
Minus: Change in Net Working Capital	\$200,000	\$1,500,000	\$0	(\$1,200,000)	(\$2,400,000)
Minus: Change in Capital Spending	\$15,000,000	\$0	\$0	\$0	\$0
Free Cash Flow:	(\$15,200,000)	\$6,050,000	\$13,230,000	\$10,206,000	\$8,040,000

NPV

\$17,461,989

5 Section I. Calculate the change in EBIT, Taxes, and Depreciation (this becomes an input in the calculation of Operating Cash Flow in Section II).

Year	0	1	2	3	4	5
Units Sold		80,000	100,000	120,000	70,000	70,000
Sale Price		\$250	\$250	\$250	\$250	\$200
Sales Revenue		\$20,000,000	\$25,000,000	\$30,000,000	\$17,500,000	\$14,000,000
Less: Variable Costs		10,400,000	13,000,000	15,600,000	9,100,000	9,100,000
Less: Fixed Costs		\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
Equals: EBDIT		\$9,300,000	\$11,700,000	\$14,100,000	\$8,100,000	\$4,600,000
Less: Depreciation		\$1,400,000	\$1,400,000	\$1,400,000	\$1,400,000	\$1,400,000
Equals: EBIT		\$7,900,000	\$10,300,000	\$12,700,000	\$6,700,000	\$3,200,000
Taxes (@34%)		\$2,686,000	\$3,502,000	\$4,318,000	\$2,278,000	\$1,088,000

Section II. Calculate Operating Cash Flow (this becomes an input in the calculation of Free Cash Flow in Section IV).**Operating Cash Flow:**

EBIT	\$7,900,000	\$10,300,000	\$12,700,000	\$6,700,000	\$3,200,000
Minus: Taxes	\$2,686,000	\$3,502,000	\$4,318,000	\$2,278,000	\$1,088,000
Plus: Depreciation	\$1,400,000	\$1,400,000	\$1,400,000	\$1,400,000	\$1,400,000
Equals: Operating Cash Flow	\$6,614,000	\$8,198,000	\$9,782,000	\$5,822,000	\$3,512,000

Section III. Calculate the Net Working Capital (this becomes an input in the calculation of Free Cash Flows in Section IV)**Change in Net Working Capital:**

Revenue:	\$20,000,000	\$25,000,000	\$30,000,000	\$17,500,000	\$14,000,000
Initial Working Capital Requirement	\$100,000				
Net Working Capital Needs:	\$2,000,000	\$2,500,000	\$3,000,000	\$1,750,000	\$1,400,000
Liquidation of Working Capital					\$1,400,000
Change in Working Capital:	\$100,000	\$1,900,000	\$500,000	(\$1,250,000)	(\$1,750,000)

Section IV. Calculate Free Cash Flow (using information calculated in Sections II and III, in addition to the Change in Capital Spending).**Free Cash Flow:**

Operating Cash Flow	\$6,614,000	\$8,198,000	\$9,782,000	\$5,822,000	\$3,512,000
Minus: Change in Net Working Capital	\$100,000	\$500,000	\$500,000	(\$1,250,000)	(\$1,750,000)
Minus: Change in Capital Spending	\$7,000,000	\$0	\$0	\$0	\$0
Free Cash Flow:	(\$7,100,000)	\$4,714,000	\$9,282,000	\$7,072,000	\$5,262,000

NPV**\$15,582,572.99**

11-16. GCC will want to incorporate the option to expand its operations into its building plan, which could be done architecturally. They should also keep in mind that they have the option to delay this project. Alternatively, they may wish to consider opening the casino in stages, as the region recovers economically and is able to support a larger and larger casino. If they do not feel the Gulf Coast will be in good enough financial shape to support a casino, then that is an option for them to consider. The bottom line here is they will want to build as much flexibility into this project as they can.

11-17. a. Initial Outlay = \$6,000,000
 Discount Rate = 10%
 Prob(This go well) = 50%
 FCF if things go well = \$800,000 perpetuity
 Prob(This go poorly) = 50%
 FCF if things go poorly = \$200,000 perpetuity
 Expected FCF = $\$800,000 \times 0.5 + \$200,000 \times 0.5 = \$500,000$

Expected NPV = $\$500,000 \div .10 - \$6,000,000$
 = $\$5,000,000 - \$6,000,000 = -\$1,000,000$

NPV if things go well = $\$800,000 \div 0.10 - \$6,000,000 = \$2,000,000$
 NPV if things go poorly = $\$200,000 \div 0.10 - \$6,000,000 = -\$4,000,000$

b. If the project goes well, its NPV will be \$2 million, while if it goes poorly, its NPV will be negative \$4 million. Since there is a 50 percent chance of going well and going poorly, the expected NPV = $\$2,000,000 \times 0.5 + -\$4,000,000 \times 0.5 = -\$1,000,000$ as determined before. However, if the project is received poorly, the restaurant chain will be abandoned. On the other hand, if it is favorably received, the firm will build 20 new restaurants. Thus the expected NPV is:

NPV = 1 restaurant $\times$ (NPV restaurant received poorly) $\times$ Prob. it is received poorly
 + 20 restaurants $\times$ (NPV restaurant received well) $\times$ Prob. it is received well
 = $1 \times -\$4,000,000 \times 0.5 + 20 \times \$2,000,000 \times 0.5$
 = $-\$2,000,000 + \$20,000,000 = \$18,000,000$

c. Thus, while the NPV is negative, if the firm has the ability to expand on this project if it is received well, then it should be taken on. In effect, if it is not received well, simply build the first restaurant and then abandon the project. If it is received well, build 19 more restaurants just like it, each with an expected NPV of \$2 million.

- 11-18. Developing the battery project themselves may give them the ability to expand if the market for nickel-metal hydride batteries expands, in effect the option to expand, which may carry the project into a positive *NPV*. In addition, by producing the batteries themselves, they may be able to refine the batteries, and make them more efficient, thereby increasing the project's *NPV*. As mentioned in the text, when Toyota first introduced the Prius, the company was losing money, but it had expanded into hybrid cars because they felt that there was a large potential market, and by being the first there they would be able to dominate it—in effect, they took on a negative *NPV* project because of the option to expand.

9

$$\sum_{t=1}^n \frac{ACF_t}{(1+i^*)^t} - IO - - - - 20$$

$$\sum_{t=1}^n \frac{ACF_t}{(1+i^*)^t} - IO 00000 - - - \sum_{t=1}^n \frac{ACF_t}{(1+i^*)^t} - IO - -$$

SOLUTION TO MINI CASE

- a. We focus on free cash flows rather than accounting profits because these are the flows that the firm receives and can reinvest. Only by examining cash flows are we able to correctly analyze the timing of the benefit or cost. Also, we are only interested in these cash flows on an after-tax basis as only those flows are available to the shareholder. In addition, it is only the incremental cash flows that interests us because, looking at the project from the point of view of the company as a whole, the incremental cash flows are the marginal benefits from the project and, as such, are the increased value to the firm from accepting the project.
- b. Although depreciation is not a cash flow item, it does affect the level of the differential cash flows over the project's life because of its effect on taxes. Depreciation is an expense item and, the more depreciation incurred, the larger the expenses. Thus, accounting profits become lower, and in turn, so do taxes, which are a cash flow item.
- c. When evaluating a capital budgeting proposal, sunk costs are ignored. We are interested in only the incremental after-tax cash flows, or free cash flows, to the company as a whole. Regardless of the decision made on the investment at hand, the sunk costs will have already occurred, which means these are not incremental cash flows. Hence, they are irrelevant.

Solution to Mini Case, parts d, e, & f.

Section I. Calculate the change in EBIT, Taxes, and Depreciation (this become an input in the calculation of Operating Cash Flow in Section II).

Year	0	1	2	3	4	5
Units Sold		70,000	120,000	140,000	80,000	60,000
Sale Price		\$300	\$300	\$300	\$300	\$260
Sales Revenue		\$21,000,000	\$36,000,000	\$42,000,000	\$24,000,000	\$15,600,000
Less: Variable Costs		12,600,000	21,600,000	25,200,000	14,400,000	10,800,000
Less: Fixed Costs		\$200,000	\$200,000	\$200,000	\$200,000	\$200,000
Equals: EBDIT		\$8,200,000	\$14,200,000	\$16,600,000	\$9,400,000	\$4,600,000
Less: Depreciation		\$1,600,000	\$1,600,000	\$1,600,000	\$1,600,000	\$1,600,000
Equals: EBIT		\$6,600,000	\$12,600,000	\$15,000,000	\$7,800,000	\$3,000,000
Taxes (@34%)		\$2,244,000	\$4,284,000	\$5,100,000	\$2,652,000	\$1,020,000

Section II. Calculate Operating Cash Flow (this becomes an input in the calculation of Free Cash Flow in Section IV).

Operating Cash Flow:						
EBIT		\$6,600,000	\$12,600,000	\$15,000,000	\$7,800,000	\$3,000,000
Minus: Taxes		\$2,244,000	\$4,284,000	\$5,100,000	\$2,652,000	\$1,020,000
Plus: Depreciation		\$1,600,000	\$1,600,000	\$1,600,000	\$1,600,000	\$1,600,000
Equals: Operating Cash Flow		\$5,956,000	\$9,916,000	\$11,500,000	\$6,748,000	\$3,580,000

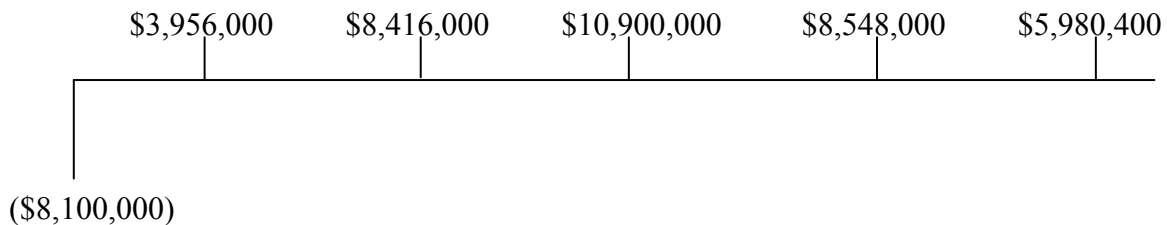
Section III. Calculate the Net Working Capital (This becomes an input in the calculation of Free Cash Flows in Section IV).

Change In Net Working Capital:						
Revenue:		\$21,000,000	\$36,000,000	\$42,000,000	\$24,000,000	\$15,600,000
Initial Working Capital Requirement	\$100,000					
Net Working Capital Needs:		\$2,100,000	\$3,600,000	\$4,200,000	\$2,400,000	\$1,560,000
Liquidation of Working Capital						\$1,560,000
Change in Working Capital:	\$100,000	\$2,000,000	\$1,500,000	\$600,000	(\$1,800,000)	(\$2,400,000)

Section IV. Calculate Free Cash Flow (using information calculated in Sections II and III, in addition to the Change in Capital Spending).

Free Cash Flow:						
Operating Cash Flow		\$5,956,000	\$9,916,000	\$11,500,000	\$6,748,000	\$3,580,000
Minus: Change in Net Working Capital	\$100,000	\$2,000,000	\$1,500,000	\$600,000	(\$1,800,000)	(\$2,400,000)
Minus: Change in Capital Spending	\$8,000,000	0	\$0	0	0	0
Free Cash Flow:	(\$8,100,000)	\$3,956,000	\$8,416,000	\$10,900,000	\$8,548,000	\$5,980,000
<i>NPV</i> =						
IRR =	77%					

g. Cash flow diagram

h. $NPV = \$16,731,096$ i. $IRR = 77\%$ j. Yes. This project should be accepted because the $NPV \geq 0$, and the $IRR \geq$ required rate of return.

k. First, there is the *total project risk* also called *project standing alone risk*, which is a project's risk, ignoring the fact that much of this risk will be diversified away as the project is combined with the firm's other projects and assets. Second, we have the project's *contribution to firm risk*, which is the amount of risk that the project contributes to the firm as a whole. This measure considers the fact that some of the project's risk will be diversified away as the project is combined with the firm's other projects and assets, but ignores the effects of the diversification of the firm's shareholders. Finally, there is *systematic risk*, which is the risk of the project from the viewpoint of a well-diversified shareholder. This measure considers the fact that some of a project's risk will be diversified away as the project is combined with the firm's other projects; additionally, some of the remaining risk will be diversified away by the shareholders as they combine this stock with other stocks in their portfolio.

l. According to the CAPM, systematic risk is the only relevant risk for capital-budgeting purposes; however, reality complicates this somewhat. In many instances, a firm will have undiversified shareholders; for them, the relevant measure of risk is the project's contribution to firm risk. The possibility of bankruptcy also affects our view of what measure of risk is relevant. Because the project's contribution to firm risk can affect the possibility of bankruptcy, this may be an appropriate measure of risk because there are costs associated with bankruptcy.

m. The idea behind simulation is to imitate the performance of the project being evaluated. This is done by randomly selecting observations from each of the distributions that affect the outcome of the project, combining each of those observations and determining the final outcome of the project, and continuing with this process until a representative record of the project's probable outcome is assembled. In effect, the output from a simulation is a probability distribution of net present values or internal rates of return for the project. The decision maker then bases his decision on the full range of possible outcomes.

n. Sensitivity analysis involves determining how the distribution of possible net present values or internal rates of return for a particular project is affected by a change in one particular input variable. This is done by changing the value of one input variable while holding all other input variables constant.

CHAPTER 12

Determining the Financing Mix

CHAPTER ORIENTATION

This chapter focuses on useful aids to the financial manager in his or her determination of the firm's proper financial structure. It includes the definitions of the different kinds of risk, a review of break-even analysis, the concepts of operating leverage, financial leverage, the combination of both leverages, and their effect on (earnings per share) EPS. Then the chapter concentrates on the way the firm arranges its sources of funds. The cost of capital-capital structure argument is highlighted in a straightforward manner without dwelling excessively on pure theory. A moderate view of the effect of financial leverage on the firm's overall cost of capital is highlighted and explained. Later, techniques useful to the financial officer faced with the determination of an appropriate financing mix are described. Agency theory and the concept of free cash flow as they relate to capital structure determination are also discussed. An overview of actual practice is also included.

CHAPTER OUTLINE

- I. Understanding the Difference Between Business Risk and Financial Risk
 - A. Risk has been defined as the likely variability associated with expected revenue streams.
 - 1. Focusing on the financial decision, the variations in the income stream can be attributed to:
 - a. The firm's exposure to business risk.
 - b. The firm's decision to incur financial risk.
 - B. Business risk can be defined as the variability of the firm's expected earnings before interest and taxes (EBIT).
 - 1. Business risk is measured by the firm's corresponding expected coefficient of variation (i.e., the larger the ratio, the more risk a firm is exposed to).
 - 2. Dispersion in operating income does not cause business risk. It is the result of several influences; (e.g., the company's cost structure, product demand characteristics, and intra-industry competition.) These influences are a direct result of the firm's investment decision.

- C. Financial risk is a direct result of the firm's financing decision. When the firm is selecting different financial alternatives, financial risk refers to the additional variability in earnings available to the firm's common shareholders and the additional chance of insolvency borne by the common shareholder caused by the use of financial leverage.
1. Financial leverage is the financing of a portion of the firm's assets with securities bearing a fixed (limited) rate of return in hopes of increasing the ultimate return to the common shareholders.
 2. Financial risk is, to a large extent, passed on to the common shareholders who must bear almost all of the potential inconsistencies of returns to the firm after the deduction of fixed payments.

II. Break-Even Analysis

- A. The objective of break-even analysis is to determine the break-even quantity of output by studying the relationships among the firm's cost structure, volume of output, and operating profit.
1. The break-even quantity of output is the quantity of output (in units) that results in an EBIT level equal to zero.
- B. Use of the model enables the financial officer to:
1. Determine the quantity of output that must be sold to cover all operating costs.
 2. Calculate the EBIT that will be achieved at various output levels.
- C. Some actual and potential applications of break-even analysis include:
1. Capital expenditure analysis as a complementary technique to discounted cash flow evaluation models.
 2. Pricing policy.
 3. Labor contract negotiations.
 4. Evaluation of cost structure.
 5. The making of financial decisions.
- D. Essential elements of the break-even model are:
1. Fixed costs are costs that do not vary in total amount as the sales volume or the quantity of output changes over some relevant range of output. For example, administrative salaries are considered fixed because these salaries are generally the same month after month. Other examples are:
 - a. Depreciation.
 - b. Insurance premiums.
 - c. Property taxes.
 - d. Rent.

The total fixed cost is unchanged regardless of the quantity of product output or sales, although, over some relevant range, these costs may be higher or lower (i.e., in the long run).

2. Variable costs are costs that tend to vary in total as output changes. Variable costs are fixed per unit of output. For example, direct materials are considered a variable cost because they vary with the amount of products produced. Other variable costs are:
 - a. Direct labor.
 - b. Energy cost associated with the production area.
 - c. Packaging.
 - d. Freight-out.
 - e. Sales commissions.
3. To implement the behavior of the break-even model, it is necessary for the financial manager to:
 - a. Identify the most relevant output range for his or her planning purposes.
 - b. Approximate all costs in the semifixed-semivariable range and allocate them to the fixed and variable cost categories.
4. Total revenue and volume of output
 - a. Total revenue from sales is equal to the price per unit multiplied by the quantity sold.
 - b. The volume of output is the firm's level from operations and is expressed as sales dollars or a unit quantity.

E. Finding the break-even point

1. The break-even model is just a simple adaptation of the firm's income statement expressed in the following format:

$$\text{Sales} - (\text{Total variable costs} + \text{Total fixed costs}) = \text{Profit}$$

- a. Trial and error
 - (1) Select an arbitrary output level.
 - (2) Calculate the corresponding EBIT amount.
 - (3) When EBIT equals zero, the break-even point has been found.
- b. Contribution margin analysis
 - (1) The difference between the unit selling price and the unit variable cost equals the contribution margin.
 - (2) Then, the fixed cost divided by the contribution margin equals the break-even quantity in units.

c. Algebraic analysis

- (1) Q_B = the break-even level of units sold,
 P = the unit sales price,
 F = the total fixed cost for the period,
 V = unit variable cost.

(2) Then,

$$Q_B = \frac{F}{P - V}$$

F. The break-even point in sales dollars:

1. Computing a break-even point in terms of sales dollars rather than units of output is convenient, especially if the firm deals with more than one product. Also, if the analyst cannot get unit cost data, he or she can compute a general break-even point in sales dollars by using the firm's annual report.
2. Since variable cost per unit and the selling price per unit are assumed constant, the ratio of total variable costs to sales (VC/S) is a constant for any level of sales. So, if the break-even level of sales is denoted S^* , the corresponding equation is:

$$S^* = \frac{F}{1 - \frac{VC}{S}}$$

G. Limitations of break-even analysis:

1. The cost-volume-profit relationship is assumed to be linear.
2. The total revenue curve is presumed to increase linearly with the volume of output.
3. A constant production and sales mix is assumed.
4. The break-even computation is a static form of analysis.

III. Sources of Operating Leverage

- A. Operating leverage is the responsiveness of a firm's EBIT to fluctuations in sales. Operating leverage results when fixed operating costs are present in the firm's cost structure. It should be noted here that fixed operating costs do not include interest charges incurred from the firm's use of debt financing.
- B. The responsiveness of a firm's EBIT to fluctuating sales levels can be measured as follows:

$$\left(\begin{array}{c} \text{degree of operating} \\ \text{leverage from the} \\ \text{base sales level} \end{array} \right) = \text{DOL}_S = \frac{\% \text{ change in EBIT}}{\% \text{ change in sales}}$$

For example, if DOL_S equals five times, a 10 percent rise in sales over the coming period will result in a 50 percent rise in EBIT. (This means of measure also holds true for the negative direction.)

C. If unit costs are available, the DOL_S can be measured by the following formula:

$$DOL_S = \frac{Q(P - V)}{Q(P - V) - F}$$

D. If an analytical income statement is the only thing available, the following formula can be used to produce the same results:

$$DOL_S = \frac{\text{revenue before fixed costs}}{\text{EBIT}} = \frac{S - VC}{S - VC - F}$$

E. It should be noted here that the three formulas stated all produce the same results. But, more important is the understanding that in this example a 1 percent change in sales will result in a 5 percent change in EBIT.

F. Implications of operating leverage:

1. At each point above the break-even level, the degree of operating leverage decreases (i.e., the greater the sales level, the lower the DOL_S).
2. At the break-even level of sales, the degree of operating leverage is undefined.
3. Operating leverage is present anytime the percentage change in EBIT divided by the percentage change in sales is greater than one.
4. The degree of operating leverage can be attributed to the business risk that a firm faces.

G. Financial leverage

1. Financial leverage, as defined earlier, is the practice of financing a portion of the firm's assets with securities bearing a fixed rate of return in hopes of increasing the ultimate return to the common stockholders. To see if financial leverage has been used to benefit the common shareholders, the discussion here will focus on the responsiveness of the company's EPS to changes in its EBIT. It should be noted here that not all analysts rely exclusively on this type of relationship.
2. The firm is using financial leverage and is exposing its owners to financial risk when:

$$\frac{\% \text{ change in EPS}}{\% \text{ change in EBIT}} \text{ is greater than } 1.00$$

3. A precise measure of the firm's use of financial leverage can be expressed in the following relationship:

$$\left(\begin{array}{l} \text{degree of financial} \\ \text{leverage from the} \\ \text{base EBIT level} \end{array} \right) = DFL_{\text{EBIT}} = \frac{\% \text{ change in EPS}}{\% \text{ change in EBIT}}$$

- a. As was the case with operating leverage, the degree of financial leverage concept can be in the negative direction as well as in the positive direction.
 - b. You should also note that the greater the degree of financial leverage, the greater the fluctuations (positive or negative) in EPS.
4. An easier way of measuring the degree of financial leverage that produces the same results without computing percentage changes in EBIT and EPS is:

$$DFL_{EBIT} = \frac{EBIT}{EBIT - I}$$

where I is the sum of all fixed financing costs.

H. Combining operating and financial leverage

1. Since changes in sales revenues cause greater changes in EBIT, and if the firm chooses to use financial leverage, changes in EBIT turn into larger variations in both EPS and EAC (earnings available to common shareholders). Then, combining operating and financial leverage causes rather large variations in EPS.
2. One way to measure the combined leverage can be expressed as:

$$\left(\begin{array}{c} \text{degree of combined} \\ \text{leverage from the} \\ \text{base sales level} \end{array} \right) = DCL_S = \frac{\% \text{ change in EPS}}{\% \text{ change in sales}}$$

If the DCL is equal to 5.0 times, then it is important to understand that a 1 percent change in sales will result in a 5 percent change in EPS.

3. The degree of combined leverage is actually the product of the two independent leverage measures. Thus, we have:

$$DCL_S = (DOL_S) \times (DFL_{EBIT})$$

4. As you might have guessed, there is still another way to compute DCL_S . It is a more direct way in that no percentage fluctuations or separate leverage values have to be determined. You need only substitute the appropriate values into the following equation:

$$DCL_S = \frac{Q(P - V)}{Q(P - V) - F - I}$$

All variables have previously been defined.

5. Implications of combining operating and financial leverage
 - a. The total risk exposure that the firm assumes can be managed by combining operating and financial leverage in different degrees.
 - b. Knowledge of the various leverage measures that have been examined here aids the financial officer in his or her determination of the proper level of overall risk that should be accepted.

I. Introduction to financing mix determination.

1. A distinction can be made between the terms financial structure and capital structure.
 - a. Financial structure is the mix of all items that appear on the right-hand side of the firm's balance sheet.
 - b. Capital structure is the mix of the long-term sources of funds used by the firm.
 - c. In this chapter, we do not dwell on the question of dealing with an appropriate maturity composition of the firm's sources of funds. Our main focus is on capital structure management, (i.e., determining the proper proportions relative to the total in which the permanent forms of financing should be used.)
2. The objective of capital structure management is to mix the permanent sources of funds in a manner that will maximize the company's common stock price. This will minimize the firm's composite cost of capital. This proper mix of funds sources is referred to as the optimal capital structure.

IV. Capital Structure Theory

- A. The cost of capital-capital structure argument may be characterized by this question:

Can the firm affect its overall cost of funds, either favorably or unfavorably, by varying the mixture of financing sources used?

- B. The argument deals with the postulated effect of the use of financial leverage on the overall cost of capital of the company.
- C. If the firm's cost of capital can be affected by the degree to which it uses financial leverage, then capital structure management is an important subset of business financial management.
- D. Capital structure theory: A moderate position

1. The moderate position on capital structure importance admits to the facts that: (1) interest expense is tax-deductible in the world of corporate activity; and (2) the probability of the firm's suffering bankruptcy costs is directly related to the company's use of financial leverage.
2. When interest expense is tax-deductible, the sum of the cash flows that the firm could pay to all contributors of corporate capital (debt investors and equity investors) is affected by its financing mix. This is not the case when an environment of no corporate taxation is presumed.
 - a. The amount of the tax shield on interest may be calculated as:

$$\text{Tax shield} = r_d(M)(T_c)$$

$$\begin{array}{lll} \text{where} & r_d & = \text{the interest rate paid on outstanding debt,} \\ & M & = \text{the principal amount of the debt,} \\ & T_c & = \text{the corporate tax rate.} \end{array}$$

- b. The moderate position presents the view that the tax shield must have value in the marketplace. After all, the government's take is decreased, and the investor's take is increased because of the deductibility of interest expense.
 - c. Therefore, according to this position, financial leverage affects firm value, and it must also affect the cost of corporate capital.
3. To use too much financial leverage, however, would be imprudent. It seems reasonable to offer that the probability that the firm will be unable to meet the financial obligations contained in its debt contracts will increase the more the firm uses leverage-inducing instruments (debt) in its capital structure. The likelihood of firm failure, then, carries with it certain costs (bankruptcy costs) that rise as leverage use increases. There will be some point at which the expected cost of default will be large enough to outweigh the tax shield advantage of debt financing. At that point, the firm will turn to common equity financing.
4. Figure 12.7 from the text (reproduced below) depicts the moderate view on capital structure importance. This view of the cost of capital-capital structure argument produces a saucer-shaped or U-shaped average cost of capital curve. In Figure 12.7, the firm's optimal range of financial leverage use lies between points A and B. It would be imprudent for the firm to use additional financial leverage beyond point B because (1) the average cost of capital would be higher than it has to be and (2) the firm's common stock price would be lower than it has to be. Therefore, we can say that the degree of financial leverage use signified by point B represents the firm's debt capacity.

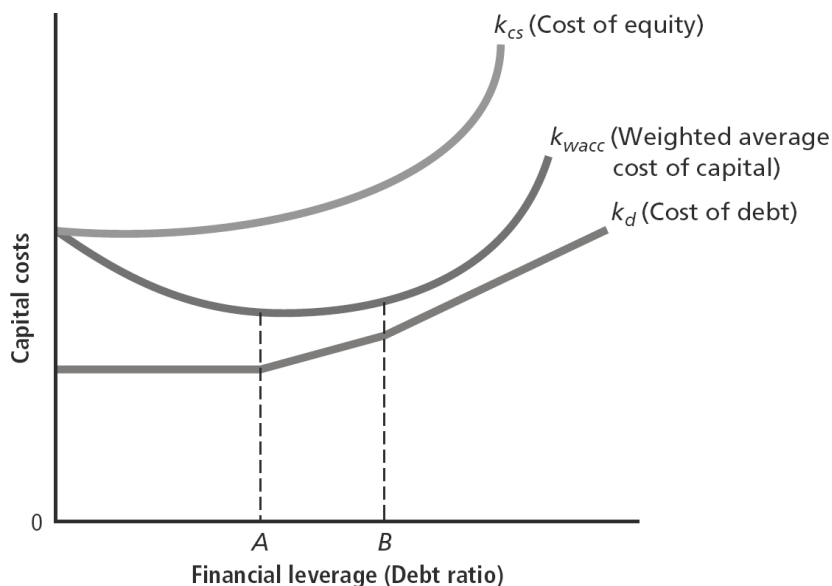


Figure 12.7

Capital Costs and Financial Leverage: The Moderate View, Considering Taxes and Financial Distress

5. We conclude that the determination of the firm's financing mix is centrally important to both the financial manager and the firm's owners.

E. Firm value and agency costs

1. Agency problem results in costs to the firm's owners to monitor management actions.
2. Capital structure management given risk to agency costs associated with conflict between firms' stockholders and bondholders.
 - a. Covenants in bond contracts may reduce potential conflicts.
 - b. Costs associated with protective covenants are borne by shareholders.
 - c. Monitoring costs rise as firm's use of financial leverage increases.
 - d. With higher degrees of financial leverage, costs associated with financial distress increase.
3. Market value of levered firm is the sum of the market value of the unlevered firm plus the present value of tax shields less the present value of the financial distress costs and of agency costs.
4. Agency costs, free cash flow, and capital structure
 - a. Free cash flow's cash flow in excess of that required to fund all positive NPV projects.
 - b. Professor Jensen suggests substantial free cash flow can lead to managerial misbehavior and poor discounts associated with expenditures of the cash.
 - c. Jensen's control hypothesis suggests that by increasing the level of firm debt, shareholders will have more control over management.
 - (1) Management working under threat of financial failure will work more efficiently.

V. Basic Tools of Capital Structure Management

- A. Recall that the use of financial leverage has two effects on the earnings stream flowing to the firm's common stockholders: (1) the added variability in the earnings per share (EPS) stream that accompanies the use of fixed-charge securities; and (2) the level of EPS at a given earnings before interest and taxes level (EBIT) associated with a specific capital structure. The first effect is quantified by the degree of financial leverage measure. The second effect is analyzed by means of what is generally referred to as EBIT-EPS analysis.
- B. The objective of EBIT-EPS analysis is to find the EBIT level that will equate EPS regardless of the financing plan chosen (from among two plans) by the financial manager.
 1. A graphic analysis or an algebraic analysis can be used.
 2. Study problems at the end of this chapter illustrate the nature of EBIT-EPS analysis.

3. EBIT-EPS analysis considers only the level of the earnings stream and ignores the variability (riskiness) in it. In other words, this tool of capital structure management disregards the implicit costs of debt financing. Therefore, it must be used with caution and in conjunction with other basic tools of capital structure management.
- C. Comparative leverage ratios provide another tool of capital structure management. This involves the computation of various balance-sheet leverage ratios and coverage ratios. Information for the latter comes essentially from the income statement. The ratios that would exist under alternative financing plans can then be computed and examined for their suitability to management.
- D. The use of industry norms in conjunction with comparative leverage ratios can aid the financial manager in arriving at an appropriate financing mix. Industry norms can be thought of as standards for comparison. We recognize that industry groupings contain firms whose basic business risk may differ widely. Nevertheless, corporate financial analysts, investment bankers, commercial loan officers, and bond-rating agencies rely on industry classes in order to compute such “normal” ratios. Since so many observers are interested in industry standards, the financial officer must be, too.
- E. A glance at actual capital structure management
1. The opinions and practices of financial executives reinforce the major topics covered in this chapter. Most senior financial officers, for example, do believe there is an optimum capital structure for the corporation.
 2. Target debt ratios are widely used by financial officers. Surveys indicate that the firm's actual target debt ratio is affected by several factors including: (1) the firm's ability to meet its financing charges adequately; (2) maintaining a desired bond rating; (3) providing an adequate borrowing reserve; and (4) exploiting the perceived advantages of financial leverage. In practice, the firm's own management group and staff of analysts seem to be the most important influence on actually setting the target debt ratio.
 3. In this chapter, we defined debt capacity as the maximum proportion of debt that the firm can include in its capital structure and still maintain its lowest composite cost of capital. Executives operationalize this concept in different ways. The most popular approach is to define the firm's debt capacity as a target percent of total capitalization (i.e., total long-term debt divided by the sum of all long-term debt, preferred equity, and common equity).
 4. In the opinion of your authors, the single most important factor that should affect the firm's financing mix is the underlying nature of the business in which it operates. This means the firm's business risk must be carefully assessed. This means the firm's capital structure cannot be properly designed without a thorough understanding of its commercial (business) strategy.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 12-1. The debt to total assets ratio is commonly used as an indicator of a firm's use of financial leverage or borrowed funds. In 2011 AT&T had \$65 billion in borrowed funds compared to \$270 billion in assets which produces a debt to total assets ratio of about 24 percent. The \$3 billion in added borrowing in 2012 then will increase total borrowing (assuming no debt is repaid in 2012) to \$68 billion. Note also that if AT&T did not pay down any of its debt in 2011, then its total assets would rise to \$273 billion, and the firm's debt to total assets ratio would increase to 24.9 percent for an increase of slightly less than 1 percent.
- 12-2. Business risk is the uncertainty that envelops the firm's stream of earnings before interest and taxes (EBIT). One possible measure of business risk is the coefficient of variation in the firm's expected level of EBIT. Business risk is the residual effect of the (1) company's cost structure, (2) product demand characteristics, and (3) intra-industry competitive position. The firm's asset structure is the primary determinant of its business risk. Financial risk can be identified by its two key attributes: (1) the added risk of insolvency assumed by the common stockholder when the firm chooses to use financial leverage; and (2) the increased variability in the stream of earnings available to the firm's common stockholders.
- 12-3. Financial leverage is financing a portion of the firm's assets with securities bearing a fixed (limited) rate of return. Anytime the firm makes its preferred dividend payment, financial leverage is provided by the use of preferred stock.
- 12-4. Operating leverage is the use of operating fixed costs in the firm's cost structure. When operating leverage is present, any percentage fluctuation in sales will result in a greater percentage fluctuation in EBIT.
- 12-5. The most important shortcomings of break-even analysis are:
- a. The cost-volume-profit relationship is assumed to be linear over the entire range of output.
 - b. All of the firm's production is assumed to be salable at the fixed selling price.
 - c. The sales mix and production mix are assumed constant.
 - d. The level of total fixed costs and the variable-cost-to-sales ratio are held constant over all output and sales ranges.
- 12-6. As the sales of a firm increase, two things occur that bias the cost and revenue functions toward a curvilinear shape. First, sales will increase at a decreasing rate. As the market approaches saturation, the firm must cut its price to generate sales revenue. Second, as production approaches capacity, inefficiencies occur that result in higher labor and material costs. Furthermore, the firm's operating system may have to bear higher administrative and fixed costs. The result is higher per unit costs as production output increases.

- 12-7.
 - a. Financial structure: the mix of all items that appear on the right-hand side of the company's balance sheet
 - b. Capital structure: the mix of long-term funds used by the firm
 - c. Optimal capital structure: the mix of long-term funds that will minimize the composite cost of capital for raising a given amount of funds
 - d. Debt capacity: the maximum proportion of debt that the firm can include in its capital structure and still maintain its lowest composite cost of capital
- 12-8. The decision to use financial leverage by the firm affects both the level and variability of the EPS flowing to the common stockholders. EBIT-EPS analysis deals only with the level (amount) of EPS available under a given financing plan. The variability in the earnings stream associated with the plan is ignored. EBIT-EPS analysis, then, disregards the riskiness inherent to a particular financing alternative.
- 12-9. The objective of capital structure management is to mix the permanent sources of funds used by the firm in a manner that will maximize the company's common stock price.
- 12-10. If revenues from sales are highly volatile, then other things being equal, cash flows will be volatile. This would make it difficult to meet, on a timely basis, a large amount of fixed financing costs. Because of this, a high degree of financial risk will be avoided by firms that operate in industries that experience large sales fluctuations.
- 12-11. Within the realm of capital structure theory, the independence hypothesis offers that both common stock price and the composite cost of capital are not affected by the firm's use of financial leverage. This presumes that interest expense is not tax deductible.
- 12-12. This means that the shape of the firm's composite cost of capital curve is saucer-shaped or U-shaped with respect to the use of financial leverage. Over moderate degrees of leverage use, the overall cost of capital decreases. Throughout the optimal range of leverage use, the cost of capital curve is relatively flat. At excessive degrees of leverage use, the overall cost of capital rises. The result is a saucer shape.
- 12-13. The level of EBIT that will result in the same EPS regardless of the financing plan ultimately chosen from a set of two alternatives.
- 12-14. The use of industry norms is actually a form of "comparative analysis" whereby the analyst tries to compare the capital structure of his firm to that of others that he or she considers to be similar. For example, computer chip manufacturer Advanced Micro Devices might look at other chip makers such as Intel and compare its use of debt financing to that of Intel. The idea here is to get some notion as to what the financial practices of other firms are but not to determine what is optimal or best.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

- 12-1. a. Note that Amos Gooding is a real estate firm, and it has acquired a new real estate investment such that there will be no change in the firm's business risk. However, the fact that the firm borrowed 100 percent of the cost of the new investment suggests that the firm's financial risk has risen.
- b. In this instance an outsourcing firm has entered into a new business related to printing. Also, the firm paid cash for the asset acquisition. One might think that the firm's business risk may have changed.
- c. Once again it would appear that this firm may have changed its overall business risk since the firm was a specialty retailer and now combines this business with that of a golf course.

12-2. a. Break-Even Point in Sales Dollars = $\frac{\text{Fixed Costs}}{1 - \frac{\text{Variable Costs}}{\text{Sales}}}$

$$\frac{\$10,143,000}{1 - \frac{\$25,137,000}{\$50,439,375}} = \frac{\$10,143,000}{1 - 0.498}$$

$$\frac{\$10,143,000}{0.502} = \underline{\underline{\$20,205,179.28}}$$

b. Percentage increase in *EBT* and *NI* = $(\% \Delta \text{ sales}) \times (\text{DCL})$

$$(+30\%) \times (1.85) = \underline{\underline{55.50\% \text{ increase}}}$$

12-3. a. $S(1 - 0.6) - \$300,000 = \$250,000$

$$0.4S = \$550,000$$

$$S = \$1,375,000 = (P \cdot Q)$$

Solve the above relationship for *P*.

$$200,000 (P) = \$1,375,000$$

$$P = \underline{\underline{\$6.875}}$$

b.	Sales	\$1,375,000
	Less: Total variable costs	<u>825,000</u>
	Revenue before fixed costs	\$550,000
	Less: Total fixed costs	<u>300,000</u>
	EBIT	<u>\$ 250,000</u>

$$12-4. \quad a. \quad Q_B = \frac{F}{P-V} = \frac{\$170,000}{\$85 - \$58} = \frac{\$170,000}{\$27} = \underline{6,296} \text{ pairs of shoes}$$

$$b. \quad S_B = \frac{F}{1 - \frac{VC}{S}} = \frac{\$170,000}{1 - \frac{\$58}{\$85}} = \frac{\$170,000}{1 - 0.682} = \frac{\$170,000}{0.318} = \underline{\$534,591.19}$$

c.		7,000	9,000	15,000
		<u>Pairs of Shoes</u>	<u>Pairs of Shoes</u>	<u>Pairs of Shoes</u>
	Sales	\$595,000	\$765,000	\$1,275,000
	Variable costs	<u>406,000</u>	<u>522,000</u>	<u>870,000</u>
	Sales before fixed costs	\$189,000	\$243,000	\$405,000
	Fixed costs	<u>170,000</u>	<u>170,000</u>	<u>170,000</u>
	EBIT	<u>\$ 19,000</u>	<u>\$ 73,000</u>	<u>\$ 235,000</u>

Notice that the degree of operating leverage decreases as the firm's sales level rises above the break-even point.

$$12-5. \quad a. \quad Q_B = \frac{F}{P-V} = \frac{\$180,000}{\$150} = \underline{1,200} \text{ units}$$

$$b. \quad S_B = \frac{F}{1 - \frac{VC}{S}} = \frac{\$180,000}{1 - 0.70} = \underline{\$600,000}$$

$$= (1,200 \text{ units}) \times (\$500/\text{unit}).$$

$$c. \quad \text{DOL} = 5,000 \times (\$500 - \$350) / [5,000 \times (\$500 - \$350) - \$180,000] = 1.316.$$

$$d. \quad (20\%) \times (1.316) = \underline{26.32\%}$$

12-6.

Terms	Definitions
Independence theory—no taxes	The cost of capital is unaffected by the firm's choice of debt and equity financing.
Saucer shaped cost of capital curve	The cost of capital decreases as the firm initially uses debt to substitute for equity financing but eventually the cost of capital begins to increase as extreme levels of debt are used.
Independence theory—with corporate taxes	The cost of capital decreases continuously as the firm increases its reliance on debt financing.

- 12-7. Both a. and b. provide examples of the problems that can arise where managers (agents) have the ability to make decisions that are not perfectly monitored by the firm's stockholders (owners). Specifically, where managerial decisions are to some extent driven by their own personal preferences, they can deviate from the best interests of shareholders. The first example describes a situation in which a manager may be incentivized to invest in very risky projects. This was, you may recall, the situation faced by Enron in the years prior to the firm's bankruptcy. The firm found itself challenged to meet its earnings projections, and managers engaged in a number of activities, including very risky investments (e.g., Enron Broadband) that they hoped would give them a shot at maintaining their high flying status with Wall Street.

But would the shareholders object to this behavior? If we are considering Enron's shareholders' claim, then shareholders should be happy to take on additional risk—it increases the value of their residual claim. Debt holders would be mad, but managers don't work for them, so there's not an agency relationship there. That's why there are all of those covenants in debt arrangements.

Situation b. describes a circumstance in which the firm's management is not under pressure to perform. They have lots of cash flow to fund the business and its investments and consequently do not feel the need to take on risky investments. This is an agency problem.

You may get the impression that borrowing too much money leads to situation a. and borrowing too little leads to situation b., and you would be right!

$$\begin{array}{rcl}
 12-8. \quad a. & \frac{(EBIT - 0)(1 - 0.35)}{160,000} & = \frac{(EBIT - \$420,000)(1 - 0.35)}{64,000} \\
 & \frac{0.65 \text{ EBIT}}{160,000} & = \frac{0.65 \text{ EBIT} - \$273,000}{64,000} \\
 & \text{EBIT} & = \underline{\underline{\$700,000}}
 \end{array}$$

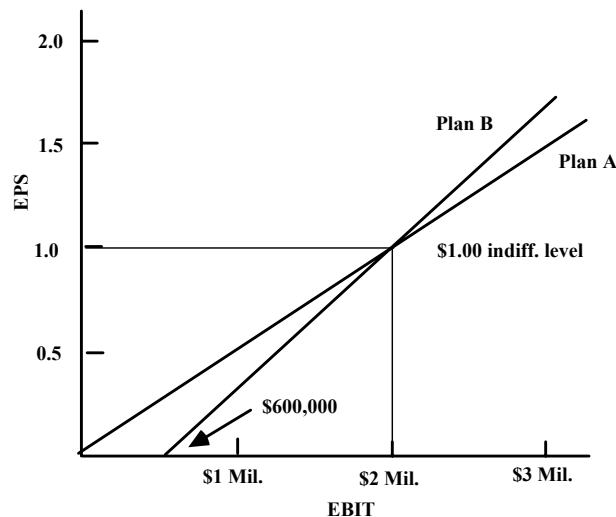
b.		Plan A	Plan B
	EBIT	\$700,000	\$700,000
	Interest	<u>0</u>	<u>420,000</u>
	<i>EBT</i>	\$700,000	\$280,000
	<i>T</i> (0.35)	<u>245,000</u>	<u>98,000</u>
	EAC	\$455,000	\$182,000
	÷ No. of common shares	<u>160,000</u>	<u>64,000</u>
	EPS	<u>\$ 2.84</u>	<u>\$ 2.84</u>

$$\begin{aligned}
 12-9. \quad a. \quad & \frac{(EBIT - I)(1 - t) - P}{S_s} = \frac{(EBIT - I)(1 - t) - P}{S_b} \\
 & \frac{(EBIT - \$0)(1 - 0.5) - 0}{1,000,000} = \frac{(EBIT - \$600,000)(1 - 0.5) - 0}{700,000} \\
 & \frac{0.5 \text{ EBIT}}{10} = \frac{0.5 \text{ EBIT} - \$300,000}{7} \\
 & \text{EBIT} = \$2,000,000
 \end{aligned}$$

b.	<u>Plan A</u>	<u>Plan B</u>
	EBIT	\$2,000,000
	Interest	<u>0</u>
	<i>EBT</i>	\$2,000,000
	Taxes	<u>1,000,000</u>
	<i>NI</i>	\$1,000,000
	Preferred Dividend	<u>0</u>
	EAC	\$1,000,000
	EPS	<u>\$ 1.00</u>
		<u>\$ 1.00</u>

c. See Analysis Chart.

d. Since, \$2,400,000 exceeds \$2,000,000, the levered plan (Plan B) will provide for higher EPS.



- 12-10. a. Firm C appears to be excessively levered. Both its debt ratio and burden coverage ratio are unfavorable relative to the industry norm. The firm's price/earnings ratio is significantly (6 versus 10) lower than the industry norm.
- b. Firm B.
- c. The investing market place seems to place more weight on coverage ratios than balance-sheet leverage measures. Thus, Firm B's price/earnings ratio exceeds that of Firm A

SOLUTION TO MINI CASES

- 12-1. In solving for the break-even point in units, the following step-by-step approach seems to be the most logical to students and the easiest for them to understand.

COMPUTE BREAK-EVEN POINT:

STEP 1: Compute the operating profit margin:

Operating profit Margin $[M]$ $\times$ Operating Asset Turnover =
Return on Operating Assets.

$$M \times 8 = 32\%$$

$$M = 4 \%$$

STEP 2: Compute the sales level associated with the given output level:

Operating Assets $\times$ Operating Asset Turnover = Sales

$$\$4,000,000 \times 8 = \text{Sales}$$

$$\text{Sales} = \$32,000,000$$

STEP 3: Compute EBIT:

Sales $[\text{STEP 2}] \times$ Operating Profit Margin $[\text{STEP 1}] = \text{EBIT}$

$$\$32,000,000 \times 4\% = \text{EBIT}$$

$$\text{EBIT} = \$1,280,000$$

STEP 4: Compute revenue before fixed costs:

EBIT $[\text{STEP 3}] \times$ Degree of Operating Leverage = Revenue before Fixed Costs

$$\$1,280,000 \times 6 = \text{Revenue before Fixed Costs}$$

$$\text{Revenue before Fixed Costs} = \$7,680,000$$

STEP 5: Compute total variable costs:

Sales [STEP 2] – Revenue before Fixed Costs [STEP 4] = Total Variable Costs

\$32,000,000 – \$7,680,000 = Total Variable Costs

Total Variable Costs = \$24,320,000

STEP 6: Compute total fixed costs:

Revenue before Fixed Costs [STEP 4] – EBIT [STEP 3] = Fixed Costs

\$7,680,000 – \$1,280,000 = Fixed Costs

Fixed Costs = \$6,400,00

STEP 7: Find selling price per unit (P) and variable cost per unit (V):

P = Sales [STEP 2] / Output in Units

P = \$32,000,000 / 80,000 units

P = \$400

V = Total Variable Costs [STEP 5] / Output in units

V = \$24,320,000 / 80,000 units

V = \$304

STEP 8: Compute break-even point (in units):

Q_B = Fixed Costs [STEP 6] / ($P - V$) [STEP 7]

Q_B = \$6,400,000 / (\$400 – \$304)

Q_B = 66,667

After determining the break-even point using the preceding approach described, the students have the information necessary to prepare an analytical income statement as follows:

Sales	[STEP 2]	\$32,000,000
(Variable Costs)	[STEP 5]	(24,320,000)
Revenue before Fixed Costs	[STEP 4]	\$7,680,000
(Fixed Costs)	[STEP 6]	(6,400,000)
EBIT	[STEP 3]	\$1,280,000
(Interest Expense)		(600,000)
Earnings before Taxes		\$680,000
(Taxes @ 35%)		(238,000)
Net Income		<u>\$442,000</u>

Thereafter, the students have the data they need to answer questions a–e as follows:

- a. Degree of Financial Leverage:

$$\begin{aligned} \text{DFL}_{\text{EBIT}} &= \text{EBIT} / (\text{EBIT} - \text{Interest}) \\ \text{DFL}_{\text{EBIT}} &= \$1,280,000 / (1,280,000 - 600,000) \\ \mathbf{\text{DFL}_{\text{EBIT}} &= 1.88} \end{aligned}$$

- b. Degree of Combined Leverage:

$$\begin{aligned} \text{DCL}_s &= \text{DOL}_s \times \text{DFL}_{\text{EBIT}} \\ \text{DCL}_s &= 6 \times 1.88 \\ \mathbf{\text{DCL}_s &= 11.28} \end{aligned}$$

- c. Break-even point in sales dollars:

$$\begin{aligned} S \times &= F / [1 - (C / S)] \\ S \times &= \$6,400,000 / [1 - (\$24,320,000 / \$32,000,000)] \\ \mathbf{S \times &= \$26,666,667} \end{aligned}$$

- d. If sales increase 30 percent, by what percent would *EBT* increase?

$$\begin{aligned} \% \text{ increase in } EBT &= \% \text{ increase in Sales} \times \text{DCL}_s \\ \% \text{ increase in } EBT &= 30\% \times 11.28 \\ \mathbf{\% \text{ increase in } EBT &= 338\%} \end{aligned}$$

- e. Analytical Income Statement to verify

Sales	\$41,600,000
(Variable Costs)	(31,616,000)
Revenue before Fixed Costs	\$9,984,000
(Fixed Costs)	(6,400,000)
EBIT	\$3,584,000
(Interest Expense)	(600,000)
Earnings before Taxes	\$2,984,000
(Taxes @ 35%)	(1,044,400)
Net Income	<u>\$1,939,600</u>

It may be useful to develop the following proof to assist in explaining the interrelationships of the various values:

$$\begin{aligned} \% \text{ change in } EBT &= (\text{EBT}_{\text{after}} - \text{EBT}_{\text{before}}) / \text{EBT}_{\text{before}} \\ \% \text{ change in } EBT &= (\$2,984,000 - \$680,000) / \$680,000 \\ \mathbf{\% \text{ change in } EBT &= 338\%} \end{aligned}$$

12-2.

COMPUTE BREAK-EVEN POINT:

STEP 1: Compute the operating profit margin:

Operating profit Margin $[M] \times$ Operating Asset Turnover =
Return on Operating Assets.

$$M \times 12 = 48\%$$

$$M = 4\%$$

STEP 2: Compute the sales level associated with the given output level:

Operating Assets $\times$ Operating Asset Turnover = Sales

$$\$6,000,000 \times 12 = \text{Sales}$$

$$\text{Sales} = \$72,000,000$$

STEP 3: Compute EBIT:

Sales [STEP 2] $\times$ Operating Profit Margin [STEP 1] = EBIT

$$\$72,000,000 \times 4\% = \text{EBIT}$$

$$\text{EBIT} = \$2,880,000$$

STEP 4: Compute revenue before fixed costs:

EBIT [STEP 3] $\times$ Degree of Operating Leverage = Revenue before Fixed Costs

$$\$2,880,000 \times 10 = \text{Revenue before Fixed Costs}$$

$$\text{Revenue before Fixed Costs} = \$28,800,000$$

STEP 5: Compute total variable costs:

Sales [STEP 2] $-$ Revenue before Fixed Costs [STEP 4] = Total Variable Costs

$$\$72,000,000 - \$28,800,000 = \text{Total Variable Costs}$$

$$\text{Total Variable Costs} = \$43,200,000$$

STEP 6: Compute total fixed costs:

Revenue before Fixed Costs [STEP 4] $-$ EBIT [STEP 3] = Fixed Costs

$$\$28,800,000 - \$2,880,000 = \text{Fixed Costs}$$

$$\text{Fixed Costs} = \$25,920,00$$

STEP 7: Find selling price per unit (P) and variable cost per unit (V):

$$P = \text{Sales [STEP 2]} / \text{Output in Units}$$

$$P = \$72,000,000 / 120,000 \text{ units}$$

$$P = \$600$$

$$V = \text{Total Variable Costs [STEP 5]} / \text{Output in units}$$

$$V = \$43,200,000 / 120,000 \text{ units}$$

$$V = \$360$$

STEP 8: Compute break-even point (in units):

$$Q_B = \text{Fixed Costs [STEP 6]} / (P - V) \text{ [STEP 7]}$$

$$Q_B = \$25,920,000 / (\$600 - \$360)$$

$$Q_B = 108,000$$

After determining the break-even point using the preceding approach described, the students have the information necessary to prepare an analytical income statement as follows:

Sales	[STEP 2]	\$72,000,000
(Variable Costs)	[STEP 5]	(43,200,000)
Revenue before Fixed Costs	[STEP 4]	\$28,800,000
(Fixed Costs)	[STEP 6]	(25,920,000)
EBIT	[STEP 3]	\$2,880,000
(Interest Expense)		(720,000)
Earnings before Taxes		\$2,160,000
(Taxes @ 42%)		(907,200)
Net Income		<u>\$1,252,800</u>

Thereafter, the students have the data they need to answer questions a–e as follows:

a. Degree of Financial Leverage:

$$DFL_{EBIT} = \text{EBIT} / (\text{EBIT} - \text{Interest})$$

$$DFL_{EBIT} = \$2,880,000 / (\$2,880,000 - 720,000)$$

$$DFL_{EBIT} = \mathbf{1.333}$$

b. Degree of Combined Leverage:

$$DCL_s = DOL_s \times DFL_{EBIT}$$

$$DCL_s = 10 \times 1.333$$

$$DCL_s = \mathbf{13.33}$$

- c. Break-even point in sales dollars:

$$S \times = F / [1 - (VC / S)]$$

$$S \times = \$25,920,000 / [1 - (\$43,200,000 / \$72,000,000)]$$

$$S \times = \mathbf{\$64,800,000}$$

- d. If sales increase 40 percent, by what percent would
- EBT*
- increase?

$$\% \text{ increase in } EBT = \% \text{ increase in Sales} \times DCL_S$$

$$\% \text{ increase in } EBT = 40\% \times 11.28$$

$$\mathbf{\% \text{ increase in } EBT = 533\%}$$

- e. Analytical Income Statement to verify

Sales	\$100,800,000
(Variable Costs)	(60,480,000)
Revenue before Fixed Costs	\$40,320,000
(Fixed Costs)	(25,920,000)
EBIT	\$14,400,000
(Interest Expense)	(720,000)
Earnings before Taxes	\$13,680,000
(Taxes @ 42%)	(5,745,600)
Net Income	<u>\$7,934,400</u>

It may be useful to develop the following proof to assist in explaining the interrelationships of the various values:

$$\% \text{ change in } EBT = (EBT_{\text{after}} - EBT_{\text{before}}) / EBT_{\text{before}}$$

$$\% \text{ change in } EBT = (\$7,934,400 - \$1,252,800) / \$1,252,800$$

$$\mathbf{\% \text{ change in } EBT = 533\%}$$

CHAPTER 13

Dividend Policy and Internal Financing

CHAPTER ORIENTATION

In determining the firm's dividend policy, two issues are important: the dividend payout ratio and the stability of the dividend payment over time. In this regard, the financial manager should consider the investment opportunities available to the firm and any preference that the company's investors have for dividend income or capital gains. Also, stock dividends, stock splits, or stock repurchases can be used to supplement or replace cash dividends.

CHAPTER OUTLINE

- I. The trade-offs in setting a firm's dividend policy
 - A. If a company pays a large dividend, it will thereby:
 - 1. Have a low retention of profits within the firm.
 - 2. Need to rely heavily on a new common stock issue for equity financing.
 - B. If a company pays a small dividend, it will thereby:
 - 1. Have a high retention of profits within the firm.
 - 2. Not need to rely heavily on a new common stock issue for equity financing. The profits retained for reinvestment will provide the needed equity financing.
 - C. The importance of a firm's dividend policy depends on the impact of the dividend decision on the firm's stock price. That is, given a firm's capital budgeting and borrowing decisions, what is the impact of the firm's dividend policies on the stock price?
- II. Does Dividend Policy Matter to Stockholders?
 - Three views about the importance of a firm's dividend policy.
 - A. View 1: Dividends do not matter.
 - 1. Assume that the dividend decision does not change the firm's capital budgeting and financing decisions.

2. Assume perfect markets, which means:
 - a. There are no brokerage commissions when investors buy and sell stocks.
 - b. New securities can be issued without incurring any flotation cost.
 - c. There is no income tax, personal tax, or corporate tax.
 - d. Information is free and equally available to all investors.
 - e. There are no conflicts of interest between management and stockholders.
3. Under the foregoing assumptions, it may be shown that the market price of a corporation's common stock is unchanged under different dividend policies. If the firm increases the dividend to its stockholders, it has to offset this increase by issuing new common stock in order to finance the available investment opportunities. If on the other hand, the firm reduces its dividend payment, it has more funds available internally to finance future investment projects. In either policy, the present value of the resulting cash flows to be accrued to the current investors is independent of the dividend policy. By varying the dividend policy, only the type of return is affected (capital gains versus dividend income), not the total return.

B. View 2: High dividends increase stock value.

1. Dividends are more predictable than capital gains because management can control dividends, while they cannot dictate the price of the stock. Thus, investors are less certain of receiving income from capital gains than from dividend income. The incremental risk associated with capital gains relative to dividend income should, therefore, cause us to use a higher required rate in discounting a dollar of capital gains than the rate used for discounting a dollar of dividends. In so doing, we would give a higher value to the dividend income than we would the capital gains.
2. Criticisms of view 2.
 - a. Since the dividend policy has no impact on the volatility of the company's overall cash flows, it has no impact on the riskiness of the firm.
 - b. Increasing a firm's dividend does not reduce the basic riskiness of the stock; rather, if dividend payment requires management to issue new stock, it only transfers risk and ownership from the current owners to new owners.

C. View 3: Low dividends increase value.

Stocks that allow us to defer taxes (low dividends-high capital gains) will possibly sell at a premium relative to stocks that require us to pay taxes currently (high dividends-low capital gains). Only then will the two stocks provide comparable after-tax returns which, suggests that a policy to pay low dividends will result in a higher stock price. That is, high dividends hurt investors, while low dividends-high retention helps the firm's investors.

But wait, then came 2003 and Congress again felt the need to change the tax code as it pertained to both dividend income and capital gains income. On May 28 President Bush signed into law the "Jobs and Growth Tax Relief Reconciliation Act of 2003."

Recall that part of the impetus for this Act was the recession that commenced in 2001 and the slow rate of payroll jobs creation that followed that recession.

In a nutshell this 2003 Act lowered the top tax rate on dividend income to 15 percent from a previous top rate of 38.6 percent and also lowered the top rate paid on realized long-term capital gains to the same 15 percent from a previous 20 percent. Thus, you can see that the so-called investment playing field was (mostly) leveled for dividend income relative to qualifying capital gains. This rather dramatic change in the tax code will immediately remind you of **Principle 8: Taxes Bias Business Decisions**. In effect, a major portion of the previous bias against paying cash dividends to investors was mitigated. But not all of it.

D. Additional thoughts about the importance of a firm's dividend policy

1. Residual dividend theory: Because of flotation costs incurred in issuing new stock, firms must issue a larger amount of securities in order to receive the amount of capital required for investments. As a result, new equity capital will be more expensive than capital raised through retained earnings. Therefore, financing investments internally (and decreasing dividends) instead of issuing new stock may be favored. This is embodied in the residual dividend theory, where a dividend would be paid only when any internally generated funds remain after financing the equity portion of the firm's investments.
2. The clientele effect: If investors do, in fact, have a preference between dividends and capital gains, we could expect them to seek out firms that have a dividend policy consistent with these preferences. They would, in essence, "sort themselves out" by buying stocks which satisfy their preferences for dividends and/or capital gains. In other words, there would be a "clientele effect," where firms draw a given clientele, given the stated dividend policy. However, unless there is a greater aggregate demand for a particular policy than is being satisfied in the market, dividend policy is still unimportant, in that one policy is as good as the other. The clientele effect tells us only to avoid making capricious changes in a company's dividend policy.
3. Information effect
 - a. We know from experience that a large, unexpected change in dividends can have significant impact on the stock price. Despite such "evidence," it is not unreasonable to hypothesize that dividend policy only appears to be important because we are not looking at the real cause and effect. It may be that investors use a change in dividend policy as a signal about the firm's "true" financial condition, especially its earning power.
 - b. Some would argue that management frequently has inside information about the firm that it cannot make available to the investors. This difference in accessibility to information between management and investors, called information asymmetry, may result in a lower stock price than would be true if we had conditions of certainty. Dividends become a means in a risky marketplace to minimize any "drag" on the stock price that might come from differences in the level of information available to managers and investors.

4. Agency costs: Conflicts between management and stockholders may exist, and the stock price of a company owned by investors who are separate from management may be less than the stock value of a closely-held firm. The difference in price is the cost of the conflict to the owners, which has come to be called agency costs. A firm's dividend policy may be perceived by owners as a tool to minimize agency costs. Assuming the payment of a dividend requires management to issue stock to finance new investments, then new investors will be attracted to the company only if management provides convincing information that the capital will be used profitably. Thus, the payment of dividends indirectly results in a closer monitoring of management's investment activities. In this case, dividends may provide a meaningful contribution to the value of the firm.
 5. Expectations theory: As the time approaches for management to announce the amount of the next dividend, investors form expectations as to how much the dividend will be. When the actual dividend decision is announced, the investor compares the actual decision with the expected decision. If the amount of the dividend is as expected, even if it represents an increase from prior years, the market price of the stock will remain unchanged. However, if the dividend is higher or lower than expected, the investors will reassess their perceptions about the firm and the value of the stock.
- E. The empirical evidence about the importance of dividend policy
1. Statistical tests. To test the relationship between dividend payments and security prices, we could compare a firm's dividend yield (dividend/stock price) and the stock's total return, the question being, "Do stocks that pay high dividends provide higher or lower returns to the investors?" Such tests have been conducted using a variety of the most sophisticated statistical techniques available. Despite the use of these extremely powerful analytical tools involving intricate and complicated procedures, the results have been mixed. However, over long periods of time, the results have given a slight advantage to the low-dividend stocks; that is, stocks that pay lower dividends appear to have higher prices. The findings are far from conclusive, however, owing to the relatively large standard errors of the estimates.
 2. Reasons for inconclusive results from the statistical tests
 - a. To be accurate, we would need to know the amount of dividends investors expect to receive. Since these expectations cannot be observed, we can use only historical data, which may or may not relate to expectations.
 - b. Most empirical studies have assumed a linear relationship between dividend payments and stock prices. The actual relationship may be nonlinear, possibly even with discontinuities in the relationship.
 3. Since our statistical prowess does not provide us with any conclusive evidence, researchers have surveyed financial managers about their perceptions of the relevance of dividend policy. In such surveys, the evidence favors the relevance of dividend policy, but not overwhelmingly so. For the most part, managers are divided between believing that dividends are important and having no opinion in the matter.

F. Conclusions about the importance of dividend policy

1. As a firm's investment opportunities increase, the dividend payout ratio should decrease.
2. The firm's dividend policy appears to be important; however, appearances may be deceptive. The real issue may be the firm's expected earnings power and the riskiness of these earnings.
3. If dividends influence stock price, it probably comes from the investor's desire to minimize and/or defer taxes and from the role of dividends in minimizing agency costs.
4. If the expectations theory has merit, which we believe it does, it behooves management to avoid surprising the investors when it comes to the firm's dividend decision.

III. The Dividend Decision in Practice

A. Legal restrictions

1. A corporation may not pay a dividend:
 - a. If the firm's liabilities exceed its assets.
 - b. If the amount of the dividend exceeds the accumulated profits (retained earnings).
 - c. If the dividend is being paid from capital invested in the firm.
2. Debtholders and preferred stockholders may impose restrictive provisions on management, such as common dividends not being paid from earnings prior to the payment of interest or preferred dividends.

B. Liquidity position: The amount of a firm's retained earnings and its cash position are seldom the same. Thus, the company must have adequate cash available as well as retained earnings to pay dividends.

1. Absence or lack of other sources of financing: All firms do not have equal access to the capital markets. Consequently, companies with limited financial resources may rely more heavily on internally generated funds.

C. Earnings predictability: A firm that has a stable earnings trend will generally pay a larger portion of its earnings in dividends. If earnings fluctuate significantly, a larger amount of the profits may be retained to ensure that enough money is available for investment projects when needed.

D. Ownership control: For many small firms, and certain large ones, maintaining the controlling vote is very important. These owners would prefer the use of debt and retained profits to finance new investments rather than issue new stock.

E. Alternative dividend policies

1. Constant dividend payout ratio: The percentage of earnings paid out in dividends is held constant. Therefore, the dollar amount of the dividend fluctuates from year to year.

2. Stable dollar dividend per share: Relatively stable dollar dividend is maintained. The dividend per share is increased or decreased only after careful investigation by the management.
3. Small, regular dividend plus a year-end extra: Extra dividend is paid out in prosperous years. Management's objective is to avoid the connotation of a permanent dividend increase.

F. Dividend payment procedures

1. Dividends are generally paid quarterly.
2. The declaration date is the date on which the firm's board of directors announces the forthcoming dividends.
3. The date of record designates when the stock transfer books are to be closed, thus identifying who is entitled to the dividend.
4. Brokerage firms terminate the right of ownership to the dividend two working days prior to the date of record. This date is called the ex-dividend date.
5. Dividend checks are mailed on the payment date.

IV. Stock Dividends and Stock Splits

- A. Both a stock dividend and a stock split involve issuing new shares of stock to current stockholders.
- B. The investor's percentage ownership in the firm remains unchanged. The investor is neither better nor worse off than before the stock split/dividend.
- C. On an economic basis, there is no difference between a stock dividend and a stock split.
- D. For accounting purposes, the stock split has been defined as a stock dividend exceeding 25 percent.
- E. Accounting treatment
 1. For a stock dividend, the dollar amount of the dividend is transferred from retained earnings to the capital accounts.
 2. In the case of a split, the dollar amounts of the capital accounts do not change. Only the number of shares is increased, while the par value of each share is decreased proportionately.
- F. Rationale for a stock dividend or split
 1. The price of stock may not fall precisely in proportion to the share increase; thus, the stockholders' value is increased.
 2. If a company is encountering cash problems, it can substitute a stock dividend for a cash dividend. Investors will probably look beyond the dividend to determine the underlying reasons for conserving cash.

V. Stock Repurchases

- A. A number of benefits exists justifying stock repurchases instead of dividend payment. Included in these are:
 - 1. To provide an internal investment opportunity.
 - 2. To modify the firm's capital structure.
 - 3. To impact earnings per share, thus increasing stock price.
- B. Share repurchase as a dividend decision
 - 1. A firm may decide to repurchase its shares, increasing the earnings per share which should be reflected in a higher stock price.
 - 2. The investor's choice
 - a. For tax purposes, the investor may prefer the firm to repurchase stock in lieu of a dividend. Dividends are taxed as ordinary income, whereas any price appreciation resulting from the stock repurchase would be taxed as a capital gain.
 - b. The investor may still prefer dividend payment because
 - (1) Dividends are viewed as more dependable than potential stock price appreciation resulting from stock repurchases.
 - (2) The price the firm must pay for its stock may be too high.
 - (3) Riskiness of the firm's capital structure may increase, lowering the P/E ratio and thus the stock price.
- C. Financing or investment decision
 - 1. A stock repurchase effectively increases the debt-equity ratio towards higher debt, thus repurchase is viewed as a financing decision.
 - 2. Buying its own stock at depressed prices, a firm may consider the repurchase as an investment decision. However, this action is not a true investment opportunity, as the extreme result would mean the company would consume itself.
- D. The repurchase procedure
 - 1. A public announcement should be made detailing the amount, purpose, and procedure for the stock repurchase.
 - 2. Open market purchase—at the current market price.
 - 3. Tender offer—more formal and at a specified price.
 - 4. Negotiated basis—repurchasing from specific large shareholders.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 13-1. The payout ratio indicates the amount of dividends paid relative to the earnings available to common stockholders, or dividend per share divided by earnings per share.
- 13-2. A firm's net profits are used to pay dividends and/or to finance new investments. As larger dividends are paid, retained earnings available for reinvestment are reduced. Conversely, as a larger amount of profits is reinvested, the capital available for common stockholders' dividends is reduced.
- 13-3. a. According to the residual dividend theory, dividends are paid only if retained earnings are available after financing all acceptable investments.
- b. This theory may not be feasible in the short term because the year-to-year variability in dividend payments is undesirable. The theory can be used in the long term if management projects financing needs for several years. A target dividend payout ratio for this planning horizon can be established that will distribute the residual capital smoothly over the period.
- 13-4. Statutory restrictions prevent a corporation from paying dividends if its liabilities exceed its assets, the amount of the dividend exceeds retained earnings, or the dividend is being paid from capital invested in the firm.
- The restrictions in debt and preferred stock contracts may also limit dividends. These contract provisions may stipulate that dividends are not to be paid from earnings prior to the debt payment. Also, a certain amount of working capital may be required. Finally, if any preferred dividends have gone unpaid, a provision may restrict payment of common dividends.
- 13-5. Conventional wisdom says that firms pay cash dividends when they have both the cash to pay out and their future prospects are favorable for continuing the dividend payment. In Apple's case, as the introduction to the chapter points out, this is certainly the case. The company's prospects with dominant products in phones and tablet PCs have led the firm into its most successful period since the advent of the Mac back in the eighties.
- 13-6. Dividends are paid with cash. If there is little or no cash available, the firm will be unable to pay dividends.
- 13-7. For many smaller companies, maintaining voting control is very important. Issuing new stock is unattractive to these firms if it results in a dilution of the control of the current stockholders. Financing by debt and through profits will be preferred. Thus, the firm's growth is limited to the amount of debt capital available and the company's ability to generate profits.
- 13-8. The declaration date is the date that the dividend is formally authorized by the board of directors. Investors shown to own the stock on the date of record receive the dividends. The ex-dividend date is two days prior to the record date. This date is set by stock

brokerage companies as the date when the right of ownership to the dividend is terminated.

- 13-9. The stockholder benefits only if the price of the stock does not fall in proportion to the number of new shares issued. An advantage to the corporation is the conservation of cash for investment opportunities.
- 13-10. A stock repurchase might be used by a firm to provide an alternative to cash dividends, to provide an “internal” investment opportunity, to alter the firm’s capital structure, or any of a variety of other reasons stemming from a reduction of shares outstanding.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

- 13-1. Carson paid \$0.02 per share in dividends to the holders of 10 million shares for a total of \$200,000. Given the firm’s \$2.4 million in earnings, this means that firm paid out 8.33 percent of its earnings.
- 13-2. The firm needs to raise \$10 million, of which 40 percent or \$4 million will be borrowed. The remaining \$6 million must be raised as equity financing. The firm had earnings of \$4 million, of which half or \$2 million will be retained. Thus, the firm must raise \$6 million in equity, which, after considering the \$2 million in retained earnings, leaves \$4 million that must be raised through the issuance of new shares of stock.
- 13-3. A perfect capital market is a fictional representation of what a market might look like with many buyers and sellers (no one of whom was large enough for her transactions to have an impact on market prices) and if there were no costs of transacting. The astute student will recall from her economics class that this idea is the same as that of a perfectly competitive market. In finance, we often refer to such a market as an efficient market in the sense that information is quickly and efficiently acted upon by investors, whose actions push prices toward full reflection of the value of that information.
- 13-4. This is often a difficult concept for students to grasp. In essence it would seem that the act of paying a cash dividend reduces the uncertainty that investors have about a firm’s future cash flows. The confusion arises from the fact that dividend policy decisions are made in a world in which the firm’s investment and financing decisions are held constant. Thus, when the firm pays out cash dividends (which are more certain than anticipated future dividends), it must issue new equity to replace those dividends when profitable investment opportunities exist. Thus, on balance, the firm is neither less nor more risky as a result of the dividend.

But what about the investor’s position, is she better off with money-in-hand? Note that the investor’s portfolio has changed: her equity position has become a less-equity-plus-cash position. If that’s what the investor wanted, she could have just sold some of her stock.

- 13-5. a. FarmCo follows a residual dividend payout policy. Sixty percent of the total new investment comes from retained earnings; earnings not needed to fund investments are paid in dividends. The firm earned \$12 million, so if it deployed all of its earnings, the firm could provide equity financing for new projects totaling \$20 million = \$12 million/0.6.
- b. If the firm's capital budget were \$10 million, then they would need to retain 60 percent of this total, or \$6 million, to help fund the investment. This would leave \$6 million to be paid out in dividends, implying a payout ratio of 50 percent (\$6 million in dividends/\$12 million net income).
- 13-6. Legal restrictions on the payment of dividends come in two basic forms. The first consist of statutory restrictions. These limitations vary by state. Examples of these restrictions are things such as the following: a dividend cannot be paid: (1) if the firm's liabilities exceed its assets, (2) if the amount of the dividend exceeds the firm's accumulated earnings, or (3) if the dividend is being paid from capital invested in the firm.
- The second type of legal restriction is unique to each firm and results from the restrictions in debt and preferred stock contracts. For example, to minimize their risk, investors in the firm's debt and preferred stock may include specific restrictions on the firm's ability to payout cash dividends.
- 13-7. See the discussion of legal and liquidity constraints found in Section 13.3 of the text. In addition, the firm should consider earnings predictability as a factor that determines the ability of the firm to sustain the dividend payment (cutting dividends is often construed to mean the company's fortunes have taken a turn for the worse). Finally, management should consider whether paying a dividend will lead to the need to raise equity capital in the future, which could dilute control of the firm by its current owners. Note however, that the dilution occurs only if the equity raised is not profitably deployed.

13-8.

<u>Year</u>	<u>Profit After Taxes</u>
1	\$18,000,000
2	21,000,000
3	19,000,000
4	23,000,000
5	<u>25,000,000</u>
Total Profit After Taxes	<u>\$106,000,000</u>
Shares Outstanding	7,500,000

- a. Stable target payout of 40%

$$\text{Target dividend: } \$1.13 = \frac{\$106,000,000 (0.4)}{7,500,000} / 5 \text{ years}$$

- b. Small regular dividend of \$0.60 plus year-end extra

Base profits \$20,000,000

% of extra profits 50.00%

Year	Dividend		
1	0.60		
2	0.67	=	$0.60 + (\$21,000,000 - \$20,000,000)(0.5)/7,500,000$
3	0.60		
4	0.80	=	$0.60 + (\$23,000,000 - \$20,000,000)(0.5)/7,500,000$
5	0.93	=	$0.60 + (\$25,000,000 - \$20,000,000)(0.5)/7,500,000$

- c. Constant Payout Ratio of 40%

<u>Year</u>	<u>Dividend</u>	=	<u>Profits × Payout Ratio</u>	÷	<u>Shares</u>
1	0.96	=	$\$18,000,000(0.4)$	÷	7,500,000
2	1.12	=	$\$21,000,000(0.4)$	÷	7,500,000
3	1.01	=	$\$19,000,000(0.4)$	÷	7,500,000
4	1.23	=	$\$23,000,000(0.4)$	÷	7,500,000
5	1.33	=	$\$25,000,000(0.4)$	÷	7,500,000

- 13-9. a. The firm needs a total of \$ 14 million to fund its expansion plans, which means it needs \$9.8 million (70 percent of \$14 million) in equity funding to maintain its desired capital structure. With \$4 million in earnings and a 50 percent payout ratio, the firm will have only \$2 million in equity funds from the retention of earnings, leaving \$7.8 million that must be raised by the sale of common stock.

- b. If the firm does not want to sell new shares and only has \$2 million in equity financing from its earnings, then their maximum capital budget if only \$2,857,143 (\$2 million is 70 percent of \$2,857,143).

- 13-10. a. To finance the needed \$30 million, assuming the firm maintains a 40 percent debt to assets ratio, will require a total of \$18 million in equity financing. Since the firm pays a dividend of \$8 million and earns \$12 million, it can retain only \$4 million to help defray the cost of the investment. This leaves \$14 million that needs to be raised by the sale of common stock.

- b. If the firm retains \$4 million and maintains a 40 percent debt to assets ratio, then it will be able to invest only \$6,666,667 (\$4 million is 60 percent of \$6,666,667).

- 13-11. See the discussion found in the final topic discussed in Section 13.3.

- 13-12. a. Earnings per share (pre) = \$10 million/20 million shares = \$0.50

- b. Earnings per share (post) = \$10 million/20.5 million shares = \$0.4878

- c. Fraction of earnings (pre) = $(1,000/20 \text{ million}) \times \$10 \text{ million} = \$500$
 $= (1,000 \text{ shares}) \times (\$0.50/\text{share}).$

Fraction of earnings (post) = $(1,025/20.5 \text{ million}) \times \$10 \text{ million} = \$500$
 $= (1,025 \text{ shares}) \times (\$0.4878/\text{share}).$

This example illustrates that the “illusion” of gain from a stock dividend is truly an illusion.

- 13-13. a. With 10 million shares outstanding and \$40 million in earnings, the earnings per share is \$4.00.
- b. The total number of shares increases four-fold with the split, from 10 million to 40 million shares.
- c. After the split the earnings are still \$40 million, but with 40 million shares the earnings per share drop to \$1.00.
- d. Before the split your 100 shares entitled you to $100 \times \$4.00$ per share or \$400 in firm earnings. After the split you own 400 shares, but earnings per share is only \$1.00, so that the total earnings associated with your investment is still \$400.
- e. There is no change in your ownership percentage of the firm. However, to the extent that more investors can now afford to purchase the firm's shares at the new lower price, your shares may indeed appreciate in value.
- 13-14. a. If a 15 percent stock dividend is issued, the financial statement would appear as follows:

Debt	\$1,800,000
Common equity	
Par (\$2 par; 115,000 shares)	230,000
Paid-in-capital	670,000
Retained earnings	<u>600,000</u>
	<u>\$3,300,000</u>

- b. A two-for-one split would result in a 100 percent increase in the number of shares. Because the total par value remains at \$200,000, the new par value per share is \$1 ($\$1,000,000/200,000 \text{ shares}$). The new financial statement would be as follows:

Debt	\$1,800,000
Common equity	
Par (\$2 par; 115,000 shares)	200,000
Paid-in-capital	400,000
Retained earnings	<u>900,000</u>
	<u>\$3,300,000</u>

13-15.

Dunn Corporation—Repurchase of Stock

Proposed dividend	\$ 500,000
Shares outstanding	250,000
Earnings per share	\$ 5.00
Ex-dividend price	\$ 50.00
Proposed dividend/share	\$2.00

- a. Repurchase price $\underline{\$ 52.00} = \$50 + \$2$
 - b. Number of shares repurchased $\underline{9,615} = \$500,000 \div (\$50 + \$2)$
 - c. The capital gains to be received by the stockholder would not be equal to the intended dividend, thus resulting in a dollar benefit or loss to the stockholders.
 - d. Unless you have a need for current income, you would probably prefer the stock repurchase plan.
- 13-16. a. If the firm purchases \$5 million of its stock for a price per share of \$50 then it will be able to acquire 100,000 shares. This represents $100,000/20,000,000 = 0.50$ percent of the firm's shares.
- b. Following the repurchase the firm will have 19.9 million shares outstanding and \$5 million in earnings, which produces earnings per share of \$0.25126.

SOLUTION TO MINI CASE

1. a.

Post-split shares owned ($30,000 \times 0.08 / 2$)	4,800 shares
Post-split share price ($\$98/2$)	\$ 49.00
Value of shares post-split ($\$49 \times 4,800$)	\$ 235,200.00
Value of shares pre-split ($\$98 \times 2,400$)	\$ 235,200.00

Assuming the firm's share price decreases by half with the doubling of the number of shares outstanding, we would expect no change in the value of the investor's position in the company's shares.

b.

Post-split price decline	45%
Post-split price	\$ 53.90
Post-split shares owned	4,800
Total value of shares	\$ 258,720.00
Gain from the split	\$ 23,520.00

If the share price drops by only 45 percent (as opposed to 50 percent as in part a) then the post-split shares will be worth \$258,720 or \$23,520 more than in the previous analysis.

2.

a.	Per share	Total
Dividend	\$ 2.00	\$ 550,000.00
Share price	45.00	12,375,000.00
Total	\$ 47.00	\$ 12,925,000.00

Value of Shares repurchased		\$ 550,000.00
Remaining shares		263,297.87
Share price (value or remaining shares)	47.00	12,375,000.00
Total	\$ 47.00	\$ 12,925,000.00

b. Shares repurchased 11,702

c. In theory, the value to the small investor should be exactly the same in either case. If the dividend is paid, then they get \$200 and have 100 shares valued at \$45 per share for a total of \$4,700. If the repurchase is carried out, then they could sell their 100 shares for \$4,700. In either case they receive the same value for their investment.

CHAPTER 14

Short-Term Financial Planning

CHAPTER ORIENTATION

This chapter is divided into two sections. The first section includes an overview of the role played by forecasting in the firm's planning process. The second section focuses on the construction of detailed financial plans, including budgets and pro forma financial statements for future periods of the firm's operations. A budget is a forecast of future events and provides the basis for taking corrective action and can also be used for performance evaluation. The cash budget and pro forma financial statements provide the necessary information to determine estimates of future financing requirements of the firm. These estimates are the key elements in our discussion of financial planning and budgeting.

CHAPTER OUTLINE

I. Financial Forecasting

- A. The need for forecasting in financial management arises whenever the future financing needs of the firm are being estimated. There are three basic steps involved in predicting financing requirements.
 - 1. Project the firm's sales revenues and expenses over the planning period.
 - 2. Estimate the levels of investment in current and fixed assets that are necessary to support the projected sales level.
 - 3. Determine the financing needs of the firm throughout the planning period.
- B. The key ingredient in the firm's planning process is the sales forecast. This forecast should reflect (1) any past trend in sales that is expected to continue and (2) the effects of any events which are expected to have a material effect on the firm's sales during the forecast period.
- C. The traditional problem faced in financial forecasting begins with the sales forecast and involves making forecasts of the impact of predicted sales on the firm's various expenses, assets, and liabilities. There are a number of techniques that can be used to make these forecasts:
 - 1. The percent of sales method involves projecting the financial variable as a percent of projected sales.

2. A slightly more refined technique involves the use of a scatter diagram in which the financial variable is plotted against corresponding levels of sales (or another predictor variable). A line is then visually fitted to the scatter plot and is used to predict the financial variable.
3. Regression analysis represents a method for mathematically “fitting” a line to a scatter plot. The resulting equation can then be used to predict the level of the subject financial variable. The regression method can be used whenever there is a single “predictor” variable (referred to as the independent variable, e.g., firm sales) and a single “predicted” variable (referred to as the dependent variable, e.g., firm inventories). Furthermore, a multiple regression analysis can be used whenever more than one predictor (independent) variable is used to predict a single financial variable.

D. Analyzing the Effects of Profitability and Dividend Policy on DFN

1. Spontaneous sources of financing include accounts payable and other liabilities (e.g., wages payable) that arise “spontaneously” as the firm conducts its business plus the firm’s net income less any dividends it pays. Consequently, the firm’s dividend policy has a direct impact on its sources of spontaneous financing and consequently its needs for discretionary financing (DFN).
2. A firm’s Discretionary Financing Needs (DFN) is the amount of financing the firm needs to raise from discretionary (non-spontaneous) sources in order to finance its assets.

II. Limitations of the Percent of Sales Forecasting Method

- A. Revenue growth has two effects on DFN. First, as revenues grow this requires that the firm invests in additional working capital (current assets less current liabilities). Furthermore, with growing revenues the firm’s profits generally increase with the effect of increasing the availability of funds to be retained and reinvested in the business.
- B. The rate of growth in revenues that the firm can sustain (i.e., provide the needed financing) from spontaneous sources, the retention of earnings, and new discretionary financing that maintains the firm’s ratio of debt to assets is commonly referred to as the firm’s Sustainable Rate of Growth. If we define b to represent the proportion of firm earnings that is retained and reinvested in the business and ROE as the rate of return earned on equity, then the Sustainable Rate of Growth can be calculated as follows:

$$\text{Sustainable Rate of Growth} = ROE (1-b)$$

III. Constructing and Using a Cash Budget

- A. In general, a business will use four types of budgets: physical, cost, profit, and cash.
 1. Physical budgets include budgets for unit sales, personnel or manpower, unit production, inventories, and actual physical facilities. They are also used as a basis for generating cost and profit budgets.
 2. Cost budgets are prepared for every major expense category of the firm, such as manufacturing or production cost, selling cost, and administrative cost.

3. The profit budget is prepared based upon information generated from the sales budget and cost budget.
 4. The cash budget is generated by converting all budget information previously discussed into a cash basis.
- B. The cash budget represents a detailed plan of future cash flows and can be broken down into four components: cash receipts, cash disbursements, net change in cash for the period, and new financing needed. Cash budgets can also be either fixed or variable.
1. In a fixed cash budget, cash flow estimates are made for a single set of sales estimates.
 2. The variable cash budget involves the preparation of several budgets with each budget corresponding to a different set of sales estimates. This budget fulfills the two following basic needs:
 - a. The variable budget gives management more information on the range of possible financing needs of the firm.
 - b. Management is provided with a standard against which it can measure the performance of subordinates responsible for various cost and revenue items contained in the budget.
- C. Although no strict rules exist, as a general rule, the budget period shall be long enough to show the effect of management policies, yet short enough so that estimates can be made with reasonable accuracy. For instance, the capital expenditure budget may be properly developed for a 10-year period while a cash budget may cover only 12 months.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 14-1. Seasonal variations in the demand for a firm's goods and/or services give rise to fluctuations in the firm's need for working capital and consequently its need for short-term financing. Specifically, when revenues rise in peak seasons (e.g., around Christmas for most retailers) the first thing we see is a need for additional inventory to meet the seasonal increase in demand. This inventory spike may be financed by the firm's suppliers in which case there is no increase in need for financing. However, the financing terms offered by suppliers may be shorter than the time the firm needs to hold the added inventory plus the time it takes to collect on credit sales in which case there will be a need for added financing. As products are sold, the firm that offers credit to its customers will need to continue to finance its inventories (that have been sold but the cash has not been collected). As the peak season passes, the firm's seasonal run-up in inventories will have been sold down, and the receivables from credit sales collected such that the firm can pay down any remaining accounts payable and any seasonal borrowing.
- 14-2. This rather simplistic forecast method assumes no other information is available which would indicate a change in the observed relationship between sales and the expense item, asset, or liability being forecast. Furthermore, the percent of sales method works best for projected sales levels that are very close to the base level sales used to determine the "percent of sales." The greater the difference in predicted and base level sales, in general, the less accurate will be the percent of sales forecast.
- 14-3. The probable effect on cash flows would be as follows:
- a. increased cash inflow from sales but increased cash outflow to finance needed increases in inventories and other assets.
 - b. increased supply of available cash.
 - c. decreased cash inflow.
 - d. immediate decrease in cash inflows (or a cash outflow).
- 14-4. A cash budget can also be used to determine the amount of excess cash on hand that will not be needed to finance future operations. This excess cash can then be invested in securities or other profitable alternatives.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

14- 1.	2013	% of Sales	2014
<u>Sales</u>	\$12,000,000		\$15,000,000
Net Income	1,200,000		2,000,000
Current Assets	3,000,000	25%	3,750,000
Net fixed assets	<u>6,000,000</u>	50%	<u>7,500,000</u>
Total	<u>\$ 9,000,000</u>		<u>\$11,250,000</u>
Liabilities and Owner's Equity			
Accounts payable	\$3,000,000	25%	\$3,750,000
Long-term debt	<u>2,000,000</u>	NA	<u>2,000,000</u>
Total Liabilities	5,000,000		5,750,000
Common stock	1,000,000	NA	1,000,000
Paid-in capital	1,800,000	NA	1,800,000
Retained earnings	<u>1,200,000</u>		<u>3,200,000</u>
Common equity	<u>4,000,000</u>		<u>6,000,000</u>
Total	<u>\$9,000,000</u>		<u>\$11,750,000</u>
	DFN =		<u>\$(500,000)</u>

- 14-2. a. Calculating the A/R balance for the end of April:

DATA

Credit sales	50%
Collection in the month after the sale	50%
Collection two months after the sale	50%

	January	February	March	April
Sales	15,000	20,000	25,000	30,000
Credit sales	7,500	10,000	12,500	15,000

Uncollected accounts receivable from sales in March (half of March sales) \$ 6,250

Uncollected account receivable from sales in April (half of April sales) 15,000

Accounts receivable at the end of April \$21,250

- b. Cash realized during April from sales and collections:

Cash sales	\$15,000
Credit sales	15,000
Accounts receivable at the beginning of the month (end of March)	17,500
Accounts receivable at the end of the month	<u>21,250</u>
Cash collected	\$26,250

14- 3. Based upon the projections made, Sambonoza can expect to have total assets next year equal to \$1.8 million made up of the \$1 million in fixed assets plus \$800,000 ($0.2 \times \$4$ million) in current assets. These assets will be financed by known sources of funding comprised of \$900,000 in common equity [$\$800,000 + (0.5)(0.05)(\$4 \text{ million}) = \$900,000$], plus payables and trade credit equal to 10 percent of projected sales (\$400,000) which totals \$1.3 million. This leaves \$500,000 (\$1.8 million – \$1.3 million), which will need to be raised to meet the financing needs of the firm.

14- 4. Instructor's Note: This is an introductory percent of sales financial forecasting problem. Students should be able to solve it after a first reading of the chapter.

a. Projected Financing Needs = Projected Total Assets

$$= \text{Projected Current Assets} + \text{Projected Fixed Assets}$$

$$= \frac{\$5\text{m}}{\$15\text{m}} \times \$20\text{m} + \$5\text{m} + \$0.1\text{m} = \$11.77\text{m}$$

b. DFN = Projected Current Assets + Projected Fixed Assets

– Present LTD – Present Owner's Equity

– [Projected Net Income – Dividends]

– Spontaneous Financing

$$= \frac{\$5\text{m}}{\$15\text{m}} \times \$20\text{m} + \$5.1\text{m} - \$2\text{m} - \$6.5\text{m}$$

$$- [0.05 \times \$20\text{m} - \$0.5\text{m}] - \frac{\$1.5\text{m}}{\$15\text{m}} \times \$20\text{m}$$

$$\text{DFN} = \$6.67\text{m} + \$5.1\text{m} - \$8.5\text{m} - \$0.5\text{m} - \$2\text{m} = \underline{\underline{\$0.77\text{m}}}$$

c. We first solve for the maximum level of sales for which DFN = 0:

$$\text{DFN} = 0.1833 \text{ SALES} - \$2.9\text{M} = 0$$

$$\text{Thus, SALES} = \$15.82\text{M}$$

The largest increase in sales that can occur without a need to raise “discretionary funds” is

$$\$15.82\text{M} - \$15\text{M} = \$820,000.$$

14-5. Given information:

Total asset turnover	1.5	times
Average collection period	15.0	days
Fixed asset turnover	5.0	times
Inventory turnover	3.0	times
Current ratio	2.0	times
Sales	\$3,000,000	
COGS	75%	of sales
Debt ratio	50%	

Proforma Balance Sheet

Cash	\$525,000
Accts receivable	125,000
Inventories	750,000
Net fixed assets	<u>600,000</u>
Total assets	<u>\$2,000,000</u>
Current liabilities	\$700,000
Long-term debt	300,000
Total liabilities	1,000,000
Common equity	<u>1,000,000</u>
Total liabilities and common equity	<u>\$2,000,000</u>

14-6.	Cash	NO ¹
	Marketable Securities	NO
	Accounts Payable	YES
	Notes Payable	NO ²
	Plant and Equipment	NO
	Inventories	YES

¹ Cash receipts follow sales with a lag related to the payment habits of the firm's customers and the firm's policy regarding payments on its accounts payable.

² Notes payable may well follow sales if the firm uses a line of credit to finance its working capital needs (discussed in a later chapter).

14-7.	DATA	
	Current assets	10.0
	Net fixed assets	15.0
	Total	25.0
	Accts payable	5.0
	Notes payable	0.0
	Bonds payable	10.0
	Common equity	10.0
	Total	25.0
	Sales	25,000,000
	Expected sales	40,000,000

- a. Proforma Balance Sheet
- | | |
|------------------|------|
| Current assets | 16.0 |
| Net fixed assets | 15.0 |
| Total | 31.0 |
| Accts payable | 8.0 |
| Notes payable | 3.0 |
| Bonds payable | 10.0 |
| Common equity | 10.0 |
| Total | 31.0 |
- b. New financing required for the coming year:
- | | | |
|-----------------|---|-----|
| Total financing | = | 3.0 |
|-----------------|---|-----|
- c. See the answer to question 14-1.

14-8. a.

Estimating Future Financing Needs
Armadillo Dog Biscuit Co., Inc.
Projected Need for Discretionary Financing

	Present Level	% of Sales (\$5m)	Projected Level (Based on \$7m Sales)
Current Assets	\$2.0m	$\frac{\$2m}{\$5m} = 0.40$ or 40%	$0.40 \times \$7m = \$2.8m$
Net Fixed Assets	<u>\$3.0m</u>	$\frac{\$3m}{\$5m} = 0.60$ or 60%	$0.60 \times \$7m = \underline{\$4.2m}$
Total	\$5.0m	<u>\$7.0m</u>	
Accounts Payable	\$0.5m	$\frac{\$0.5m}{\$5m} = 0.10$ or 10%	$0.10 \times 7m = 0.7m$
Accrued Expenses	\$0.5m	$\frac{\$0.5m}{\$5m} = 0.10$ or 10%	$0.10 \times 7m = 0.7m$
Notes Payable ¹	----	---	Plug Figure = 1.11m
Current Liabilities	\$1.0m		\$2.51m
Long-Term Debt	\$2.0m	No Change	\$2.00m
Common Stock	0.5m	No Change	0.50m
Retained Earnings ²	<u>1.5m</u>	$\$1.5m + 0.07 \times \$7m =$	<u>\$1.99m</u>
Common Equity	<u>\$2.0m</u>		\$2.49m
Total	<u>\$5.0m</u>		<u>\$7.00m</u>

¹ Notes payable is a balancing figure which equals discretionary financing needed, DFN, which equals: Total Assets – Accounts Payable – Accrued Expenses – Long-Term Debt – Common Stock – Retained Earnings = \$7.0m – \$0.7m – \$0.7m – \$2.0m – \$0.5m – \$1.99m = \$1.11m.

² The projected retained earnings is the sum of the beginning balance of \$1.5m plus net income for the period ($0.07 \times \$7m$) or \$1.99 m.

	Before			After		
b.	Current Ratio	$\frac{\$2\text{m}}{\$1\text{m}}$	= 2 times	$\frac{\$2.8\text{m}}{\$2.51\text{m}}$	=	1.12 times
	Debt Ratio	$\frac{\$3\text{m}}{\$5\text{m}}$	= 0.60 or 60%	$\frac{\$4.51\text{m}}{\$7.0\text{m}}$	=	0.644 or 64.4%

The growth in the firm's assets (due to the projected increase in sales) was financed predominantly with notes payable (a current liability). This led to a substantial deterioration in both the firm's liquidity (as reflected in the current ratio) and an increase in its use of financial leverage.

- c. The slower rate of growth in sales would have allowed Armadillo to finance a larger portion of the funds needed using retained earnings. For example, using the 7 percent net profit margin, Armadillo would have $0.07 \times \$6\text{m} = \$420,000$ it could reinvest after one-year's operations plus $0.07 \times \$7\text{ million} = \$490,000$ from the second year's sales. The total amount of retained earnings over the two years then would be \$910,000 rather than only \$490,000 as before. This would mean that notes payable would be only $\$1.11\text{m} - \$0.42\text{m} = \$690,000$. The resulting level of current liabilities would be \$2.09m. Thus, the post-sales growth current ratio after two years would be 1.34 ($\$2.8\text{m}/\$2.09\text{m} = 1.34$) compared to 1.12 with a one-year growth period. The debt ratio under the two-year growth period will be only 62 percent compared to approximately 64 percent with the single-year growth period. Thus, the slower growth pace would allow the firm to expand its assets more gradually, thus requiring less external financing, since more earnings can be retained.

- 14-9. Instructor's Note: This problem differs from the text discussion of "discretionary financing needed" in that it relies on the projected change in assets rather than the projected level of total assets. Under these circumstances $\text{DFN} = \Delta\text{TA} - \Delta\text{SL} - \Delta\text{RE}$ where ΔTA = the projected change in total assets which is the amount of new financing needed (in total); ΔSL = the projected change in spontaneous liabilities; and ΔRE = the projected change in retained earnings that will be available to finance a portion of the firm's needs for new funds.

First, we estimate that the projected change in assets during the coming year will be:

$$\begin{aligned}\Delta\text{TA} &= 0.30 \Delta\text{Sales} \\ &= 0.30 (\$500,000) = \$150,000\end{aligned}$$

Thus, total new financing of \$150,000 must be obtained from somewhere during the next year to support the growth in firm sales.

Next, we project the change in spontaneous liabilities (ΔSL)

$$\begin{aligned}\Delta\text{SL} &= 0.15 \Delta\text{Sales} \\ &= 0.15 (\$500,000) = \$75,000\end{aligned}$$

Finally, we project new retained earnings (ΔRE) that will be available to help finance the firm's operations during the next year,

$$\begin{aligned}\Delta RE &= \text{New Income} - \text{Dividends} \\ &= 0.05 \times \text{Projected Sales} - 0.04 \times \text{Projected Sales} \\ &= 0.01 (\$5,500,000) \\ \Delta RE &= \$55,000\end{aligned}$$

Discretionary Financing Needed (DFN) can now be calculated as follows:

$$\begin{aligned}\text{DFN} &= \Delta TA - \Delta SL - \Delta RE \\ &= \$150,000 - 75,000 - 55,000 \\ &= \underline{\$20,000}\end{aligned}$$

Note that this problem solution works with the *change* in financing needs rather than *totals*. The same solution would result if we projected total assets, total spontaneous financing, etc. However, in this problem we do not know the existing levels of the liabilities and owner's equity accounts. Thus, we cannot use this latter approach to solve this problem.

14-10. a.

Given:

Sales Growth Rate	20%
COGS/Sales	70%
Operating Expenses/Sales	15%
Depreciation Expense (000)	\$ 50
Interest Expense (000)	\$ 10
Tax Rate	35%
Dividends (000)	\$20.00

Income Statement (000)

	2010	2011
Sales	\$1,500	1800
Cost of Goods Sold	<u>(1,050)</u>	<u>(1,260)</u>
Gross Profit	450	540
Operating Costs	<u>(225)</u>	<u>(270)</u>
Depreciation Expense	<u>(50)</u>	<u>(50)</u>
Net Operating Profit	175	220
Interest Expense	<u>(10)</u>	<u>(10)</u>
Earnings Before Taxes	165	210
Taxes	<u>(58)</u>	<u>(74)</u>
Net Income	<u>\$ (107)</u>	<u>\$ (137)</u>
Dividends	\$ 20	\$ 20
Addition to Retained Earnings	\$ 87	\$ (117)

b.

Given:

Sales Growth Rate	40%
COGS/Sales	70%
Operating Expenses/Sales	15%
Depreciation Expense (000)	\$ 58
Interest Expense (000)	\$ 15
Tax Rate	35%
Dividends (000)	\$20.00

Income Statement (000)

	2010	2011
Sales	\$ 1,500	\$ 2,100
Cost of Goods Sold	<u>(1,050)</u>	<u>(1,470)</u>
Gross Profit	<u>450</u>	<u>630</u>
Operating Costs	(225)	(315)
Depreciation Expense	<u>(58)</u>	<u>(58)</u>
Net Operating Profit	<u>167</u>	<u>257</u>
Interest Expense	<u>(15)</u>	<u>(15)</u>
Earnings Before Taxes	<u>152</u>	<u>242</u>
Taxes	<u>53</u>	<u>85</u>
Net Income	<u>\$ 99</u>	<u>\$ 157</u>
Dividends	\$ 20	\$ 20
Addition to Retained Earnings	\$ 79	\$ 137

14-11. a. Percent of sales forecast

Year	Sales	Inventories	Inventory as a % of Sales	Forecast % of Sales	Regression
2005	\$ 5,250,000	\$ 1,590,924	30%		
2006	6,200,000	1,724,221	28%		
2007	6,940,000	1,899,573	27%		
2008	5,650,000	1,530,054	27%		
2009	6,255,000	1,772,059	28%		
2010	7,100,000	1,919,042	27%		
2011	7,350,000	2,012,025	27%		
2012	8,010,000	2,006,023	25%		
2013	8,775,000	2,292,119	26%		
2014	10,390,000	2,537,486	24%		
2015	11,500,000		27.09%	\$ 3,115,191	\$ 2,774,758
2016	12,000,000			3,250,634	2,873,008
2017	12,500,000			3,386,077	2,971,258
2018	13,000,000			3,521,521	3,069,508
2019	13,500,000			3,656,964	3,167,758

Average %
of Sales

The percentage of sales forecast use the average percent of sales for 2005–2014 which is 27.09 percent to estimate the firm's needs for inventory. Specifically, for 2015 we estimate inventory as follows:

$$\text{Inventory (2015)} = 0.2709 \times 11,500,000 = \$3,115,191$$

The regression forecast included in the above analysis is not discussed in the text, but the instructor may want to discuss it. The estimated coefficients for the model are as follows:

$$\text{Inventory (2015)} = 515,008 + 0.1965 \text{ Sales Forecast (2015)}$$

Note that the coefficient on the Sales Forecast is only 0.1965, which is substantially lower than the percentage of sales estimate of 0.2709. This difference is caused by the fact that the percentage of sales method has a zero intercept while the regression model allows for a non-zero intercept. That is, the percent of sales forecast found above was the following:

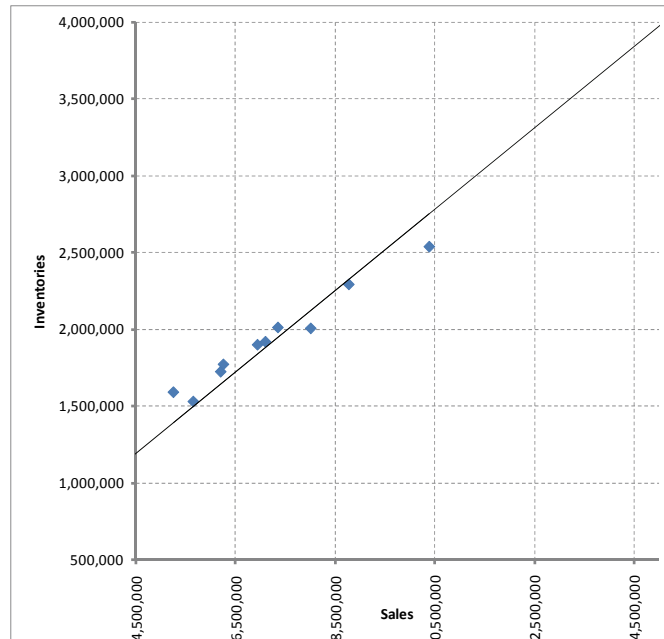
$$\text{Inventory (2015)} = 0.2709 \times \text{Sales Forecast (2015)}$$

Note that for each dollar of sales that is forecast, we estimate the 27.09 percent of it will be needed in inventory. With the regression forecast using a straight line equation, the forecast looks like the following:

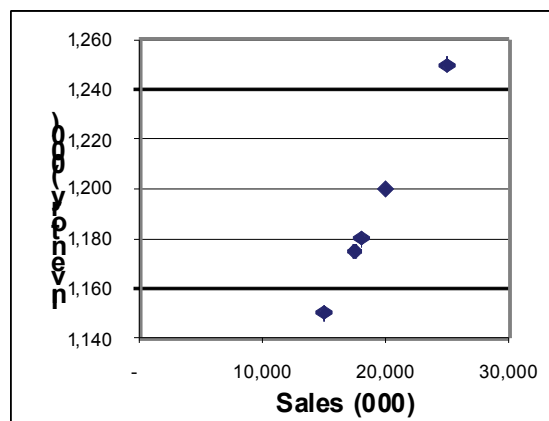
$$\text{Inventory (2015)} = 515,008 + 0.1965 \text{ Sales Forecast (2015)}$$

In this equation, there is a constant amount of inventory equal to 515,008 that is projected to be held by the firm regardless of the predicted level of sales. To this constant are added 19.65 percent of the projected sales.

- b. The plot of actual inventory levels and the percentage of sales forecast (the solid line) reveal a common problem with the percentage of sale method. Specifically, note that the percentage of sales line under forecasts inventory levels for low levels of sales and begins to over predict them for higher levels. In other words the predictions do not fit the historical data perfectly. The reason for this is that the percentage of sales method “assumes” that firm inventory level is zero where sales are zero. In mathematical terms this is a “zero intercept” for the predictive equation. Where this assumption is incorrect, we will get this type of prediction error.



- 14-12. a. Findlay's sales and inventory balances are plotted in the figure below. Note that the relationship between the two variables is very nearly linear. However, the intercept for the relationship is not zero; consequently, the percent of sales projections is going to provide erroneous estimates of future sales.



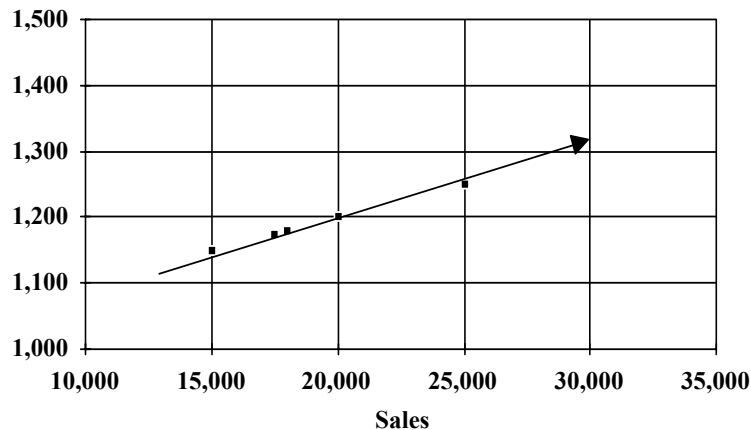
- b. The average of the inventories as a percent of sales ratio for the last five years was 6.39 percent. Thus, we project inventories for a sales level of \$30 million to be \$1,917,000. That is,

$$\begin{aligned} \text{Projected Inventories} &= \frac{\text{Average percent of sales}}{\text{of sales}} \times \text{Projected sales} \\ &= 0.0639 \times \$30 \text{ million} = \$1,917,000 \end{aligned}$$

Similarly, using the most recent year's percent of sales (5 percent) we calculate inventories to be \$1,500,000. That is,

$$\begin{aligned} \text{Projected Inventories} &= \frac{\text{Average percent of sales}}{\text{of sales}} \times \text{Projected sales} \\ &= 0.05 \times \$30 \text{ million} = \$1,500,000 \end{aligned}$$

We can make a forecast of inventories using the relationship observed between sales and inventories in part a by sketching a line through the observed relationship and extrapolating the line to sales of \$30,000,000.



Using this graphical technique, we see that the level of inventories will probably be just over \$1,300,000. The substantial difference in the percentage of sales forecast and the “true relationship” forecast is a result of the implicit assumption made when using the percentage of sales forecast. That is, the percentage of sales forecast is simply a linear extrapolation of inventories based on sales where the intercept is assumed to be zero. As we saw in part a, this assumption is not valid for this problem.

14-13. a. The cash budget for the Sharpe Corporation covering the first six months of 2014 is found below:

	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Sales	<u>\$220,000</u>	<u>\$175,000</u>	<u>\$190,000</u>	<u>\$120,000</u>	<u>\$135,000</u>	<u>\$240,000</u>	<u>\$300,000</u>	<u>\$270,000</u>	<u>\$225,000</u>
Collections:									
Month of sale (10%)			19,000	12,000	13,500	24,000	30,000	27,000	22,500
First month (60%)			105,000	114,000	72,000	81,000	144,000	180,000	162,000
Second month (30%)			<u>66,000</u>	<u>52,500</u>	<u>57,000</u>	<u>36,000</u>	<u>40,500</u>	<u>72,000</u>	<u>90,000</u>
Total Collections			190,000	178,500	142,500	141,000	214,500	279,000	274,500
Purchases		72,000	81,000	144,000	180,000	162,000	135,000	90,000	
Payments (one-month lag)			72,000	81,000	144,000	180,000	162,000	135,000	90,000
Cash Receipts									
(collections)			<u>190,000</u>	<u>178,500</u>	<u>142,500</u>	<u>141,000</u>	<u>214,500</u>	<u>279,000</u>	<u>274,500</u>
Cash Disbursements									
Purchases			72,000	81,000	144,000	180,000	162,000	135,000	90,000
Rent			10,000	10,000	10,000	10,000	10,000	10,000	10,000
Other Expenditures			20,000	20,000	20,000	20,000	20,000	20,000	20,000
Tax Deposits					22,500			22,500	
Interest on Short-Term Borrowing								(550)	
Total Disbursements			<u>\$102,000</u>	<u>\$111,000</u>	<u>\$196,500</u>	<u>\$210,000</u>	<u>\$192,675</u>	<u>\$186,950</u>	<u>\$120,000</u>
Net Monthly Change			\$88,000	\$67,500	(\$54,000)	(\$69,000)	\$22,500	\$92,050	\$154,500
Beginning Cash Balance			22,000	110,000	177,500	123,500	54,500	22,000	169,050
Additional Financing Needed (Repayment)							(55,000)	55,000	
Ending Cash Balance			<u>\$110,000</u>	<u>\$177,500</u>	<u>\$123,500</u>	<u>\$54,500</u>	<u>\$ 22,000</u>	<u>\$169,050</u>	<u>\$323,550</u>
Cumulative Borrowing					0	0	(55,000)	0	0

- b. The company's ending cash balance (projected) for July is \$323,550, which is more than ample to make the loan payment. Of course, this is a "projection" that could be in error. The benefit of doing the cash budget is to estimate the future cash flow consequences (not to determine them) so the firm's management will need to monitor actual results over the period to be assured that it has the proper amount of cash on hand.

14-14.

- a. Projections of Lewis Printing Company's financing requirements for the next six months are found in the table below. The firm expects to borrow \$60,000 in March and an additional \$32,350 in April. However, by the end of June the firm will have retired all its short-term borrowing and have an ending cash balance in excess of \$100,000. If Harrison's sales are 20 percent higher than anticipated (simply scale sales projections up to 120 percent of their projected level), then the cash position is even better than anticipated. However, if sales are only 80 percent of projected levels, then the firm will be able to retire all its debt, but this will not occur until the end of June.
- b. Yes. Based on the expected set of revenues the ending cash balance for June exceeds \$100,000 and under the low (–20 percent) and high (+20 percent) sales revenue scenarios the ending cash balance is adequate to retire the \$20,000 note in June.

Definitions of Terms used in problems 14- 12 and 14- 13:

Return on Equity (ROE) = Net Income / Common Equity

Dividend Payout Ratio (b) = Dividends / Net Income

Sustainable rate of Growth (g^*) = $ROE (1 - b)$

Sales growth rate for period t (g) = $(Sales_{t+1} - Sales_t) \div Sales_t$

Debt-to-assets ratio = Total liabilities $\div$ Total Assets

Total Assets = Liabilities + Common Equity

Cash Budget for January thru June

	Nov 220,000	Dec 175,000	Jan 100,000	Feb 120,000	Mar 150,000	Apr 300,000	May 275,000	June 200,000	July 200,000
Collections:									
Month of sales			20,000	24,000	30,000	60,000	55,000	40,000	40,000
First month			87,500	50,000	60,000	75,000	150,000	137,500	100,000
Second month			66,000	52,500	30,000	36,000	45,000	90,000	82,500
Total collections			173,500	126,500	120,000	171,000	250,000	267,500	222,500
Purchases	65,000	78,000	97,500	195,000	178,750	130,000	130,000	97,500	65,000
Payments		65,000	78,000	97,500	195,000	178,750	130,000	130,000	117,000
<i>Cash Receipts</i> (collections)			173,500	126,500	120,000	171,000	250,000	267,500	222,500
<i>Cash Disbursements</i>									
Payments for Purchases			78,000	97,500	195,000	178,750	130,000	130,000	97,500
Rent			10,000	10,000	10,000	10,000	10,000	10,000	10,000
Other expenditures			20,000	20,000	20,000	20,000	20,000	20,000	20,000
Tax Deposits					22,500			22,500	
Interest on S-T borrowing						600	984	93	0
<i>Total Disbursements</i>			108,000	127,500	247,500	209,350	160,984	182,593	127,500
<i>Net Monthly Change</i>			65,500	(1,000)	(127,500)	(38,350)	89,017	84,907	95,000
<i>Analysis of Borrowing Needs</i>									
Beginning Cash Balance			28,000	93,500	92,500	25,000	25,000	25,000	100,573
Ending Cash (No Borrowing)			93,500	92,500	(35,000)	(13,350)	114,017	109,907	195,573
Needed(Borrowing)			0	0	60,000	38,350	0	0	0
Loan Repayment			0	0	0	0	89,017	9,334	0
Ending Cash Balance			93,500	92,500	25,000	25,000	25,000	100,573	195,573
Cumulative Borrowing			0	0	60,000	98,350	9,334	0	0

SOLUTION TO MINI CASE

Historical data for Phillips Petroleum: 1986-92

	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
Sales	10,018	10,917	11,490	12,492	13,975	13,259	12,140
Net Income	228	35	650	219	541	98	270
Earnings per share	0.89	0.06	2.72	0.90	2.18	0.38	1.04
Dividends per share	2.02	1.73	1.34	0.00	1.03	1.12	1.12
Number of Common Shares							259,615,385
Current Assets	2,802	2,855	3,062	2,876	3,322	2,459	2,349
Total Assets	12,403	12,111	11,968	11,256	12,130	11,473	11,468
Current Liabilities	2,234	2,402	2,468	2,706	2,910	2,503	2,517
Long-term Debt	5,758	5,419	4,761	3,939	3,839	3,876	3,718
Total Liabilities	10,409	10,289	9,855	9,124	9,411	8,716	8,411
Preferred Stock	270	205	0	0	0	0	359
Common Equity	1,724	1,617	2,113	2,132	2,719	2,757	2,698
Total	12,403	12,111	11,968	11,256	12,130	11,473	11,468
Projected Sales	<u>1993</u> 13,000	<u>1994</u> 13,500	<u>1995</u> 14,000	<u>1996</u> 14,500	<u>1997</u> 15,500		

Note to the instructor: Since the answers to parts b through d depend upon the sales projections made here, you may wish to consider supplying sales forecasts.

a. Projected Net Income using the percent of sales method.

	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
Sales	10,018	10,917	11,490	12,492	13,975	13,259	12,140
Net Income	228	35	650	219	541	98	270
Net Income/Sales	2.2759%	0.3206%	5.6571%	1.7531%	3.8712%	0.7391%	2.2241%
Average Net Income/Sales		2.4059%					
Projected Net Income	<u>1993</u> 313	<u>1994</u> 325	<u>1995</u> 337	<u>1996</u> 349	<u>1997</u> 373		

b. Projected total assets and current liabilities

	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
Sales	10,018	10,917	11,490	11,492	13,975	13,259	12,140
Total Assets	12,403	12,111	11,968	11,256	12,130	11,473	11,468
Current Liabilities	2,234	2,402	2,468	2,706	2,910	2,503	2,517
TA/Sales	123.81%	110.94%	104.16%	90.11%	86.80%	86.53%	94.46%
CL/Sales	22.30%	22.00%	21.48%	21.66%	20.82%	18.88%	20.73%
Average TA/Sales	99.54%						
Average CL/Sales	21.13%						
Projected Total Assets	<u>1993</u> 12,941	<u>1994</u> 13,438	<u>1995</u> 13,939	<u>1996</u> 14,443	<u>1997</u> 15,428		
Projected C. Liabilities	2,746	2,852	2,958	3,063	3,274		

c. Projected discretionary financing requirements for 1993-97.

	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>
Total Assets	12,941	13,438	13,936	14,434	15,429
Current Liabilities	2,746	2,852	2,958	3,068	3,274
Non-current Liabilities*	5,894	5,894	5,894	5,894	5,894
Preferred Stock	359	359	359	359	359
Common Equity**	2,720	2,754	2,800	2,858	2,940
Discretionary Financing Needed***	1,221	1,579	1,925	2,259	2,961

* Note that all non-current liabilities for 1992 equal total liabilities of \$8,411 less current liabilities of \$2,517 or \$5,894.

** Common dividends = $\$1.12 \times$ the number of common shares outstanding in 1992 = 290,769,231

Thus, Common Equity (1993) = Common Equity (1992) + NI (1993) – Dividends (1993).

*** Discretionary Financing Needed = Projected Total Assets – Current Liabilities – Long-term Debt – Preferred Stock – Common Equity

CHAPTER 15

Working-Capital Management

CHAPTER ORIENTATION

In this chapter, we introduce working-capital management in terms of managing the firm's liquidity. Specifically, working capital is defined as the difference in current assets and current liabilities. The hedging principle is offered as one approach to addressing the firm's liquidity problems. In addition, this chapter deals with the sources of short-term financing that must be repaid within one year.

CHAPTER OUTLINE

I. Managing Current Assets and Liabilities

- A. The firm's investment in current assets (such as fixed assets) is determined by the marginal benefits derived from investing in them compared with their acquisition cost.
- B. However, the current versus fixed-asset mix of the firm's investment in assets is an important determinant of the firm's liquidity. That is, the greater the firm's investment in current assets, other things remaining the same, the greater the firm's liquidity. This is generally true, since current assets are usually more easily converted into cash.
- C. The firm can invest in marketable securities to increase its liquidity. However, such a policy involves committing the firm's funds to a relatively low-yielding (in comparison to fixed assets) investment.
- D. The greater the firm's use of current liabilities, other things being the same, the less will be the firm's liquidity.
- E. There are a number of advantages associated with the use of current liabilities for financing the firm's asset investments.
 1. Flexibility. Current liabilities can be used to match the timing of a firm's short-term financing needs exactly.
 2. Interest cost. Historically, the interest cost on short-term debt has been lower than that on long-term debt.

F. The following are the disadvantages commonly associated with the use of short-term debt:

1. Short-term debt exposes the firm to an increased risk of illiquidity because short-term debt matures sooner and in greater frequency, by definition, than does long-term debt.
2. Since short-term debt agreements must be renegotiated from year to year, the interest cost of each year's financing is uncertain.

II. Determining the Appropriate Level of Working Capital

A. Pragmatically, it is impossible to derive the “optimal” level of working capital for the firm. Such a derivation would require estimation of the potential costs of illiquidity which, to date, have eluded precise measurement.

B. However, the “hedging principle” provides the basis for the firm's working-capital decisions.

1. The hedging principle or rule of self-liquidating debt involves the following: Those asset needs of the firm not financed by spontaneous sources (i.e., payables and accruals) should be financed in accordance with the following rule: Permanent asset investments are financed with permanent sources and temporary investments are financed with temporary sources, of financing.
2. A permanent investment in an asset is one which the firm expects to hold for a period longer than one year. Such an investment may involve current or fixed assets.
3. Temporary asset investments comprise the firm's investment in current assets that will be liquidated and not replaced during the year.
4. Spontaneous sources of financing include all those sources that are available upon demand (e.g., trade credit—accounts payable) or that arise naturally as a part of doing business (e.g., wages payable, interest payable, taxes payable, etc.).
5. Temporary sources of financing include all forms of current or short-term financing not categorized as spontaneous. Examples include bank loans, commercial paper, and finance company loans.
6. Permanent sources of financing include all long-term sources such as debt having a maturity longer than one year, preferred stock, and common stock.

C. Although the hedging principle provides a useful guide to the firm's working-capital decisions, no firm will follow its tenets strictly. At times, a firm may rely too much on temporary financing for its cash needs, or it may have excess cash as a result of excessive use of permanent financing.

III. The Cash Conversion Cycle

A. The cash conversion cycle, or CCC, is simply the sum of days of sales outstanding and days of sales in inventory less days of payables outstanding

IV. Estimating the Cost of Short-Term Credit Using the Approximation Cost-of-Credit Formula

A. Determining the appropriate level of short-term financing

1. The hedging concept was presented as one basis for determining the firm's use of short-term debt.
2. Hedging involves attempting to match temporary needs for funds with short-term sources of financing and permanent needs with long-term sources.

B. Selecting a source of short-term financing

1. In general, there are three basic factors that should be considered in selecting a source of short-term financing:
 - a. The effective cost of the credit source
 - b. The availability of credit
 - c. The effect of the use of a particular source of credit on the cost and availability of other sources
2. The basic procedure used in estimating the cost of short-term credit utilizes the basic interest equation, i.e., $\text{interest} = \text{principal} \times \text{rate} \times \text{time}$.
3. The problem faced in assessing the cost of a source of short-term financing involves estimating the annual percentage rate (APR) where the interest amount, the principal sum, and the time for which financing will be needed is known. Thus, the basic interest equation is "rearranged" as follows:

$$\text{APR} = \frac{\text{interest}}{\text{principal}} \times \frac{1}{\text{time}}$$

4. Compound interest was not considered in the simple APR calculation. To consider compounding, the following relation is used:

$$\text{EAR} = \left(1 + \frac{i}{M} \right)^M - 1$$

Where;

EAR = effective annual rate,

i = nominal rate of interest per year, and

M = number of compounding periods within one year.

The effect of compounding is to raise the effective cost of short-term credit

V. Sources of Short-Term Credit

A. The two basic sources of short-term credit are unsecured and secured credit.

1. Unsecured credit consists of all those sources that have as their security only the lender's faith in the ability of the borrower to repay the funds when due.
2. Secured funds include additional security in the form of assets that are pledged as collateral in the event the borrower defaults in payment of principal or interest.

- B. There are three major sources of unsecured short-term credit: trade credit, unsecured bank loans, and commercial paper.
1. Trade credit provides one of the most flexible sources of financing available to the firm. To arrange for credit, the firm need only place an order with one of its suppliers. The supplier then checks the firm's credit, and if the credit is good, the supplier sends the merchandise.
 2. Commercial banks provide unsecured short-term credit in two basic forms: lines of credit and transaction loans (notes payable). Maturities of both types of loans are usually one year or less with rates of interest depending on the credit-worthiness of the borrower and the level of interest rates in the economy as a whole.
 3. A line of credit is generally an informal agreement or understanding between the borrower and the bank as to the maximum amount of credit that the bank will provide the borrower at any one time. There is no "legal" commitment on the part of the bank to provide the stated credit. There is another variant of this form of financing referred to as a revolving credit agreement whereby such a legal obligation is involved. The line of credit generally covers a period of one year corresponding to the borrower's "fiscal" year.
 4. Transaction loans are another form of unsecured short-term bank credit. The transaction loan, in contrast to a line of credit, is made for a specific purpose.
 5. Only the largest and most creditworthy companies are able to use commercial paper, which consists of unsecured promissory notes in the money market.
 - a. The maturities of commercial paper are generally six months or less with the interest rate slightly lower than the prime rate on commercial bank loans. The new issues of commercial paper are either directly placed or dealer placed.
 - b. There are a number of advantages that accrue to the user of commercial paper: Interest rates are generally lower than rates on bank loans and comparable sources of short-term financing; no minimum balance requirements are associated with commercial paper; and commercial paper offers the firm with very large credit needs a single source for all its short-term financing needs. Since it is widely recognized that only the most creditworthy borrowers have access to the commercial paper market, its use signifies a firm's credit status.
 - c. However, a very important "risk" is involved in using this source of short-term financing; the commercial paper market is highly impersonal and denies even the most creditworthy borrower any flexibility in terms of repayment.
- C. Secured sources of short-term credit have certain assets of the firm, such as accounts receivable or inventories, pledged as collateral to secure a loan. Upon default of the loan agreement, the lender has first claim to the pledged assets.
1. Generally, a firm's receivables are among its most liquid assets. Two secured loan arrangements are generally made with accounts receivable as collateral:
 - a. Under the arrangement of pledged accounts receivable, the amount of the loan is stated as a percentage of the face value of the receivables pledged.

- b. Factoring accounts receivable involves the outright sale of a firm's accounts receivables to a factor.
2. Four secured loan arrangements are generally made with inventory as collateral:
- a. Under the floating lien agreement, the borrower gives the lender a lien against all his or her inventories.
 - b. The chattel mortgage agreement involves having specific items of inventory identified in the security agreement.
 - c. The field warehouse financing agreement means that the inventories used as collateral are physically separated from the firm's other inventories and are placed under the control of a third-party field warehousing firm.
 - d. Terminal warehouse agreements involve transporting the inventories pledged as collateral to a public warehouse that is physically removed from the borrower's premises.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

15-1. Dell's innovation in working capital management came from a recognition that the primary contributors to a firm's need for working capital were inventory and accounts receivable. If the firm can find a way to reduce its need for inventory, for example, by arranging with firm suppliers to provide inventory items just when they are needed (just in time inventory management) and to sell for cash (even collect the cash before the item is shipped) then there is little need for inventory. Of course, this requires careful coordination between Dell and its suppliers and doing business without extending credit (the latter describes Dell's consumer sales). Combining these two practices along with negotiating favorable credit terms with the firm's suppliers turned Dell in to a working capital guru for the industry.

15-2. Working capital has traditionally been defined as the firm's investment in current assets. Current assets are comprised of all assets which the firm expects to convert into cash within one year including: cash, marketable securities, accounts receivable, and inventories.

Net working capital refers to the difference in the firm's current assets and its current liabilities (i.e., Net working capital = current assets – current liabilities).

15-3. The final composition of the firm's current and fixed asset investments is an important determinant of the firm's liquidity since, other things remaining the same, the greater the firm's investment in current assets the greater its liquidity.

The firm may choose to invest additional funds in cash and/or marketable securities as a means of increasing its liquidity. However, this type of action involves a trade-off between the risk of illiquidity and the firm's return on invested funds. By increasing its investment in cash and marketable securities, the firm reduces its risk of illiquidity. However, the firm has increased its investment in assets which earn little or no return. The firm can reduce its risk of illiquidity only by reducing its overall return on invested funds and vice versa.

15-4. Advantages of Short-Term versus Long-Term Debt:

- (1) The interest rate is usually lower (i.e., the term structure of interest rates is generally upward sloping).
- (2) Funds are available only when they are needed.

Disadvantages:

- (1) Short-term debts must be repaid sooner; thus, there is a greater risk of illiquidity.
- (2) Interest costs on short-term debts vary from year to year, whereas long-term debt agreements "lock in" the cost of funds to the firm.

- 15-5. The use of current liabilities, or short-term debt as opposed to long-term debt, subjects the firm to a greater risk of illiquidity. That is, short-term debt, by its very nature, must be repaid or “rolled over” more often than long-term debt. Thus, the possibility that the firm’s financial condition might deteriorate to a point where the needed funds might not be available is increased where short-term debt is used.
- 15-6. The hedging principle involves matching the maturities of the sources of financing for the firm’s assets with the useful lives of the assets. To implement the hedging principle, the firm must fund all its permanent assets investments not financed by spontaneous sources (payables) with long-term sources of funds and then finance all its temporary asset investments not funded by spontaneous sources of financing with short-term sources of funds.
- 15-7. Definitions:
- (1) A permanent asset investment in an asset is one which the firm expects to hold for a period longer than one year.
 - (2) Temporary asset investments are comprised of the firm’s investments in current assets which will be liquidated and not replaced within the current year.
 - (3) Permanent sources of financing include intermediate and long-term debt, preferred stock, and common equity.
 - (4) Temporary financing consists of the various sources of short-term debt: including secured and unsecured bank loans, commercial paper, loans secured by accounts receivable, and loans secured by inventories.
 - (5) Spontaneous financing consists of the trade credit and other accounts payable which arise “spontaneously” in the firm’s day-to-day operations. Examples include wages and salaries payable, accrued interest, and accrued taxes.
- 15-8. The procedure used in estimating the cost of short-term credit relies on the use of the basic interest equation:

$$I = P \times \text{APR} \times T$$

The problem faced in assessing the cost of a source of short-term financing, however, generally involves estimating the annual effective rate for which the interest amount, the principal sum, and the time for which financing will be needed is known.

To find the effective rate of interest, we simply solve the interest equation for the rate (APR), i.e.,

$$\text{APR} = \frac{I}{P} \cdot \frac{1}{T}$$

- 15-9. Compound interest was not considered in the simple APR calculation. To consider the influence of compounding, we can use the following relation:

$$\text{EAR} = (1 + i/m)^m - 1$$

where i is the nominal rate of interest per year and m is the number of compounding periods within a year. This cost of credit relationship is frequently referred to as the Annual Percentage Yield or EAR.

- 15-10. The three major sources of unsecured short-term credit are trade credit, unsecured bank loans, and commercial paper.

To arrange for trade credit, the firm need only place an order with one of its suppliers. The supplier then checks the firm's credit and, if it is good, sends the merchandise. The purchasing firm then pays for the goods in accordance with supplier's credit terms.

The advantages of trade credit are that it is easily and conveniently obtained as a normal part of the firm's operations. No formal agreements are generally involved in extending credit. Furthermore, the amount of credit extended expands and contracts with the needs of the firm. This latter advantage of trade credit as a source of financing underlies the reason for its earlier classification as a spontaneous source of financing.

Commercial banks provide unsecured short-term credit in two basic forms: lines of credit and transaction loans (notes payable). Maturities of both types of loans are usually one year or less with rates of interest depending on the creditworthiness of the borrower and the level of interest rates in the economy as a whole.

A line of credit is generally an informal agreement or understanding between the borrower and the bank as to the maximum amount of credit that the bank will provide the borrower at any one time. Under this type of agreement, there is no "legal" commitment on the part of the bank to provide the stated credit.

Lines of credit usually do not involve fixed rates of interest but state that credit will be extended "at 1/2 percent over prime" or some other spread over the bank's prime rate. The agreement generally does not "spell out" the specific use that will be made of the funds beyond some general statement such as "for working-capital purposes." Lines of credit usually require that the borrower maintain a minimum balance in the bank throughout the loan period.

Transaction loans are made for a specific purpose. Unsecured transaction loans are very similar to a line of credit with regard to their cost, term to maturity, and compensating balance requirements. This type of loan is the one that most individuals associate with bank credit. The loan is obtained by signing a promissory note.

In order to obtain a transaction loan, commercial banks often require that the borrower "clean up" its short-term loans for a 30- to 45-day period during the year. This is also often a requirement of a line of credit.

Only the largest and most creditworthy companies are able to use commercial paper. Commercial paper consists of unsecured promissory notes sold in the money market. The maturity of this credit source is generally six months or less with some issues carrying 270-day maturities. The interest rate on commercial paper is generally slightly lower (one-half of one percent) than the prime rate on commercial bank loans.

There are a number of advantages which accrue to the user of commercial paper:

- (1) Interest rate. Commercial paper rates are generally lower than rates on bank loans and comparable sources of short-term financing.
- (2) Compensating balance requirement. No minimum balance requirements are associated with commercial paper.

- (3) Amount of credit. Commercial paper offers the firm with very large credit needs a single source for all its short-term financing needs.
- (4) Prestige. Since it is widely recognized that only the most credit worthy borrowers have access to the commercial paper market, its use signifies a firm's credit status.

15-11. The trade credit term “2/10, net 30” means that a 2 percent discount is offered for payment within 10 days, or the full amount is due in 30 days: “4/20, net 60”—4 percent discount within 20 days, full amount 60 days; “3/15, net 45”—3 percent within 15 days, full amount 45 days.

15-12. A line of credit is generally an informal agreement or understanding between the borrower and the banks as to the maximum amount of credit which the bank will provide the borrower at any one time.

Commercial paper consists of unsecured promissory notes of firms that are sold in the money market.

Compensation balance is a minimum balance that a borrower must maintain in a bank throughout a loan period.

The prime rate of interest represents that rate which a bank charges its most creditworthy borrowers on short-term loans.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

15-1. a.

	2010	2011	2012	2013	2014
Current Assets	\$ 100	\$ 130	\$ 160	\$ 190	\$ 220
Fixed Assets	250	270	290	310	330
Total	<u>\$ 350</u>	<u>\$ 400</u>	<u>\$ 450</u>	<u>\$ 500</u>	<u>\$ 550</u>
Current Liabilities	\$ 50	\$ 90	\$ 130	\$ 170	\$ 210
Long-term Liabilities	100	100	100	100	100
Owner's Equity	200	210	220	230	240
Total	<u>\$ 350</u>	<u>\$ 400</u>	<u>\$ 450</u>	<u>\$ 500</u>	<u>\$ 550</u>
Current Ratio	2.00	1.44	1.23	1.12	1.05
Debt Ratio	43%	48%	51%	54%	56%

Carton Packing Company's financial risk has steadily increased over the period. The current ratio has declined by one-half from 2.00 to only 1.05, indicating that the firm is just barely able to cover its current liabilities with its current assets. Moreover, the firm's use of financial leverage (debt financing) relative to its total assets has risen by about 25 percent from 43 percent to 56 percent.

b.

	2010	2011	2012	2013	2014
Current Assets	\$ 100	\$ 130	\$ 160	\$ 190	\$ 220
Fixed Assets	250	270	290	310	330
Total	<u>\$ 350</u>	<u>\$ 400</u>	<u>\$ 450</u>	<u>\$ 500</u>	<u>\$ 550</u>
Current Liabilities	\$ 50	\$ 50	\$ 50	\$ 50	\$ 50
Long-term Liabilities	100	140	180	220	260
Owner's Equity	200	210	220	230	240
Total	<u>\$ 350</u>	<u>\$ 400</u>	<u>\$ 450</u>	<u>\$ 500</u>	<u>\$ 550</u>
Current Ratio	2.00	2.60	3.20	3.80	4.40
Debt Ratio	43%	48%	51%	54%	56%

By financing the firm's operations with long-term debt the current ratio increases dramatically, although the debt ratio remains constant.

c. The second plan is much less risky to the firm in that the firm's current financial obligations are a much lower percent of the firm's current assets. This is true even though the total debt use is the same (as a percent of assets).

- 15-2. a. The principle of self-liquidating debt (hedging principle) suggests that the long-term care facilities, which are expected to be productive for 20 years, should be financed with a source of financing that has a similar maturity. Thus, Longleaf should use long-term debt for its expansion.
- b. This example is a “permanent” increase in the firm’s needs for inventory. Consequently, this financing would be best raised using a permanent source of financing.
- c. Seasonal expansions in working capital are followed by seasonal contractions. Therefore, this need for financing would best be provided by a short-term loan or temporary source of financing.

15-3.

DATA	Jan-10	Jan-11	Jan-12	Jan-13	Jan-14
Sales—Net	2,873	3,475	5,296	7,759	12,327
Receivables—Total	411	538	726	903	1,486
Accounts Payable	283	447	466	1,040	1,643
Inventories—Total	220	293	429	251	233

a.	Jan-10	Jan-11	Jan-12	Jan-13	Jan-14
Days-sales-outstanding-in-receivables	52.22	56.51	50.04	42.48	44.00
Days-sales-in-inventory*	27.95	30.78	29.57	11.81	6.90
Days-sales-in-inventory**	39.93	43.97	42.24	16.87	9.86
Days-payables-outstanding	35.95	46.95	32.12	48.92	48.65

*Note that days sales in inventory should be calculated using cost of goods sold which is not known in this problem. Consequently, we use sales instead.

**Assuming the firm’s cost of goods sold equals 70percent of sales.

From the calculations above it is apparent that Simms has successfully increased the efficiency of its management of both accounts receivable and inventory.

b.	Jan-10	Jan-11	Jan-12	Jan-13	Jan-14
Cash conversion cycle*	44.21	40.33	47.49	5.36	2.25
Cash conversion cycle**	56.19	53.52	60.16	10.42	5.21

*Uses sales instead of COGS to calculate the days inventory outstanding.

**Uses COGS = 70% of sales to calculate days inventory outstanding.

Simms has made dramatic improvements to its working capital management by making more than a ten-fold reduction in the firm’s cash conversion cycle.

15-4. First, we calculate the interest expense for the three-month loan as follows:

$$\text{Interest} = 0.12 \times \$100,000 \times 3/12 = \$3,000.$$

Assuming that Paymaster has to leave 10 percent of the loan idle in a compensating balance, the effective cost of credit can be calculated as follows:

$$\text{APR} = [\$3,000/(\$100,000 - 10,000 - 3,000)] \times (12/3) = 13.79\%$$

If the company already has sufficient funds in the bank to satisfy the compensating balance requirement, then the cost of credit drops to 12.37 percent.

- 15-5. a. Bank Loan Alternative. Since interest on the bank loan is discounted, we must first determine how much R. Morin will have to borrow in order that the firm receive the needed \$100,000. This involves solving for B (the amount to be borrowed) such that

$$B - 0.14B = \$100,000$$

That is, B is that amount which must be borrowed such that the proceeds to the firm, after interest at a rate of 14 percent for one year has been deducted, will equal the needed \$100,000.

$$\begin{aligned} \text{Thus, } 0.86 B &= \$100,000 \\ B &= \$100,000/0.86 \\ B &= \$116,279.07 \\ \text{Interest} &= 0.14 \times \$116,279.07 \\ &= \$16,279.07 \end{aligned}$$

Therefore, the effective rate of interest on the loan is calculated as follows:

$$\begin{aligned} \text{APR} &= \frac{\$16,279.07}{\$116,279.07 - \$16,279.07} \times \frac{1}{360 / 360} \\ &= 0.1628 \text{ or } 16.28\% \end{aligned}$$

Dealer Financing Alternative

$$\begin{aligned} \text{APR} &= \frac{\$16,300}{\$100,000} \times \frac{1}{360 / 360} \\ &= 0.163 \text{ or } 16.3\% \end{aligned}$$

Analysis. The costs of the two sources of financing are identical for practical purposes. The final choice can now be made based upon other nonquantitative factors. For example, the firm may find that using dealer financing is less time consuming and allows the firm to leave its credit line with the bank unchanged. Since bank credit can be used for a much wider array of financing needs than dealer financing, R. Morin would find that using dealer financing leaves the firm with greater flexibility in raising funds for its future needs.

- b. If the compensating balance becomes binding, then the bank loan alternative will require that R. Morin borrow

$$\begin{aligned}
 B - 0.14B - 0.15B &= \$100,000 \\
 0.71B &= \$100,000 \\
 B &= \$100,000/0.71 \\
 &= \$140,845.07 \\
 \text{Interest} &= 0.14 \times \$140,845.07 \\
 &= \$19,718.31 \\
 \text{Compensating Balance} &= 0.15 \times \$140,845.07 \\
 &= \$21,126.76
 \end{aligned}$$

$$\begin{aligned}
 \text{APR} &= \frac{\$19,718.31}{\$140,845.07 - \$19,718.31 - \$21,126.76} \times \frac{1}{360/360} \\
 &= 0.197 \text{ or } 19.7\%
 \end{aligned}$$

Thus, where the 15 percent compensating balance requirement is binding on R. Morin, the cost of the bank loan rises to 19.7 percent. In this case, dealer financing is clearly less costly.

Note that equipment dealers will frequently price their merchandise so as to compensate them for offering “below market” rates of interest for financing. This may well be the case here such that R. Morin should use the dealer financing unless it can negotiate a price concession equal to the value of “bargain financing.”

- 15-6. a. Pledged Receivables (A/R):

$$\begin{aligned}
 0.80 \text{ A/R} &= \$500,000 \text{ loan} \\
 \text{A/R} &= \$500,000/0.80 = \$625,000 \\
 \text{Fee} &= (0.01) (\$625,000) = \$6,250 \\
 \text{Interest Cost} &= (0.11) (\$500,000) \times 1/4 = \$13,750 \\
 \text{Effective Rate} &= \left(\frac{\$13,750 + \$6,250}{\$500,000} \right) \left(\frac{1}{90/360} \right) \\
 &= 0.16 \text{ or } 16\%
 \end{aligned}$$

- b. Warehousing cost = $\$2,000 \times 3 \text{ months} = \$6,000$
 Interest cost = $0.09 \times \$500,000 \times 1/4 = \$11,250$
 Effective Rate = $\left(\frac{\$6,000 + \$11,250}{\$500,000} \right) \left(\frac{1}{90/360} \right)$
 = 0.138 or 13.8%

The inventory loan would be preferred because its cost is lowest under the conditions presented to S-J.

$$\begin{aligned} 15-7. \quad a. \quad \text{Interest} &= \$20,000 \times .10 \times 1/2 \\ &= \$1,000 \end{aligned}$$

$$\begin{aligned} \text{APR} &= \frac{\$1,000}{\$20,000} \times \frac{1}{(180/360)} \\ &= 0.10 \text{ or } 10\% \end{aligned}$$

- b. The net proceeds from the loan are now $\$20,000 - (.15 \times \$20,000)$ or \$17,000. Thus, the effective cost of credit is

$$\begin{aligned} \text{APR} &= \frac{\$1,000}{\$17,000} \times \frac{1}{180/360} \\ &= 0.1176 \text{ or } 11.76\% \end{aligned}$$

We would have gotten the same answer by assuming that you borrow the necessary compensating balance. In that case, the amount borrowed (B) is found as follows:

$$B - .15B = \$20,000$$

$$0.85B = \$20,000$$

$$\begin{aligned} B &= \$20,000/0.85 \\ &= \$23,529.41 \end{aligned}$$

$$\begin{aligned} \text{Interest} &= .10 \times 1/2 \times \$23,529.41 \\ &= \$1,176.47 \end{aligned}$$

$$\begin{aligned} \text{APR} &= \frac{\$1,176.47}{\$20,000} \times \frac{1}{180/360} \\ &= 0.1176 \text{ or } 11.76\% \end{aligned}$$

- c. In this case we assess the impact of discounted interest and the 15 percent compensating balance. As in part b, the discounted interest serves to reduce the loan proceeds:

$$\begin{aligned} \text{APR} &= \frac{\$1,000}{\$20,000 - \$3,000 - \$1,000} \times \frac{1}{(180/360)} \\ &= 0.125 \text{ or } 12.5\% \end{aligned}$$

If you borrowed enough to cover both the compensating balance requirement and discounted interest, then you would borrow (B) such that

$$B - 0.15B - (0.10 \times \frac{1}{2})B = \$20,000$$

$$0.8B = \$20,000$$

$$B = \$25,000$$

$$\begin{aligned} \text{Interest} &= 0.10 \times \frac{1}{2} \times \$25,000 \\ &= \$1,250 \end{aligned}$$

$$\begin{aligned} \text{Compensating Balance} &= 0.15 \times \$25,000 \\ &= \$3,750 \end{aligned}$$

Thus,

$$\begin{aligned} \text{APR} &= \frac{\$1,250}{\$25,000 - \$1,250 - \$3,750} \times \frac{1}{180/360} \\ &= 0.125 \text{ or } 12.5\% \end{aligned}$$

The cost of the bank loan rises once again in part c due to the reduction in funds available to you from the loan as a result (this time) of discounted interest.

15-8. Interest expense for the commercial paper issue is calculated as follows:

$$\text{Interest} = 0.11 \times \$20 \text{ million} \times (270/360) = \$1,650,000$$

The effective rate of interest to Burlington Western (including the issue fee of \$200,000) is calculated as follows:

$$\text{APR} = [(\$1,650,000 + 200,000)/(\$20 \text{ million} - \$1,650,000 - 200,000)] \times (360/270) = 13.59\%$$

Note that both the interest expense and the issue fee are prepaid.

15-9. a. $\frac{0.02}{0.98} \times \frac{1}{20/360} = 0.36734 \text{ or } 36.73\%$

b. $\frac{0.03}{0.97} \times \frac{1}{15/360} = 0.74226 \text{ or } 74.23\%$

c. $\frac{0.03}{0.97} \times \frac{1}{30/360} = 0.37113 \text{ or } 37.11\%$

d. $\frac{0.02}{0.98} \times \frac{1}{45/360} = 0.16327 \text{ or } 16.33\%$

- 15-10. Instructor's Note: This problem can be easily solved using the exponent function (y^x) on a hand calculator. Simply let $y = (1 + r/m)$ and $x = m$, then solve for y^x . Finally, subtract "1" to obtain the effective cost of credit with compounding of interest.

$$\text{EAR} = (1 + i/m)^m - 1$$

$$i = \text{Nominal interest rate}$$

$$m = \# \text{ of compounding periods in a year}$$

$$\begin{aligned} \text{a. } \text{EAR} &= \left(1 + \frac{0.3673}{18}\right)^{18} - 1 \\ &= 1.4385 - 1 \\ &= 0.4385 \text{ or } 43.85\% \end{aligned}$$

$$\begin{aligned} \text{b. } \text{EAR} &= \left(1 + \frac{0.7423}{24}\right)^{24} - 1 \\ &= 2.0773 - 1 \\ &= 1.0773 \text{ or } 107.73\% \end{aligned}$$

$$\begin{aligned} \text{c. } \text{EAR} &= \left(1 + \frac{0.3711}{12}\right)^{12} - 1 \\ &= 1.4412 - 1 \\ &= 0.4412 \text{ or } 44.12\% \end{aligned}$$

$$\begin{aligned} \text{d. } \text{EAR} &= \left(1 + \frac{0.1633}{8}\right)^8 - 1 \\ &= 1.1755 - 1 \\ &= 0.1755 \text{ or } 17.55\% \end{aligned}$$

$$\begin{array}{r} 15-11. \quad 100,000 \\ \quad \times 0.13 \\ \hline \quad \$13,000 \end{array}$$

\$1,083/month—interest

\$20,000—compensating balance

$$\text{a. } \text{APR} = \frac{\$13,000}{\$100,000} \times \frac{1}{360/360} = 0.13 \text{ or } 13\%$$

$$\text{b. } \text{APR} = \frac{\$13,000}{\$80,000} \times \frac{1}{360/360} = 0.1625 \text{ or } 16.25\%$$

Interest expense for the loan is

$$(\$100,000)(0.13) \frac{360}{360} = \$13,000$$

However, the firm gets the use of only $0.8 \times \$100,000 = \$80,000$.

$$\begin{aligned}
 15-12. \text{ a. } \text{APR} &= \frac{\text{interest}}{\text{principal}} \times \frac{1}{\text{time}} \\
 \text{APR} &= \frac{\$25,625^* + \$12,000}{\$500,000 - \$12,000 - \$25,625} \times \frac{1}{180/360} \\
 &= 0.1627 = 16.27\% \\
 * \text{Interest} &= 0.1025 \times \$500,000 \times 180/360
 \end{aligned}$$

- b. The risk involved with the issue of commercial paper should be considered. This risk relates to the fact that the commercial paper market is highly impersonal and denies even the most creditworthy borrower any flexibility in terms of when repayment is made.

In addition, commercial paper is a viable source of credit to only the most creditworthy borrowers. Thus, it may simply not be available to the firm.

$$15-13. \text{ a. } \text{APR} = \frac{\$39,000^* + \$24,000^{**}}{\$300,000} \times \frac{1}{360/360} = 0.21 \text{ or } 21\%$$

$$* (\$400,000 \times 0.13 \times .75) = \$39,000$$

$$** (200,000 \times 0.01 \times 12) = \$24,000$$

- b. $\$300,000 \times 0.15 = \$45,000$ (compensating balance)

Since Johnson normally maintains a balance of \$80,000 with the bank, the compensating balance requirement will not increase the effective cost of credit.

$$\frac{\$42,000}{\$300,000} \times \frac{1}{360/360} = 0.14 \text{ or } 14\%$$

$$\text{Interest} = \$300,000 \times 0.14 = \$42,000.$$

- c. Choose the line of credit since the effective interest is considerably lower. Note, however, that the pledging arrangement may involve credit services to Johnson which would reduce Johnson's credit department expense. If this were the case, then these savings would reduce the effective cost of that financing arrangement.

- 15-14. a. Maximum Advance

Face Value of Receivables (2 months credit sales)	\$ 800,000
Less: Factoring Fee (1%)	(8,000)
Reserve (9%)	(72,000)

Interest (60 days) *	<u>(21,600)</u>
Loan Advance (less discount interest)	<u>\$ 698,400</u>

*Interest is calculated on the 90 percent of the factored accounts that can be borrowed, $(0.90 \times \$800,000 \times 0.015 \times 2 \text{ months}) = \$21,600$ or $(\$800,000 - 8,000 - 72,000) \times 0.015 \times 2 \text{ months} = \$21,600$.

Thus, the effective cost of credit to MDM is calculated as follows:

$$\begin{aligned} \text{APR} &= \frac{\$21,600 + 8,000 - 3,000^{**}}{\$698,400} \times \frac{1}{(60 / 360)} \\ &= 0.2285 \text{ or } 22.85\% \end{aligned}$$

**Credit department savings for 60 days equals $2 \times \$1500$.

- b. Of particular concern here is the presence of any “stigma” associated with factoring. In some industries, factoring simply is not used unless the firm’s financial condition is critical. This would appear to be the case here, given the relatively high effective rate of interest on borrowing.

15-15. Calculation of the Maximum Advance

Face Amount of Receivables Factored	\$300,000
Less: Fee $(0.02 \times \$300,000)$	(6,000)
Reserve $(0.20 \times \$300,000)$	(60,000)
Interest $(0.01 \times \$234,000 \times 3 \text{ months})$	<u>(7,020)</u>
Maximum Advance	<u>\$226,980</u>

Calculation of the cost of credit

$$\begin{aligned} \text{APR} &= \frac{\$7,020 + 6,000 - 6,000}{\$226,980} \times \frac{12}{3} \\ &= 0.0309 \times 4 = 0.1237 \text{ or } 12.37\% \end{aligned}$$

15-16.

a. Given:

Loan amount	\$240,000.00
Loan period	3 months
Loan rate	8%
Compensating balance	20%
Current bank balance	\$ 4,000.00

Analysis

Interest cost	\$ 4,800.00
Added compensating balance	\$ 44,000.00
Cost of credit	9.80%

b. Cost of credit 8.79%

15-17.

Source of Credit	Secured	Unsecured
Line of credit		X
Trade credit		X
Pledging of accounts receivable	X	
Factoring of accounts receivable	X	
Inventory loans	X	
Commercial paper		X

CHAPTER 16

International Business Finance

CHAPTER ORIENTATION

This chapter introduces some of the financial techniques and strategies necessary for the efficient operation of an international business. Problems inherent to these firms include multiple currencies, differing legal and political environments, differing economic and capital markets, and internal control problems. The difficulties arising from multiple currencies are stressed here, including the dimensions of foreign exchange risk and strategies for reducing this risk. We also cover working-capital management and direct foreign investment for international firms.

CHAPTER OUTLINE

- I. The Globalization of Product and Financial Markets
 - A. World trade has grown faster over the last few decades than has aggregate world GNP.
 - B. In less-developed countries, long-run overseas investments of the United States' companies have yielded high returns.
 - C. Many American **multinational corporations** (MNC) have significant assets, sales, and profits attributable to foreign investments.
 - D. Many foreign MNCs have significant operations in the United States.
 - E. Many firms, investment companies, and individuals invest in the capital markets of foreign companies to receive:
 - 1. Higher returns than those available in domestic capital markets.
 - 2. Reduced portfolio risk through international diversification.
- II. Foreign Exchange Markets and Currency Exchange Rates
 - A. Foreign Exchange rates
 - 1. **Foreign exchange (FX) market** is the market in which the currencies of various countries are traded.
 - 2. The **spot rate** is the rate at which one currency can be immediately exchanged for another currency.

3. **Direct quote** expresses the exchange rate in the units of home currency required to buy one unit of foreign currency, for example, 1.5562 U.S. dollars per British pound.
4. **Indirect Quotes** indicate the number of foreign currency units needed to purchase one unit of home currency, for example, 0.6426 British pounds per U.S. dollar.

EXAMPLE

Using the rates listed previously, how many dollars would a U.S. manufacturer pay for a part costing 250 pounds?

$$250 \text{ (pounds)} \times 1.5562 \text{ (\$/pound)} = \$389.05$$

5. The direct and indirect quotes should have a reciprocal relationship. In formula

$$\text{Direct Quote} = \frac{1}{\text{Indirect Quote}}$$

or

$$\text{Indirect Quote} = \frac{1}{\text{Direct Quote}}$$

6. When these quotes are not equal, **arbitrage** will occur, where a trader (or arbitrageur) makes a riskless profit, by exchanging currency in two markets.
7. The **asked rate** is the rate which the bank or foreign exchange trader “asks” the buyer to pay for the foreign currency.
8. The **bid rate** is the rate with which the bank or foreign exchange trader buys the foreign currency from the customer.
9. The **spread** is the difference in the bid and the asked rates.
10. The narrower the spread, the greater is the efficiency in the spot exchange market.
11. A **cross rate** is the result of an indirect computation of one currency’s exchange rate from the exchange rate of two other currencies. For example, the calculation of marks per British pound from U.S. dollars per British pound and marks per U.S. dollars.
12. Triangular arbitrage will occur when the cross rates calculated are not equal to the exchange rates offered.

B. Forward exchange rates

1. A **forward exchange rate** specifies *today* the rate at which currencies will be exchanged in the future, usually 30, 90, or 180 days from today.
2. Rates are quoted in both the direct and indirect form.
3. Forward rates are often quoted at a **premium** or a **discount** to the existing spot rate. This is also referred to as the forward-spot differential.
4. These differentials may be stated either in absolute terms or as an annualized percent premium or discount.

5. The use of forward contracts allows for risk reduction, in that future cash outlays are known with certainty.

III. Interest Rate Parity

- A. Theorem states that the forward premium or discount should be equal and opposite in sign to the difference in the national interest rates for securities of the same maturity (except for the effects of small transaction costs). Notationally, this is expressed as

$$\left(1 + \frac{\text{Domestic}}{\text{Rate of Interest}}\right) = \left(\frac{\text{Forward Exchange Rate}}{\text{Spot Exchange Rate}}\right) \left(1 + \frac{\text{Foreign}}{\text{Rate of Interest}}\right)$$

$$\frac{\text{Nominal Rate of Interest}}{\text{of Interest}} = \frac{\text{Expected Rate of Inflation}}{\text{of Inflation}} + \frac{\text{Real Rate of Interest}}{\text{of Interest}} \div \left[\frac{\text{Expected Rate of Inflation}}{\text{of Inflation}} \right] \left[\frac{\text{Real Rate of Return}}{\text{of Return}} \right]$$

IV. Purchasing-Power Parity and the Law of One Price

- A. According to purchasing power parity, exchange rates will adjust over time so that the currencies of different countries will have the same purchasing power. The exchange rates will adjust to cover the inflation rate differential between the two countries.

- B. The law of one price

The law of one price underlies purchasing power parity. This law suggests that where there are no transportation costs or barriers to trade, the same good sold in different countries should sell for the same price if all the different prices are expressed in terms of the same currency.

- C. International Fisher effect

1. According to the Fisher effect, interest rates reflect not only the real rate of return but the expected inflation rate.
2. The Fisher effect can be expressed as

$$I = P + I_r + (P)(I_r)$$

where

$$I = \text{the nominal interest rate}$$

$$I_r = \text{the real rate of return}$$

$$P = \text{the expected inflation rate}$$

3. The international Fisher effect suggests that the exchange rate adjusts to cover the interest rate differential between two countries.
4. This theory suggests that in efficient markets, with rational expectations, the forward rate is an unbiased forecast of the future spot rate.

V. Capital Budgeting for Direct Foreign Investment

A. Risk in international capital budgeting

1. Political risk arises from operating a business in a different and possibly less stable business climate than the United States.
2. Because of currency fluctuations, exchange risk incorporates changes in the future earnings stream, possibly in both foreign and domestic currencies.
3. Business risk is affected by the response of business and the MNC to economic conditions within the foreign country.
4. Financial risk arises from the financial structure of the firm and its effect on the profit stream.

B. Cash flows must be estimated considering the potential effects of exchange rate changes, governmental policy, and other items that determine product demand and sales.

C. A foreign investment can be evaluated from either a parent or a local firm perspective. If a firm uses a local perspective, the initial investment and all of its cash flows should be discounted at a rate that reflects the local inflation rate and the riskiness of the project. When using the parent company perspective, the discount rate should reflect the expected inflation rate in the parent currency, and foreign currency cash flows should be converted to the parent currency cash flows using projected exchange rates.

D. The net present value (NPV) must be calculated using the previous factors.

1. If NPV is greater than zero, generally accept direct foreign investments.
2. If NPV is less than zero, the MNC may decide to
 - a. Reject direct foreign investment.
 - b. Establish a sales office in the foreign country.
 - c. License a local company to manufacture the product, where the MNC receives royalty payments.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 16-1. The additional factors that must be considered in international finance relate to multiple currencies, different legal requirements, institutional restrictions, and internal control problems. These issues are discussed in the introduction to the chapter.
- 16-2. The different types of businesses that operate in the international environment are: one time (or occasional) exporters and importers, exporters and importers that do business (repeatedly) with one foreign country; exporters and importers that conduct business in many countries; companies that have a production plant or subsidiary abroad; multinational corporations with many subsidiaries in different countries.

The techniques and strategies open to these firms differ mainly due to the differing exposure to risk. Firms with plants abroad are subject to the political risk of expropriation. Firms doing import or export business do not have much risk of expropriation. The ideas of exchange risk apply to all these firms. The relevant measures of exchange risk differ between businesses due to their amount of foreign exchange diversification.

- 16-3. Arbitrage profits are the riskless profits made without investing funds. These profits are generated when certain assets are not priced according to an equilibrium relationship. For example, arbitrage profits are possible in the spot and forward-exchange markets if the indirect quote or cross-quote relationships are out of line. The respective arbitrage processes are called simple and triangular arbitrage. Arbitrage opportunities exist if the money market rates differ from the forward market rates. This is referred to as Covered Interest Arbitrage.
- 16-4. a. **Simple Arbitrage** is possible when the quoted rates in a foreign market are not the inverse of the rates quoted in the home market. For example, the dollar quote in Frankfurt should be the inverse of the DM quote in New York. Otherwise, arbitrage opportunities would prevail. See Problem 17-5 and its solution in this regard. Simple arbitrage is also possible in the forward quotes.
- b. **Triangular Arbitrage** is possible when the cross rate is out of line. For example, if the pound rate in Frankfurt (quoted as DM/pound) is different from the $\left(\frac{\text{DM}}{\$}\right) \times \left(\frac{\$}{\text{Pound}}\right)$ rate, then an arbitrageur could sell and buy different currencies in Frankfurt, London, and New York to turn an arbitrage profit.
- c. **Covered Interest Arbitrage** is possible when the money market rates are different from the forward market premium (or discount). This arbitrage involves at least four steps, as laid down in the text.

- 16-5. The purchasing power parity theory states that exchange rates will adjust so that the purchasing power of each currency remains the same after adjusting for inflation rates, while the international fisher effect states that real interest rates should be the same all over the world, and the interest rate parity theory states that the forward premium (or discount) should be equal and opposite in size to the difference in the national interest rates for securities of the same maturity. To keep this all in balance, any differentials are arbitrated away in the current, future forward and futures markets
- 16-6. a. **Exchange Risk:** Refers to the change in value of a profit stream or the economic value of an asset due to changes in the exchange rate.
- b. **Political Risk:** Refers to the risks associated with direct foreign investment due to changes in political climate or structure in the foreign country. These risks are due to expropriation, lack of compensation, or other unanticipated governmental controls imposed on the multinational corporation.
- 16-7. Since the forward market for the Indian Rupee does not exist, a trader can affect a hedge via the money markets in the United States and India. Other ways of covering an exposed position in rupees are by bilateral swap arrangements with other companies in India.
- 16-8. The risks associated with direct foreign investment are: business risk, financial risk, exchange risk, and political risk. The direct foreign investment has the additional factors of exchange and political risk compared to domestic investment. The exchange risk is due to the fact that the profit stream and the value of the subsidiary fluctuate due to changes in the exchange rate. The political risk arises from the fact that the political system and laws in many foreign countries are not as stable as in the United States.
- 16-9. The direct foreign investment problem is a capital-budgeting problem. All the relevant risks such as business risk, financial risk, exchange risk, and political risk are to be considered. The cash flow estimates should take into account the risks and demand-related factors. The choice of the appropriate discount rate should include the following: the risks of the investment and the choice of the “correct” component costs of financing. Finally, the net present value of the project is calculated, and the project is accepted if the NPV is positive.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

- 16-1. a. $10,000 \text{ (Canadian \$)} \times 0.8437 \text{ (U.S. \$/Canadian \$)} = \$8,437$
 b. $2,000,000 \text{ (Yen)} \times 0.004684 \text{ (\$/Yen)} = \$ 9,368$
 c. $50,000 \text{ (Swiss franc)} \times 0.5139 \text{ (\$/Swiss franc)} = \$25,695.$
- 16-2. a. $10,000 \text{ (\$)} \times 1/0.004684 \text{ (Yen/\$)} = 2,134,927.4 \text{ Y}$
 b. $15,000 \text{ (\$)} \times 1/0.5139 \text{ (Swiss franc/\$)} = 29,188.56 \text{ Swiss franc}$
 c. $20,000 \text{ (\$)} \times 1/0.8437 \text{ (Canadian \$/U.S. \$)} = 23,705.11 \text{ Canadian \$}.$
- 16-3. Recall that the indirect quote = (1/Direct Quote). The results are tabulated below:

	<u>Foreign Currency/¥</u>	
Canadian—dollar	Spot	1.1853
	30 day	1.1881
	90 day	1.1912
Japan—Yen	Spot	213.4927
	30 day	211.9992
	90 day	209.1613
Swiss—franc	Spot	1.9459
	30 day	1.9346
	90 day	1.8815

- 16-4. The Tokyo rate is 216.6743 Yen/\$
 The (indirect) New York rate is $1/0.004684 = 213.4927 \text{ Yen/\$}.$
- Assuming no transaction costs, the rate between Tokyo and New York are out of line.
 Arbitrage profits are possible.
- Yen is cheaper in Tokyo. Buy Yen for \$10,000.
- $$\$10,000 \times 216.6743 = 2,166,743 \text{ ¥.}$$
- Sell the Yen in New York at the prevailing rate.
- $$2,166,743 \times 0.004684 = \$10,149.02$$
- Your net gain is $\$10,149.02 - \$10,000 = \underline{\$149.02}$

$$\begin{aligned}
 16-5. \quad a. \quad (\text{Canadian dollar/Yen}) &= (\$/\text{Yen}) \times \left(\frac{\text{Canadiandollar}}{\text{U.S.dollar}} \right) \\
 &= 0.004684 \times (1/0.8437) \\
 &= 0.00555
 \end{aligned}$$

$$\begin{aligned}
 b. \quad (\text{Yen/Swiss franc}) &= (\$/\text{Swiss franc}) \times \left(\frac{\text{Yen}}{\$} \right) \\
 &= 0.5139 \times (1/0.004684) \\
 &= 109.7139
 \end{aligned}$$

16-6. We know that:
 1 Euro = 1.32 USD
 Therefore,
 3 U.S. Dollars = 3/1.32 Euros

\$3 USD can purchase 2.2727 Euros

16-7. We are told that:
 One U.S. dollar = 79.1 JPY
 One U.S. dollar = 0.64 £

Therefore,
 $\text{¥/£} = \text{¥/\$} \times \text{\$/£}$
 $\text{¥/£} = 79.1 \times 1.5625$
 $\text{¥/£} = 123.59$

16-8. Inventory value 1,500,000
 Spot rate, dollars/francs 1 yr. ago 1.15
 Current spot rate dollars/francs 1.06

Dollar value of inventory this year = Current spot rate dollars/francs × franc inv. value
 = \$1,590,000.00

Dollar value of inventory last year = Last year's spot rate dollars/francs × franc inv.
 value = \$1,725,000.00

Change in inventory value = −\$135,000.00

- 16-9. Given that 103.25 yen = 1 pound
 1 yen = 1/103.25 pounds
 1 yen = 0.009685 pounds

Taking this pounds-denominated number, we substitute it into an exchange rate function for dollars to yen:

$$\begin{aligned} 1 \text{ dollar} &= 81.23 \text{ yen} \\ 1 \text{ dollar} &= 81.23 \times (0.009685) \\ 1 \text{ dollar} &= 0.7867 \text{ pounds} \end{aligned}$$

We also know that 1 dollar = 0.77 Euros, so by substituting that information into the equation we see that:
 0.7867 pounds = 0.77 Euros

We then divide by 0.7867 to get our answer:
 1 British pound = 0.9787 Euros

- 16-10. We are given the information:

$$\begin{aligned} 90\text{-day } r_f, (\text{Annual}/4) & 1.25\% \\ 90\text{-day } r_h, (\text{Annual}/4) & 1.75\% \\ 90\text{-day forward rate } (\$/\epsilon) & \$1.32 \end{aligned}$$

Because $\left(1 + \frac{\text{Domestic}}{\text{Rate of Interest}}\right) = \left(\frac{\text{Forward Exchange Rate}}{\text{Spot Exchange Rate}}\right) \left(1 + \frac{\text{Foreign}}{\text{Rate of Interest}}\right)$, then

$$\left(\frac{\text{Forward Exchange Rate}}{\text{Spot Exchange Rate}}\right) = \frac{\left(1 + \frac{\text{Domestic}}{\text{Rate of Interest}}\right)}{\left(1 + \frac{\text{Foreign}}{\text{Rate of Interest}}\right)}$$

$$\begin{aligned} \frac{\$1.32}{\text{Spot exchange rate}} &= \frac{1.0175}{1.0125} \\ \frac{\$1.32}{\text{Spot exchange rate}} &= 1.004938 \end{aligned}$$

$$\begin{aligned} \$1.32 &= 1.004938 \times \text{Spot exchange rate} \\ \text{Spot exchange rate} &= \$1.32/1.004938 \\ \text{Spot exchange rate} &= 1.3135 \end{aligned}$$

16-11. We know that:

Price of Big Mac in yuan 2.44

Price of Big Mac in dollars 4.20

Therefore,

$$P_h = P_f \times \text{Spot rate}$$

$$\$4.20 = 2.44 \times \text{Spot rate}$$

$$\text{Spot rate, \$/yuan} = \$1.7213 \text{ per Chinese yuan}$$

This spot rate is the number of dollars equivalent to one yuan. However, the problem asks for the number of yuan equivalent to one U.S. dollar. Therefore, we need to calculate the inverse of the spot rate above.

$$\text{Spot rate, yuan/\$} = 1/\text{Spot rate of \$/yuan}$$

$$\text{Spot rate, yuan/\$} = 1/1.7213$$

$$\text{Spot rate, yuan/\$} = 0.5810$$

SOLUTIONS TO MINI CASE

- a. The additional factors that must be considered in international finance relate to multiple currencies, different legal requirements, institutional restrictions, and internal control problems. These issues are discussed in the introduction to the chapter.
- b. Arbitrage profits are the riskless profits made without investing funds. These profits are generated when certain assets are not priced according to an equilibrium relationship. For example, arbitrage profits are possible in the spot and forward exchange markets if the indirect quote or cross-quote relationships are out of line. The respective arbitrage processes are called simple and triangular arbitrage. Arbitrage opportunities exist if the money market rates differ from the forward market rates. This is referred to as: Covered Interest Arbitrage.
- c. Short-term exchange risk can be covered by either the money market or the forward market hedge. The hedge should be constructed so that the net asset (liability) position in a foreign currency is zero. In addition to the amount of hedge, the maturity of the hedge should also be matched. This ensures that the risk of foreign exchange exposure is eliminated.
- d. A forward exchange contract requires delivery at a specified future date, of one currency for a specified amount of another currency. The exchange rate for the future transaction is agreed upon today. The physical transaction takes place at the future date.
- Futures contracts (like forward exchange contracts) provide fixed prices for the required delivery of a foreign currency at maturity.
- Options, on the other hand, permit fixed (strike) price foreign currency transactions anytime prior to maturity.
- Futures contracts and options are traded in standardized amounts with standardized maturity dates. These instruments are traded on organized security exchanges. The individual traders deal with the exchange-based clearing organization rather than the direct parties to the foreign currency transaction.
- Forward contracts are quite different. Typically, they are written by banks and the firm deals directly with the banking institution rather than the organized security exchange.
- e. (1) $15,000 \text{ (Canadian \$)} \times 0.8450 \text{ (U.S. \$/Canadian \$)} = \$12,675$
(2) $1,500,000 \text{ (Yen)} \times 0.004700 \text{ (\$/Yen)} = \$ 7,050$
(3) $55,000 \text{ (Swiss-franc)} \times 0.5150 \text{ (\$/Swiss franc)} = \$28,325.$
- f. (1) $20,000 \text{ (\$)} \times 1/0.004700 \text{ (Yen/\$)} = 4,255,319.15 \text{ Yen}$
(2) $5,000 \text{ (\$)} \times 1/0.5150 \text{ (Swiss franc/\$)} = 9,708.74 \text{ Swiss franc}$
(3) $15,000 \text{ (\$)} \times 1/0.8450 \text{ (Canadian \$/U.S. \$)} = 17,751.48 \text{ Canadian \$}.$

- g. Recall that the indirect quote = (1/Direct Quote). The results are tabulated below:

Foreign Currency / \$

Canadian - dollar

Spot 1.1834

30 day 1.1884

90 day 1.1919

- h. The Tokyo rate is 216.6752 Yen/\$.

The (indirect) New York rate is $1/0.004700 = 212.7660$ Yen/\$.

Assuming no transaction costs, the rate between Tokyo and New York are out of line.

Arbitrage profits are possible.

Yen is cheaper in Tokyo. Buy Yen for \$10,000.

$\$10,000 \times 216.6752 = 2,166,752$ Y.

Sell the Yen in New York at the prevailing rate.

$2,166,752 \times 0.004700 = \$10,183.73$

Your net gain is $\$10,183.73 - \$10,000 = \underline{\$183.73}$

- i.
$$\begin{aligned} (\text{Canadian dollar/Yen}) &= (\$/\text{Yen}) \times \left(\frac{\text{Canadian dollar}}{\text{U.S. dollar}} \right) \\ &= .004700 \times (1/.8450) \\ &= 0.00556 \end{aligned}$$

WEB CHAPTER 17

Cash, Receivables, and Inventory Management

CHAPTER ORIENTATION

This chapter initiates our study of liquidity management. Here, we focus on the cash flow process and the reasons why a firm holds cash balances. The objectives of a sound cash management system are identified. The concept of float is defined. Several techniques that firms can use to favorably affect their cash receipts and disbursement patterns are examined. Finally, the composition of the firm's marketable securities portfolio is discussed.

Additionally, the risk-return trade-off associated with the firm's investment in accounts receivable is discussed. For accounts receivable, this trade-off occurs as less creditworthy customers with a higher probability of bad debts are taken on to increase sales. The analysis is similar to sound inventory management. Here a larger investment in inventory leads to more efficient production and speedier delivery; this should result in increased sales. However, additional financing costs to support the increase in inventory and increased handling and carrying costs are required.

CHAPTER OUTLINE

- I. Managing the Firm's Investment in Cash and Marketable Securities
 - A. Why a company holds cash: The firm's cash balance is constantly affected by a variety of influences. Sound cash management techniques are based on a thorough understanding of the cash flow process.
 - 1. On an irregular basis, cash holdings are increased from several external sources, such as from the sale of securities.
 - 2. In a similar fashion, irregular cash outflows reduce the firm's cash balance. Typical examples include cash dividend payments and the interest requirements on debt agreements.
 - 3. Other major sources of cash arising from internal operations occur on a rather regular basis. Accounts receivable collections are an example.

- B. Three motives for holding cash balances have been identified by Keynes.¹
1. The transactions motive is the need for cash to meet payments that arise in the ordinary course of doing business. Holding cash to meet a payroll or to acquire raw materials characterizes this motive.
 2. The precautionary motive describes the investment in liquid assets that are used to satisfy possible, but as yet indefinite, needs for cash. Precautionary balances are a buffer against all kinds of things that might happen to drain the firm's cash resources.
 3. The speculative motive describes holding cash to take advantage of hoped-for, profit-making situations.
- C. Variations in liquid asset holdings: Considerable variation is present in the liquid asset holdings of major industry groups and individual firms.
1. This is because (1) not all of the factors noted above affect every firm and (2) the executives in different firms who are ultimately responsible for cash management tasks have different risk-bearing preferences.
 2. Some industries invest very heavily in liquid assets. For example, the total-liquid-assets-to-total-assets ratio of the contract construction industry greatly exceeds that of the utility industry.
- D. Because assets are acquired, used, and sold every day, the management of liquid assets must be viewed as a dynamic process. The cash flow process is complex. In order to cut through this complexity, it is necessary that the firm's cash management system operates within clearly defined objectives.
- E. Cash management objectives and decisions
1. A properly designed cash management program forces the financial manager to come to grips with a risk-return trade-off.
 - a. He or she must strike an acceptable balance between holding too much cash and holding too little cash.
 - b. A large cash investment minimizes the chances of insolvency, but it penalizes company profitability.
 - c. A small cash investment frees excess (cash) balances for investment in longer-lived and more profitable assets, which increases the firm's profitability.
 2. The firm's cash management system should strive to achieve two prime objectives:
 - a. Enough cash must be on hand to dispense effectively with the disbursement needs that arise in the course of doing business.
 - b. The firm's investment in idle cash balances must be reduced to a minimum.

¹ John Maynard Keynes, *The General Theory of Employment Interest and Money* (New York: Harcourt Brace Jovanovich, Inc., 1936).

3. In the attempt to meet the two objectives noted above, certain decisions dominate the cash management process. These decision areas can be reduced to the three following questions:
 - a. What can be done to speed up cash collections and slow down or better control cash outflows?
 - b. What should be the composition of the marketable securities portfolio?
 - c. How should the investment in liquid assets be split between actual cash holdings and marketable securities?

F. Collection and disbursement procedures

1. Cash acceleration and deceleration techniques revolve around the concept of float. Float can be broken down into four elements:
 - a. Mail float refers to funds that are tied up as a result of the time that elapses from the moment a customer mails his or her remittance check until the firm begins to process the check.
 - b. Processing float refers to funds that are tied up as a result of the firm's recording and processing remittance checks prior to their deposit in the bank.
 - c. Transit float refers to funds that are tied up as a result of the time needed for a deposited check to clear through the commercial banking system and become "usable" funds to the firm.
 - d. Disbursing float refers to funds that are technically usable to the firm until its payment check has cleared through the banking system and has been charged against its deposit account.
2. Float reduction can result in considerable benefits in terms of (1) usable funds that are released for company use and (2) in the returns produced on these freed-up balances. A study problem at the end of this chapter illustrates the calculation of such savings.

In October 2003, President Bush signed into law the Check Clearing for the 21st Century Act. The law took effect on October 28, 2004. This new law is now commonly referred to as "Check 21." Prior to this new regulation, ordinary paper checks were physically transported by land carrier or air carrier from the depositing location to the financial institution that would eventually pay the check drawn against the firm's or individual's bank account.

Check 21 allows financial institutions the option of clearing a check image instead of the original check. Such digital substitutes can then be quickly processed within the banking clearing system in the same way that you use the Internet on your personal computer. These digital substitutes are being referred to as substitute checks or image replacement documents.

The impetus for this new law was threefold: (1) bank regulators, like those at the Federal Reserve System, feel that Check 21 will accelerate check collection at the ultimate or payee bank; (2) it is forecast that out-of-pocket transportation costs to the banking system will be reduced, thus increasing individual bank profitability;

and (3) the high degree of physical risk exposure associated with airline service can be minimized.

From the viewpoint of the firm's cash management system, "managing the float" will eventually be directly impacted. What is called "disbursing float" above could be dramatically reduced toward a few hours instead of a day or two. But Check 21 did not require banks to alter their "hold" time on specific checks or substitute checks posted to the firm's account within the bank (these are ultimately cash inflows that become "good" funds).

So while the check may have cleared within the bank clearing mechanism, (i.e., from bank to bank), the firm may not have use of "good" funds until banks are forced by a yet-to-be-defined regulatory change to reduce their "hold" time on checks that have actually cleared. Thus, the effects of Check 21 on "transit float" (the third type of float mentioned above) will occur gradually as pressure is put on individual financial institutions to reduce hold times and make the funds available for disbursement by the receiving firm.

The upshot for the firm, and its cash management system, is that the greatest profitability opportunities are still associated with reducing mail float and processing float.

3. Several techniques are available to improve the management of the firm's cash inflows. These techniques may also provide for a reduction in float. The lock-box arrangement is a widely used commercial banking service for expediting cash gathering.
 - a. The objective is to reduce both mail and processing float.
 - b. The procedure behind a lock-box system is very simple. The firm rents a local post office box and authorizes a local bank in which a deposit account is maintained to pick up remittances from the box.
 - (1) Customers are instructed to mail their payments to the numbered post office box.
 - (2) A deposit form is prepared by the bank for each batch of processed checks.
 - (3) The bank may notify the firm daily as to the amount of funds deposited on the firm's behalf.
 - (4) The firm that receives checks from all over the country establishes several lock boxes.
 - c. A lock-box arrangement provides for (1) increased working cash, (2) elimination of clerical functions, and (3) early knowledge of dishonored checks.

- d. The firm must carefully evaluate whether this or any cash management service is worth the added costs. Usually, the bank levies a charge for each check processed through the system. The marginal income generated from released funds must exceed the added costs of the system to make it economically beneficial. A study problem at the end of this chapter illustrates this kind of calculation.
4. Techniques used by firms that hope to improve the management of their cash outflows include: (1) zero balance accounts, (2) payable-through drafts, and (3) remote disbursing.
- a. Zero balance accounts (ZBAs) permit centralized control (i.e., at the head office) over cash disbursements, but, at the same time, they allow the firm to maintain disbursing authority at the local or divisional level.
 - b. The major objective of a ZBA system is to achieve better control over cash payments. A secondary benefit of this technique might be an increase in disbursement float.
 - c. Under a ZBA system, each profit center (division) has a disbursing account located in the same concentration bank.
 - (1) The firm's authorized employees write payment checks in the usual manner.
 - (2) These checks then clear through the banking system and are presented to the firm's concentration bank for payment.
 - (3) The checks are paid by the bank and negative balances build up in the appropriate disbursing accounts.
 - (4) Daily, the negative balances are restored to a zero level by means of credits to the various ZBAs and a corresponding reduction in the firm's master demand deposit account in the concentration bank.
 - d. For the firm that has several operating units, the benefits from using a ZBA system include:
 - (1) Centralized control over disbursements.
 - (2) Reduction of time spent on superficial cash management activities.
 - (3) Reduction of excess cash balances held in outlying accounts.
 - (4) An increase in disbursement float.

- e. Payable-through drafts (PTDs) have the physical appearance of ordinary checks, but they are drawn on and paid by the issuing firm instead of the bank. The bank serves as a collection point for the documents and passes the documents on to the firm for inspection and authorization for payment.
 - (1) The objective of a payable-through draft system is to provide for effective control of field authorized payments. An example would be a claim settlement authorized by an insurance agent.
 - (2) Stop payment orders can be initiated by the firm's headquarters on any drafts considered inappropriate.
 - (3) Legal payment of individual drafts takes place after review and approval of the drafts by the company. Disbursing float, however, is usually not increased by the use of drafts. For purposes of measuring usable funds to the firm, drafts presented daily for payment are charged in total against the corporate master demand deposit account.
- f. Electronic funds transfer methods are serving to reduce transit, mail, and processing float.
 - (1) If Firm A owes money to Firm B, this situation ought to be immediately reflected on both the books and bank accounts of these companies.
 - (2) This ideal within the U.S. financial system has not been reached; the trend toward it is readily observable. Business firms, for example, are using systems like terminal-based wire transfers to move funds within their cash management systems.
 - (3) The heart of electronic funds transfer (EFT) is the elimination of the check as a method of transferring funds. The process of EFT should provide for a more efficient economy, since funds (cash) will be released for more productive purposes.

G. Evaluating the costs of cash management services

1. Whether a particular cash management system will provide an economic benefit to the firm can be evaluated by use of this relationship:

$$\text{added costs} = \text{added benefits}$$
2. Clearly, if the benefits exceed the costs of using the system, then the system is economically feasible.

3. On a per unit-basis, this relationship can be expressed as follows:

$$P = (D) (S) (i)$$

where P = increase in per-check processing cost, if the new system is adopted,

D = days saved in the collection process, i.e., float reduction,

S = average check size in dollars,

i = the daily, before-tax opportunity cost (rate of return) of carrying cash.

4. The sum of $(D) (S) (i)$ must exceed P for the system to be beneficial to the firm. A study problem at the end of this chapter provides an example of this logic.

H. Composition of the marketable securities portfolio

1. When selecting a proper marketable securities mix, five factors should be considered.

- Financial risk is the uncertainty of expected returns from a security due to unforeseeable changes in the financial capacity of the security issuer to make future payments to the security owner.
- Interest rate risk is the uncertainty in expected returns caused by possible changes in interest rates. This is particularly important for securities that have long, as opposed to short, terms of maturity. (See study problem 5 for an illustration of this point.)
- Liquidity is the ability to transform a security into cash. Consideration should be given to (1) the time needed to sell the security and (2) the likelihood that the security can be sold at or near its prevailing market price.
- The taxability of interest income and capital gains is seriously considered by some corporate treasurers.
- The interest income from municipal obligations is tax-exempt.
- The following equation may be used to determine an equivalent before-tax yield on a taxable security.

(1) Notation:

r = equivalent before-tax yield.

r^* = after-tax yield on tax-exempt security.

T = firm's marginal income tax rate.

(2) Computation

$$r = \frac{r^*}{(1 - T)}$$

- (3) Example: Suppose a firm has a choice between investing in a one-year tax-free debt issue yielding 6 percent on a \$1,000 outlay or a one-year taxable issue that yields 7 percent on a \$1,000 outlay. The firm pays federal taxes at the rate of 34 percent. Which security is more beneficial to the firm?

$$r = \frac{0.06}{(1 - 0.34)} = 9.09\%$$

- (4) Clearly, this firm should choose the tax-exempt security.
- g. The yield criterion involves a weighing of the risks and benefits inherent in the four previously mentioned factors. The higher the risks associated with a particular security, the higher the expected yield (risk-return trade-off).

2. Marketable security alternatives

- a. A Treasury bill is a direct obligation of the U.S. government sold on a regular basis by the U.S. Treasury.
- (1) These bills may now be purchased in denominations as small as \$1,000.
 - (2) The bills are currently offered with maturities of 91, 182, and 365 days.
 - (3) Because Treasury bills are sold on a discount basis, the investor does not receive an actual interest payment.
 - (4) Because Treasury bills are backed by the U.S. government, they are considered risk-free and consequently sell at lower yields than those obtainable on other marketable securities.
 - (5) The income from Treasury bills is subject only to federal income taxes and is always taxed as an ordinary gain.
- b. Federal agency securities represent debt obligations of federal government agencies and were created to carry out lending programs of the U.S. government.
- (1) The Federal National Mortgage Association (FNMA) renders supplementary assistance to the secondary market for mortgages.
 - (2) The Federal Home Loan Banks (FHLB) function as a credit reserve system for member banks.
 - (3) The Federal Land Banks grant loans to members of Federal Land Bank Associations who are engaged in agriculture, provide agricultural services, or own rural homes.
 - (4) The Federal Intermediate Credit Banks grant loans to and purchase notes originating from loans made to farmers by other financial institutions.
 - (5) The Banks for Cooperatives make loans to cooperative associations which are owned and controlled by individuals involved in general farm business.
 - (6) Securities of these “big five” federally sponsored agencies are not directly backed by the U.S. government.

- (7) The maturities available range from 30 days to 15 years, with most (80 percent) maturing in five years or less.
- (8) The yields available always exceed those of Treasury bills of comparable maturity and are taxable at the federal, state, and local level.
- c. Bankers' acceptances are largely concentrated in the financing of foreign transactions; this acceptance is a draft (order to pay) drawn on a specific bank by an exporter in order to obtain payment for goods shipped to a customer who maintains an account with that bank.
 - (1) The maturities run mostly from 30 to 180 days, with the most common period being 90 days.
 - (2) Like Treasury bills, the acceptances are sold on a discount basis.
 - (3) Income generated from acceptances is fully taxable at all governmental levels.
 - (4) Acceptances provide investors with a higher yield than do Treasury bills and agency obligations of comparable maturity.
- d. A negotiable certificate of deposit (CD) is a marketable receipt for funds that have been deposited in a bank for a fixed time period at a fixed interest rate.
 - (1) CDs are offered in denominations ranging from \$25,000 to \$10,000,000, with popular sizes of \$100,000, \$500,000 and \$1,000,000.
 - (2) Original maturities on CDs range from 1 to 18 months.
 - (3) Yields on CDs are higher than yields on Treasury bills, and in recent years, they have exceeded those available on acceptances.
 - (4) The income received from CDs is taxed at all governmental levels.
- e. Commercial paper refers to short-term, unsecured promissory notes sold by large businesses in order to raise cash.
 - (1) Paper is usually sold in relatively large denominations, typically in excess of \$25,000, and ranging up to \$1,000,000.
 - (2) The notes are sold on a discount basis with maturities ranging from 3 to 270 days.
 - (3) It is the only investment instrument discussed here that has no active trading in a secondary market.
 - (4) The return on commercial paper is fully taxable at all governmental levels.
- f. Repurchase agreements are legal contracts that involve the actual sale of securities by a borrower to the lender, with a commitment on the part of the borrower to repurchase the securities at the contract price plus a stated interest charge.
 - (1) These agreements are usually executed in sizes of \$500,000 or more.
 - (2) The maturity is either for a specified time period (tailored to the needs of the investor) or there is no fixed maturity date.

- (3) The yields are generally less than those of Treasury bill rates of comparable maturities and are taxable at all governmental levels.
- g. Money market mutual funds usually invest in a diversified portfolio of short-term, high-grade debt instruments like those described in this section.
 - (1) These funds sell their shares to a large number of small investors in order to raise cash.
 - (2) The funds offer the investing firm a high degree of liquidity and investment expertise.
 - (3) The returns earned from owning shares in a money market fund are taxable at all governmental levels.
 - (4) Table 17.1 summarizes the salient features of the major money market instruments important to businesses.

Table 17.1 Features of Selected Money Market Instruments

<u>Instrument</u>	<u>Denominations</u>	<u>Maturities</u>	<u>Basis</u>	<u>Liquidity</u>	<u>Taxability</u>
<u>U.S. Treasury Bills:</u> Direct obligations of the U.S. government	\$1,000 and increments of \$1,000	91 days 182 days 365 days Nine-month not presently issued	Discount	Excellent secondary market	Exempt from state and local income; do <u>not</u> qualify for favorable capital gains rate
<u>Federal Agency Securities:</u> Obligations of corporations and agencies created to affect the federal government's lending programs.	Wide variation from \$1,000 to \$1,000,000	Five days* to more than 10 years (*Farm Credit consolidated system-wide discount notes)	Discount or coupon; usually on coupon	Good for issues of "Big Five" agencies	Generally exempt at local level; FNMA issues are not
<u>Bankers' Acceptances:</u> Drafts accepted for future payment by commercial banks	No set size; typically range from \$25,000 to \$1,000,000	Predominantly from 30 to 180 days	Discount	Good for acceptances of large "money market" banks	Taxed at all levels of government
<u>Negotiable Certificates of Deposit:</u> Marketable receipts for funds deposited in a bank for a fixed time period.	\$15,000 to \$10,000,000	1 to 18 months	Accrued interest	Fair to good	Taxed at all levels of government
<u>Commercial Paper:</u> Short-term, unsecured promissory notes.	\$5,000 to \$5,000,000; \$1,000 and \$5,000 multiples above the initial offering size are sometimes available	3 to 270 days	Discount	Poor; no active, secondary market in usual sense	Taxed at all levels of government
<u>Repurchase Agreements:</u> Legal contracts between a borrower (security seller) and lender (security buyer.) The borrower will repurchase at the contract price plus an interest charge	Typical sizes are \$500,000 or more	According to terms of contract	Not applicable	Fixed by the agreement, i.e., borrower will repurchase	Taxed at all levels of government
<u>Money Market Mutual Funds:</u> Hold a diversified portfolio of short-term, high-grade debt instruments	Some require an initial investment as small as \$1,000	Shares can be sold at any time	Net asset value	Good; provided by the fund itself	Taxed at all levels of government

- h. Money market deposit accounts became available to the public on December 14, 1982, on authorization of the Depository Institutions Deregulatory Committee.
- (1). These accounts are offered by commercial banks and thrift institutions. The intent is to compete with money market mutual funds, but they do differ in significant ways from the funds.
 - (2). One characteristic of the money market deposit accounts (MMDAs) that makes them inappropriate for most businesses is that the number of transactions per month on each account is limited. Firms generally do not want to be restricted on the number of times per month that they can tap their liquid asset reserves. That runs counter to the very logic of holding a buffer stock of liquidity.
 - (3). Alternatively, the MMDAs have become very popular with individual investors.

II. Managing the Firm's Investments in Accounts receivable

- A. Typically, accounts receivable represent just over 25 percent of a firm's assets.
- B. The size of the investment in accounts receivable varies from industry to industry and is affected by several factors including the percentage of credit sales to total sales, the level of sales, and the credit and collection policies—more specifically the terms of sale, the quality of customer, and collection efforts.
- C. Although all these factors affect the size of the investment, only the credit and collection policies are decision variables under the control of the financial manager.
- D. The terms of sale are generally stated in the form **a/b net c**, indicating that the customer can deduct **a** percentage if the account is paid within **b** days; otherwise, the account must be paid within **c** days.
- E. If the customer decides to forgo the discount and not pay until the final payment date, the annualized opportunity cost of passing up this **a** percent discount and withholding payment until the **c**th day is determined as follows:

annualized opportunity

$$\text{cost of forgoing the discount} = \frac{a}{1-a} \times \frac{360}{c-b}$$

Example: Given the trade credit terms of 3/20 net 60, what is the annualized opportunity cost of passing up the 3 percent discount and withholding payment until the 60th day?

Solution: Substituting in the values from the example, we get

$$27.8\% = \frac{0.03}{1-0.03} \times \frac{360}{60-20}$$

- F. A second decision variable in determining the size of the investment in accounts receivable in addition to the trade credit terms is the type of customer.
 - 1. The costs associated with extending credit to lower-quality customers include:
 - a. Increased costs of credit investigation.
 - b. Increased probability of customer default.
 - c. Increased collection costs.
- G. Analyzing the credit application is a major part of accounts receivable management.
 - 1. Several avenues are open to the firm in considering the credit rating of an applicant. Among these are financial statements, independent credit ratings and reports, bank checking, information from other companies, and past experiences.
 - 2. One commonly used method for credit evaluation is called credit scoring and involves the numerical evaluation of each applicant in which an applicant receives a score based upon the answers to a simple set of questions. The score is then evaluated relative to a predetermined standard, its level relative to that standard determining whether or not credit scoring should be extended to the applicant. The major advantage of credit scoring is that it is inexpensive and easy to perform.
 - 3. Once the decision to extend credit has been made and if the decision is yes, a maximum credit line is established as a ceiling on the amount of credit to be extended.
- H. The third and final decision variable in determining the size of the investment in accounts receivable is the firm's collection policies.
 - 1. Collection policy is a combination of letter sending, telephone calls, personal visits, and legal actions.
 - 2. The greater the amount spent on collecting, the lower the volume of bad debts.
 - a. The relationship is not linear, however, and, beyond a point, is not helpful.
 - b. If sales are independent of collection efforts, then methods of collection should be evaluated with respect to the reduction in bad debts against the cost of lowering those bad debts.
- I. Credit should be extended to the point that marginal profitability on additional sales equals the required rate of return on the additional investment in receivables necessary to generate those sales.
- J. Credit policy changes involve direct trade-offs between costs and benefits. Determining whether the increased sales contribute more toward profits than the increased costs take away from them is the job of marginal or incremental analysis. Marginal analysis is performed as follows:

1. Estimate the change in profits from the new policy. This is equal to the increased sales times the profit contribution less any additional bad debts incurred.
2. Estimate the cost of the additional investment in accounts receivable and inventory.
3. Estimate the change in the cost of the cash discount (if a change in the cash discount is enacted).
4. Compare the incremental revenues with the incremental costs.

K. Inventory

1. Typically, inventory accounts for about 4.88 percent of a firm's assets.
2. The purpose of carrying inventories is to uncouple the operations of the firm. (i.e., to make each function of the business independent of each other function.)
3. As such, the decision with respect to the size of the investment in inventory involves a basic trade-off between risk and return.
4. The risk comes from the possibility of running out of inventory if too little inventory is held, while the return aspect of this trade-off results because increased inventory investment costs money.
5. There are several general types of inventory.
 - a. Raw materials inventory consists of the basic materials that have been purchased from other firms to be used in the firm's productions operations. This type of inventory uncouples the production function from the purchasing function.
 - b. Work in process inventory consists of partially finished goods that require additional work before they become finished goods. This type of inventory uncouples the various production operations.
 - c. Finished goods inventory consists of goods on which the production has been completed but the goods are not yet sold. This type of inventory uncouples the production and sales function.
 - d. Stock of cash inventory serves to make the payment of bills independent of the collection of accounts due.
6. In order to manage the investment in inventory effectively, two problems must be dealt with: the order quantity problem and the order point problem.
7. The order quantity problem involves the determination of the optimal order size for an inventory item given its expected usage, carrying, and ordering costs.
8. The economic order quantity (EOQ) model attempts to determine the order size that will minimize total inventory costs. The EOQ is given as:

$$Q^* = \sqrt{\frac{2SO}{C}}$$

where C = carrying costs per unit

O = ordering costs per order

S = total demand in units over the planning period

Q^* = the optimal order quantity in units

9. The order point problem attempts to answer the following question: How low should inventory be depleted before it is reordered?
10. In answering this question, two factors become important:
 - a. What is the usual procurement or delivery time, and how much stock is needed to accommodate this time period?
 - b. How much safety stock does the management desire?
11. Modification for safety stocks is necessary, since the usage rate of inventory is seldom stable over a given timetable.
12. This safety stock is used to safeguard the firm against changes in order time and receipt of shipped goods.
13. The greater the uncertainty associated with forecasted demand or order time, the larger the safety stock.
 - a. The costs associated with running out of inventory will also determine the safety stock levels.
 - b. A point is reached where it is too costly to carry a larger safety stock given the associated risk.
14. Inflation can also have an impact on the level of inventory carried.
 - a. Goods may be purchased in large quantities in anticipation of price rises.
 - b. The cost of carrying goods may increase, causing a decline in Q^* , the optional order quantity.
15. The just-in-time inventory control system is more than just an inventory control system; it is a production and management system.
 - a. Under this system, inventory is cut down to a minimum, and the time and physical distance between the various production operations are also minimized.
 - b. Actually, the just-in-time inventory control system is just a new approach to the EOQ model which tries to produce the lowest average level of inventory possible.
 - c. Average inventory is reduced by locating inventory supplies in convenient locations and setting up restocking strategies that cut time and thereby reduce the needed level of safety stock.

ANSWERS TO END-OF-CHAPTER REVIEW QUESTIONS

- 17-1. Perhaps your first response to this question is that Apple is a very profitable company and they have earned huge profits on a string of very innovative new products. But why hold the cash in the firm? We addressed this question back in Chapter 13 when we discussed dividend policy. In fact, this is a tough question to answer, and we can only speculate as to the motives of Apple's management. First, the firm may be holding an unusually large amount of cash in anticipation of an acquisition opportunity. Moreover, the firm's large cash balance may be held as a precaution against a time in the future when the firm may need the cash and not be able to raise in under reasonable terms.
- 17-2. The procedure by which funds generated from company activity are accommodated (directed) through the firm from the time of their initial receipt until their ultimate disposition. Over the long run, accounts receivable collections account for the largest regular source of cash in the typical manufacturing company. Payment of accounts payable, payroll expenses, and the distribution of income to the owners (cash dividends) are the major forms of cash disbursement. Other sources of cash for a company may include receipts from the sale of assets, assumption of additional debt, issuance of new stock, or gains realized from investments. While these are important sources of cash to a company, the proceeds are not available on a regular basis. Major capital expenditure programs, new company acquisitions, and inventory stockpiling are examples of irregular disbursements of cash outside the normal course of everyday business.
- 17-3. The three classical motives for holding cash and near-cash balances are: (1) the transactions motive; (2) the precautionary motive; (3) the speculative motive. Transactions balances allow the firm to make payments that arise in the ordinary course of doing business. Precautionary balances provide a buffer stock of liquid assets that can be drawn down if unexpected demands for cash arise. Speculative balances permit the economic unit to take advantage of future profit-making situations.
- 17-4. The firm must: (1) maintain adequate cash balances that will permit it to meet the disbursement needs that occur in the course of doing business; (2) reduce idle cash balances to a minimum.
- 17-5.
 - a. Mail float: this represents funds which are not usable to the firm because of the time necessary for a customer's remittance check to travel through the mail to a company collection center.
 - b. Processing float: this represents funds tied up due to the time needed for the company to process the remittance checks and get them ready for deposit in a demand deposit account.

- c. Transit float: this represents funds tied up because of the time necessary for a deposited check to clear through the commercial banking system and become “good” funds to the firm.
 - d. Disbursing float: this refers to funds available in the firm’s demand deposit account due to the time needed for a payment check to clear through the banking system.
- 17-6. In the context of cash management, financial risk is the uncertainty of future returns from a security caused by possible changes in the financial capability of the security-issuer to make future payments to the security-owner. This is sometimes called default risk. On the other hand, the uncertainty related to the expected returns from a financial asset caused by changes in interest rates is called interest rate risk.
- 17-7. The size of the investment in accounts receivable is determined primarily by these factors:
- a. The percentage of credit sales to total sales. While this factor plays a major role in determining the investment in accounts receivable, it is generally not within the control of the financial manager. In essence, the nature of the business tends to determine the blend between credit sales and cash sales.
 - b. The level of sales. As sales increase, so will accounts receivable. Again, this is not an effective decision tool.
 - c. Credit and collection policies. Specifically the terms of sale, the quality of customer, and collection efforts are determinants of the level of investment in receivables that are under the control of the financial manager.
- 17-8. If a credit manager experienced no bad debt losses over the past year, then credit was probably not extended to enough customers. Ideally, credit should be extended to the point where marginal revenue from added sales due to increased credit is equal to the marginal costs associated with increased bad debts, costs of investigation, costs of collection, and increased required rate of return. Obviously, the credit manager was nowhere near this level if no bad debts were incurred.
- 17-9. The returns associated with a more liberal credit policy come from the fact that extending credit to weaker customers or liberalizing the trade credit terms will probably increase sales, resulting in a larger profit level. The risks involved largely result from the increased possibility of extending credit that will eventually become bad debts.

- 17-10. The purpose of carrying inventories is to uncouple the operations of the firm (i.e., to make each function of the business independent of each other's function.) By uncoupling the various operations of the firm, delays or shutdowns in one area no longer affect the production and sale of the final product. Raw materials inventory, for example, uncouples the production function from the purchasing function. Goods in process inventory uncouples the various production operations in the firm's production and sales functions.
- 17-11. The major assumptions of the EOQ model include:
- (1) Constant or uniform demand.
 - (2) Constant unit price regardless of amount ordered.
 - (3) Constant carrying costs per unit.
 - (4) Constant ordering costs per order regardless of the size of the order.
 - (5) Instantaneous delivery.

SOLUTIONS TO END-OF-CHAPTER STUDY PROBLEMS

- 17-1. a. First, it is necessary to compute Portobello's average remittance check size and the daily opportunity cost of carrying cash. The average check size is:

$$\frac{\$24,000,000}{10,000} = \$2,400 \text{ per check}$$

The daily opportunity cost of carrying cash is:

$$\frac{0.08}{365} = 0.00021692 \text{ per day}$$

Second, the days saved in the collection process can be evaluated according to the general format of:

Added Costs = Added Benefits

or

$$P = (D) (S) (i)$$

$$0.25 = (D) (\$2,400) (0.0002192)$$

$$0.4752 \text{ days } D$$

Therefore, Portobello Scuba Diving will experience a financial gain if it adopts the lock-box system and by doing so, will speed up its collections by more than 0.4752 days.

- b. In this situation, the daily opportunity cost of carrying cash is:

$$\frac{0.04}{365} = 0.0001096 \text{ per day}$$

For Portobello to break even should it choose to install the lock-box system, the cash collections must be accelerated by 0.9504 days as follows:

$$\$0.25 = (D) (\$2,400) (0.0001096)$$

$$0.9504 \text{ days } = D$$

- c. The break-even cash acceleration period of 0.9504 days is greater than the 0.4752 days found in part a. This is due to the lower yield available on near cash assets (or 4 percent annually versus 8 percent). Since the alternative rate of return on the freed-up balances is lower on the second situation, more funds must be invested to cover the costs of operating the lock-box system. The greater cash acceleration period generates this increased level of required funds.

17-2. a. Annual collections = $(\$4,800,000) \times (10) = \$48,000,000$

Daily collections = $\$48,000,000/365 = \$131,507$

The opportunity cost of the mail and processing float is:

$(\$131,507) \times (4.2 \text{ days}) \times (0.07) = \underline{\$38,663}$

- b. Use of the suggested cash acceleration system will result in a float reduction of 3.2 days (i.e., 1.2 days mail float, 1 day processing float, and 1 day transit float). The gross annual savings from the system, then, can be calculated as:

$(\$131,507) \times (3.2) \times (.07) = \$29,458$

The cost of operation of the lock-box system is:

$(\$250 \text{ per month}) \times (10 \text{ regions}) \times (12 \text{ months}) = \$30,000$

Therefore, the net annual savings (costs) are:

$(\$29,458) - (\$30,000) = \underline{-\$542}$

The firm should not adopt the system, as the net gain is negative and equal to $-\$542$.

17-3. a. Reduction in mail float:
 $(2 \text{ days}) \times (\$1,000,000) = \$2,000,000$

Reduction in processing float:
 $(2 \text{ days}) \times (\$1,000,000) = \underline{\$2,000,000}$

Total float reduction = $\$4,000,000$

b. $(0.06) \times (\$4,000,000) = \$240,000$

- c. The average number of checks to be processed each day through the lock-box arrangement is:

$$\frac{(\$1,000,000)}{\$2,000} = 500 \text{ checks per day}$$

Thus, the cost of the lock-box system on an annual basis is:

$$(500) \times (\$0.18) \times (270 \text{ days}) = \$24,300$$

Next, we have to calculate the cost of the ADTC system. The First Pennsylvania Bank will not contribute to the cost of the ADTC arrangement because it is the lead concentration bank and thereby receives the transferred data. This means Pierce Designs will be charged for six ADTCs each business day. The ADTC system, then, costs $(\$15) \times (6) \times (270) = \$24,300$. Note that only by mere coincidence does the cost of the ADTC system equal that of the lock-box arrangement. Finally, we have the total cost of the proposed system:

Lock-box cost	\$ 24,300
ADTC cost	<u>24,300</u>
Total cost	<u>\$ 48,600</u>

- d. The information just developed strongly indicates that Pierce Designs should install the proposed cash receipts acceleration system. The net annual gain associated with this recommendation is \$191,400 as follows:

Projected return on freed balances	\$240,000
Less cost of new system	<u>(48,600)</u>
Net annual gain	<u>\$191,400</u>

- 17-4. a. The average accrued wages under the monthly payment system are:

$$\frac{4 \times (\$500,000)}{2} = \$1,000,000$$

This means that the firm has, on the average, \$750,000 (i.e., $\$1,000,000 - \$250,000$) more to invest. This provides an annual return of $(\$750,000) \times (0.07) = \$52,500$. Therefore, Daniel Shoe should move to the monthly payment system since it will generate $\$52,500 - \$35,000 = \$17,500$ in net annual savings.

- b. Let r = the break-even rate of return on the near-cash portfolio:

$$\begin{aligned} \$750,000 \times (r) &= \$35,000 \\ r &= 0.0467 \text{ or } 4.67\% \end{aligned}$$

A reasonable margin of safety favoring adoption of the monthly payment proposal is present.

- 17-5. This exercise attempts to illustrate that a change in the firm's accounts payable policy can properly be viewed as a part of the overall problem of cash management. Before evaluating the 45-day and 60-day payment alternatives, it is necessary to calculate the amount of purchases that are actually discounted and the value of the annual purchase discount earned by Bradford Construction. These amounts are calculated below:

Purchases discounted

$$(\$37,500,000 \text{ annual purchases}) \times (0.25) = \$9,375,000$$

Purchase discounts earned

$$(\$9,375,000) \times (0.03) = \$281,250$$

with \$281,250 in purchase discounts earned. Bradford actually pays:

$$(\$9,375,000) - (\$281,250) = \$9,093,750, 10 \text{ days after purchase.}$$

The annual amount not discounted is $(\$37,500,000) - (\$9,375,000) = \$28,125,000$.

We are now in a position to evaluate first the 45-day proposal and, second, the 60-day proposal.

45-day alternative:

(1) Principal amount	(2) Extra time available	(3) Interest rate	(4) = (1) × (2) × (3) Interest earned
\$ 28,125,000	15 days	$0.12 \div 365$	= \$138,699
9,093,750	35 days	$0.12 \div 365$	= <u>104,640</u>
		Total added return	<u>\$243,339</u>
-\$281,250	Lost discounts earned		
+ <u>243,339</u>	Total added return		
<u>-\$ 37,911</u>	Loss to Bradford by stretching payables to 45 days.		

60-day alternative:

(1) Principal amount	(2) Extra time available	(3) Interest rate	(4) = (1) × (2) × (3) Interest earned
\$28,125,000	30 days	$0.12 \div 365$	= \$277,397
9,093,750	50 days	$0.12 \div 365$	= <u>149,486</u>
		Total added return	<u>\$426,883</u>
-\$281,250	Lost discounts earned		
+ <u>\$426,883</u>	Total added return		
<u>\$145,633</u>	Gained by Bradford by stretching payables to 60 days		

Finally, we can evaluate the effect of the projected price increase to Bradford that is associated with the 60-day alternative.

Price Increase:

\$37,500,000 Purchases
<u>0.005</u>
\$ <u>187,500</u> Price increase
\$187,500 Price increase
<u>-145,633</u> Net added return
\$ <u>41,867</u> Loss to Bradford

Ultimately, none of the proposed courses of action would benefit the firm.

17-6. a.
$$P = \sum_{t=1}^{18} \frac{\$80}{(1.09)^t} + \frac{\$1,000}{(1.09)^{18}} = \$912.44$$

The bond can be sold for \$912.44. This was developed as follows:

$$\$80 \times (8.7556) + \$1,000 \times (0.21199) = \underline{\$912.44}$$

b. $\$1,000 - \$912.44 = \underline{\$87.56}$ loss

c. First, we find the price of the four-year bond, which now has two years remaining to maturity:

$$P = \sum_{t=1}^2 \frac{\$80}{(1.09)^t} + \frac{\$1,000}{(1.09)^2} = \$982.41$$

Then, we can determine the expected capital loss on the shorter-term bond as follows:

$$\$1,000 - \$982.41 = \underline{\$17.59}$$

The capital loss on the shorter-term bond is much less than that suffered on the longer-term instrument.

d. Interest rate risk, which leads to a maturity premium, as discussed in Chapter 2.

- 17-7. a. The after-tax yield to Aggieland Fireworks on the BBB-rated bond is $(0.09) \times (1-0.46) = .0486 = 4.86\%$. Since the yield on the tax-exempt issue is already stated on an after-tax basis, we can conclude the $5\frac{1}{2}$ percent return on the municipal is preferable.

b.
$$r = \frac{r^*}{(1-T)}$$

$$r = \frac{0.055}{(1-0.46)} = \frac{0.055}{0.54} = 0.10185 \text{ or } \underline{10.185\%}$$

17-8

17-9. a.
$$\frac{a}{1-a} \times \frac{360}{c-b}$$

where a = amount of the discount
 b = the discount period
 c = the net period

$$\frac{0.01}{1-0.01} \times \frac{360}{20-10} = 0.3636 \text{ or } 36.36\%$$

b.
$$\frac{0.02}{1-0.02} \times \frac{360}{30-10} = 0.3673 \text{ or } 36.73\%$$

c.
$$\frac{0.03}{1-0.03} \times \frac{360}{30-10} = 0.5567 \text{ or } 55.67\%$$

d.
$$\frac{0.03}{1-0.03} \times \frac{360}{60-10} = 0.2227 \text{ or } 22.27\%$$

e.
$$\frac{0.03}{1-0.03} \times \frac{360}{90-10} = 0.1392 \text{ or } 13.92\%$$

f.
$$\frac{0.05}{1-0.05} \times \frac{360}{60-10} = 0.3789 \text{ or } 37.89\%$$

17-10. Applicant #1

$$Z = 3.3(0.2) + 1.0(0.2) + 0.6(1.2) + 1.4(0.3) + 1.2(0.5)$$

$$Z = 0.66 + 0.2 + 0.72 + 0.42 + 0.6$$

$$Z = 2.6 < 2.7 \text{ thus, reject}$$

Applicant #2

$$\begin{aligned} Z &= 3.3(0.2) + 1.0(0.8) + 0.6(1.0) + 1.4(0.3) + 1.2(0.8) \\ Z &= 0.66 + 0.8 + 0.6 + 0.42 + 0.96 \\ Z &= 3.44 > 2.7 \text{ thus, accept} \end{aligned}$$

Applicant #3

$$\begin{aligned} Z &= 3.3(0.2) + 1.0(0.7) + 0.6(0.6) + 1.4(0.3) + 1.2(0.4) \\ Z &= 0.66 + 0.7 + 0.36 + 0.42 + 0.48 \\ Z &= 2.62 < 2.7 \text{ thus, reject} \end{aligned}$$

Applicant #4

$$\begin{aligned} Z &= 3.3(0.1) + 1.0(0.4) + 0.6(1.2) + 1.4(0.4) + 1.2(0.4) \\ Z &= 0.33 + 0.4 + 0.72 + 0.56 + 0.48 \\ Z &= 2.49 < 2.7 \text{ thus, reject} \end{aligned}$$

Applicant #5

$$\begin{aligned} Z &= 3.3(0.3) + 1.0(0.7) + 0.6(0.5) + 1.4(0.4) + 1.2(0.7) \\ Z &= 0.99 + 0.7 + 0.30 + 0.56 + 0.84 \\ Z &= 3.39 > 2.7 \text{ thus, accept} \end{aligned}$$

Applicant #6

$$\begin{aligned} Z &= 3.3(0.2) + 1.0(0.5) + 0.6(0.5) + 1.4(0.4) + 1.2(0.4) \\ Z &= 0.66 + 0.5 + 0.30 + 0.56 + 0.48 \\ Z &= 2.5 < 2.7 \text{ thus, reject} \end{aligned}$$

17-11. a.

$$\begin{aligned} Q^* &= \sqrt{\frac{2SO}{C}} \\ &= \sqrt{\frac{2(3000)10}{0.10}} \\ &= \sqrt{600,000} \\ &= 775 \text{ units} \end{aligned}$$

b. Total costs = $\left(\frac{Q}{2}\right)C + \left(\frac{S}{Q}\right)O$

Order one time:

$$\begin{aligned} &= \left(\frac{3000}{2}\right)\$.10 + \left(\frac{3000}{3000}\right)\$10 \\ &= \$150 + \$10 \\ &= \$160 \end{aligned}$$

Order four times:

$$\begin{aligned} &= \left(\frac{750}{2}\right)\$.10 + \left(\frac{3000}{750}\right)\$10 \\ &= \$37.50 + \$40 \\ &= \$77.50 \end{aligned}$$

Order five times:

$$\begin{aligned} &= \left(\frac{600}{2}\right)\$.10 + \left(\frac{3000}{600}\right)\$10 \\ &= \$30.00 + \$50.00 \\ &= \$80 \end{aligned}$$

Order ten times:

$$\begin{aligned} &= \left(\frac{300}{2}\right)\$.10 + \left(\frac{3000}{300}\right)\$10 \\ &= \$15.00 + \$100 \\ &= \$115 \end{aligned}$$

Order 15 times:

$$\begin{aligned} &= \left(\frac{200}{2}\right)\$.10 + \left(\frac{3000}{200}\right)\$10 \\ &= \$10 + \$150 \\ &= \$160 \end{aligned}$$

- c.
- (1) constant or uniform demand
 - (2) constant unit price
 - (3) constant carrying costs
 - (4) constant ordering costs
 - (5) instantaneous delivery
 - (6) independent orders

$$\begin{aligned}
 17-12. \text{ a. } \quad \text{EOQ} &= \sqrt{\frac{2SO}{C}} \\
 &= \sqrt{\frac{2(250,000)100}{1}} \\
 &= 7,071 \text{ units or } 7,100 \text{ units}
 \end{aligned}$$

$$\text{b. } \quad \frac{250,000}{7,100} = 35.2 \text{ orders per year}$$

$$\begin{aligned}
 \text{c. } \quad \text{Inventory order point} &= \text{Delivery time stock} + \text{safety stock} \\
 &= \frac{1}{50} \times 250,000 + 5,000 \\
 &= 5,000 + 5,000 \\
 &= 10,000 \text{ units}
 \end{aligned}$$

$$\begin{aligned}
 \text{d. } \quad \text{Average inventory} &= \frac{\text{EOQ}}{2} + \text{Safety stock} \\
 &= \frac{7,100}{2} + 5,000 \\
 &= 8,550 \text{ units}
 \end{aligned}$$

$$\begin{aligned}
 \text{e. } \quad \text{EOQ} &= \sqrt{\frac{2(500,000)100}{1}} \\
 &= 10,000 \text{ units}
 \end{aligned}$$

$$\begin{aligned}
 &\text{Elasticity of} \\
 &\text{EOQ with} \\
 &\text{respect to a} \\
 &\text{double in sales}
 \end{aligned}
 = \frac{\% \Delta \text{EOQ}}{\% \Delta \text{Sales}}$$

$$\begin{aligned}
 &= \frac{\Delta \text{EOQ}}{\text{EOQ}} \div \frac{\Delta \text{Sales}}{\text{Sales}} \\
 &= \left(\frac{10,000 - 7,100}{7,100} \right) / \left(\frac{500,000 - 250,000}{250,000} \right) \\
 &= \frac{0.4085}{1.0} = 0.4085 \text{ or } 40.85\%
 \end{aligned}$$

$$\begin{aligned}
 \text{f.} \quad \text{EOQ} &= \sqrt{\frac{2(250,000)100}{2}} \\
 &= 5,000 \\
 \text{Elasticity of} & \\
 \text{EOQ with} & \\
 \text{respect to a} &= \frac{\% \Delta \text{EOQ}}{\% \Delta \text{Carrying Costs}} \\
 \text{double in} & \\
 \text{carrying costs} & \\
 &= \frac{5,000 - 7,100}{7,100} \div \frac{2 - 1}{1} = -0.2958 \text{ or } -29.58\%
 \end{aligned}$$

$$\begin{aligned}
 \text{g.} \quad \text{EOQ} &= \sqrt{\frac{2(250,000)200}{1}} \\
 &= 10,000 \\
 \text{Elasticity of} & \\
 \text{EOQ with} & \\
 \text{respect to a} &= \frac{\% \Delta \text{EOQ}}{\% \Delta \text{Ordering Costs}} \\
 \text{double in} & \\
 \text{ordering costs} & \\
 &= \frac{10,000 - 7,100}{7,100} \div \frac{200 - 100}{100} = 40.85\%
 \end{aligned}$$

- h. The selling price of the item does not enter the EOQ equation and does not affect the level of EOQ (although the carrying cost which is 10 percent of the selling price does). The EOQ equation attempts to minimize costs and, as such, the selling price does not enter into its calculation; thus, the elasticity of EOQ with respect to the selling price is 0.

SOLUTION TO MINI CASE

- a. The amount of cash balances that will be freed if New Wave Surfing Stuff, Inc. adopts the system proposed by the Bank of the U.S.:

Cash balances freed due to the reduction in mail float =

$$(\text{\# of days eliminated}) \times (\text{Average daily cash remittances})$$

$$2.5 \quad \times \quad \$150,000 \quad = \quad \underline{\$375,000}$$

Cash balances freed due to the reduction in processing float =

$$(\text{\# of days eliminated}) \times (\text{Average daily cash remittances})$$

$$3 \quad \times \quad \$150,000 \quad = \quad \underline{\$450,000}$$

$$\textbf{Total float reduction} \quad \underline{\underline{\$825,000}}$$

- b. Opportunity cost of maintaining the current banking arrangement:

Opportunity Cost—Interest =

$$(\text{Forecast yield on marketable securities portfolio}) \times (\text{Total float reduction})$$

$$0.05 \quad \times \quad 825,000$$

$$\text{Opportunity Cost—Interest} \quad = \quad \$41,250$$

$$\text{Opportunity Cost—Clerical Expense} \quad = \quad \underline{55,000}$$

$$\textbf{Total Opportunity Cost} \quad \underline{\underline{\$96,250}}$$

- c. Projected annual cost of operating the proposed system:

Average number of checks to be processed each day through the lock-box arrangement:

$$\frac{\text{Daily remittance}}{\text{Average Check Size}} = \frac{\$150,000}{\$750} = 200 \text{ checks}$$

Resulting cost of lock-box system on an annual basis:

Cost =

[(Average # of checks) $\times$ (Processing cost per check) $\times$ (# of business days per year)]

$$200 \times \$0.30 \times 270 = \text{Cost} = \$16,200$$

Next, the estimated cost of the automated deposit transfer center (ADTC) must be calculated. The Bank of the U.S. will not contribute to the cost of the ADTC because it is the lead concentration bank and thereby receives the transferred data. As a result, New Wave will be charged for six ADTCs (three locations @ two checks each) each business day. The ADTC system, therefore, costs:

$$\text{Cost} = [(\# \text{ of daily transfers}) \times (\text{cost per transfer}) \times (\# \text{ of business days per year})]$$

$$\text{Cost} = 6 \times \$0.35 \times 270$$

Cost = \$567

Accordingly, the total cost of the proposed system is:

Lock-box cost	\$16,200
ADTC cost	<u>567</u>
Total Cost	<u>\$16,767</u>

- d. The net annual gain associated with adopting the proposed system is:

Opportunity cost of current system	[STEP B]	\$96,250
(Total cost of new system)	[STEP C]	(16,767)
Net annual gain (loss)		<u>\$79,483</u>

As a result, the analysis suggests the company should adopt the proposed cash receipts acceleration system.