

Instructor's Manual

Fundamentals of Financial Management

Thirteenth edition

**James C. Van Horne
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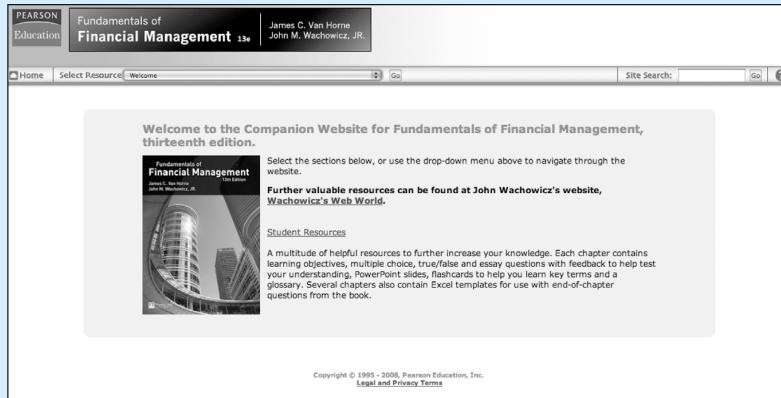
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*Note: Some instructors prefer to cover Chapters 6 and 7 before going into Chapters 3-5. These chapters have been written so that this can be done without any problem.

Visit the Van Horne and Wachowicz: *Fundamentals of Financial Management* thirteenth edition Companion Website at www.pearsoned.co.uk/wachowicz to find valuable student learning material including:

- Learning objectives for each chapter
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- An online glossary to explain key terms and flash cards to test your knowledge of key terms and definitions in each chapter
- Excel templates for end of chapter problems to help you model a spread sheet approach to solving the problem
- Link to author's own award-winning website with even more multiple choice and true/false questions, as well as web-based exercises and regularly updated links to additional support material
- New to this edition, PowerPoint presentations for key chapters integrating and demonstrating how Excel can be used to solve calculations.



Introduction

Many approaches might be used in teaching the basic financial management course. **Fundamentals of Financial Management** sequences things in order to cover certain foundation material first, including: the role of financial management; the business, tax, and financial setting; the mathematics of finance; basic valuation concepts; the idea of a trade-off between risk and return; and financial analysis, planning, and control. Given a coverage of these topics, we then have found it easier to build upon this base in the subsequent teaching of financial management.

More specifically, the book goes on to investigate current asset and liability decisions and then moves on to consider longer-term assets and financing. A good deal of emphasis is placed on working capital management. This is because we have found that people tend to face problems here when going into entry-level business positions to a greater extent than they do to other asset and financing area problems.

Nonetheless, capital budgeting, capital structure decisions, and long-term financing are very important, particularly considering the theoretical advances in finance in recent years. These areas have not been slighted. Many of the newer frontiers of finance are explored in the book. In fact, one of the book's distinguishing features is its ability to expose the student reader to many new concepts in modern finance. By design, this exposure is mainly verbal with only limited use of mathematics. The last section of the book deals with the more specialized topics of: convertibles, exchangeables, and warrants; mergers and other forms of corporate restructuring; and international financial management.

While the book may be used without any formal prerequisites, often the student would have had an introductory course in accounting and economics (and perhaps a course in statistics). Completion of these courses allows the instructor to proceed more rapidly over financial analysis, capital budgeting, and certain other topics. The book has a total of twelve appendices, which deal with more advanced issues and/or topics of special interest. The book's continuity is not adversely affected if these appendices are omitted. While we feel that all of the appendices are relevant for a thorough understanding of financial management, the instructor can choose those most appropriate to his or her course.

If the book is used in its entirety, the appropriate time frame is a semester or, perhaps, two quarters. For the one-quarter basic finance course, we have found it necessary to omit coverage of certain chapters. However, it is still possible to maintain the book's thrust of providing a fundamental understanding of financial management. For the one-quarter course, the following sequencing has proven manageable:

Chapter 1	THE ROLE OF FINANCIAL MANAGEMENT
Chapter 3	THE TIME VALUE OF MONEY*
Chapter 4	THE VALUATION OF LONG-TERM SECURITIES*
Chapter 5	RISK AND RETURN*
Chapter 6	FINANCIAL STATEMENT ANALYSIS*
Chapter 7	FUNDS ANALYSIS, CASH-FLOW ANALYSIS, AND FINANCIAL PLANNING*
Chapter 8	OVERVIEW OF WORKING CAPITAL MANAGEMENT
Chapter 9	CASH AND MARKETABLE SECURITIES MANAGEMENT
Chapter 10	ACCOUNTS RECEIVABLE AND INVENTORY MANAGEMENT
Chapter 11	SHORT-TERM FINANCING
Chapter 12	CAPITAL BUDGETING AND ESTIMATING CASH FLOWS
Chapter 13	CAPITAL BUDGETING TECHNIQUES
Chapter 14	RISK AND MANAGERIAL (REAL) OPTIONS IN CAPITAL BUDGETING (some sections may be omitted in an abbreviated course)
Chapter 15	REQUIRED RETURNS AND THE COST OF CAPITAL
Chapter 16	OPERATING AND FINANCIAL LEVERAGE (may be omitted in an abbreviated course)
Chapter 17	CAPITAL STRUCTURE DETERMINATION
Chapter 18	DIVIDEND POLICY
Chapter 19	THE CAPITAL MARKET
Chapter 20	LONG-TERM DEBT, PREFERRED STOCK, AND COMMON STOCK
Chapter 21	TERM LOANS AND LEASES (may be omitted in an abbreviated course)

*Note: Some instructors prefer to cover Chapters 6 and 7 before going into Chapters 3-5. These chapters have been written so that this can be done without any problem.

In a one-quarter course, few if any of the appendices are assigned. While chapter substitutions can be made, we think that 19 or 20 chapters are about all that one should try to cover in a quarter. This works out to an average of two chapters a week. For working capital management and longer-term financing, it is possible to cover more than two chapters a week. For the time value of money and capital budgeting, the going is typically slower. Depending on the situation, the pace can be slowed or quickened to suit the circumstances.

The semester course allows one to spend more time on the material. In addition, one can take up most of the chapters omitted in a one-quarter course. Two quarters devoted to finance obviously permits an even fuller and more penetrating exploration of the topics covered in the book. Here the entire book, including many of the appendices, can be assigned together with a special project or two.

The coverage suggested above is designed to give students a broad perspective of the role of financial management. This perspective embraces not only the important managerial considerations but certain valuation and conceptual considerations as well. It gives a suitably wide understanding of finance for the non-major while simultaneously laying the groundwork for more advanced courses in finance for the student who wants to take additional finance courses.

For the one-quarter required course, the usual pedagogy is the lecture coupled perhaps with discussion sections. In the latter it is possible to cover cases and some computer exercises. The semester course or the two-quarter sequence permits the use of more cases and other assignments. Students (and instructors) are invited to visit the text's website, *Wachowicz's Web World*, currently residing at:

http://web.utk.edu/~jwachowi/wacho_world.html

Our website provides links to hundreds of financial management websites grouped to correspond with the major topic headings in the text (e.g., Valuation, Tools of Financial Analysis and Planning, etc.), interactive quizzes, web-based exercises, and more. (*Note:* The Pearson Education Website - <http://www.pearsoned.co.uk/wachowicz> - will also allow you to access **Wachowicz's Web World**.)

Another aid is a Test-Item File of extensive questions and problems, prepared by Professor Gregory A. Kuhlemeyer, Carroll College. This supplement is available as a custom computerized test bank (for Windows) through your Prentice-Hall sales representative. In addition, Professor Kuhlemeyer has done a wonderful job in preparing an extensive collection of Microsoft PowerPoint slides as outlines (with examples) to go along with the text. The PowerPoint presentation graphics are available for downloading through the following Pearson Education Website:

<http://www.pearsoned.co.uk/wachowicz>

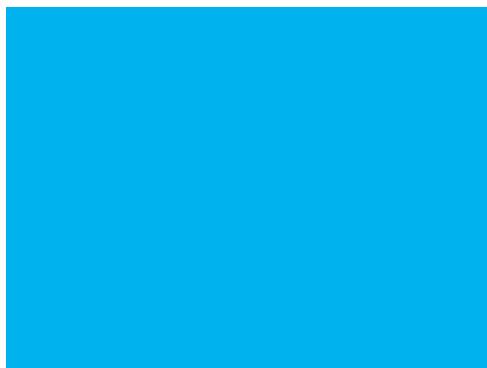
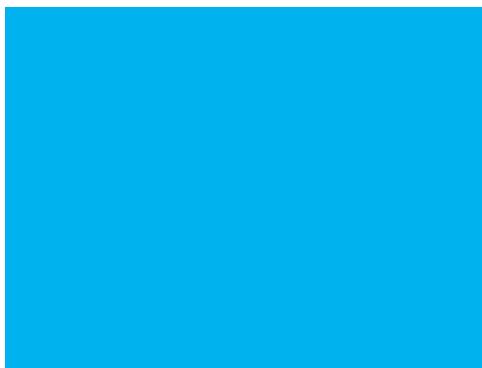
All text figures and tables are available as transparency masters through the same web site listed above. Finally, computer application software that can be used in conjunction with specially identified end-of-chapter problems is available in Microsoft Excel format on the same web site.

We hope that ***Fundamentals of Financial Management*** contributes to your students' understanding of finance and imparts a sense of excitement in the process. We thank you for choosing our textbook and welcome your comments and suggestions (please E-mail: jwachowi@utk.edu).

JAMES C. VAN HORNE Palo Alto, California

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The Role of Financial Management



Increasing shareholder value over time is the bottom line of every move we make.

ROBERT GOIZUETA
Former CEO, The Coca-Cola Company

ANSWERS TO QUESTIONS

1. With an objective of maximizing shareholder wealth, capital will tend to be allocated to the most productive investment opportunities on a risk-adjusted return basis. Other decisions will also be made to maximize efficiency. If all firms do this, productivity will be heightened and the economy will realize higher real growth. There will be a greater level of overall economic want satisfaction. Presumably people overall will benefit, but this depends in part on the redistribution of income and wealth via taxation and social programs. In other words, the economic pie will grow larger and everybody should be better off if there is no reslicing. With reslicing, it is possible some people will be worse off, but that is the result of a governmental change in redistribution. It is not due to the objective function of corporations.
2. Maximizing earnings is a nonfunctional objective for the following reasons:
 - a. Earnings is a time vector. Unless one time vector of earnings clearly dominates all other time vectors, it is impossible to select the vector that will maximize earnings.
 - b. Each time vector of earning possesses a risk characteristic. Maximizing expected earnings ignores the risk parameter.
 - c. Earnings can be increased by selling stock and buying treasury bills. Earnings will continue to increase since stock does not require out-of-pocket costs.
 - d. The impact of dividend policies is ignored. If all earnings are retained, future earnings are increased. However, stock prices may decrease as a result of adverse reaction to the absence of dividends.

Maximizing wealth takes into account earnings, the timing and risk of these earnings, and the dividend policy of the firm.

3. Financial management is concerned with the acquisition, financing, and management of assets with some overall goal in mind. Thus, the function of financial management can be broken down into three major decision areas: the investment, financing, and asset management decisions.
4. Yes, zero accounting profit while the firm establishes market position is consistent with the maximization of wealth objective. Other investments where short-run profits are sacrificed for the long-run also are possible.
5. The goal of the firm gives the financial manager an objective function to maximize. He/she can judge the value (efficiency) of any financial decision by its impact on that goal. Without such a goal, the manager would be "at sea" in that he/she would have no objective criterion to guide his/her actions.
6. The financial manager is involved in the acquisition, financing, and management of assets. These three functional areas are all interrelated (e.g., a decision to acquire an asset necessitates the financing and management of that asset, whereas financing and management costs affect the decision to invest).
7. If managers have sizable stock positions in the company, they will have a greater understanding for the valuation of the company. Moreover, they may have a greater incentive to maximize shareholder wealth than they would in the absence of stock holdings. However, to the extent persons have not only human capital but also most of their financial

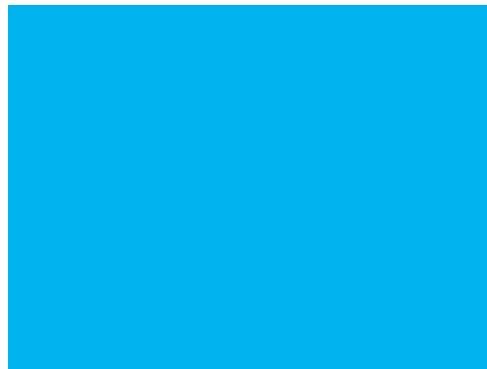
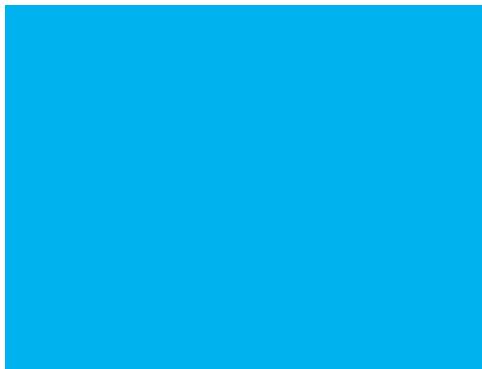
capital tied up in the company, they may be more risk averse than is desirable. If the company deteriorates because a risky decision proves bad, they stand to lose not only their jobs but have a drop in the value of their assets. Excessive risk aversion can work to the detriment of maximizing shareholder wealth as can excessive risk seeking, if the manager is particularly risk prone.

8. Regulations imposed by the government constitute constraints against which shareholder wealth can still be maximized. It is important that wealth maximization remain the principal goal of firms if economic efficiency is to be achieved in society and people are to have increasing real standards of living. The benefits of regulations to society must be evaluated relative to the costs imposed on economic efficiency. Where benefits are small relative to the costs, businesses need to make this known through the political process so that the regulations can be modified. Presently there is considerable attention being given in Washington to deregulation. Some things have been done to make regulations less onerous and to allow competitive markets to work.
9. As in other things, there is a competitive market for good managers. A company must pay them their opportunity cost, and indeed this is in the interest of stockholders. To the extent managers are paid in excess of their economic contribution, the returns available to investors will be less. However, stockholders can sell their stock and invest elsewhere. Therefore, there is a balancing factor that works in the direction of equilibrating managers' pay across business firms for a given level of economic contribution.
10. In competitive and efficient markets, greater rewards can be obtained only with greater risk. The financial manager is constantly involved in decisions involving a trade-off between the two. For the company, it is important that it do well what it knows best. There is little reason to believe that if it gets into a new area in which it has no expertise that the rewards will be commensurate with the risk that is involved. The risk-reward trade-off will become increasingly apparent to the student as this book unfolds.
11. Corporate governance refers to the system by which corporations are managed and controlled. It encompasses the relationships among a company's shareholders, board of directors, and senior management. These relationships provide the framework within which corporate objectives are set and performance is monitored.
The board of directors sets company-wide policy and advises the CEO and other senior executives, who manage the company's day-to-day activities. The Board reviews and approves strategy, significant investments, and acquisitions. The board also oversees operating plans, capital budgets, and the company's financial reports to common shareholders.
12. The controller's responsibilities are primarily accounting in nature. Cost accounting, as well as budgets and forecasts, would be for internal consumption. External financial reporting would be provided to the IRS, the SEC, and the stockholders.
The treasurer's responsibilities fall into the decision areas most commonly associated with financial management: investment (capital budgeting, pension management), financing (commercial banking and investment banking relationships, investor relations, dividend disbursement), and asset management (cash management, credit management).



2

The Business, Tax, and Financial Environments



Corporation, n. *An ingenious device for obtaining individual profit without individual responsibility.*

AMBROSE BIERCE
The Devil's Dictionary

ANSWERS TO QUESTIONS

1. The principal advantage of the corporate form of business organization is that the corporation has limited liability. The owner of a small family restaurant might be required to personally guarantee corporate borrowings or purchases anyway, so much of this advantage might be eliminated. The wealthy individual has more at stake and unlimited liability might cause, one failing business to bring down the other healthy businesses.
2. The liability is limited to the amount of the investment in both the limited partnership and in the corporation. However, the limited partner generally does not have a role in selecting the management or in influencing the direction of the enterprise. On a pro rata basis, stockholders are able to select management and affect the direction of the enterprise. Also, partnership income is taxable to the limited partners as personal income whereas corporate income is not taxed unless distributed to the stockholders as dividends.
3. With both a sole proprietorship and partnership, a major drawback is the legal liability of the owners. It extends beyond the financial resources of the business to the owners personally. Fringe benefits are not deductible as an expense. Also, both forms of organization lack the corporate feature of "unlimited life". With the partnership there are problems of control and management. The ownership is not liquid when it comes to planning for individual estates. Decision making can be cumbersome. An LLC generally lacks the feature of "unlimited life", and complete transfer of an ownership interest is usually subject to the approval of at least a majority of the other LLC members.
4. The chief beneficiaries are smaller companies where the first \$75,000 in taxable income is a large portion, if not all, of their total taxable income.
5. Accelerated depreciation is used up to the point it is advantageous to switch to straight line depreciation. A one-half year convention is followed in the first year, which reduces the cost recovery in that year from what would otherwise be the case. Additionally, a one-half year convention is followed in the year following the asset class. This pushes out the depreciation schedule, which is disadvantageous from a present value standpoint. The double declining balance method is used for the first four asset classes, 3, 5, 7 and 10 years. The asset category determines the project's depreciable life.
6. The immunity from each other's taxing power dates back to the early part of the 19th century. It used to apply to salaries of government employees as well. The exemption is historical, and it is hard to rationalize from the standpoint of economic/taxing efficiency.
7. Personal tax rates are progressive up to a point, then become regressive.
8. With the differential taxation of ordinary income and capital gains, securities with a higher likelihood of capital gains are tax advantaged. These include low dividend common stocks, common stocks in general, discount bonds, real estate, and other investments of this sort.
9. Depreciation changes the timing of tax payments. The longer these payments can be delayed, the better off the business is.
10. One advantage to S becoming a corporation occurs when investors have outside income against which to use losses by the company. Even with no outside income, stockholders still may find S to be advantageous. If dividends are paid, the stockholder under a S corporation

is subject only to taxation on the profits earned by the company. Under the corporate method, the company pays taxes on its profits and then the owners pay personal income taxes on the dividends paid to them.

11. Tax incentives are the result of special interest groups influencing legislators. For example, exporters influenced the passage of DISCs. Doctors and attorneys influenced the passage of the Keogh pension plans. Some of these incentives benefit society as a whole; others benefit only a few at the expense of the rest of society. It is hard to imagine all individuals placing the interest of the whole above their own interests. Therefore, it is difficult to perceive that tax incentives will be discontinued. Further, some incentives can be used to benefit large groups of people.
12. The purpose of the *carryback* and *carryforward* provisions is to allow the cyclical company with large profit swings to obtain most of the tax benefits available to a company with more steady profits. Also, the provision protects the company with a large loss in a given year. While if a company has steady losses it does not benefit from this provision, the marginal company with profit swings does.
13. Financial markets allow for efficient allocation in the flow of savings in an economy to ultimate users. In a macro sense, savings originate from savings-surplus economic units whose savings exceed their investment in real assets. The ultimate users of these savings are savings-deficit economic units whose investments in real assets exceed their savings. Efficiency is introduced into the process through the use of financial markets. Since the savings-surplus and savings-deficit units are usually different entities, markets serve to channel these funds at the least cost and inconvenience to both. As specialization develops, efficiency increases. Loan brokers, secondary markets, and investment bankers all serve to expedite this flow from savers to users.
14. Financial intermediaries provide an indirect channel for the flow of funds from savers to ultimate users. These institutions include commercial banks, savings and loan associations, life insurance companies, pension and profit-sharing funds and savings banks. Their primary function is the transformation of funds into more attractive packages for savers. Services and economies of scale are side benefits of this process. Pooling of funds, diversification of risk, transformation of maturities and investment expertise are desirable functions that financial intermediaries perform.
15. Differences in maturity, default risk, marketability, taxability, and option features affect yields on financial instruments. In general, the longer the maturity, the greater the default risk, the lower the marketability and the more the return is subject to ordinary income taxation as opposed to capital gains taxation or no taxation, the higher the yield on the instrument. If the investor receives an option (e.g., a conversion feature or warrant), the yield would be lower than otherwise. Conversely, if the firm issuing the security receives an option, such as a call feature, the investor must be compensated with a higher yield. Another factor – one not taken up in this chapter – is the coupon rate. Lower the coupon rate, greater the price volatility of a bond, and all other things being the same, generally higher the yield.
16. The market becomes more efficient when the cost of financial intermediation is reduced. This cost is represented by the difference in interest rate between what the ultimate saver receives and what the ultimate borrower pays. Also, the inconvenience to one or both parties is an indirect cost. When financial intermediation reduces these costs, the market becomes more efficient. The market becomes more complete when special types of financial instruments and financial processes are offered in response to an unsatisfied

- demand by investors. For example, the new product might be a zero-coupon bond and the new process, automatic teller machines.
17. These exchanges serve as secondary markets wherein the buyer and seller meet to exchange shares of companies that are listed on the exchange. These markets have provided economies of time and scale in the past and have facilitated exchange among interested parties.
18. a. All other things being the same, the cost of funds (interest rates) would rise. If there are no disparities in savings pattern, the effect would fall on all financial markets.
b. Given a somewhat segmented market for mortgages, it would result in mortgage rates falling and rates on other financial instruments rising somewhat.
c. It would lower the demand for common stock, bonds selling at a discount, real estate, and other investments where capital gains are an attraction for investment. Prices would fall for these assets relative to fixed income securities until eventually the expected returns after taxes for all financial instruments were in equilibrium.
d. Great uncertainty would develop in the money and capital markets and the effect would likely be quite disruptive. Interest rates would rise dramatically and it would be difficult for borrowers to find lenders willing to lend at a fixed interest rate. Disequilibrium would likely to continue to occur until the rate of inflation reduced to a reasonable level.
e. Financial markets would be less efficient in channeling funds from savers to investors in real estate.
19. Answers to this question will differ depending on the financial intermediary that is chosen. The economic role of all is to channel savings to investments at a lower cost and/or with less inconvenience to the ultimate borrower and to the ultimate saver than would be the case in their absence. Their presence improves the efficiency of financial markets in allocating savings to the most productive investment opportunities.
20. Money markets serve the short-term liquidity needs of investors. The usual line of demarcation is one year; money markets include instruments with maturities of less than a year while capital markets involve securities with maturities of more than one year. However, both markets are financial markets with the same economic purpose so the distinction of maturity is somewhat arbitrary. Money markets involve instruments that are impersonal; funds flow on the basis of risk and return. A bank loan, for example, is not a money-market instrument even though it might be short-term.
21. Transaction costs impede the efficiency of financial markets. The larger they are, the less efficient are financial markets. Financial institutions and brokers perform an economic service for which they must be compensated. The means of compensation is transaction costs. If there is competition among them, transaction costs will be reduced to justifiable levels.
22. The major sources are bank loans, bond issues, mortgage debt, and stock issues.
23. Financial brokers, such as investment bankers in particular as well as mortgage bankers, facilitate the matching of borrowers in need of funds with savers having funds to lend. For this matching and servicing, the broker earns a fee that is determined by competitive forces. In addition, security exchanges and the over-the-counter market improve the secondary market and hence the efficiency of the primary market where securities are sold originally.

SOLUTIONS TO PROBLEMS

1. a. Under the partnership, \$418,000 in actual liabilities. If sued, they could lose up to their full combined net worths. As a corporation, their exposure is limited to the \$280,000 in equity that they have in the business.
- b. Creditors should be less willing to extend credit, because the personal net worths of the owners no longer back the claims.

2.

	<u>Equipment</u>	<u>Machine</u>
Cost	\$28,000.00	\$53,000.00
Depreciation in year:		
1	9,332.40	10,600.00
2	12,446.00	16,960.00
3	4,146.80	10,176.00
4	2,074.80	6,105.60
5		6,105.60
6	<u> </u>	<u>3,052.80</u>
	\$28,000.00	\$53,000.00

3. Tripex rates

	<u>Payment</u>	<u>Percent Subject to Taxes</u>	<u>Amount Subject to Taxes</u>	<u>Taxes</u>
Interest	\$180,000	100%	\$180,000	\$61,200
Pfd. Div.	300,000	30%	90,000	<u>30,600</u>

4. Corporate income tax

<u>Year</u>	<u>Profit</u>	<u>Taxes</u>
20X1	\$ 0	\$ 0
20X2	35,000	5,250
20X3	68,000	12,000
20X4	-120,000	(17,250) tax refund of all prior taxes paid
20X5	52,000	5,250*

*Loss carryforward through 20X4 = -\$120,000 + \$35,000 + \$68,000 = -\$17,000

Taxable income in 20 × 5 = \$52,000 - \$17,000 = \$35,000

5. a. The expected real rate of return is 5 percent, and the inflation premium is 4 percent.
 - b. The lender gains in that his real return is 7 percent instead of the 5 percent that was expected. In contrast, the borrower suffers in having to pay a higher real return than expected. In other words, the loan is repaid with more expensive dollars than anticipated.
 - c. With 6 percent inflation, the real return of the lender is only 3 percent, so he suffers whereas the borrower gains.
6. No specific solution is recommended. The student should consider default risk, maturity, marketability, and any tax effects.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a. Henry is responsible for all liabilities, book as well as contingent. If the lawsuit were lost, he would lose all his net assets, as represented by a net worth of \$467,000. Without the lawsuit, he still is responsible for \$90,000 in liabilities if for some reason the business is unable to pay them.
 - b. He still could lose all his net assets because Kobayashi's net worth is insufficient to make a major dent in the lawsuit: $\$600,000 - \$36,000 = \$564,000$. As the two partners have substantially different net worths, they do not share equally in the risk. Henry has much more to lose.
 - c. Under the corporate form, he could lose the business, but that is all. The net worth of the business is $\$263,000 - \$90,000 = \$173,000$, and this represents Henry's personal financial stake in the business. The remainder of his net worth, $\$467,000 - \$173,000 = \$294,000$, would be protected under the corporate form.
2. Depreciation charges for the equipment:

Year	Percent	Amount
1	20.00%	\$ 3,200.00
2	32.00	5,120.00
3	19.20	3,072.00
4	11.52	1,843.20
5	11.52	1,843.20
6	5.76	<u>921.60</u>
	Total	\$16,000.00

3. a. At \$2 million in expenses per \$100 million in loans, administrative costs come to 2 percent. Therefore, to just break even, the firm must set rates so that (at least) a 2 percent difference exists between the deposit interest rate and the mortgage rate. In addition, market conditions dictate that 3 percent is the floor for the deposit rate, while 7 percent is the ceiling for the mortgage rate. Suppose that Wallopalooza wished to increase the current deposit rate and lower the current mortgage rate by equal amounts while earning a before-tax return spread of 1 percent. It would then offer a deposit rate of 3.5 percent and a mortgage rate of 6.5 percent. Of course, other answers are possible, depending on your profit assumptions.
 - b. Before-tax profit of 1 percent on \$100 million in loans equals **\$1 million**.

4. a. The premium attributable to default risk and lower marketability is $9\% - 7.25\% = \mathbf{1.75\%}$.
- b. The premium attributable to maturity is $7.25\% - 6\% = \mathbf{1.25\%}$. In this case, default risk is held constant and marketability, for the most part, is also held constant.

The Time Value of Money

The chief value of money lies in the fact that one lives in a world in which it is overestimated.

H.L. MENCKEN
From A Mencken Chrestomathy

ANSWERS TO QUESTIONS

1. Simple interest is interest that is paid (earned) on only the original amount, or principal, borrowed (lent).
2. With compound interest, interest payments are added to the principal and both then earn interest for subsequent periods. Hence interest is compounded. The greater the number of periods and the more times a period interest is paid, the greater the compounding and future value.
3. The answer here will vary according to the individual. Common answers include a savings account and a mortgage loan.
4. An annuity is a series of cash receipts of the same amount over a period of time. It is worth less than a lump sum equal to the sum of the annuities to be received because of the time value of money.
5. Interest compounded continuously. It will result in the highest terminal value possible for a given nominal rate of interest.
6. In calculating the future (terminal) value, we need to know the beginning amount, the interest rate, and the number of periods. In calculating the present value, we need to know the future value or cash-flow, the interest or discount rate, and the number of periods. Thus, there is only a switch of two of the four variables.
7. They facilitate calculations by being able to multiply the cash-flow by the appropriate discount factor. Otherwise, it is necessary to raise 1 plus the discount rate to the n^{th} power and divide. Prior to electronic calculators, the latter was quite laborious. With the advent of calculators, it is much easier and the advantage of present value tables is lessened.
8. Interest compounded as few times as possible during the five years. Realistically, it is likely to be at least annually. Compounding more times will result in a lower present value.
9. For interest rates likely to be encountered in normal business situations the “Rule of 72” is a pretty accurate *money doubling* rule. Since it is easy to remember and involves a calculation that can be done in your head, it has proven useful.
10. Decreases at a decreasing rate. The present value equation, $1/(1+i)^n$, is such that as you divide 1 by increasing (linearly) amounts of i , present value decreases towards zero, but at a decreasing rate.
11. Decreases at a decreasing rate. The denominator of the present value equation increases at an increasing rate with n . Therefore, present value decreases at a decreasing rate.
12. A lot. Turning to FVIF Table 3.3 in the chapter and tracing down the 3 percent column to 25 years, we see that he will increase his weight by a factor of 2.09 on a compound basis. This translates into a weight of about 418 pounds at age 60.

SOLUTIONS TO PROBLEMS

1. a. $FV_n = P_0(1 + i)^n$

(i) $FV_3 = \$100(2.0)^3 = \$100(8) = \$800$

(ii) $FV_3 = \$100(1.10)^3 = \$100(1.331) = \$133.10$

(iii) $FV_3 = \$100(1.0)^3 = \$100(1) = \$100$

b. $FV_n = P_0(1 + i)^n; FVA_n = R[(1 + i)^n - 1]/i$

(i) $FV_5 = \$500(1.10)^5 = \$500(1.611) = \$805.50$

$$FVA_5 = \$100[(1.10)^5 - 1]/(0.10) \\ = \$100(6.105) = \frac{610.50}{\$1,416.00}$$

(ii) $FV_5 = \$500(1.05)^5 = \$500(1.276) = \$638.00$

$$FVA_5 = \$100[(1.05)^5 - 1]/(0.05) \\ = \$100(5.526) = \frac{552.60}{\$1,190.60}$$

(iii) $FV_5 = \$500(1.0)^5 = \$500(1) = \$500.00$

$$FVA_5 = \$100(5)* = \frac{500.00}{\$1,000.00}$$

*[Note: We had to invoke l'Hospital's rule in the special case where $i = 0$; in short, $FVIFA_n = n$ when $i = 0$.]

c. $FV_n = P_0(1 + i)^n; FVAD_n = R[(1 + i)^n - 1]/i[1 + i]$

(i) $FV_6 = \$500(1.10)^6 = \$500(1.772) = \$886.00$

$$FVAD_5 = \$100[(1.10)^5 - 1]/(.10) \times [1.10] \\ = \$100(6.105)(1.10) = \frac{671.55}{\$1,557.55}$$

(ii) $FV_6 = \$500(1.05)^6 = \$500(1.340) = \$670.00$

$$FVAD_5 = \$100[(1.05)^5 - 1]/(0.05) \times [1.05] \\ = \$100(5.526)(1.05) = \frac{580.23}{\$1,250.23}$$

(iii) $FV_6 = \$500(1.0)^6 = \$500(1) = \$500.00$

$$FVAD_5 = \$100(5) = \frac{500.00}{\$1,000.00}$$

d. $FV_n = PV_0(1 + [i/m])^{mn}$

(i) $FV_3 = \$100(1 + [1/4])^{12} = \$100(14.552) = \$1,455.20$

(ii) $FV_3 = \$100(1 + [0.10/4])^{12} = \$100(1.345) = \$134.50$

- e. The more times a year interest is paid, the greater the future value. It is particularly important when the interest rate is high, as evidenced by the difference in solutions between Parts 1.a. (i) and 1.d. (i).

f. $FV_n = PV_0(1 + [i/m])^{mn}$; $FV_n = PV_0(e)^{in}$

$$(i) \$100(1 + [0.10/1])^{10} = \$100(2.594) = \$259.40$$

$$(ii) \$100(1 + [0.10/2])^{20} = \$100(2.653) = \$265.30$$

$$(iii) \$100(1 + [0.10/4])^{40} = \$100(2.685) = \$268.50$$

$$(iv) \$100(2.71828)^1 = \$271.83$$

2. a. $P_0 = FV_n[1/(1 + i)^n]$

$$(i) \$100[1/(2)^3] = \$100(0.125) = \$12.50$$

$$(ii) \$100[1/(1.10)^3] = \$100(0.751) = \$75.10$$

$$(iii) \$100[1/(1.0)^3] = \$100(1) = \$100$$

b. $PVA_n = R[(1 - [1/(1 + i)^n])/i]$

$$(i) \$500[(1 - [1/(1 + .04)^3])/0.04] = \$500(2.775) = \$1,387.50$$

$$(ii) \$500[(1 - [1/(1 + 0.25)^3])/0.25] = \$500(1.952) = \$976.00$$

c. $P_0 = FV_n[1/(1 + i)^n]$

$$(i) \$100[1/(1.04)^1] = \$100(0.962) = \$96.20$$

$$500[1/(1.04)^2] = 500(0.925) = 462.50$$

$$1,000[1/(1.04)^3] = 1,000(0.889) = \underline{889.00} \\ \$1,447.70$$

$$(ii) \$100[1/(1.25)^1] = \$100(0.800) = \$80.00$$

$$500[1/(1.25)^2] = 500(0.640) = 320.00$$

$$1,000[1/(1.25)^3] = 1,000(0.512) = \underline{512.00} \\ \$912.00$$

d. (i) $\$1,000[1/(1.04)^1] = \$1,000(0.962) = \$962.00$

$$500[1/(1.04)^2] = 500(0.925) = 462.50$$

$$100[1/(1.04)^3] = 100(0.889) = \underline{88.90} \\ \$1,513.40$$

(ii) $\$1,000[1/(1.25)^1] = \$1,000(0.800) = \$800.00$

$$500[1/(1.25)^2] = 500(0.640) = 320.00$$

$$100[1/(1.25)^3] = 100(0.512) = \underline{51.20} \\ \$1,171.20$$

- e. The fact that the cash flows are larger in the first period for the sequence in Part (d) results in their having a higher present value. The comparison illustrates the desirability of early cash flows.

3. $\$25,000 = R(PVIFA_{6\%,12}) = R(8.384)$

$$R = \$25,000/8.384 = \$2,982$$

4. $\$50,000 = R(FVIFA_{8\%,10}) = R(14.486)$

$$R = \$50,000/14.486 = \$3,452$$

5. $\$50,000 = R(FVIFA_{8\%,10})(1 + 0.08) = R(15.645)$

$$R = \$50,000/15.645 = \$3,196$$

6. $\$10,000 = \$16,000(PVIF_{x\%,3})$

$$(PVIF_{x\%,3}) = \$10,000/\$16,000 = 0.625$$

Going to the PVIF table at the back of the book and looking across the row for $n = 3$, we find that the discount factor for 17 percent is 0.624 and that is closest to the number above.

7. $\$10,000 = \$3,000(PVIFA_{x\%,4})(PVIFA_{x\%,4}) = \$10,200/\$3,000 = 3.4$ Going to the PVIFA table at the back of the book and looking across the row for $n = 4$, we find that the discount factor for 6 percent is 3.465, while for 7 percent it is 3.387. Therefore, the note has an implied interest rate of almost 7 percent.

8. Year	Sales		
1	\$ 600,000	=	\$ 500,000(1.2)
2	720,000	=	600,000(1.2)
3	864,000	=	720,000(1.2)
4	1,036,800	=	864,000(1.2)
5	1,244,160	=	1,036,800(1.2)
6	1,492,992	=	1,244,160(1.2)

9. Present Value

Year	Amount	Factor at 14%	Present Value
1	\$1,200	0.877	\$1,052.40
2	2,000	0.769	1,538.00
3	2,400	0.675	1,620.00
4	1,900	0.592	1,124.80
5	1,600	0.519	<u>830.40</u>
Subtotal (a)		\$6,165.60
1–10 (annuity)	1,400	5.216	\$7,302.40
1–5 (annuity)	1,400	3.433	<u>–4,806.20</u>
Subtotal (b)		\$2,496.20
Total Present Value (a + b)		\$8,661.80

10.	<u>Amount</u>	<u>Present Value Interest Factor</u>	<u>Present Value</u>
	\$1,000	$1/(1 + .10)^{10} = 0.386$	\$386
	1,000	$1/(1 + .025)^{40} = 0.372$	372
	1,000	$1/e^{(.10)(10)} = 0.368$	368
11.	\$1,000,000	$= \$1,000(1 + x\%)^{100}$	
		$(1 + x\%)^{100} = \$1,000,000/\$1,000 = 1,000$	

Taking the square root of both sides of the above equation gives

$$(1 + x\%)^{50} = (FVIFA_{x\%, 50}) = 31.623$$

Going to the FVIF table at the back of the book and looking across the row for $n = 50$, we find that the interest factor for 7 percent is 29.457, while for 8 percent it is 46.901. Therefore, the implicit interest rate is slightly more than 7 percent.

12. a. Annuity of \$10,000 per year for 15 years at 5 percent. The discount factor in the PVIFA table at the end of the book is 10.380.

$$\text{Purchase price} = \$10,000 \times 10.380 = \$103,800$$

- b. Discount factor for 10 percent for 15 years is 7.606

$$\text{Purchase price} = \$10,000 \times 7.606 = \$76,060$$

As the insurance company is able to earn more on the amount put up, it requires a lower purchase price.

- c. Annual annuity payment for 5 percent = $\$30,000/10.380 = \$2,890$

$$\text{Annual annuity payment for 10 percent} = \$30,000/7.606 = \$3,944$$

The higher the interest rate embodied in the yield calculations, the higher the annual payments.

13. $\$190,000 = R(PVIFA_{17\%, 20}) = R(5.628)$

$$R = \$190,000/5.628 = \$33,760$$

$$14. \text{ a. } PV_0 = \$8,000 = R(PVIFA_{1\%, 36})$$

$$= R[(1 - [1/(1 + .01)^{36}])/(0.01)] = R(30.108)$$

Therefore, $R = \$8,000/30.108 = \265.71

End of Month	(1) Installment Payment	(2) Monthly Interest $(4)_{t-1} \times 0.01$	(3) Principal Payment $(1) - (2)$	(4) Principal Amount Owing At Month End $(4)_{t-1} - (3)$
0	--	--	--	\$8,000.00
1	\$ 265.71	\$ 80.00	\$ 185.71	7,814.29
2	265.71	78.14	187.57	7,626.72
3	265.71	76.27	189.44	7,437.28
4	265.71	74.37	191.34	7,245.94
5	265.71	72.46	193.25	7,052.69
6	265.71	70.53	195.18	6,857.51
7	265.71	68.58	197.13	6,660.38
8	265.71	66.60	199.11	6,461.27
9	265.71	64.61	201.10	6,260.17
10	265.71	62.60	203.11	6,057.06
11	265.71	60.57	205.14	5,851.92
12	265.71	58.52	207.19	5,644.73
13	265.71	56.44	209.27	5,435.46
14	265.71	54.35	211.36	5,224.10
15	265.71	52.24	213.47	5,010.63
16	265.71	50.11	215.60	4,795.03
17	265.71	47.95	217.76	4,577.27
18	265.71	45.77	219.94	4,357.33
19	265.71	43.57	222.14	4,135.19
20	265.71	41.35	224.36	3,910.83
21	265.71	39.11	226.60	3,684.23
22	265.71	36.84	228.87	3,455.36
23	265.71	34.55	231.16	3,224.20
24	265.71	32.24	233.47	2,990.73
25	265.71	29.91	235.80	2,754.93
26	265.71	27.55	238.16	2,516.77
27	265.71	25.17	240.54	2,276.23
28	265.71	22.76	242.95	2,033.28
29	265.71	20.33	245.38	1,787.90
30	265.71	17.88	247.83	1,540.07
31	265.71	15.40	250.31	1,289.76
32	265.71	12.90	252.81	1,036.95
33	265.71	10.37	255.34	781.61
34	265.71	7.82	257.89	523.72
35	265.71	5.24	260.47	263.25
36	<u>265.88*</u>	<u>2.63</u>	<u>263.25</u>	0.00
	\$9,565.73	\$1,565.73	\$8,000.00	

*The last payment is slightly higher due to rounding throughout.

$$\begin{aligned} b. \quad PV_0 &= \$184,000 = R(PVIFA_{10\%, 25}) \\ &= R(9.077) \end{aligned}$$

Therefore, $R = \$184,000/9.077 = \$20,271.01$

End of Year	(1) Installment Payment	(2) Annual Interest $(4)_{t-1} \times 0.10$	(3) Principal Payment $(1) - (2)$	(4) Principal Amount Owing At Year End $(4)_{t-1} - (3)$
0	--	--	--	\$ 184,000.00
1	\$ 20,271.01	\$ 18,400.00	\$ 1,871.01	182,128.99
2	20,271.01	18,212.90	2,058.11	180,070.88
3	20,271.01	18,007.09	2,263.92	177,806.96
4	20,271.01	17,780.70	2,490.31	175,316.65
5	20,271.01	17,531.67	2,739.34	172,577.31
6	20,271.01	17,257.73	3,013.28	169,564.03
7	20,271.01	16,956.40	3,314.61	166,249.42
8	20,271.01	16,624.94	3,646.07	162,603.35
9	20,271.01	16,260.34	4,010.67	158,592.68
10	20,271.01	15,859.27	4,411.74	154,180.94
11	20,271.01	15,418.09	4,852.92	149,328.02
12	20,271.01	14,932.80	5,338.21	143,989.81
13	20,271.01	14,398.98	5,872.03	138,117.78
14	20,271.01	13,811.78	6,459.23	131,658.55
15	20,271.01	13,165.86	7,105.15	124,553.40
16	20,271.01	12,455.34	7,815.67	116,737.73
17	20,271.01	11,673.77	8,597.24	108,140.49
18	20,271.01	10,814.05	9,456.96	98,683.53
19	20,271.01	9,868.35	10,402.66	88,280.87
20	20,271.01	8,828.09	11,442.92	76,837.95
21	20,271.01	7,683.80	12,587.21	64,250.74
22	20,271.01	6,425.07	13,845.94	50,404.80
23	20,271.01	5,040.48	15,230.53	35,174.27
24	20,271.01	3,517.43	16,753.58	18,420.69
25	<u>20,262.76*</u>	<u>1,842.07</u>	<u>18,420.69</u>	0.00
	\$506,767.00	\$322,767.00	\$184,000.00	

*The last payment is somewhat lower due to rounding throughout.

15. $\$14,300 = \$3,000(PVIFA_{15\%, n})$

$$(PVIFA_{15\%, n}) = \$14,300/\$3,000 = 4.767$$

Going to the PVIFA table at the back of the book and looking down the column for $i = 15\%$, we find that the discount factor for 8 years is 4.487, while the discount factor for 9 years is 4.772. Thus, it will take approximately 9 years of payments before the loan is retired.

16. a. $\$5,000,000 = R[1 + (0.20/1)]^5 = R(2.488)$

$$R = \$5,000,000/2.488 = \$2,009,646$$

b. $\$5,000,000 = R[1 + (0.20/2)]^{10} = R(2.594)$

$$R = \$5,000,000 / 2.594 = \$1,927,525$$

c. $\$5,000,000 = R[1 + (0.20/4)]^{20} = R(2.653)$

$$R = \$5,000,000 / 2.653 = \$1,884,659$$

d. $\$5,000,000 = R(e)^{(0.20)(5)} = R(2.71828)^{(1)}$

$$R = \$5,000,000 / 2.71828 = \$1,839,398$$

17. FV of Earl's plan $= (\$2,000) \times (FVIFA_{7\%, 10}) \times (FVIF_{7\%, 35})$

$$= (\$2,000) \times (13.816) \times (10.677)$$

$$= \$295,027$$

FV of Ivana's plan $= (\$2,000) \times (FVIFA_{7\%, 35})$

$$= (\$2,000) \times (138.237)$$

$$= \$276,474$$

Earl's investment program is worth $(\$295,027 - \$276,474) = \$18,553$ more at retirement than Ivana's program.

18. Tip: First find the future value of a \$1,000-a-year ordinary annuity that runs for 25 years. Unfortunately, this future value overstates our "true" ending balance because three of the assumed \$1,000 deposits never occurred. So, we need to then subtract three future values from our "trial" ending balance: (1) the future value of \$1,000 compounded for $25 - 5 = 20$ years; (2) the future value of \$1,000 compounded for $25 - 7 = 18$ years; and (3) the future value of \$1,000 compounded for $25 - 11 = 14$ years. After collecting terms, we get the following:

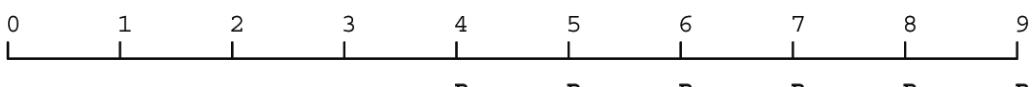
$$FV_{25} = \$1,000[(FVIFA_{5\%, 25}) - (FVIF_{5\%, 20}) - (FVIF_{5\%, 18}) - (FVIF_{5\%, 14})]$$

$$= \$1,000[(47.727) - (2.653) - (2.407) - (1.980)]$$

$$= \$1,000[40.687] = \$40,687$$

19. There are many ways to solve this problem correctly. Here are two:

Cash withdrawals at the END of year ...

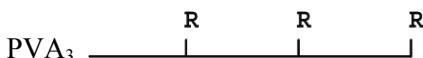


Alt. %1

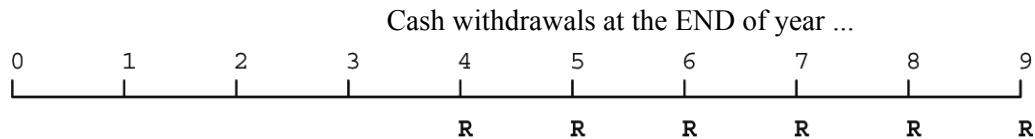
This above pattern is equivalent to ...



-- minus --



$$\begin{aligned}
 PVA_9 &= PVA_3 &= \$100,000 \\
 R(PVIFA_{.05, 9}) &= R(PVIFA_{.05, 3}) &= \$100,000 \\
 R(7.108) &= R(2.723) &= \$100,000 \\
 &R(4.385) &= \$100,000 \\
 R = \$100,000/(4.385) &= \$22,805.02
 \end{aligned}$$



Alt. %2

This above pattern is equivalent to ...

$$\begin{array}{ccccccccc}
 & & & & \xrightarrow{\quad R \quad} \\
 \$100,000 & \xrightarrow{\quad PVA_6 \quad} & & & & & & &
 \end{array}$$

$$\begin{aligned}
 PVA_6 &\times (PVIF_{.05, 3}) &= \$100,000 \\
 R(PVIFA_{.05, 6}) &\times (PVIF_{.05, 3}) &= \$100,000 \\
 R(5.076) &\times (.864) &= \$100,000 \\
 &R(4.386) &= \$100,000 \\
 R &= \$100,000/(4.386) &= \$22,799.82
 \end{aligned}$$

NOTE: Answers to Alt. #1 and Alt. #2 differ slightly due to rounding in the tables.20. Effective annual interest rate $= (1 + [i/m])^m - 1$

- a. (annually) $= (1 + [0.096/1])^1 - 1 = 0.0960$
- b. (semiannually) $= (1 + [0.096/2])^2 - 1 = 0.0983$
- c. (quarterly) $= (1 + [0.096/4])^4 - 1 = 0.0995$
- d. (monthly) $= (1 + [0.096/12])^{12} - 1 = 0.1003$
- e. (daily) $= (1 + [0.096/365])^{365} - 1 = 0.1007$

Effective annual interest
rate with continuous compounding $= (e)^i - 1$

- f. (continuous) $= (2.71828)^{0.096} - 1 = 0.1008$

21. (Note: You are faced with determining the present value of an annuity due. And, $(PVIFA_{8\%, 40})$ can be found in Table IV at the end of the textbook, while $(PVIFA_{8\%, 39})$ is not listed in the table.)

$$\text{Alt. 1: } PVAD_{40} = (1 + 0.08)(\$25,000)(PVIFA_{8\%, 40})$$

$$= (1.08)(\$25,000)(11.925) = \$321,975$$

$$\text{Alt. 2: } PVAD_{40} = (\$25,000)(PVIFA_{8\%, 39}) + \$25,000$$

$$= (\$25,000)[(1 - [1/(1 + 0.08)^{39}])/0.08] + \$25,000$$

$$= (\$25,000)(11.879) + \$25,000 = \$321,950$$

NOTE: Answers to Alt. 1 and Alt. 2 differ slightly due to rounding.

22. For approximate answers, we can make use of the “Rule of 72” as follows:

- (i) $72/14 = 5.14$ or **5%** (to the nearest whole percent)
- (ii) $72/8 = 9\%$
- (iii) $72/2 = 36\%$

For greater accuracy, we proceed as follows:

- (i) $(1 + i)^{14} = 2$
 $(1 + i) = 2^{1/14} = 2^{0.07143} = 1.0508$
 $i = 5\%$ (to the nearest whole percent)
- (ii) $(1 + i)^8 = 2$
 $(1 + i) = 2^{1/8} = 2^{1/25} = 1.0905$
 $i = 9\%$ (to the nearest whole percent)
- (iii) $(1 + i)^2 = 2$
 $(1 + i) = 2^{1/2} = 2^{5} = 1.4142$
 $i = 41\%$ (to the nearest whole percent)

Notice how the “Rule of 72” does not work quite so well for high rates of growth such as that seen in situation (iii).

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a. Future (terminal) value of each cash-flow and total future value of each stream are as follows (using Table I in the end-of-book Appendix):

CASH-FLOW STREAM	PV ₀ FOR INDIVIDUAL CASH FLOWS RECEIVED AT END OF YEAR					TOTAL FUTURE VALUE
	1	2	3	4	5	
W	\$146.40	\$266.20	\$242	\$330	\$ 300	\$1,284.60
X	878.40	--	--	--	--	878.40
Y	--	--	--	--	1,200	1,200.00
Z	292.80	--	--	605	300	1,197.80

b. Present value of each cash-flow and total present value of each stream (using Table II in the end-of-book Appendix):

CASH-FLOW STREAM	PV ₀ FOR INDIVIDUAL CASH FLOWS RECEIVED AT END OF YEAR					TOTAL FUTURE VALUE
	1	2	3	4	5	
W	\$ 87.70	\$153.80	\$135.80	\$177.60	\$155.70	\$709.80
X	526.20	--	--	--	--	526.20
Y	--	--	--	--	622.80	622.80
Z	175.40	--	337.50	--	155.70	668.60

2. a. $FV_{10} \text{ Plan 1} = \$500(FVIFA_{3.5\%, 20})$
 $= \$500([(1 + .035)^{20} - 1]/[0.035]) = \$14,139.84$
- b. $FV_{10} \text{ Plan 2} = \$1,000(FVIFA_{7.5\%, 10})$
 $= \$1,000([(1 + 0.075)^{10} - 1]/[0.075]) = \$14,147.09$
- c. Plan 2 would be preferred by a slight margin -- \$7.25.
- d. $FV_{10} \text{ Plan 2} = \$1,000(FVIFA_{7\%, 10})$
 $= \$1,000([1 + 0.07)^{10} - 1]/[0.07]) = \$13,816.45$

Now, Plan 1 would be preferred by a nontrivial \$323.37 margin.

3. Indifference implies that you could reinvest the \$25,000 receipt for 6 years at X% to provide an equivalent \$50,000 cash-flow in year 12. In short, \$25,000 would double in 6 years. Using the "Rule of 72," $72/6 = 12\%$

Alternatively, note that $\$50,000 = \$25,000(FVIF_{X\%, 6})$. Therefore, $(FVIF_{X\%, 6}) = \$50,000/\$25,000 = 2$. In Table I in the Appendix at the end of the book, the interest factor for 6 years at 12 percent is 1.974 and that for 13 percent is 2.082. Interpolating, we have

$$X\% = 12\% + \frac{2.000 - 1.974}{2.082 - 1.974} = 12.24\%$$

as the interest rate implied in the contract.

For an even more accurate answer, recognize that $FVIF_{X\%, 6}$ can also be written as $(1 + i)^6$. Then we can solve directly for i (and $X\% = i(100)$) as follows:

$$\begin{aligned} (1 + i)^6 &= 2 \\ (1 + i) &= 2^{1/6} = 2^{.1667} &= 1.1225 \\ i &= 0.1225 \text{ or } X\% &= 12.25\% \end{aligned}$$

4. a. $PV_0 = \$7,000(PVIFA_{6\%, 20}) = \$7,000(11.470) = \$80,290$

$$\text{b. } PV_0 = \$7,000(PVIFA_{8\%, 20}) = \$7,000(9.818) = \$68,726$$

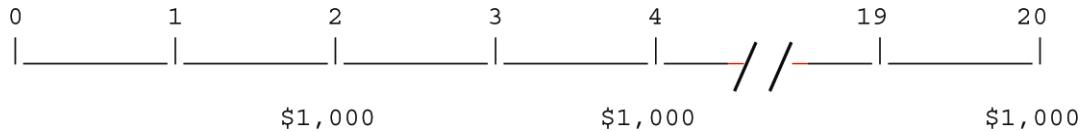
5. a. $PV_0 = \$10,000 = R(PVIFA_{14\%, 4}) = R(2.914)$

Therefore, $R = \$10,000/2.914 = \$3,432$ (to the nearest dollar).

b.

End of Year	(1) Installment Payment	(2) Annual Interest $(4)_{t-1} \times 0.14$	(3) Principal Payment	(4) Principal Amount Owing At Year End $(4)_{t-1} - (3)$
0	--	--	--	\$10,000
1	\$ 3,432	\$1,400	\$ 2,032	7,968
2	3,432	1,116	2,316	5,652
3	3,432	791	2,641	3,011
4	<u>3,432</u>	<u>421</u>	<u>3,011</u>	0
	\$13,728	\$3,728	\$10,000	

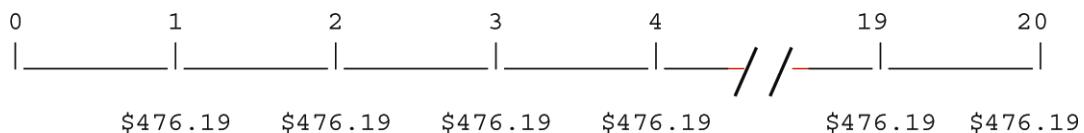
6. When we draw a picture of the problem, we get \$1,000 at the end of every even-numbered year for years 1 through 20:



TIP: Convert \$1,000 every 2 years into an *equivalent annual annuity* (i.e., an annuity that would provide an equivalent present or future value to the actual cash flows) pattern. Solving for a 2-year annuity that is equivalent to a future \$1,000 to be received at the end of year 2, we get

$$FVA_2 = \$1,000 = R(FVIFA_{10\%, 2}) = R(2.100)$$

Therefore, $R = \$1,000/2.100 = \476.19 . Replacing every \$1,000 with an equivalent two-year annuity gives us \$476.19 for 20 years.



$$PVA_{20} = \$476.19(PVIFA_{10\%, 20}) = \$476.19(8.514) = \mathbf{\$4,054.28}$$

7. Effective annual interest rate $= (1 + [i/m])^m - 1$

$$= (1 + [0.0706/4])^4 - 1 = 0.07249 \text{ (approx. 7.25%)}$$

Therefore, we have **quarterly compounding**. And, investing \$10,000 at 7.06% compounded quarterly for 7 months (Note: 7 months equals 2 and 1/3 quarter periods), we get

$$\$10,000(1 + [0.0706/4])^{2.33} = \$10,000(1.041669) = \mathbf{\$10,416.69}$$

8. $FVA_{65} = \$1,230(FVIFA_{5\%, 65}) = \$1,230[(1 + 0.05)^{65} - 1]/(0.05)$
 $= \$1,230(456.798) = \mathbf{\$561,861.54}$

Our “penny saver” would have been better off by $(\$561,861.54 - \$80,000) = \mathbf{\$481,861.54}$ -- or **48,186,154 pennies** -- by depositing the pennies saved each year into a savings account earning 5 percent compound annual interest.

9. a. $\$50,000(0.08) = \$4,000$ interest payment

$$\$7,451.47 - \$4,000 = \mathbf{\$3,451.47 \text{ principal payment}}$$

- b. Total installment payments – total principal payments

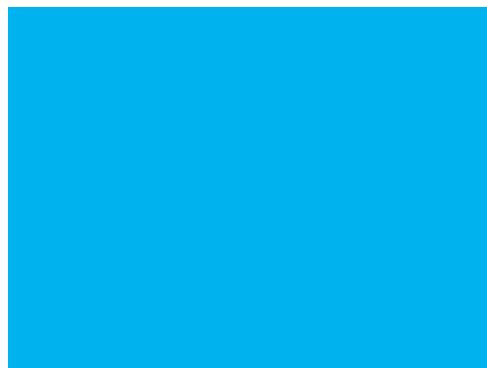
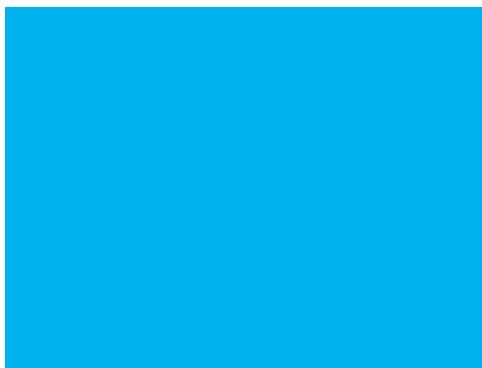
$$= \text{total interest payments}$$

$$\$74,514.70 - \$50,000 = \mathbf{\$24,514.70}$$



4

The Valuation of Long-Term Securities



What is a cynic? A man who knows the price of everything and the value of nothing.

OSCAR WILDE

ANSWERS TO QUESTIONS

1. The *market value* of a firm is the market price at which the firm trades in an open marketplace. This value is often viewed as being the higher of the firm's *liquidation value* (i.e., amount that could be realized if the firm's assets are sold separately from its operating organization) or *going concern value* (i.e., amount a firm could be sold for as a continuing business)
2. The *intrinsic value* (or economic value) of a security could differ from its *market value* (or price). Even in a market that is reasonably efficient and informed, the market price of a security will fluctuate about its intrinsic value. The less efficient and informed the market may be, the greater the likelihood that intrinsic value will differ from market value.
3. Both bonds and preferred stocks are fixed-income securities. The interest payment or dividend is fixed at the time of issuance, is contractual, and occurs at regular intervals. Thus, we apply the same general approach to valuing bonds and preferred stock -- that is, we determine the present value of a fixed payment stream.
4. The longer the maturity, the less important the principal payment, and the more important the interest payments in the bond's valuation. As a result, the principal payment acts less as a buffer against the effect of changes in yield on market price.
5. The lower coupon bond will suffer the greater proportional market decline. Its income stream is further in the future than that for the higher coupon bond, and hence subject to more volatility.
6. Dividends are all that investors as a whole receive. As shown in the chapter, a dividend capitalization model does not preclude consideration of capital gains. In fact, it embodies market price changes.
7. The stock would be worth zero. There must be the prospect for an ultimate cash payment to someone for an investment to have value.
8. As companies grow larger, growth becomes more difficult. Unless there is some competitive advantage or monopolistic position, most large companies grow roughly in keeping with growth in the economy. A company can of course grow at an increasing rate for a while, but increasing rates become increasingly harder to sustain in a competitive economy. If increasing rates of growth could be sustained for a number of years, the value of the stock would explode and approach infinity. This can be illustrated with the perpetual growth model where "g" is greater than "k".
9. A company could grow at this rate for a while, but not forever. At the end of 25 years, it would be over 700 times larger. Obviously this cannot go on forever in real terms or the company will end up owning the world. The real rate of growth of the economies of the world is single digit. Eventually, the growth of this company must taper off.
10. She is right. The constant growth dividend valuation model states that $P_0 = D_1/(k_e - g)$. Multiplying both sides of this equation by $(k_e - g)/P_0$ reveals that $(k_e - g)$ equals D_1/P_0 , or in other words, the expected dividend yield.

11. The ad does not reveal that the current value of this zero-coupon bond is nowhere close to being worth 1,000. For example, at a 10 percent discount rate this bond is only worth about \$57.

SOLUTIONS TO PROBLEMS

1.

<u>End of Year</u>	<u>Payment</u>	<u>Discount Factor (14%)</u>	<u>Present Value</u>
1	\$ 100	0.877	\$ 87.70
2	100	0.769	76.90
3	1,100	0.675	<u>742.50</u>
Price per bond			<u>\$ 907.10</u>

2. End of Six-month Period

<u>End of Six-month Period</u>	<u>Payment</u>	<u>Discount Factor (7%)</u>	<u>Present Value</u>
1	\$ 50	0.935	\$ 46.75
2	50	0.873	43.65
3	50	0.816	40.80
4	50	0.763	38.15
5	50	0.713	35.65
6	1,050	0.666	<u>699.30</u>
Price per bond			<u>\$ 904.30</u>

3. Current price: $P_0 = D_p/k_p = (0.08)(\$100)/(0.10) = \80.00 Later price: $P_0 = D_p/k_p = (\$8)/(0.12) = \66.67

The price drops by \$13.33 (i.e., \$80.00 – \$66.67).

4. Rate of return = $\frac{\$1 \text{ dividend} + (\$23 - \$20) \text{ capital gain}}{\$20 \text{ original price}}$
 $= \$4/\$20 = 20\%$

5. Phases 1 and 2: Present Value of Dividends to Be Received Over First 6 Years

<u>End of Year</u>	<u>Present Value Calculation</u>			<u>Present Value of Dividend</u>
	(Dividend \times PVIF _{18%,t})			
P				
h	1	\$2.00 (1.15) ¹	=	\$2.30 \times 0.847 = \$ 1.95
a	2	2.00 (1.15) ²	=	2.65 \times 0.718 = 1.90
s	3	2.00 (1.15) ³	=	3.04 \times 0.609 = 1.85
e				
1				

P	<u>4</u>	3.04(1.10)¹	=	3.34	×	0.516	=	1.72
h	<u>5</u>	3.04(1.10)²	=	3.68	×	0.437	=	1.61
a	<u>6</u>	3.04(1.10)³	=	4.05	×	0.370	=	1.50
s								
e								
2								

or $\left[\sum_{t=1}^6 \frac{D_t}{(1.18)^t} \right] = \10.53

Phase 3: Present Value of Constant Growth Component

Dividend at the end of year 7 = $\$4.05(1.05) = \4.25

$$\text{Value of stock at the end of year 6} = \frac{D_7}{(K_e - g)} = \frac{\$4.25}{(.18 - .05)} = \$32.69$$

$$\text{Present value of } \$32.69 \text{ at end of year 6} = (\$32.69)(\text{PVIF}_{18\%, 6})$$

$$= (\$32.69)(.370) = \$12.10$$

Present Value of Stock

$$V = \$10.53 + \$12.10 = \$22.63$$

6. a. $P_0 = D_1/(k_e - g): (\$1.50)/(0.13 - 0.09) = \37.50

b. $P_0 = D_1/(k_e - g): (\$1.50)/(0.16 - 0.11) = \30.00

c. $P_0 = D_1/(k_e - g): (\$1.50)/(0.14 - 0.10) = \37.50

Either the present strategy (a) or strategy (c). Both result in the same market price per share.

7. a. $k_p = D_p/P_0: \$8/\$100 = 8 \text{ percent}$

b. Solving for YTC by computer for the following equation

$$\begin{aligned} \$100 &= \$8/(1 + \text{YTC})^1 + \$8/(1 + \text{YTC})^2 + \$8/(1 + \text{YTC})^3 \\ &\quad + \$8/(1 + \text{YTC})^4 + \$118/(1 + \text{YTC})^5 \end{aligned}$$

we get $\text{YTC} = 9.64$ percent. (If the students work with present-value tables, they should still be able to determine an approximation of the yield to call by making use of a trial-and-error procedure.)

8. $V = D_p/k_p = [(0.09)(\$100)]/(0.12) = \$9/(0.12) = \$75$

9. $V = (I/2)(\text{PVIFA}_{7\%, 30}) + \$1,000(\text{PVIF}_{7\%, 30})$

$$= \$45(12.409) + \$1,000(0.131)$$

$$= \$558.41 + \$131 = \$689.41$$

10. a. $P_0 = D_1/(k_e - g) = [D_0(1 + g)]/(k_e - g)$

$$\$21 = [\$1.40(1 + g)]/(0.12 - g)$$

$$\$21(0.12 - g) = \$1.40(1 + g)$$

$$\$2.52 - \$21(g) = \$1.40 + \$1.40(g)$$

$$\$1.12 = \$22.40(g)$$

$$g = \$1.12/\$22.40 = 0.05 \text{ or } 5 \text{ percent}$$

b. Expected dividend yield = $D_1/P_0 = D_0(1 + g)/P_0$

$$= \$1.40(1 + 0.05)/\$21 = \$1.47/\$21 = 0.07$$

c. Expected capital gains yield = $g = 0.05$.

11. a. $P_0 = (I/2)/(\text{semiannual yield})$

$$\$1,120 = (\$45)/(\text{semiannual yield})$$

$$\text{semiannual yield} = \$45/\$1,120 = 0.0402$$

b. $(\text{semiannual yield}) \times (2) = (\text{nominal annual}) \text{ yield}$

$$(0.0402) \times (2) = 0.0804$$

c. $(1 + \text{semiannual yield})^2 - 1 = (\text{effective annual}) \text{ yield}$

$$(1 + 0.0402)^2 - 1 = 0.0820$$

12. Trying a 4 percent semiannual YTM as a starting point for a trial-and-error approach, we get

$$\begin{aligned} P_0 &= \$45(\text{PVIFA}_{4\%, 20}) &+& \$1,000(\text{PVIF}_{4\%, 20}) \\ &= \$45(13.590) &+& \$1,000(0.456) \\ &= \$611.55 &+& \$456 = \$1,067.55 \end{aligned}$$

Since \$1,067.55 is less than \$1,120, we need to try a lower discount rate, say 3 percent

$$\begin{aligned} P_0 &= \$45(\text{PVIFA}_{3\%, 20}) &+& \$1,000(\text{PVIF}_{3\%, 20}) \\ &= \$45(14.877) &+& \$1,000(0.554) \\ &= \$669.47 &+& \$554 = \$1,223.47 \end{aligned}$$

To approximate the actual discount rate, we interpolate between 3 and 4 percent as follows:

$$\frac{X}{.01} = \frac{\left[\begin{array}{cc} .03 & \$1,223.47 \\ \text{semiannual YTM} & \$1,120.00 \\ .15 & \$1,067.55 \end{array} \right] \$103.47}{\$155.92} = .0066$$

$$\frac{X}{.01} = \frac{103.47}{\$155.92} \text{ Therefore, } X = \frac{(.01) \times (\$103.47)}{\$155.92} = .0066$$

and semiannual YTM = $0.03 + X = 0.03 + 0.0066 = 0.0366$, or **3.66 percent**. (The use of a computer provides a precise semiannual YTM figure of **3.64 percent**.)

b. $(\text{semiannual YTM}) \times (2) = (\text{nominal annual}) \text{ YTM}$

$$(0.0366) \times (2) = 0.0732$$

c. $(1 + \text{semiannual YTM})^2 - 1 = (\text{effective annual}) \text{ YTM}$

$$(1 + 0.0366)^2 - 1 = 0.0754$$

13. a. Old Chicago's 15-year bonds should show a greater price change than Red Frog's bonds. With everything being the same except for maturity, the longer the maturity, the greater the price fluctuation associated with a given change in market required return. The closer in time that you are to the relatively large maturity value being realized, the less important are interest payments in determining the market price, and the less important is a change in market required return on the market price of the security.

- b. (Red Frog):

$$\begin{aligned}
 P_0 &= \$45(PVIFA_{4\%, 10}) &+& \quad \$1,000(PVIF_{4\%, 10}) \\
 &= \$45(8.111) &+& \quad \$1,000(0.676) \\
 &= \$365 &+& \quad \$676 &=& \$1,041
 \end{aligned}$$

(Old Chicago):

$$\begin{aligned}
 P_0 &= \$45(PVIFA_{4\%, 30}) &+& \quad \$1,000(PVIF_{4\%, 30}) \\
 &= \$45(17.292) &+& \quad \$1,000(0.308) \\
 &= \$778.14 &+& \quad \$308 &=& \$1,086.14
 \end{aligned}$$

Old Chicago's price per bond changes by $(\$1,086.14 - \$1,000) = \$86.14$, while Red Frog's price per bond changes by less than half that amount, or $(\$1,041 - \$1,000) = \$41$.

14. $D_0(1 + g)/(k_c - g) = V$

- a. $\$2(1 + 0.10)/(0.16 - 0.10) = \$2.20/0.06 = \$36.67$
- b. $\$2(1 + 0.09)/(0.16 - 0.09) = \$2.18/0.07 = \$31.14$
- c. $\$2(1 + 0.11)/(0.16 - 0.11) = \$2.22/0.05 = \$44.40$

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a, b.

End of year	Payment	Discount Factor, 15%	Present Value, 15%	Discount Factor, 12%	Present Value, 12%
1–3	\$ 80	2.283	\$182.64	2.402	\$192.16
4	1,080	0.572	617.76	0.636	686.88
Market value			<u>\$800.40</u>		<u>\$879.04</u>

Note: Rounding error incurred by use of tables may sometimes cause slight differences in answers when alternative solution methods are applied to the same cash flows.

The market value of an 8 percent bond yielding 8 percent is its face value, of **\$1,000**.

- c. The market value would be **\$1,000** if the required return were 15 percent.

End Of Year	Payment	Discount Factor, 8%	Present Value, 8%
1–3	\$ 150	2.577	\$ 386.55
4	1,150	0.735	845.25
Market value			\$1,231.80

2.

Phases 1 and 2: Present Value of Dividends to Be Received Over First 8 Years

End of Year	Present Value Calculation (Dividend \times PVIF _{16%, t})	Present Value of Dividend
P h a s e 1	1 \$1.60 (1.20) ¹ = \$1.92 \times 0.862 = \$ 1.66	
P h a s e 2	2 1.60 (1.20) ² = 2.30 \times 0.743 = 1.71	
P h a s e 3	3 1.60 (1.20) ³ = 2.76 \times 0.641 = 1.77	
P h a s e 4	4 1.60 (1.20) ⁴ = 3.32 \times 0.552 = 1.83	
P h a s e 5	5 3.32 (1.13) ¹ = 3.75 \times 0.476 = 1.79	
P h a s e 6	6 3.32 (1.13) ² = 4.24 \times 0.410 = 1.74	
P h a s e 7	7 3.32 (1.13) ³ = 4.79 \times 0.354 = 1.70	
P h a s e 8	8 3.32 (1.13) ⁴ = 5.41 \times 0.305 = 1.65	
or $\left[\sum_{t=1}^8 \frac{D_t}{(1.16)^t} \right]$		\$13.85

Phase 3: Present Value of Constant Growth Component

Dividend at the end of year 9 = $\$5.41(1.07) = \5.79

$$\text{Value of stock at the end of year 8} = \frac{D_9}{(k_e - g)} = \frac{\$5.79}{(.16 - .07)} = \$64.33$$

Present value of \$64.33 at end of year 8 = $(\$64.33)(PVF_{16\%, 8})$

$$= (\$64.33)(0.305) = \mathbf{\$19.62}$$

Present Value of Stock

$$V = \$13.85 + \$19.62 = \mathbf{\$33.47}$$

3. The yield to maturity is higher than the coupon rate of 8 percent because the bond sells at a discount from its face value. The (nominal annual) yield to maturity as reported in bond circles is equal to $(2 \times \text{semiannual YTM})$. The (effective annual) YTM is equal to $(1 + \text{semiannual YTM})^2 - 1$. The problem is set up as follows:

$$\begin{aligned} \$935 &= \sum_{t=1}^{20} \frac{\$40}{(1 + k_d/2)^t} + \frac{\$1,000}{(1 + k_d/2)^{20}} \\ &= (\$40)(\text{PVIFA}_{k_d/2, 20}) + \text{MV}(\text{PVIF}_{k_d/2, 20}) \end{aligned}$$

- a. Solving for $k_d/2$ (the semiannual YTM) in this expression using a calculator, a computer routine, or present value tables yields **4.5 percent**.
- b. (i) The (nominal annual) YTM is then 2×4.5 percent = **9 percent**.
 (ii) The (effective annual) YTM is $(1 + 0.045)^2 - 1 = \mathbf{9.2025\ percent}$.

4. a. $P_0 = \text{FV}_{20}(\text{PVIF}_{k_d/2, 20})$
 $(\text{PVIF}_{k_d/2, 20}) = P_0/\text{FV}_{20} = \$312/\$1,000 = 0.312$

From Table II in the end-of-book Appendix, the interest factor for 20 periods at 6 percent is 0.312; therefore, the bond's semiannual yield to maturity (YTM) is **6 percent**.

- b. (i) (nominal annual) YTM = $2 \times (\text{semiannual YTM})$
 $= 2 \times (0.06) = \mathbf{12\ percent}$
 (ii) (effective annual) YTM = $(1 + \text{semiannual YTM})^2 - 1$
 $= (1 + 0.06)^2 - 1 = \mathbf{12.36\ percent}$

5. a. $k_e = (D_1/P_0) + g = ([D_0(1 + g)]/P_0) + g$
 $= ([\$1(1 + 0.06)]/\$20) + 0.06$
 $= 0.053 + 0.06 = \mathbf{0.113}$
- b. expected dividend yield = $D_1/P_0 = \$1(1 + 0.06)/\$20 = \mathbf{0.053}$
- c. expected capital gains yield = $g = \mathbf{0.06}$

6. a. (i) $V = (\$140/2)(\text{PVIFA}_{.06, 6}) + \$1,000(\text{PVIF}_{.06, 6})$
 $= \$70(4.917) + \$1,000(0.705)$
 $= \$344.19 + \$705 = \mathbf{\$1,049.19}$
- (ii) $V = (\$140/2)(\text{PVIFA}_{.07, 6}) + \$1,000(\text{PVIF}_{.07, 6})$
 $= \$70(4.767) + \$1,000(0.666)$
 $= \$333.69 + \$666 = \mathbf{\$999.69* or \$1,000}$

(*Value should equal \$1,000 when the nominal annual required return equals the coupon rate; our answer differs from \$1,000 only because of rounding in the Table values used.)

$$\begin{aligned} \text{(iii)} V &= (\$140/2)(\text{PVIFA}_{.08, 6}) + \$1,000(\text{PVIF}_{.08, 6}) \\ &= \$70(4.623) + \$1,000(0.630) \\ &= \$323.61 + \$630 = \mathbf{\$953.61} \end{aligned}$$

- b. The value of this type of bond is based on simply discounting to the present the maturity value of each bond. We have already done that in answering Part (a) and those values are: (i) **\$705**; (ii) **\$666**; and (iii) **\$630**.



5

Risk and Return



Take calculated risks. That is quite different from being rash.

GENERAL GEORGE S. PATTON

ANSWERS TO QUESTIONS

1. Virtually none of the concepts presented would hold. Risk would not be a dimension of concern to the risk-neutral investor. The only concern would be with expected return, and market equilibrium would be in relation to seeking the highest expected return. If investors were risk seekers, increased risk would provide positive utility and would be sought along with higher expected returns. Obviously there would be no risk-return trade-off of the type described.
2. The *characteristic line* depicts the expected relationship between excess returns (in excess of the risk-free rate) for the security involved and for the market portfolio. The *beta* is the slope of the characteristic line. [The *alpha* is the intercept on the vertical axis. It should be zero in theory, but may be positive or negative in practice.]
3. *Beta* measures the responsiveness of changes in excess returns for the security involved to changes in excess returns for the market portfolio. It tells us how attuned fluctuations in returns for the stock are with those for the market. A beta of one indicates proportional fluctuation and systematic risk; a beta greater than one indicates more than proportional fluctuation; and a beta less than one indicates less than proportional fluctuation relative to the market.
4. $\text{Req. } (R_j) = R_f + [E(R_m) - R_f] \text{ Beta}_j$
 R_f = risk-free rate;
 $\text{Req. } (R_j)$ = required rate of return for security j ;
 $E(R_m)$ = expected rate of return for the market portfolio;
 Beta_j = beta for security j .
5. No. The security market line (SML) can vary with changes in interest rates, investor psychology, and perhaps with other factors.
6. a. Lower the market price.
b. Raise the market price.
c. Lower the market price.
d. Lower the market price.
7. If you limit yourself to *only common stock*, you would seek out defensive stocks -- where returns tend to go up and down by less than those for the overall market. Therefore, the betas would be less than 1.0. However, it is important to recognize that there are few stocks with betas of less than 0.5. Most have betas of 0.7 or more.
8. The undervalued stock would lie above the security market line, thereby providing investors with more expected return than required for the systematic risk involved. Investors would buy the stock and cause it to rise in price. The higher price will result in a lower expected return. Equilibrium is achieved when the expected return lies along the security market line.

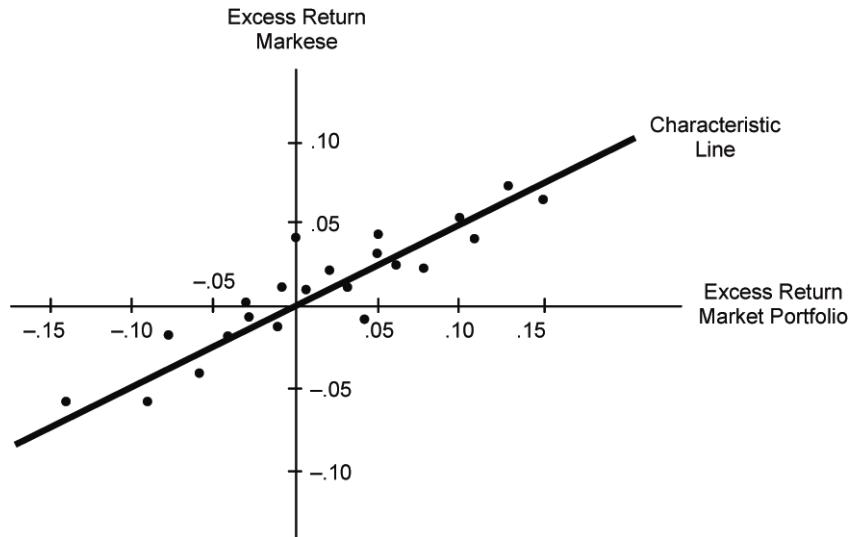
SOLUTIONS TO PROBLEMS

1. a.

Possible Return, R_i	Probability of Occurrence, P_i	$(R_i)(P_i)$	$(R_i - \bar{R})^2(P_i)$
-.10	.10	-.10	$(-0.10 - 0.11)^2 (.10)$
.00	.20	.00	$(.00 - 0.11)^2 (.20)$
.10	.30	.03	$(0.10 - .11)^2 (0.30)$
.20	.30	.06	$(0.20 - .11)^2 (0.30)$
.30	<u>.10</u>	<u>.03</u>	$(0.30 - .11)^2 (0.10)$
	$\Sigma = 1.00$	$\Sigma = 0.11 = \bar{R}$	$\frac{\Sigma = .0129 = \sigma^2}{(0.0129)^{.5} = 11.36\% = \sigma}$

- b. There is a 30 percent probability that the actual return will be zero (prob. $E(R) = 0$ is 20%) or less (prob. $E(R) <$ is 10%). Also, by inspection we see that the distribution is skewed to the left.
2. a. For a return that will be zero or less, standardizing the deviation from the expected value of return we obtain $(0\% - 20\%)/15\% = -1.333$ standard deviations. Turning to Table V at the back of the book, 1.333 falls between standard deviations of 1.30 and 1.35. These standard deviations correspond to areas under the curve of 0.0968 and 0.0885 respectively. This means that there is **approximately a 9 percent probability** that actual return will be zero or less. (Interpolating for 1.333, we find the probability to be 9.13%).
- b. 10 percent:: Standardized deviation = $(10\% - 20\%)/15\% = -0.667$. Probability of 10 percent or less return = (approx.) 25 percent. Probability of 10 percent or more return = $100\% - 25\% = 75\%$ **percent**.
- 20 percent: **50 percent** probability of return being above 20 percent.
- 30 percent: Standardized deviation = $(30\% - 20\%)/15\% = +0.667$. Probability of 30 percent or more return = (approx.) **25 percent**.
- 40 percent: Standardized deviation = $(40\% - 20\%)/15\% = +1.333$. Probability of 40 percent or more return = (approx.) **9 percent** -- (i.e., the same percent as in part (a)).
- 50 percent: Standardized deviation = $(50\% - 20\%)/15\% = +2.00$. Probability of 50 percent or more return = **2.28 percent**.

3. As the graph will be drawn by hand with the characteristic line fitted by eye, All of them will not be same. However, students should reach the same general conclusions.

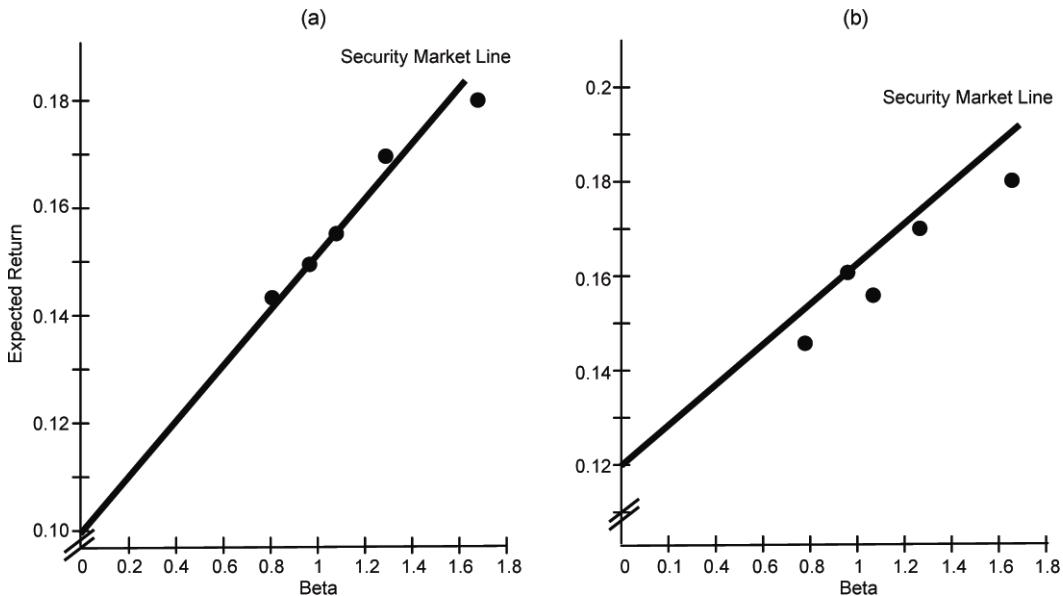


The beta is approximately 0.5. This indicates that excess returns for the stock fluctuate less than excess returns for the market portfolio. The stock has much less systematic risk than the market as a whole. It would be a defensive investment.

4. Req. (R_A) = 0.07 + $(0.13 - 0.07)(1.5)$ = 0.16
 Req. (R_B) = 0.07 + $(0.13 - 0.07)(1.0)$ = 0.13
 Req. (R_C) = 0.07 + $(0.13 - 0.07)(0.6)$ = 0.106
 Req. (R_D) = 0.07 + $(0.13 - 0.07)(2.0)$ = 0.19
 Req. (R_E) = 0.07 + $(0.13 - 0.07)(1.3)$ = 0.148

The relationship between required return and beta should be stressed.

5. Expected return = $0.07 + (0.12 - 0.07)(1.67) = 0.1538$, or 15.38%
6. Perhaps the best way to visualize the problem is to plot expected returns against beta. This is done below. A security market line is then drawn from the risk-free rate through the expected return for the market portfolio which has a beta of 1.0.



The (a) panel, for a 10% risk-free rate and a 15% market return, indicates that stocks 1 and 2 are undervalued while stock 4 is overvalued. Stock 3 is priced so that its expected return exactly equals the return required by the market; it is neither overpriced nor underpriced.

The (b) panel, for a 12% risk-free rate and a 16% market return, shows all of the stocks overvalued. It is important to stress that the relationships are expected ones. Also, with a change in the risk-free rate, the betas are likely to change.

7. a. _____

Ticker Symbol	Amount Invested	Proportion, P_i	Expected Return, R_i	Weighted Return, $(P_i)(R_i)$
WOOPS	\$ 6,000	0.100	0.14	0.0140
KBOOM	11,000	0.183	0.16	0.0293
JUDY	9,000	0.150	0.17	0.0255
UPDWN	7,000	0.117	0.13	0.0152
SPROUT	5,000	0.083	0.20	0.0167
RINGG	13,000	0.217	0.15	0.0325
EIEIO	<u>9,000</u>	<u>0.150</u>	0.18	<u>0.0270</u>
	\$60,000	1.000		0.1602

Selena's expected return is **0.1602** or **16.02 percent**.

b.

Ticker Symbol	Amount Invested	Proportion, P_i	Expected Return, R_i	Weighted Return, $(P_i)(R_i)$
WOOPS	\$6,000	0.08	0.14	0.0112
KBOOM	11,000	0.147	0.16	0.0235
JUDY	9,000	0.120	0.17	0.0204
UPDWN	7,000	0.093	0.13	0.0121
SPROUT	20,000	0.267	0.20	0.0534
RINGG	13,000	0.173	0.15	0.0260
EIEIO	<u>9,000</u>	<u>0.120</u>	0.18	<u>0.0216</u>
	\$75,000	1.000		0.1682

The expected return on Selena's portfolio increases to **16.82 percent**, because the additional funds are invested in the highest expected return stock.

$$\begin{aligned} \text{8. Required return} &= 0.10 + (0.15 - .10)(1.08) \\ &= 0.10 + .054 = 0.154 \text{ or } 15.4 \text{ percent} \end{aligned}$$

Assuming that the perpetual dividend growth model is appropriate, we get

$$V = D_1/(k_e - g) = \$2/(0.154 - 0.11) = \$2/0.044 = \$\mathbf{45.45}$$

9. a. The beta of a portfolio is simply a weighted average of the betas of the individual securities that make up the portfolio.

Ticker Symbol	Beta	Proportion	Weighted Beta
NBS	1.40	0.2	0.280
YUWHO	0.80	0.2	0.160
SLURP	0.60	0.2	0.120
WACHO	1.80	0.2	0.360
BURP	1.05	0.1	0.105
SHABOOM	0.90	<u>0.1</u>	<u>0.090</u>
		1.0	1.115

The portfolio beta is **1.115**.

$$\begin{aligned} \text{b. Expected portfolio return} &= 0.08 + (0.14 - 0.08)(1.115) \\ &= 0.08 + .0669 = \mathbf{0.1469 \text{ or } 14.69\%} \end{aligned}$$

$$\begin{aligned} \text{10. a. Required return} &= 0.06 + (0.14 - 0.06)(1.50) \\ &= 0.06 + 0.12 = 0.18 \text{ or } 18\% \end{aligned}$$

Assuming that the constant dividend growth model is appropriate, we get

$$V = D_1/(k_e - g) = \$3.40/(0.18 - 0.06) = \$3.40/0.12 = \$\mathbf{28.33}$$

- b. Since the common stock is currently selling for \$30 per share in the marketplace, while we value it at only \$28.33 per share, the company's common stock appears to be "overpriced". Paying \$30 per share for the stock would likely result in our receiving a rate of return less than that required based on the stock's systematic risk.

Solution to Appendix A Problem:

11. $E(R_p) = (0.20)(0.08) + (0.30)(0.15) + (0.50)(0.12) = 0.121$

The standard deviation for the portfolio is found by summing up all the elements in the following variance-covariance matrix and then taking the sum's square root.

	D	E	F	
D	$(0.2)^2 (1) (.02)^2$	$(0.2) (0.3) (0.4) (0.02) (0.16)$	$(0.2) (0.5) (0.6) (0.02) (0.08)$	
E	$(0.3) (0.2) (0.4) (0.16) (0.02)$	$(0.3)^2 (1) (0.16)^2$	$(0.3) (0.5) (0.8) (0.16) (0.08)$	
F	$(0.5) (0.2) (0.6) (0.08) (0.02)$	$(0.5) (0.3) (0.8) (0.08) (0.16)$	$(0.5)^2 (1) (0.08)^2$	

Therefore, the standard deviation of the portfolio equals:

$$\begin{aligned} & [(0.2)^2(1)(0.02)^2 + (0.3)^2(1)(0.16)^2 + (0.5)^2(1)(0.08)^2 \\ & + 2(0.2)(0.3)(0.4)(0.02)(0.16) + 2(0.2)(0.5)(0.6)(0.02)(0.08) \\ & + 2(0.3)(0.5)(0.8)(0.16)(0.08)]^{\frac{1}{2}} = [0.0073376]^{\frac{1}{2}} = 8.56\% \end{aligned}$$

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

Possible Return, R_i	Probability of Occurrence, P_i	$(R_i)(P_i)$	$(R_i - \bar{R})^2 (P_i)$
-0.10	0.10	-0.010	$(-0.10 - 0.20)^2 (0.10)$
0.05	0.20	0.010	$(0.05 - 0.20)^2 (0.20)$
0.20	0.40	0.080	$(0.20 - 0.20)^2 (0.40)$
0.35	0.20	0.070	$(0.35 - 0.20)^2 (0.20)$
0.50	0.10	0.050	$(0.50 - 0.20)^2 (0.10)$
<hr/>		<hr/>	<hr/>
$\Sigma = 1.00$		$\Sigma = 0.200 = \bar{R}$	$\Sigma = 0.027 = \sigma^2$
$(0.027)^{\frac{1}{2}} = 16.43\% = \sigma$			

- b. For a return that will be zero or less, standardizing the deviation from the expected value of return we obtain $(0\% - 20\%)/16.43\% = -1.217$ standard deviations. Turning to Table V in the appendix at the back of the book, 1.217 falls between standard deviations of 1.20 and 1.25. These standard deviations correspond to areas under the curve of 0.1151 and 0.1056 respectively. This means that there is **approximately an 11% probability** that actual return will be zero or less.

For a return that will be 10 percent or less, standardizing the deviation we obtain $(10\% - 20\%)/16.43\% = -0.609$ standard deviations. Referring to Table V, we see that this corresponds to **approximately 27%**.

For a return of 40% or more, standardizing the deviation we obtain $(40\% - 20\%)/16.43\% = 1.217$ standard deviations. This is the same as in our first instance involving a zero return or less, except that it is to the right, as opposed to the left, of the mean. Therefore, the probability of a return of 40% or more is **approximately 11%**.

2. a. $\bar{R} = 8\% + (13\% - 8\%)1.45 = \mathbf{15.25\%}$
- b. If we use the perpetual dividend growth model, we would have

$$P_0 = \frac{D_1}{k_e - g} = \frac{\$2(1.10)}{0.1525 - 0.10} = \$\mathbf{41.90}$$

$$c. \quad \bar{R} = 8\% + (13\% - 8\%)0.80 = \mathbf{12\%}$$

$$P_0 = \frac{\$2(1.10)}{0.12 - 0.10} = \$\mathbf{110}$$

SOLUTION TO APPENDIX A SELF-CORRECTION PROBLEM

$$3. \quad \bar{R}_p = (0.60)(0.10) + (0.40)(0.06) = \mathbf{8.4\%}$$

$$\sigma_p = [(0.6)^2(1.0)(0.05)^2 + 2(0.6)(0.4)(-0.35)(0.05)(0.04) + (0.4)^2(1.0)(0.04)^2]^{0.5}$$

In the above expression, the middle term denotes the covariance $(-0.35)(0.05)(0.04)$ times the weights of .6 and .4, all of which is counted twice -- hence the two in front. For the first and last terms, the correlation coefficients for these weighted-variance terms are 1.0. This expression reduces to

$$\sigma_p = [0.00082]^{.5} = \mathbf{2.86\%}$$

Financial Statement Analysis



Financial statements are like a fine perfume – to be sniffed but not swallowed.

ABRAHAM BRILLOFF

ANSWERS TO QUESTIONS

1. The purpose of a balance sheet is to present a picture of the firm's financial position at one moment in time. The income statement, on the other hand, depicts a summary of the firm's profitability over time.
2. By analyzing trends, one is able to determine whether there has been improvement or deterioration in the financial condition and performance of a firm. This is particularly useful in the prediction of insolvency and the taking of remedial steps before insolvency can occur.
3. Receivables and inventories undoubtedly dominate the current asset position of the firm. Moreover, the collection period is probably slow and there may be some hidden bad debts. Also, inventory turnover may be slow, indicating inefficiency and excessive investment in inventory. This question points to the fact that the current ratio is a very crude indicator of liquidity and that one must analyze the specific current assets.
4. A firm may generate a high return and still be technically insolvent for many reasons. Most frequently, the profitable firm is growing at a rate that cannot be supported by internal sources of funds, and external sources of funds beyond a point are unavailable.
5. Both measures relate a balance sheet figure, which was the result of the last month, or so, of sales, to annual income statement figures. Comparing a "stock" (balance sheet) item to a "flow" (income statement) item might involve a mismatch of variables. The stock item may not be representative of how this variable looked over the period during which the flow occurred. Therefore, where appropriate, we may need to use an "average" balance sheet figure in order to better match the income statement flow item with a balance sheet stock figure more representative of the entire period.
6. A long-term creditor is interested in liquidity ratios because short-term creditors may force bankruptcy, imposing some substantial costs on the long-term creditor.
7.
 - a. Liquidity ratios to insure payment of principal by the going concern and debt ratios as a measure of protection of his/her principal in bankruptcy.
 - b. The equity investor is interested in profitability ratios and ratios that provide information about risk.
 - c. The fund manager is interested in profitability ratios to provide some assurance of the long-run viability of the firm, leverage (debt) ratios to get an indication of risk, and liquidity ratios to determine if the firm is technically solvent.
 - d. The president, as a manager, is interested in all the ratios, with particular emphasis on profitability.
8. The ratio of debt-to-equity and long-term debt to total capitalization both historically and in comparison with other companies. Coverage ratios give some indication of the firm's ability to service debt. With all of these ratios, comparisons with other companies in the industry as well as over time add additional insight.
9. Such a situation could come about if the company had invested its profits in large, slow-moving inventory, an addition to fixed assets, or in increased accounts receivable. A slow-moving inventory would be visible in a low inventory turnover ratio and in a below average quick or acid-test ratio. An addition to fixed assets would be visible in the fixed asset

turnover ratio. An increase in accounts receivable would be reflected in a lengthening average collection period and, possibly, in a stretching of the receivable aging schedule.

In addition, if the firm has recently suffered a decline in the *market* value of its securities carried at cost on the balance sheet, the firm could find itself in difficulty when attempting to sell out to pay maturing obligations.

10. Yes, it could. By increasing the turnover the company is really reducing its investment in excessive stocks of inventory carrying a low or zero rate of return. The resulting inventory is said to be more liquid or more readily convertible into cash. However, if the reduction in inventory levels is accomplished by a loss of sales due to stockouts, the increased turnover ratio may be unfavorable.

The use of cost of goods sold in the ratio allows the analyst to separate the effects of an increased gross margin (resulting from an increase in selling price or a decrease in costs) from the effects of a more efficient inventory management *per se* (high volume of sales for a given level of inventory investment).

11. No. The appropriate standard varies by industry. What is a good ratio for one industry may not be so for another. Also, no one financial ratio tells the whole story. Only by analyzing multiple ratios can one get a reasonably complete picture of a firm's financial condition and performance.
12. Both firms are equally profitable. Each has an "earning power" or return on investment (ROI) of 20%. An example of Firm A might be a grocery store such as Safeway or Winn-Dixie. An example of Firm B might be a retail department store.
13. Short-term creditors look at balance sheet assets as a loan safety margin for repayment in the event of default. The income statement is ignored because the impact of future earnings on this safety margin is small over short time periods. Yet for that portion of short-term credit renewed on a more or less permanent basis, the "earning power" of the firm represents the real margin of credit risk over the long-term regardless of initial asset strength.
14. The use of index analysis allows one to go behind some of the trends that are evident in a trend analysis of financial ratios. For example, if the current ratio deteriorates, index analysis permits one to determine the specific current assets and/or liabilities that are causing this trend.

SOLUTIONS TO PROBLEMS

1.

	(a) Total Asset Turnover	(b) Net Profit Margin	(a) × (b) Earning Power (ROI)
Co.			
A	$(\$10M/\$8M) = 1.25$	$(\$.7M/\$10M) = 0.07$	0.0875
B	$(\$20M/\$10M) = 2.00$	$(\$2M/\$20M) = 0.10$	0.2000
C	$(\$8M/\$6M) = 1.33$	$(\$.8M/\$8M) = 0.10$	0.1333
D	$(\$5M/\$2.5M) = 2.00$	$(\$.5M/\$5M) = 0.10$	0.2000
E	$(\$12M/\$4M) = 3.00$	$(\$1.5M/\$12M) = 0.125$	0.3750
F	$(\$17M/\$8M) = 2.125$	$(\$1M/\$17M) = 0.0588$	0.1250

2. a. Current ratio = $(\$3,800 / \$1,680) = 2.26$
 - b. Acid-test ratio = $(\$3,800 - \$2,100) / \$1,680 = 1.01$
 - c. Average collection period = $(\$1,300 \times 365 \text{ days}) / \$12,680 = 37.42 \text{ days}$
 - d. Inventory turnover = $(\$8,930 / \$2,100) = 4.25$
 - e. Debt to net worth = $(\$1,680 + \$2,000) / \$3,440 = 1.07$
 - f. LTD to total capitalization = $(\$2,000) / (\$2,000 + \$3,440) = 0.37$
 - g. Gross profit margin = $(\$3,750) / \$12,680 = 0.2957$
 - h. Net profit margin = $(\$670) / \$12,680 = 0.0528$
 - i. Return on equity = $(\$670) / \$3,440 = 0.1948$
3. a. The return on investment declined because total asset turnover declined and the net profit margin declined. Apparently, sales did not keep up with asset expansion or sales decreased while assets did not. In either case, fixed costs would command a larger percentage of the sales dollar, causing profitability on sales to decrease. The lower profitability on sales and lower asset turnover resulted in lower return on investment.
 - b. The increase in debt came from short-term sources. Current assets increased relative to sales as is indicated by the inventory turnover and collection period. The current ratio and the acid-test ratio, however, decreased. This indicates a substantial increase in current liabilities.
4. Profit after taxes = Sales \times Net profit margin
 $= \$8,000 \times 0.07 = \560

Profit before taxes = $\$560 / (1 - \text{Tax rate})$

$$= \$560 / (1 - 0.44) = \$1,000$$

Taxes = $\$1,000 - \$560 = \$440$

Total liabilities = (Shareholders' equity) \times (Total liabilities/Shareholders' equity)

$$= (\$3,750)(1/1) = \$3,750$$

Total liabilities & Equity = $\$3,750 + 3,750 = \$7,500$

Current liabilities = Total Liabilities – Long-term debt

$$= \$3,750 - \$2,650 = \$1,100$$

Bank loan = Current liabilities – Payables – Accruals

$$= \$1,100 - \$400 - \$200 = \$500$$

Total assets = Total liabilities & Equity = $\$7,500$

Current assets = Current liabilities \times Current Ratio

$$= \$1,100 \times 3 = \$3,300$$

Net fixed assets = Total assets – Current assets

$$= \$7,500 - \$3,300 = \$4,200$$

Accounts receivable = [(Credit sales) \times (Average collection period)]/360 days

$$= [(\$8,000) \times (45 \text{ days})] / 360 \text{ days} = \$1,000$$

Inventories = Current assets – Cash – Receivables

$$= \$3,300 - \$500 - \$1,000 = \$1,800$$

Cost of Goods Sold = (Inventories) × (Inventory turnover ratio)

$$= \$1,800 \times 3 = \$5,400$$

Gross Profit = Sales – Cost of goods sold

$$= \$8,000 - \$5,400 = \$2,600$$

Selling & Administrative Expenses = Gross profit – Interest – Profit before taxes

$$= \$2,600 - \$400 - \$1,000 = \$1,200$$

5. a. Cost of goods sold = (1 – Gross profit margin)(Net sales)

$$= (1 - 0.20)(\$400,000) = \$320,000$$

Inventory turnover = Cost of goods sold/(average)Inventory

Therefore, . . . (average) Inventory = Cost of goods sold/Inventory turnover

$$= \$320,000/4 = \$80,000$$

- b. Average collection period = $\frac{(\text{average}) \text{ Receivable} \times 360 \text{ days}}{\text{Annual credit sales}}$

$$45 \text{ days} = (\$50,000 \times 360 \text{ days})/\$400,000$$

6. a. Earning power = Sales profitability × Asset efficiency

ROI = Net profit margin × Total asset turnover

$$\text{ROI} = (\$120,000/\$6,000,000) \times 6 = 0.12$$

- b. Total assets = Sales/Total asset turnover = \$6M/6 = \$1M

“New” ROI = Net profit margin × Total asset turnover

$$= 0.03 \times (\$6M/(\$1M \times 1.2)) = 0.15$$

7. Interest on each issue:

(9-1/4s)	\$2,500,000	×	0.0925	=	\$231,250
(12-3/8s)	\$1,500,000	×	0.12375	=	185,625
(10-1/4s)	\$1,000,000	×	0.1025	=	102,500
(14-1/2s)	\$1,000,000	×	0.145	=	<u>145,000</u>
					\$664,375

EBIT/Interest expense = interest coverage ratio $\$1,500,000/\$664,375 = 2.26$

8.

	<u>20X1</u>	<u>20X2</u>	<u>20X3</u>	<u>20X4</u>
Cash	100.00	43.46	19.63	17.76
Receivables	100.00	129.35	152.18	211.21
Inventories	100.00	137.63	174.98	202.71
Net fixed assets	<u>100.00</u>	<u>105.72</u>	<u>107.62</u>	<u>121.32</u>
Total assets	100.00	120.06	138.38	166.20
Accounts payable	100.00	139.52	163.40	262.42
Notes payable	100.00	130.00	150.00	150.00
Accruals	100.00	131.25	196.49	265.70
Long-term debt	100.00	160.00	160.00	160.00
Common stock	100.00	100.00	100.00	100.00
Retained earnings	<u>100.00</u>	<u>101.85</u>	<u>111.08</u>	<u>111.99</u>
Total liabilities & shareholders' equity	100.00	120.06	138.38	166.20

In the last three years, the company has increased its receivables and inventories rather dramatically. While net fixed assets jumped in 20X4, changes were only modest in 20X2 and 20X3. The basic problem is that retained earnings have grown at only a very slow rate, almost all of which occurred in 20X3. This is due to inadequate profitability, excessive dividends, or both. While the company increased its long-term debt in 20X2, it has not done so since. The burden of financing has fallen on accounts payable and accruals, together with drawing down the cash position and \$50,000 in increased short-term borrowings (notes payable). The question would be whether payables are past due and whether employees are being paid on time. It is clear that the company cannot continue to expand its assets without increasing its equity base in a significant way.

9. a. (i) Current ratio = Current assets/Current liabilities

$$= \$13M/\$8M = 162.5\%$$

(ii) Acid-test ratio = (Current assets - Inventories)/Current liabilities

$$= \$6M/\$8M = 75\%$$

(iii) Receivable turnover = Annual credit sales/Receivables

$$= \$16M/\$5M = 3.2x$$

(iv) Inventory turnover = Cost of goods sold/Inventory

$$= \$12M/\$7M = 1.7x$$

(v) Long-term debt/Total capitalization

$$= \$12M/(\$12M + \$4M + \$6M)$$

$$= \$12M/\$22M = 54.5\%$$

$$\begin{aligned}
 \text{(vi) Gross profit margin} &= (\text{Sales} - \text{Cost of goods sold})/\text{Sales} \\
 &= (\$20M - \$12M)/\$20M = 40\% \\
 \text{(vii) Net profit margin} &= \text{Net income after taxes}/\text{Sales} \\
 &= \$2M/\$20M = 10\% \\
 \text{(viii) Return on equity} &= \frac{\text{Net income after taxes} - \text{Dividends on preferred stock}}{\text{Net worth} - \text{Par value of preferred stock}} \\
 &= \$1,760,000/(\$10,000,000 - \$4,000,000) = 29.3\%
 \end{aligned}$$

$$\begin{aligned}
 \text{(ix) Return on assets} &= \text{Net income after taxes}/\text{Total assets} \\
 &= \$2M/\$30M = 6.7\%
 \end{aligned}$$

$$\text{(x) Total asset turnover} = \text{Sales}/\text{Total assets} = \$20M/\$30M = 0.67x$$

$$\begin{aligned}
 \text{(xi) Interest coverage} &= \text{EBIT}/\text{Interest charges} \\
 &= \$4.4M/\$1.2M = 3.67x
 \end{aligned}$$

- b. (i) Ratios 1-5 uniformly indicate that liquidity is deteriorating.
- (ii) The gross profit margin (#6) remains relatively constant and at the industry norm, while the net profit margin (#7) is declining. This indicates that interest, depreciation, and selling and administrative expenses are rising relative to sales.
- (iii) Part of the margin decline is accounted for by the rapid rise in debt (#5). This increase also explains why the return on equity (#8) has been rising while the return on assets (#9) has been falling. The impact of the increase in debt and overall decline in profitability is also shown by the reduction in coverage (#11).
- (iv) The intention of the authors was to depict a fundamentally deteriorating situation that company officials had attempted to hide through the excessive use of financial leverage.
- c. (i) Primary interest should be in ratios 1-4. The overall reduction in liquidity, together with the large amount involved and the lengthy terms, would argue against granting the credit. Of course, this argument would have to be balanced against the importance to the vendor of this sale and possible repeat sales.
- (ii) If this were done, the new capitalization would be:

Debt (long-term)	\$16,000,000	61.5%
Preferred stock	4,000,000	15.4%
Common equity	<u>6,000,000</u>	<u>23.1%</u>
	\$26,000,000	100.0%

Pro forma interest coverage would be

$$\$4.4M/\$1,760,000 = 2.5x$$

(#11 *pro forma*.) The student should be especially concerned with this ratio. In addition, he/she would have to be concerned with all of the rest, as both deteriorating liquidity and profitability would affect a 10-year note of the company. There would appear to be little advantage in granting the loan.

(iii) An easy answer would be to point to the high rate of return on equity (#8) and say “buy”. On the other hand, the high degree of leverage (#5) and the declining profitability (#s 7, 8, and 9), would indicate caution. The student should at least be aware of the multitude of fundamentally negative factors involved.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. Present current ratio = \$800/\$500 = **1.60**.
 - a. $\$700/\$500 = 1.40$. Current assets decline, and there is no change in current liabilities.
 - b. $\$900/\$600 = 1.50$. Current assets and current liabilities each increase by the same amount.
 - c. $\$800/\$500 = 1.60$. Neither current assets nor current liabilities are affected.
 - d. $\$760/\$540 = 1.41$. Current assets decline and current liabilities increase by the same amount.

2.

	20X1	20X2	20X3
Current ratio	1.19	1.25	1.20
Acid-test ratio	0.43	0.46	0.40
Average collection period	18	22	27
Inventory turnover	8.0	7.5	5.5
Total debt/equity	1.38	1.40	1.61
Long-term debt/total capitalization	0.33	0.32	0.32
Gross profit margin	0.200	0.163	0.132
Net profit margin	0.075	0.047	0.026
Total asset turnover	2.80	2.76	2.24
Return on assets	0.21	0.13	0.06

The company's profitability has declined steadily over the period. As only \$50,000 is added to retained earnings, the company must be paying substantial dividends. Receivables are growing at a slower rate, although the average collection period is still very reasonable relative to the terms given. Inventory turnover is slowing as well, indicating a relative buildup in inventories. The increase in receivables and inventories, coupled with the fact that shareholders' equity has increased very little, has resulted in the total debt-to-equity ratio increasing to what would have to be regarded on an absolute basis as quite a high level.

The current and acid-test ratios have fluctuated, but the current ratio is not particularly inspiring. The lack of deterioration in these ratios is clouded by the relative buildup in both receivables and inventories, evidencing a deterioration in the liquidity of these two assets. Both the gross profit and net profit margins have declined substantially. The relationship between the two suggests that the company has reduced relative expenses in 20X3 in particular. The buildup in inventories and receivables has resulted in a decline in the asset turnover ratio, and this, coupled with the decline in profitability, has resulted in a sharp decrease in the return on assets ratio.

3. $\frac{\text{Long-term debt}}{\text{Equity}} = 0.5 = \frac{\text{Long-term debt}}{\$200,000}$ Long-term debt = **\$100,000**

Total liabilities and shareholders' equity = **\$400,000**

Total assets = **\$400,000**

$$\frac{\text{Sales}}{\text{Total assets}} = 2.5 = \frac{\text{Sales}}{\$400,000} \quad \text{Sales} = \mathbf{\$1,000,000}$$

$$\begin{aligned} \text{Cost of goods sold} &= (1 - \text{gross profit margin}) (\text{Sales}) \\ &= (0.9) (\$1,000,000) = \mathbf{\$900,000} \end{aligned}$$

$$\frac{\text{Cost of good sold}}{\text{Inventory}} = \frac{\$900,000}{\text{Inventory}} = 9 \quad \text{Inventory} = \mathbf{\$100,000}$$

$$\frac{\text{Receivables} \times 360 \text{ days}}{\$1,000,000} = 18 \text{ days} \quad \text{Receivables} = \$50,000$$

$$\frac{\text{Cash} + \$50,000}{\$100,000} = 1 \quad \text{Cash} = \$50,000$$

Plant and equipment (plug figure on left-hand side of the balance sheet) = **\$200,000**

Balance Sheet

Cash	\$ 50,000	Notes and payables	\$100,000
Accounts receivable	50,000	Long-term debt	100,000
Inventory	100,000	Common stock	100,000
Plant and equipment	<u>200,000</u>	Retained earnings	<u>100,000</u>
Total	<u><u>\$400,000</u></u>	Total	<u><u>\$400,000</u></u>

4.

Common-Size Analysis (%)	20X1	20X2	20X3
Cash	7.9	3.8	1.7
Receivables	27.5	27.8	34.0
Inventories	<u>28.4</u>	<u>25.4</u>	<u>27.6</u>
Current assets	63.8	57.0	63.3
Net fixed assets	<u>36.2</u>	<u>43.0</u>	<u>36.7</u>
Total assets	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>
Payables	26.1	28.6	30.4
Accruals	4.2	5.0	4.9
Bank loan	<u>3.5</u>	<u>8.7</u>	<u>8.8</u>
Current liabilities	33.8	42.3	44.1
Long-term debt	7.0	9.7	8.0
Shareholders' equity	<u>59.2</u>	<u>48.0</u>	<u>47.9</u>
Total liabilities and shareholders' equity	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>
Sales	100.0	100.0	100.0
Cost of goods sold	72.0	74.4	73.5
Selling, general, and administrative expenses	19.2	16.5	17.1
Interest	<u>0.6</u>	<u>1.3</u>	<u>1.2</u>
Profit before taxes	8.2	7.8	8.2
Taxes	<u>3.3</u>	<u>3.0</u>	<u>3.5</u>
Profit after taxes	<u>4.9</u>	<u>4.8</u>	<u>4.7</u>

Index Analysis (%)	20X1	20X2	20X3
Cash	100.0	69.0	36.0
Receivables	100.0	146.2	206.4
Inventories	<u>100.0</u>	<u>128.7</u>	<u>161.8</u>
Current assets	100.0	128.9	165.5
Net fixed assets	<u>100.0</u>	<u>171.6</u>	<u>169.1</u>
Total assets	<u>100.0</u> —	<u>144.3</u> —	<u>166.8</u> —
Payables	100.0	158.1	194.0
Accruals	100.0	171.4	195.0
Bank loan	<u>100.0</u>	<u>360.0</u>	<u>420.0</u>
Current liabilities	100.0	180.7	217.6
Long-term debt	100.0	200.0	190.0
Shareholders' equity	<u>100.0</u>	<u>117.0</u>	<u>135.1</u>
Total liabilities and shareholders' equity	<u>100.0</u> —	<u>144.3</u> —	<u>166.8</u> —
Sales	100.0	126.0	137.8
Cost of goods sold	100.0	130.3	140.8
Selling, general, and administrative expenses	100.0	108.6	101.8
Interest	<u>100.0</u>	<u>257.5</u>	<u>273.9</u>
Profit before taxes	100.0	119.7	137.2
Taxes	<u>100.0</u>	<u>115.9</u>	<u>147.7</u>
Profit after taxes	<u>100.0</u> —	<u>122.2</u> —	<u>130.2</u> —

The common-size analysis shows that cash declined dramatically relative to other current assets and total assets in general. Net fixed assets surged in 20X2, but then fell back as a percentage of the total to almost the 20X1 percentage. The absolute amounts suggest that the company spent less than its depreciation on fixed assets in 20X3. With respect to financing, shareholders' equity has not kept up, so the company has had to use somewhat more debt percentage-wise. It appears to be leaning more on trade credit as a financing source as payables increased percentage-wise. Bank loans and long-term debt also increased sharply in 20X2, no doubt to finance the bulge in net fixed assets. The bank loan remained about the same in 20X3 as a percentage of total liabilities and shareholders' equity, while long-term debt declined as a percentage. Profit after taxes slipped slightly as a percentage of sales over the 3 years. In 20X2, this decline was a result of the cost of goods sold and interest expense, as other expenses and taxes declined as a

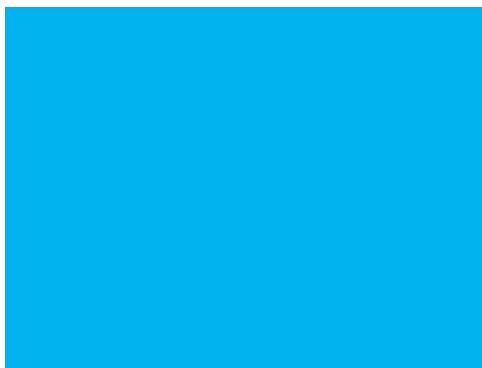
percentage of sales. In 20X3, cost of goods sold declined as a percentage of sales, but this was more than offset by increases in other expenses and taxes as percentages of sales.

Index analysis shows much the same picture. Cash declined faster than total assets and current assets, and receivables increased faster than these two benchmarks. Inventories fluctuated, but were about the same percentage-wise to total assets in 20X3 as they were in 20X1. Net fixed assets increased more sharply than total assets in 20X2 and then fell back into line in 20X3. The sharp increase in bank loans in 20X2 and 20X3 and the sharp increase in long-term debt in 20X2, along with the accompanying increases in interest expenses, are evident. The percentage increases in shareholders' equity were less than those for total assets, so debt increased by a larger than for either of the other two items. With respect to profitability, net profits increased less than sales, for the reasons indicated earlier.



7

Funds Analysis, Cash-Flow Analysis, and Financial Planning



Forecasting is very difficult, especially if it is about the future.

ANONYMOUS

ANSWERS TO QUESTIONS

1. Flow of funds (sources and uses) statements provide the analyst with information generally being about year-to-year changes in assets and how these changes are financed. It is important to recognize that these sources and uses of funds are changes in the balance sheet that occur from one point in time to another without revealing any information about the interim time period. Also, the sources and uses of funds statement does not represent cash movements. The cash budget, on the other hand, represents the flow of cash and is usually short-run (month-to-month) in nature.
2. A *statement of cash flows* reports a firm's cash inflows and outflows during a period of time segregated into three categories: operating, investing, and financing activities. When used with other financial statements and disclosures, the statement of cash flows should help the analyst to: assess a firm's ability to generate cash for dividends and investments; identify a firm's needs for external financing; and, understand the difference between net income and net cash flow from operating activities.
3. The variable that most directly affects the cash budget is sales since the cash inflow is proportional to sales and cash outflow is proportional to production, which is determined by sales.
4. Cash budgeting can lower the cost of borrowing for two reasons. By knowing ahead of time how much financing is required, the financial manager can bargain for funds. Also, the quality of cash budgeting can convince lenders to lower their risk perceptions of the firm and, therefore, charge a lower interest rate.
5. Cash is an asset item. If it decreases it is (by definition) a source of funds. The increase in any asset (cash included) is (by definition) a use of funds.
6. The decrease in inventory is a source that is automatically applied as a use to finance the resulting increase in accounts receivable.
7. The purpose of accounting statements is to provide information to creditors and investors so that they may make a correct assessment of the risk and return characteristics of the firm. The statement of cash flows may provide insights not apparent in studying either the income statement or balance sheet. The statement of cash flows reports the firm's cash inflows and outflows, during the year, segregated into three categories: operating, investing, and financing activities. (And, yes, Statement of Financial Accounting Standards(SFAS) No. 95 requires that a statement of cash flows be included as part of a complete set of audited financial statements.)
8. Some managers prefer the flow of funds statement over the more complex cash-flow statement because: (1) unlike the cash-flow statement, the flow of funds statement does not omit the net effects of important noncash transactions; and (2) it is easier to prepare.
9. Whether or not depreciation is a source of funds has been debated for many years by accountants and financial analysts. Accountants argue that depreciation is an accounting entry that does not affect cash flows. People in finance argue that whether the funds from operations are determined by restating the income statement on a cash basis or by adding back to earnings after tax all the noncash deductions, the result is the same. Thus, the argument is nothing more than a discussion of semantics. Obviously, if a firm incurs losses, depreciation does not provide funds.

10. An insight is gained with respect to the use of the funds provided by the banker as well as the source that will enable the firm to pay off the banker's loan.
11.
 - a. Source/Investing
 - b. Use/Financing
 - c. Use/Operating
 - d. Source/Operating
 - e. Source (if tax deductible)/Operating
 - f. Source/Investing
12. The cash budget deals with inflows and outflows of cash and not necessarily accounting flows. The cash flow is short-run in nature. The sources and uses of funds statement deals with accounting flows and not necessarily cash flows.
13. The financial manager should concentrate on accurate projections of sales as well as the projection of collections on credit sales. The other important estimate that must be accurate is the cost of production.
14. Probably the cash budget is a better measure of liquidity. The current ratio and quick ratio are historical "pictures" of account balances as of a particular day. The cash budget is concerned with events in the future rather than historical events.
15. Virtually everything in the cash budget depends on sales: receivables, production costs, purchases, taxes, etc. It is truly the cornerstone on which the cash budget is built and must come first in the preparation of the cash budget.
16. Forecast statements are projections of expected future income statements and balance sheets. The principal purpose is that they allow us to study the composition of future financial statements. If the firm is interested in staying within certain financial ratios, as is required under a loan agreement, the forecast balance sheet allows this determination.

While both the cash budget and the forecast income statement are forecasts of the future, the former is monthly and involves cash, not accounting income. Forecast statements are quarterly, or annual, and the balance sheet is not given by a cash budget.
17. The two principal ways by which to prepare forecast statements are through a cash budget and by direct estimates of the items. The latter involves projections, usually on the basis of historical financial ratios. The base starting point is projected sales.

Answers to Appendix Questions:

18. A sustainable growth rate (SGR) is the maximum percentage growth in sales that can occur consistent with target operating, debt, and dividend ratios. With sustainable growth modeling, one can determine whether the sales growth objectives of the firm are consistent with its operating characteristics and its financial objectives. When the marketing, operations, and finance objectives are not mutually consistent, this will be shown. A change in one or more of the targets will need to occur. Such modeling is essential for effective planning.

19. Steady-state modeling assumes that balance sheet and performance ratios do not change over time. The future is like the past, and the firm grows in a steady, consistent manner over time. No external equity financing is assumed. Growth is entirely through earnings retention coupled with debt. When changing assumptions are invoked, the ratios need not be constant over time. Moreover, equity financing is allowed.
20. The input variables are beginning sales and beginning equity. Target variables are the ratio of assets-to-sales, the net profit margin, debt-to-equity, the amount of dividends, and the amount of new stock financing. These are in addition to the growth rate in sales. In general, the assets-to-sales ratio and the debt-to-equity ratio have the greatest influence on the sustainable growth rate.

SOLUTIONS TO PROBLEMS

1. Source: - \$ 100 Cash
Use: + \$ 700 Accounts receivable
Source: - \$ 300 Inventory
Use: + \$ 400 Dividends paid
Source: + \$1,000 Depreciation
Source: + \$ 300 Accounts payable
Use: - \$ 100 Accrued expenses
Use: - \$ 200 Long-term debt
Source: + \$ 600 Net profit
Use: + \$ 900 Additions to fixed assets

2. a.

Svoboda Corporation

**Sources and uses of funds statement
for December 31, 20X1 to December 31, 20X2 (in millions)**

Sources	Uses	
Funds provided by operations:		
Net profit	\$ 7	Dividends
Depreciation	5	Additions to fixed assets
Decrease, other assets	3	Increase,
Increase, accounts payable	3	accounts receivable
Increase, accrued taxes	2	Increase, inventories
Increase, long-term debt	15	Decrease, notes payable
Increase, common stock	6	
Decrease, cash and equivalents	<u>2</u>	
	<u>\$43</u>	<u>\$43</u>

b.

**Svoboda Corporation Statement of cash flows
for the year ended December 31, 20X2 (in millions)**

CASH FLOW FROM OPERATING ACTIVITIES:

Net income	\$ 7
Depreciation	5
Cash provided (used) by current assets and operating-related current liabilities:	
Increase, accounts payable	3
Increase, accrued taxes	2
Increase, accounts receivable	(7)
Increase, inventories	(3)
Net cash provided (used) by operating activities	\$ 7

CASH FLOW FROM INVESTING ACTIVITIES:

Additions to fixed assets	\$ (10)
Proceeds from sale of other assets	3
Net cash provided (used) by investing activities	\$ (7)

CASH FLOW FROM FINANCING ACTIVITIES:

Decrease in short-term bank borrowings	\$ (20)
Additions to long-term borrowing	15
Proceeds from the sale of common stock	6
Dividends paid	(3)
Net cash provided (used) by financing activities	\$ (2)

Increase (decrease) in cash	\$ (2)
Cash, December 31, 20X1	5
Cash, December 31, 20X2.....	<u>\$ 3</u>

Supplemental cash flow disclosures:

Interest paid	\$ 2
Taxes paid*	2

*Note: Taxes paid = Taxes (from income statement) minus increase in accrued taxes (from comparative balance sheets) -- \$2 = \$4 - \$2.

3. a.

Begalla Corporation**Sources and uses of funds statement****for December 31, 20X1 to December 31, 20X2 (in millions)**

Sources	Uses		
Funds provided by operations:			
Net profit	\$15	Dividends	\$10
Depreciation	3	Additions to fixed assets	3
Increase, accrued wages	1	Increase, accounts receivable	3
Increase, accounts payable	2	Increase, inventory	3
		Decrease, accrued taxes	1
		Increase, cash	1
	<hr/> <u>\$21</u>		<hr/> <u>\$21</u>

b.

Begalla Corporation
Statement of cash flows
for the year ended December 31, 20X2 (in millions)

CASH FLOW FROM OPERATING ACTIVITIES:

Net income	\$ 15
Depreciation	3
Cash provided (used) by current assets and operating-related current liabilities:	
Increase, accounts payable	2
Increase, accrued wages	1
Increase, accounts receivable	(3)
Increase, inventory.....	(3)
Decrease, accrued taxes.....	(1)
Net cash provided (used) by operating activities	<u>\$ 14</u>

CASH FLOW FROM INVESTING ACTIVITIES:

Additions to fixed assets	\$ (3)
Net cash provided (used) by investing activities	<u>\$ (3)</u>

CASH FLOW FROM FINANCING ACTIVITIES:

Dividends paid	<u>(10)</u>
Net cash provided (used) by financing activities	<u>\$ (10)</u>
Increase (decrease) in cash.....	\$ 1
Cash, December 31, 20X1.....	4
Cash, December 31, 20X2	<u>\$ 5</u>

Supplemental cash flow disclosures:

Interest paid	\$ 2
Taxes paid*	11

*Note: Taxes paid = Taxes (from income statement) plus decrease in accrued taxes (from comparative balance sheets) -- \$11 = \$10 + \$1.

4.

**Schedules of projected sales and collections
for May to July (in thousands)**

	Mar.	Apr.	May	June	July	Aug.
Frame A: Sales						
Credit sales, 50%	\$ 30.0	\$ 30.0	\$ 35.0	\$ 40.0	\$ 50.0	\$ 50.0
Cash sales, 50%	<u>30.0</u>	<u>30.0</u>	<u>35.0</u>	<u>40.0</u>	<u>50.0</u>	<u>50.0</u>
Total sales, 100%	<u><u>\$ 60.0</u></u>	<u><u>\$ 60.0</u></u>	<u><u>\$ 70.0</u></u>	<u><u>\$ 80.0</u></u>	<u><u>\$100.0</u></u>	<u><u>\$100.0</u></u>
Frame B: Cash Collections						
Cash sales, this month			\$ 35.0	\$ 40.0	\$ 50.0	
50% of last month's credit sales			15.0	17.5	20.0	
50% of two-month old credit sales			<u>15.0</u>	<u>15.0</u>	<u>17.5</u>	
Total cash receipts			<u><u>\$ 65.0</u></u>	<u><u>\$ 72.5</u></u>	<u><u>\$ 87.5</u></u>	

Schedule of projected disbursements for operating expenses for May to July (in thousands)

	Mar.	Apr.	May	June	July	Aug.
Frame A: Cost of Goods Mfd.						
	<u>\$ 42.0</u>	<u>\$ 42.0</u>	<u>\$ 49.0</u>	<u>\$ 56.0</u>	<u>\$ 70.0</u>	<u>\$ 70.0</u>
Frame B: Cash Disbursements for Cost of Goods Mfd.						
90% of last month's cost			\$ 37.8	\$ 44.1	\$ 50.4	
10% of two-month old cost			<u>4.2</u>	<u>4.2</u>	<u>4.9</u>	
Total disbursements for cost of goods mfd.			<u><u>\$ 42.0</u></u>	<u><u>\$ 48.3</u></u>	<u><u>\$ 55.3</u></u>	
Frame C: Cash Disbursements for Selling, General, and Administrative Expenses						
100% of current month's expense			<u>\$ 17.0</u>	<u>\$ 18.0</u>	<u>\$ 20.0</u>	
Total disbursements for all operating expenses			<u><u>\$ 59.0</u></u>	<u><u>\$ 66.3</u></u>	<u><u>\$ 75.3</u></u>	

Schedule of projected total cash disbursements for May to July (in thousands)

	May	June	July
Total disbursements for all operating expenses	\$ 59.0	\$ 66.3	\$ 75.3
Interest payment			9.0
Sinking fund payment			50.0
Dividend payment			10.0
Capital expenditures		40.0	
Tax payments			1.0
Total cash disbursements	<u>\$ 59.0</u>	<u>\$106.3</u>	<u>\$145.3</u>

Schedule of projected net cash flows and cash balances for May to July (in thousands)

	May	June	July
Beginning cash balance, without additional financing	\$ 20.0	\$ 26.0	\$ (7.8)
Total cash receipts	65.0	72.5	87.5
Total cash disbursements	<u>59.0</u>	<u>106.3</u>	<u>145.3</u>
Net cash flow	<u>6.0</u>	<u>(33.8)</u>	<u>(57.8)</u>
Ending cash balance, without additional financing	\$ 26.0	\$ (7.8)	\$ (65.6)
“Cumulative” borrowing required to maintain minimum cash balance of \$20,000	\$ 0.0	\$ 27.8	\$ 85.6
Ending cash balance with additional financing	<u>\$ 26.0</u>	<u>\$ 20.0</u>	<u>\$ 20.0</u>

5.

Schedules of projected sales and collections for January to June (in thousands)

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
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Frame A: Sales

Credit sales, 75%	\$262.5	\$300.0	\$112.5	\$150.0	\$150.0	\$225.0	\$187.5	\$150.0
Cash sales, 25%	87.5	100.0	37.5	50.0	50.0	75.0	62.5	50.0
Total sales, 100%	<u>\$350.0</u>	<u>\$400.0</u>	<u>\$150.0</u>	<u>\$200.0</u>	<u>\$200.0</u>	<u>\$300.0</u>	<u>\$250.0</u>	<u>\$200.0</u>

Frame B: Cash Collections

Cash sales, this month	\$ 37.5	\$ 50.0	\$ 50.0	\$ 75.0	\$ 62.5	\$ 50.0
60% of last month's credit sales	180.0	67.5	90.0	90.0	135.0	112.5
30% of two-month old credit sales	78.75	90.0	33.75	45.0	45.0	67.5
10% of three-month old credit sales	22.5	26.25	30.0	11.25	15.0	15.0
Total cash receipts	<u>318.75</u>	<u>233.75</u>	<u>203.75</u>	<u>221.25</u>	<u>257.5</u>	<u>245.0</u>

Schedule of projected total cash disbursements for January to June (in thousands)

	Jan.	Feb.	Mar.	Apr.	May	June
Cash payments for:						
Purchases	\$160.0	\$160.0	\$240.0	\$200.0	\$160.0	\$240.0
Wages and salaries	30.0	40.0	50.0	50.0	40.0	35.0
Rent	2.0	2.0	2.0	2.0	2.0	2.0
Interest			7.5			7.5
Tax				50.0		
Capital investment	—	—	—	—	—	<u>30.0</u>
Total cash disbursements	<u>\$192.0</u>	<u>\$202.0</u>	<u>\$299.5</u>	<u>\$302.0</u>	<u>\$202.0</u>	<u>\$314.5</u>

Schedule of projected net cash flows and cash balances for January to June (in thousands)

	Jan.	Feb.	Mar.	Apr.	May	June
Beginning cash balance, without additional financing	\$100.0	\$226.75	\$258.5	\$162.75	\$ 82.0	\$137.5
Total cash receipts	318.75	233.75	203.75	221.25	257.5	245.0
Total cash disbursements	<u>192.0</u>	<u>202.0</u>	<u>299.5</u>	<u>302.0</u>	<u>202.0</u>	<u>314.5</u>
Net cash flow	<u>126.75</u>	<u>31.75</u>	<u>(95.75)</u>	<u>(80.75)</u>	<u>55.5</u>	<u>(69.5)</u>
Ending cash balance, without additional financing	\$226.75	\$258.5	\$162.75	\$ 82.0	\$137.5	\$ 68.0
Borrowing (repayment) required to maintain minimum cash balance of \$100,000	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>20.0*</u>	<u>(20.0)</u>	<u>35.0*</u>
Ending cash balance with additional financing	<u>\$226.75</u>	<u>\$258.5</u>	<u>\$162.75</u>	<u>\$102.0</u>	<u>\$107.5</u>	<u>\$103.0</u>

*Funds can be borrowed in \$5,000 multiples.

6.

Central City Department Store**Forecast income statement for six months ending June 30, 20X2
(in thousands)**

		<u>Assumptions and/or sources of information</u>
Net sales	\$1,300.0	■ Based on schedule of estimates.
Cost of goods sold	<u>1,040.0</u>	■ Forecast at 80% of net sales -- see part (e) of Q. #5.
Gross profit	260.0	
Operating expenses:		
Rent	12.0	■ \$2,000 a month.
Interest	15.0	■ \$7,500 per quarter.
Depreciation	12.5	■ \$25,000 per year.
Wages & salaries	245.0	■ Based on schedule of estimates.
Profit (loss) before taxes	<u>284.5</u>	
	\$ (24.5)	

7. Central City Department Store Forecast balance sheet at June 30, 20X2 (in thousands)

<u>Assets</u>	<u>Actual 12-31-X1</u>	<u>Change</u>	<u>Forecast 6-30-X2</u>	<u>Assumptions</u>
Cash	\$ 100.0	+ 3.0	\$ 103.0	■ Based on cash budget.
Receivables	427.5	- 180.0	247.5	■ 100% June credit sales plus 40% May credit sales, 10% April credit sales.
Inventory	200.0	+ 120.0	320.0	■ Inventory (12/31/X1) plus forecast purchases minus forecast cost of goods sold.
Prepaid taxes	0.0	+ 50.0	50.0	■ Per cash budget.
Current assets	\$ 777.5	- 7.0	\$ 720.5	
Net fixed assets	250.0	+ 17.5	267.5	■ Capital expenditures of \$30 and depreciation of \$12.5.
Total assets	<u>\$ 977.5</u>	<u>+ 10.5</u>	<u>\$ 988.0</u>	

Liabilities

Bank borrowings	\$ 0.0	+ 35.0	\$ 35.0	■ Previous balance plus additional financing needed.
Accounts payable	130.0	0.0	130.0	■ Assumed to remain the same as at 12/31/X1.
Current liabilities	\$ 130.0	+ 35.0	\$ 165.0	
Bonds	500.0	0.0	500.0	■ Assumed to remain the same as at 12/31/X1.
Common stock and retained earnings	347.5	- 24.5	323.0	■ Retained earnings 12/31/X1 minus \$24.5 loss per forecast income statement.
Total liabilities and shareholders' equity	<u>\$ 977.5</u>	<u>+ 10.5</u>	<u>\$ 988.0</u>	

Solutions to Appendix Problems:

8. a. $\text{SGR} = \frac{0.60 (.07) (1.50)}{0.40 - [(0.60) (0.07) (1.50)]} = 18.69\%$

b. $\text{SGR} = \left[\frac{(40-5)(1.45)(2.381)}{1-(0.06)(1.45)(2.381)} \right] \times \left[\frac{1}{150} \right] - 1 = 1.60\%$

Moving to lower relative profitability and lower debt ratio, which may be a one-shot occurrence, lowers dramatically the sustainable growth rate. The change in debt ratio affects the level of overall assets, not just the growth component.

9. a. $\frac{S}{A} = \frac{(1.35)(30)}{[1.60][12 + 0.5 + (0.08)(1.35)(30)]} = 1.6082$

$$A/S = 1/(S/A) = 1/(1.6082) = 0.6218$$

b. $NP/S = 1/[(1.60)(1.4925)] + [(12 + 0.5)/(1.35)(30)] = 11.01\%$

c. $\frac{D}{E} = \frac{(1.35)(30)}{[12 + 0.5 + (0.08)(1.35)(30)][1.4925]} - 1 = 0.724$

In order to achieve a sales growth rate of 35 percent next year, one or both of the profitability ratios must improve and/or the debt ratio must increase.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

Sources and uses of funds statement for Dana-Stallings, Inc. (in thousands)

Sources	Uses
Funds provided by operations:	
Net profit	\$172
Depreciation	189 Additions to fixed assets
	<hr/>
	\$361
Decrease, marketable securities	87 Increase, accounts receivable
Increase, accounts payable	214 Increase, inventories
Increase, accrued expenses	88
Increase, bank borrowings	135
Decrease, cash	22
	<hr/>
	<u>\$907</u>
	<u>\$907</u>

The company has had substantial capital expenditures and increases in current assets. This growth has far outstripped the growth in retained earnings. To finance this growth, the company has reduced its marketable securities to zero, has leaned heavily on trade credit (accounts payable), and has increased its accrued expenses and bank borrowings. All of this is short-term financing of mostly long-term buildups in assets.

b.

Statement of cash flows for Dana-Stallings, Inc. (in thousands)**CASH FLOW FROM OPERATING ACTIVITIES:**

Net income	\$ 172
Depreciation	189
Cash provided (used) by current assets and operating-related current liabilities:	
Increase, accounts payable	214
Increase, accrued expenses	88
Increase, accounts receivable	(182)
Increase, inventories	(251)
Net cash provided (used) by operating activities	<u>\$ 230</u>

CASH FLOW FROM INVESTING ACTIVITIES:

Additions to fixed assets	\$ (474)
Decrease, marketable securities	87
Net cash provided (used) by investing activities	
Net cash provided (used) by investing activities	<u>\$ (387)</u>

CASH FLOW FROM FINANCING ACTIVITIES:

Increase in short-term bank borrowings	\$ 135
Net cash provided (used) by financing activities	
Net cash provided (used) by financing activities	<u>\$ 135</u>
Increase (decrease) in cash	\$ (22)
Cash, December 31, 20X1	
Cash, December 31, 20X1	<u>53</u>
Cash, December 31, 20X2	<u><u>\$ 31</u></u>

Supplemental cash flow disclosures:

Interest paid	\$ 21
Taxes paid	114

In addition to the same points raised by an analysis of the sources and uses of funds statement, we see that all of the firm's cash flow from operating activities (and then some) went towards additions to fixed assets. By and large, the cash-flow statement prepared using the indirect method gives you much of the same information gathered from an analysis of the sources and uses of funds statement.

2. a.

Cash budget (in thousands)

	Nov	Dec	Jan	Feb	Mar	Apr
Sales	<u>\$500</u>	<u>\$600</u>	<u>\$600</u>	<u>\$1,000</u>	<u>\$650</u>	<u>\$750</u>
Cash Collections						
20% of current month sales			\$120	\$200	\$130	
70% of last month's sales			420	420	700	
10% of 2-month old sales			50	60	60	
			—	—	—	
Total cash receipts			<u>\$590</u>	<u>\$680</u>	<u>\$890</u>	
Purchases	<u>\$360</u>	<u>\$600</u>	<u>\$390</u>	<u>\$450</u>		
Cash disbursements for purchases and operating expenses						
100% of last month's purchases			\$360	\$600	\$390	
Labour costs			150	200	160	
Other expenses paid			100	100	100	
			—	—	—	
Total cash disbursements			<u>\$610</u>	<u>\$900</u>	<u>\$650</u>	
Cash receipts less cash disbursements			<u>\$ 20</u>	<u>\$220</u>	<u>\$240</u>	

b.

	Dec	Jan	Feb	Mar
Beginning bank borrowings		\$400	\$420	\$ 640
Additional borrowings		<u>20</u>	<u>220</u>	<u>(240)</u>
Ending bank borrowings	\$400	\$420	\$640	\$ 400

The amount of financing peaks in February owing to the need to pay for purchases made the previous month and higher labour costs. In March, substantial collections are made on the prior month's billings, causing a large net cash inflow sufficient to pay off the additional borrowings.

c.

Forecast balance sheet at March 31 (in thousands)

Assets	Actual		Forecast		Assumptions
	12-31	Change	3-31		
Cash	\$ 50	0	\$ 50		■ Set at estimated minimum balance.
Receivables	530	+ 90	620		■ 80% March sales plus 10% February sales.
Inventory	545	+ 90	635		■ Based on \$545 plus \$1,985 in purchases (Jan.-Mar.) minus .6 times \$2,250 in sales (Jan.-Mar.).
Current assets	\$ 1,125	+ 180	\$ 1,305		
Net fixed assets	<u>1,836</u>	<u>- 24</u>	<u>1,812</u>		■ Depreciation expected to be \$24.
Total assets	<u>\$ 2,961</u>	<u>+156</u>	<u>\$ 3,117</u>		
<hr/>					
Liabilities					
Bank borrowings	\$ 400	0	\$ 400		■ Previous balance plus zero additional financing needed.
Accounts payable	360	+ 90	450		■ 100% March purchases.
Accrued expenses	<u>212</u>	<u>0</u>	<u>212</u>		■ No change expected.
Current liabilities	\$ 972	+ 90	\$ 1,062		
Long-term debt	450	0	450		■ No change expected.
Common Stock	100	0	100		■ No change expected.
Retained earnings	<u>1,439</u>	<u>+ 66</u>	<u>1,505</u>		■ Change in retained earnings equals sales, minus payment for purchases, minus labour costs, depreciation, and other expenses, for Jan.-Mar.
Total liabilities and shareholders' equity	<u>\$ 2,961</u>	<u>+156</u>	<u>\$3,117</u>		

3.

Forecast income statement (in thousands)

	Assumptions
Net sales	\$2,400
Cost of goods sold	<u>1,440</u>
Gross profit	960
Expenses	576
Profit before taxes	384
Taxes	192
Profit after taxes	\$ 192
Dividends	0
Increase in retained earnings	<u>\$ 192</u>

Forecast balance sheet (in thousands)

Assets	End of year	Assumptions
Cash	\$ 96	■ Set at estimated minimum balance; 4% of annual sales of \$2.4 M.
Receivables	400	■ Based on 60-day average collection period; (net sales of \$2.4 M)/(360/60).
Inventory	180	■ Based on an annual turnover of 8; (cost of goods sold of \$1.44 M)/8.
Current assets	<u>\$ 676</u>	
Net fixed assets	500	■ \$500,000 at beginning of year and capital expenditures expected to equal depreciation charge for the year.
Total assets	<u><u>\$ 1,176</u></u>	
<hr/>		
Liabilities		
Bank borrowings	\$ 27	■ Plug figure equal to total assets minus all the individual items listed below.
Accounts payable	60	■ 1 month's purchases; (.5)(cost of goods sold of \$1.44 M)/12.
Accrued expenses	72	■ Estimated at 3% of sales of 2.4 M.
Current liabilities	<u>\$ 159</u>	
Long-term debt	225	■ \$300,000 minus year-end \$75,000 principal payment.
Common Stock	100	■ No change expected.
Retained earnings	692	■ \$500,000 plus \$192,000 change in retained earnings per forecast income statement.
Total liabilities and shareholders' equity	<u><u>\$ 1,176</u></u>	

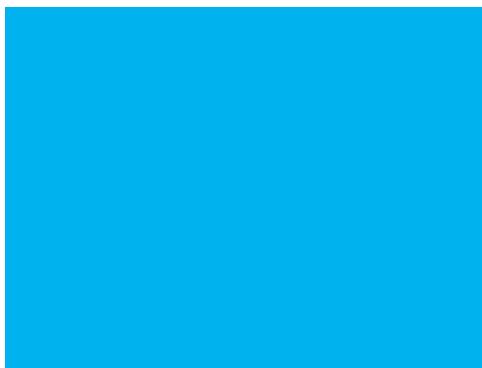
SOLUTIONS TO APPENDIX SELF-CORRECTION PROBLEMS

4. a. $\text{SGR} = \frac{0.75(0.04)(1.6667)}{0.6667 - [0.75(0.04)(1.6667)]} = \mathbf{8.11\%}$

b. $\text{SGR} = \left[\frac{(12 + 1 - 0.3)(1.80)(1.6129)}{1 - [(0.05)(1.80)(1.6129)]} \right] \times \left[\frac{1}{30} \right] - 1 = \mathbf{43.77\%}$

The company has moved from steady state with higher target operating efficiency, a higher debt ratio, and the sale of common stock. All of these things permit a high rate of growth in sales next year. Unless further changes in these directions occur, the SGR will decline.

Overview of Working Capital Management



Every noble acquisition is attended with risks; he who fears to encounter the one must not expect to obtain the other.

PIETRO METASTASIO

ANSWERS TO QUESTIONS

1. *Working capital management* encompasses the administration of the firm's current assets -- namely, cash and marketable securities, receivables, and inventory -- and the financing (especially, current liabilities) needed to support current assets. The fundamental decisions underlying this management involve the level of investment in current assets and the appropriate mix of short-term and long-term financing used to support this investment in current assets. Such decisions are governed by the important financial principle of a trade-off between risk and profitability. Usually, increased profitability is only possible with the addition of risk.
2. In broad terms, the profitability and risk associated with current assets are a function of the level, composition, and financing of these assets. As the level of current assets increases (a movement to a more "conservative" working capital strategy), the riskiness of the firm generally decreases -- but, so too does the firm's profitability. (See Question #8 for an exception to this "rule".)
3. The difference in the industries that accounts for the level of current assets in each is that utilities cannot store their product for future consumption. Therefore, the inventory held by utilities is limited to parts and supplies for their plant and equipment. There is no finished product inventory. The retail trade industry is at the other extreme of the spectrum. All their product first goes to inventory.
4. When we speak of *working capital*, we mean current assets. Therefore, "temporary" working capital is the amount of current assets that varies with a firm's seasonal needs, and "permanent" current assets, on the other hand, is the amount of current assets required to meet a firm's long-term minimum needs.
5. If a firm adopts a *hedging (maturity matching) approach* to financing, each asset would be offset with a financing instrument of the same approximate maturity. Temporary or seasonal variations in current assets would be financed with short-term debt. The permanent component of current assets would be financed with long-term debt or equity.
6. In general, short-term debt carries a lower explicit cost of capital. The decision to finance the permanent component of working capital with short-term debt may result in higher reported earnings per share. If stockholders do not perceive a higher risk characteristic for the firm as a result of higher proportions of short-term debt, the financial manager may be exploiting an imperfection in the capital market to maximize the wealth of stockholders. However, the existence of this imperfection is doubtful.
7. The use of permanent financing for short-term needs may result in inefficient operation of the firm. During periods of slow operation in the seasonal cycle, the firm will be unable to reduce its asset volume. Consequently, the firm will be paying for capital when it is not needed. Further, the explicit cost of long-term funds is usually higher than the cost of short-term financing. Thus, the firm is paying a higher cost of capital in exchange for a reduction in the risk characteristic of the firm. The reduction may be insignificant in relation to the cost paid for it.
8. No. Increasing the level of current assets past some level may actually increase risk as a result of the increasing risk of obsolescence of inventory, the increasing risk of uncollectible accounts, and the increasing risk of loss of purchasing power of money assets.

9. While short-term rates exceeding long-term rates makes the long-term financing method more attractive at the particular moment involved, it does not necessarily make it more attractive over a period of time. The above phenomenon is usually associated with times when interest rates are high and expected to fall. Over a period of ten years, the interest cost might be lower by financing on a short-term basis and refinancing at each maturity as opposed to long-term debt financing. This occurs because short-term rates fall sufficiently below the present long-term rate so that the total interest cost associated with short-term borrowing is lower than that associated with long-term borrowing. Another reason the firm might not wish to entirely use long-term debt is that if there are seasonal funds requirements it would be borrowing at certain times when the funds were not needed.
10. An increase in the risk of the firm occurs from several sources. First, if sinking fund or amortization payments are required for the debt, the larger amortization payments of a shortened debt schedule consume a larger and larger percentage of the period's expected net cash flow. Increasingly, as the debt maturity is shortened, smaller and smaller adverse deviations from the expected cash flow can send the firm into technical insolvency. The reduced safety margin against adverse net cash flow fluctuations results in an increased risk level for the firm.
- Second, if no amortization payments are required (i.e., the principal is due in a lump sum), shortening the maturity structure results in rolling the debt over more frequently. The firm faces the risk of not being able to refinance the maturing debt and the risk of being forced to pay higher interest payments on any refinancing available.
- Increasing the firm's liquidity increases the safety margin against adverse cash flow fluctuations (increases the probability of interest and principal repayment) and thus reduces all the risks outlined above.
11. *Too large* an investment in working capital lowers the firm's profitability without a corresponding reduction in risk. (In fact, risk might actually increase -- see answer to Question #8.) *Too small* a level of working capital could also lower profitability due to stockouts and too few credit sales (because of an overly strict credit policy).
12. A margin of safety to offset uncertainty can be provided by increasing the level of current assets of the firm, by increasing the maturity schedule of its debt, or by some combination of the two. In all cases the increased safety comes at a cost of lower profitability.

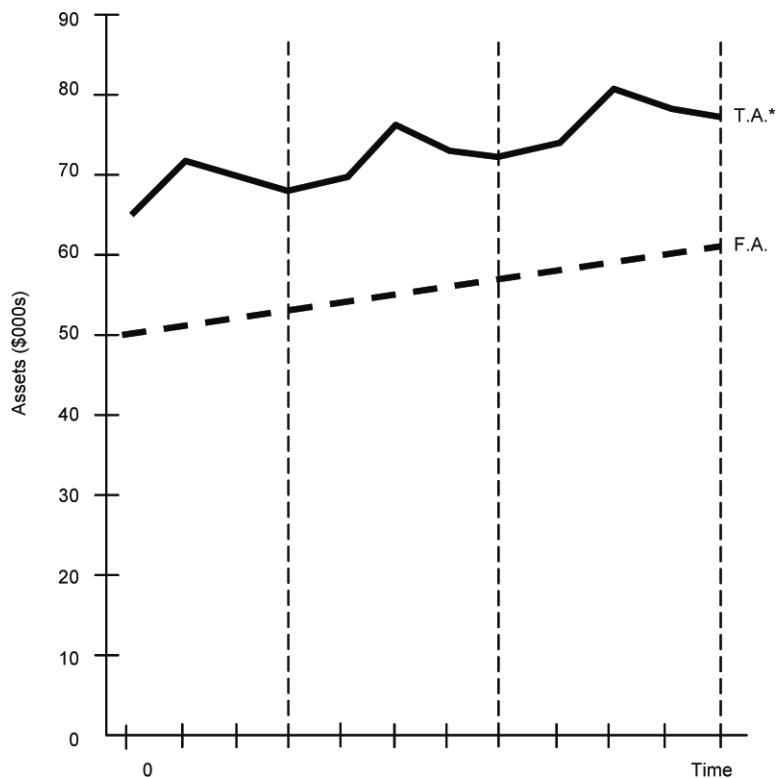
SOLUTIONS TO PROBLEMS

1. a. Total asset turnover = $\frac{\$ 280,000}{\$ 150,000} = 1.867$
- Return on assets before taxes = $\frac{\$ 28,000}{\$ 150,000} = 18.67\%$

b.

<u>Profit</u>	<u>Current Assets</u>	<u>Fixed Assets</u>	<u>Total Assets</u>	<u>Return on Assets</u>
\$28,000	\$10,000	\$100,000	\$110,000	25.45%
28,000	25,000	100,000	125,000	22.40%
28,000	40,000	100,000	140,000	20.00%
28,000	55,000	100,000	155,000	18.06%
28,000	70,000	100,000	170,000	16.47%
28,000	85,000	100,000	185,000	15.14%
28,000	100,000	100,000	200,000	14.00%

- c. The implicit assumption in (b) above is that the level of working capital has no impact on sales or costs. One can visualize situations where sales are lost as a result of stockouts and costs may increase as more lost time in production is caused by shortages of materials.



* less amount financed spontaneously by payables and accruals

- b. Finance \$14 million of working capital with permanent sources of funds. Finance fixed assets with common stock and retained earnings. Finance the temporary working capital with short-term debt.

3. a.	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
<u>Alternative 1:</u>					
Incremental borrowings	\$300,000	\$1,000,000	\$1,400,000	\$500,000	
Bank loan cost*	9,000	30,000	42,000	15,000	<u>\$ 96,000</u>
<u>Alternative 2:</u>					
Term Loan Cost	(\$500,000 at 13.5%)				\$67,500
Incremental borrowings	0	\$ 500,000	\$ 900,000	0	
Bank loan cost*	0	15,000	27,000		<u>42,000</u>
					<u>\$109,500</u>
<u>Alternative 3:</u>					
Term Loan Cost	(\$1,000,000 at 13.5%)				135,000
Incremental borrowings	0	0	\$ 400,000	0	
Bank Loan Cost*			12,000		<u>12,000</u>
					<u>\$147,000</u>

* $(11\% + 1\%)/4 = 3\%$ per quarter.

Alternative 1 is lowest in cost because the company borrows at a lower rate, 12 percent versus 13.5 percent, and because it does not pay interest on funds employed when they are not needed.

- b. While alternative 1 is cheapest it entails financing the expected build up in permanent funds requirements (\$500,000) on a short-term basis. There is a risk consideration in that if things turn bad the company is dependent on its bank for continuing support. There is risk of loan renewal and of interest rates changing.

Alternative 2 involves borrowing the expected increase in permanent funds requirements on a term basis. As a result, only the expected seasonal component of total needs would be financed with short-term debt.

Alternative 3, the most conservative financing plan of the three, involves financing on a term basis more than the expected build up in permanent funds requirements. In all three cases, there is the risk that actual total funds requirements will differ from those that are expected.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

	Policy		
	Existing	2	3
Sales (millions)	\$10.0	\$10.0	\$10.0
EBIT (millions)	1.2	1.2	1.2
Total assets (millions)	3.2	3.5	3.8
Total asset turnover	3.125	2.857	2.632
Before-tax return on assets	37.5%	34.3%	32.6%
Before-tax net profit margin	12.0%	12.0%	12.0%

The before-tax net profit margin is unchanged, as sales and earnings before interest and taxes (EBIT) are the same regardless of the liquidity policy employed.

b.

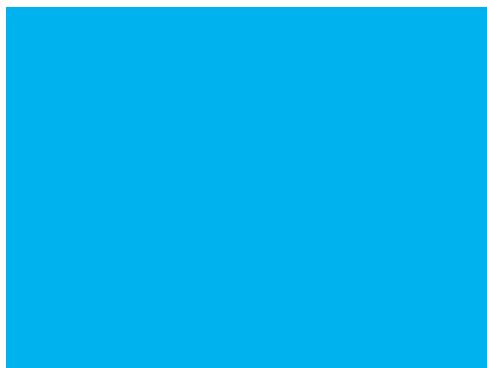
	Policy	
	2	3
Additional debt	\$300,000	\$600,000
Additional interest	45,000	90,000

The “cost” of financing additional current assets could be reduced by the amount that could be earned on any additional investment of cash in marketable securities. Also, more lenient credit terms may lead to increased sales and profits. A hidden cost is that part of the debt capacity of the firm is used up by virtue of financing increased levels of current assets with debt.



9

Cash and Marketable Securities Management



Money is like muck, not good except it be spread.

FRANCIS BACON

ANSWERS TO QUESTIONS

1. *Cash management* involves the efficient collection and disbursement of cash and any temporary investment of cash while it resides with the firm. The general idea is that the firm will benefit by “speeding up” cash receipts and “slowing down” cash payouts.
2. *Concentration banking* involves the movement of cash from lock-box or field banks into the firm’s central cash pool residing in a concentration bank. This process is needed to: (1) *improve control* over inflows and outflows of corporate cash; (2) *reduce idle cash balances*; and (3) *allow for more effective investment*.
3. The *lock-box system* may improve the efficiency of cash management by reducing the float. The funds made available by this reduction in float may be invested to produce additional profit.
4. The most important criterion for asset selection is *safety of principal*. Since the funds invested represent only temporary funds which will be needed in the short run, the ability to convert the investments into cash is more important than the expected return to be earned.
5. *Lock-box banking* provides the financial manager an opportunity to contribute to the objective of maximizing wealth by reducing the redundant assets tied up in the collection process. Reducing the funds in the collection “pipeline” will not affect the risk characteristics of the firm as these funds are reinvested in productive assets. Corporate cash balances should be reduced as a result of the lock-box banking.
6. In the “ready cash segment,” a major requirement is instant liquidity. These securities may need to be liquidated on very short notice. Safety is also of high concern. Treasury bills, because they are the safest and most marketable of all money-market instruments, would be the best choice. Commercial paper, while relatively safe, is generally held to maturity and has poor marketability.
7. *Compensating balances* are a requirement imposed by a bank. Usually, the requirement is expressed in terms of an average collected balance. Its purpose is to compensate the bank for the activity in the account (checks cleared, deposits accepted, transfers, etc.). These things cost the bank money to administer and the bank hopes to earn enough on the balances maintained to offset its costs. Because the activity in an account varies by company, so too will the compensating balance requirement.
8. *Net float* is the dollar difference between the balance shown in a firm’s checkbook balance and the balance on the bank’s books. Until a check is collected at the bank, it is not deducted on the bank’s books. A company can “play the float” by anticipating the size of net float, reducing bank balances not needed to cover checks actually presented for payment, and using these otherwise idle funds until needed.
9. Marketable securities serve as a temporary investment for funds which later will be needed for transaction purposes. They also serve as a liquidity buffer for unforeseen cash drains. This buffer can be quickly converted into cash. In this sense, marketable securities serve as precautionary balances.

10. Cash inflows would need to be perfectly synchronized with cash outflows and there would need to be complete certainty. In the real world, these conditions seldom, if ever, would be met.
11. The three motives for holding cash are: (1) *transactions* to meet ordinary payments; (2) *precautionary* to maintain a safety cushion or buffer against unexpected cash drains; and (3) *speculative* to try to take advantage of temporary opportunities.
12. Treasury bills are the most liquid securities available; they have tremendous marketability. Moreover, they are risk free with respect to default. For these reasons they provide the lowest return of the money-market instruments. Bankers' acceptances are marketable, though less so than Treasury bills. They have a degree of default risk in that banks can fail. As a result, they yield more than bills. Both instruments serve the liquidity needs of the corporate investor, have comparable maturities and are traded in impersonal markets where funds flow on the basis of risk and return.
13. *Electronic commerce (EC)* is the exchange of business information in an electronic (non-paper) format. At the structured end of the EC spectrum, we find *electronic data interchange (EDI)*. EDI involves the transfer of business information (e.g., invoices, purchase orders, and shipping information) in a computer-readable format. *Electronic funds transfer (EFT)* and *financial EDI (FEDI)* are two subsets of EDI. The distinguishing feature of EFT is that a transfer of value (money) occurs in which depository institutions (primarily banks) send and receive electronic payments. Examples of EFT include automated clearinghouse (ACH) transfers and wire transfers. FEDI involves the exchange of electronic business information (non value transfer) between a firm and its bank or between banks. Examples include lock-box remittance information and bank balance information.
14. *Outsourcing* consists of subcontracting a certain business operation to an outside firm, instead of doing it "in-house." As firms have increasingly focused on the core processes of their businesses, all other essential, but non-core areas of business are candidates for outsourcing. Cash management is an essential, but generally non-core business activity. Therefore, all the major areas of cash management -- collections, disbursements, and marketable securities investment -- are ripe for outsourcing consideration.
Reducing and controlling costs is a reason often cited for outsourcing a cash management process. Other popular reasons for outsourcing include improving company focus and gaining access to world-class capabilities.
Business process outsourcing (BPO) is a form of outsourcing in which an entire business process, such as finance and accounting, is handed over to a third-part provider.
15. "Check 21" in the US created an opportunity for banks to save both time and money by encouraging check truncation (removing original paper checks from the payment processing stream). By processing fewer original checks and more electronic image files of checks and substitute checks, the time to transport check information and the costs of transporting check information are reduced.

SOLUTIONS TO PROBLEMS

1. a. $\$420,000 \times 6 = \$2,520,000$.

b. Funds released = $\$420,000 \times 2 = \$840,000$

Value of funds released on an annual basis = $\$840,000 \times 9$ percent = \$75,600

The company should not inaugurate the plan.

c. Value of funds released on an annual basis = $\$420,000 \times 9$ percent = \$37,800

The company should undertake the plan.

2. a. \$3m a day \times 0.5 days = \$ 1.5m saved in collections

\$2m + \$1m - \$2m = 1.0m increased balances

\$ 0.5m net saving in cash

$\times .07$ opportunity cost

\$35,000 annual saving

b. $\$2m \times .07 = \$140,000$ opportunity cost of maintaining

\$2m balance at New Orleans bank

- 35,000 savings under new arrangement

(see answer to part a)

\$105,000 maximum charge by New Orleans bank

3. If the company were certain of the pattern shown, it would wish to have the following deposits in its payroll account in order to cover the checks that were cashed:

Friday \$ 30,000

Monday 60,000

Tuesday 37,500

Wednesday 15,000

Thursday 7,500

\$150,000

If employee check cashing behavior is subject to fluctuations, the company will need to maintain "buffer" cash in the account. The greater the uncertainty, the greater is the buffer that will be needed.

4. a. $\$5,000 \times 41 \text{ stores} \times 6 \text{ days} = \$1,230,000$

$$\text{b. } \$15,000 \times 41 = \$615,000$$

$$\$1,230,000 - \$615,000 = \$615,000$$

$$\text{c. Interest earned} = \$615,000 \times 10\% = \$61,500$$

$$\text{Cost} = 250 \text{ transfers} \times 41 \text{ stores} \times \$7 \text{ cost} = \$71,750$$

As the cost exceeds the interest earned on the net released funds, the arrangement would not be worthwhile. The transfers are not large enough to offset the fixed cost.

5. No specific solution recommended.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a. Total time savings = $2.5 + 1 = 3.5 \text{ days}$

$$\begin{array}{rclcrcl} \text{Time} & \times & \text{daily} & & & \text{cash} \\ \text{savings} & & \text{average collection} & = & & \text{released} \\ 3.5 & \times & \$500,000 & = & & \$1,750,000 \end{array}$$

$$\text{b. } 5\% \times \$1,750,000 = \$87,500$$

- c. Since the dollar gross benefit of the lock-box system (\$87,500) exceeds the cost of the lock-box system (\$75,000), the system should be initiated.

- 2.

Security	Federal Tax	State Tax	Combined Effect	After-Tax Expected Return
Treasury bills	.30	0	.30	$(1 - .30) 8.00\% = 5.60\%$
Commercial paper	.30	.07	.37	$(1 - .37) 8.50\% = 5.36\%$
Money-market preferred stock	.09*	.07	.16	$(1 - .16) 7.00\% = 5.88\%$

$$*(1 - 0.70)(0.30) = 0.09$$

The money-market preferred is the most attractive after taxes, owing to the 70 percent exemption for federal income tax purposes. Commercial paper is less attractive than Treasury bills because of the state income tax from which Treasury bills are exempt. (In states with no income taxes, the after-tax yield on commercial paper would be higher.)

Preferred stock may not be the most attractive investment when risk is taken into account. There is the danger that interest rates will rise above the ceiling and the market value will fall. There also is default risk with respect to dividend payment, whereas Treasury bills have no default risk.



10

Accounts Receivable and Inventory Management



IN GOD WE TRUST. All others must pay cash.

ANONYMOUS

ANSWERS TO QUESTIONS

1. No. Only if the added profitability of the additional sales to the “deadbeats” (less bad-debt loss and other costs) does not exceed the required return on the additional (and prolonged) investment in accounts receivable, should the firm cease sales to these customers. Some firms (such as jewellery or audio equipment dealers) are very happy to sell to almost any “deadbeat” because their margins are *very* high.
2.
 - a. Sales unaffected; profits decreased. This policy suggests that the firm has a poor collection policy. Accounts that are collectable are being written off too quickly. Thus, the turnover is maintained at the expense of increased bad-debt losses.
 - b. Sales increased; profitability probably reduced. This policy suggests a lax collection policy or ineffective screening of poor credit risks. The final profitability position depends upon the profitability and costs of servicing the past-due accounts.
 - c. Sales decreased, profits decreased. Credit standards are probably too strict. Customers accepting credit are not of uniform high quality.
 - d. Sales decreased, profits decreased. Credit standards are probably too strict. Customers accepting credit are of uniform high quality.
3. No. Liberalizing credit terms may stimulate sales. The incremental profit may be greater than the required return on the investment necessary to finance added accounts receivable.
4. To analyze a credit applicant, one might turn to financial statements provided by the applicant, credit ratings and reports, a check with the applicant’s bank (particularly if a loan is involved), a check with trade suppliers, and a review of your own credit experience if the applicant has done business with you in the past. Each step involves a cost and the value of additional information must be balanced against the profitability of the order and the cost of the information.
5. The quality of account accepted, the credit period, the discount, and the discount period.
6. The level of sales, the level of investment in receivables, and the percent of bad-debt losses.
7. Beyond a certain point, increased expenditures will yield no results as those accounts will default regardless of the pressure brought upon them to pay.
8. A *line of credit* establishes the maximum amount of credit, that an account can have outstanding at one time. The advantage of this arrangement is that it is automatic. An order can be filled as long as it does not bring the total owed above the line. This facilitates order taking and reduces delays. However, the line must be reevaluated periodically in order to keep abreast of developments in the account.
9. *Aging accounts receivable* represents an effort to determine the age composition of receivables. A similar approach for inventory could involve determining the inventory turnover in days (ITD) of product lines and of individual products. For example, General Electric may evaluate inventory policy by comparing the trend in inventory turnover in days of home appliances. Within the home appliance category, the inventory turnover in days of refrigerators, for example, may yield an insight into inventory policy.

10. The greater the ordering costs, the more inventory that will be maintained, all other things the same, and the greater the funds that will be tied up in inventory. The greater the storage costs and cost of capital, the lesser inventory that will be maintained.
11. Efficient inventory management implies the elimination of redundant inventory and selecting a level of inventory that provides the risk-profitability trade-off desired by investors. Eliminating redundant inventory does not involve increasing risk. The profitability will increase, but since the inventory was redundant, the risk will not increase. In fact, there could be a situation where risk decreases since the risk of obsolescence is reduced. After the redundant inventory is eliminated, any further reduction of inventory will increase the risk as well as the profitability. Efficient inventory management means selecting that combination of inventory that possesses the combination of profitability and risk desired by investors.
12. The firm could lower its investment in inventories by
 - a. shortening the lead time on purchases;
 - b. improving sales forecasts;
 - c. trimming the product line or standardizing parts;
 - d. scheduling smaller, more flexible production runs; and
 - e. shifting inventory burden to suppliers (purchases shipped on consignment) or to customers (manufacturing to order or shipping upon discretion).
- Increased costs include
 - a. higher prices from suppliers;
 - b. increased ordering costs;
 - c. loss of sales due to stockout or shifted inventory burden; and
 - d. increased production costs.
13. With no variation in product demand, the firm would be able to minimize costs by maintaining a level production schedule and eliminating inventory safety stocks. With seasonal demand, however, the firm is unable to pursue such a policy. Unless production is tied exactly to sales, production decisions will influence inventory levels. For example, a level production schedule with seasonal demand results in counter-seasonal inventory movement. Likewise, with seasonal demand, a constant inventory level requires a seasonal production schedule. This interdependence of demand, production, and inventory, considerably complicates any optimal solution.
14. From the standpoint of dollars committed, the two are the same. However, inventories change rapidly over time, whereas fixed assets do not. Therefore, one is concerned with the level of investment in inventories, as opposed to the investment in a specific asset, as it would be the case with fixed asset.
15. Usually a company will use the same required rate of return for both. However, if one type of inventory was significantly more risky than the other, one might wish to apply a higher required rate of return. This might occur if the raw materials had a ready market with little price fluctuation, whereas, the finished products were subject to considerable uncertainty.

SOLUTIONS TO PROBLEMS

1.

Credit Policy	A	B	C	D
a. Incremental sales	\$2,800,000	\$1,800,000	\$1,200,000	\$600,000
b. Incremental profitability ¹	280,000	180,000	120,000	60,000
c. New receivable turnover ²	8	6	4	2.5
d. Additional receivables ³	\$ 350,000	\$ 300,000	\$ 300,000	\$240,000
e. Additional investment ⁴	315,000	270,000	270,000	216,000
f. Opportunity cost ⁵	94,500	81,000	81,000	64,800
g. (b) > (f)?	yes	yes	yes	no

¹(10% contribution margin) × (incremental sales)²(360 days/new average collection period)³(incremental sales/new receivable turnover)⁴(0.9) × (additional receivables)⁵(0.30) × (additional receivables)

The company should adopt credit policy C because incremental profitability exceeds the increased carrying costs for policies A, B, and C, but not for policy D.

2.

Credit Policy	A	B	C	D
a. Incremental sales	\$2,800,000	\$1,800,000	\$1,200,000	\$600,000
b. Percent default	3%	6%	10%	15%
c. Incremental bad-debt losses (a) × (b)	84,000	108,000	120,000	90,000
d. Opportunity cost (from Ans. #1)	94,500	81,000	81,000	64,800
e. Total costs (c) + (d)	178,500	189,000	201,000	154,800
f. Incremental profitability (from Ans. #1)	280,000	180,000	120,000	60,000
g. (f) > (e)?	yes	no	no	no

Adopt credit policy A. It is the only one where incremental profitability exceeds opportunity costs plus bad-debt losses.

3.

Credit Policy	A	B	C	D
a. Incremental sales	\$2,800,000	\$1,800,000	\$1,200,000	\$600,000
b. Percent default	1.5%	3%	5%	7.5%
c. Incremental bad-debt losses (a) × (b)	42,000	54,000	60,000	45,000
d. Opportunity cost (from Ans. #1)	94,500	81,000	81,000	64,800
e. Total costs (c) + (d)	136,500	135,000	141,000	109,800
f. Incremental profitability (from Ans. #1)	280,000	180,000	120,000	60,000
g. (f) > (e)?	yes	yes	no	no

Credit policy B now would be best. Any more liberal credit policy beyond this point would only result in more incremental costs than benefits.

4. Current investment in accounts receivable =

$$(60/360) \times ([0.8] \times [\$10,000,000]) = \$1,333,333$$

New policy investment in accounts receivable =

$$(40/360) \times ([0.8] \times [\$10,000,000]) = \$888,889$$

$$\text{Investment reduction} = \$1,333,333 - \$888,889 = \$444,444$$

$$\text{Profit from change} = (0.12) \times (\$444,444) = \$53,333$$

$$\text{Cost of change} = (0.02) \times (\$8,000,000) \times (0.60) = \$96,000$$

Change should not be made. The incremental cost (\$96,000) is higher than the incremental profit (\$53,000).

5.

	<u>Present Program</u>	<u>New Program Assuming 20% Opportunity Cost</u>	<u>New Program Assuming 10% Opportunity Cost</u>
a. Annual sales	\$12 million	\$12 million	\$12 million
b. Receivable turnover (RT) (360 days/RTD)	4.8	6	6
c. Receivable level (b) / (a)	\$2,500,000	\$2,000,000	\$2,000,000
d. Reduction from present level \$2.5M – (c)	N/A	500,000	500,000
e. Return on reduction (at 20% and 10% opportunity costs)	N/A	100,000	50,000
f. Bad-debt %-age	4%	3%	3%
g. Annual bad-debt losses (a) × (f)	\$480,000	\$360,000	\$360,000
h. Reduction in bad-debt losses \$480,000 – (g)	N/A	120,000	120,000
i. (e) + (h)	N/A	220,000	170,000

As the sum of the return on the reduction in receivables with a 20 percent opportunity cost plus, the reduction in bad-debt losses exceeds the increased collection expense of \$180,000, for which, the intensified collection program should be undertaken. If the opportunity cost is 10 percent, however, the program is not worthwhile as shown in the last column.

6. Positive factors:

- a. The firm has maintained a reasonably good cash position over the period.
- b. The firm has reduced by 50 percent its outstanding long-term debt.
- c. The firm has been increasing its net worth by \$1 million annually.
- d. The firm has taken cash discounts when offered.

Negative factors:

- a. The firm has only a “fair” Dun & Bradstreet rating.
- b. The firm has been a slow payer to trade creditors not offering a discount.
- c. The liquidity of the firm has been reduced substantially over the past three years as the acid-test ratio went from 1.28 to 1.05 to 0.92. Short-term debt and trade credit from suppliers have increased faster than total liabilities and net worth while inventory and receivable turnovers have slowed.
- d. Cost of goods sold has increased from 75.3% to 76.6% to 80.2%.

7. a. $C(Q/2) + O(S/Q) = TC$

(1×):	\$1(5,000/2)	+	\$100(5,000/5,000)	=	\$2,600
(2×):	\$1(2,500/2)	+	\$100(5,000/2,500)	=	\$1,450
(5×):	\$1(1,000/2)	+	\$100(5,000/1,000)	=	\$1,000
(10×):	\$1(500/2)	+	\$100(5,000/500)	=	\$1,250
(20×):	\$1(250/2)	+	\$100(5,000/250)	=	\$2,125

b. $Q^* = \sqrt{\frac{2OS}{C}} = \sqrt{\frac{(2)(\$100)(5,000)}{\$1}} = \sqrt{1 \text{ million}} = 1,000$

- c. It is assumed that sales are made at a steady rate, which may not be correct for textbooks. The nature of academics suggests that sales would occur at the beginning of each term.

8. a. Total number of dints required = $150,000 \times 12 = 1,800,000$

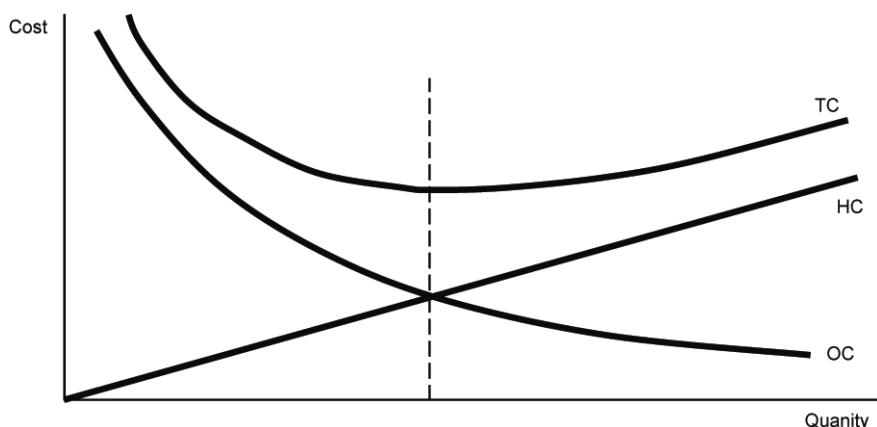
$$Q^* = \sqrt{\frac{(2)(\$200)(1,800,000)}{\$8}} = \sqrt{90,000,000} = 9,487 \text{ units}$$

b. $\begin{aligned} TC &= C(Q/2) + O(S/Q) \\ &= \$8(9,487/2) + \$200(1,800,000/9,487) \\ &= \$37,948 + \$37,947 &= \$75,895 \end{aligned}$

c. $1,800,000/9,487 = (\text{approx.}) 190 \text{ times a year, or every 2 days}$

$$\begin{aligned}
 9. \text{ a. } \text{TC} &= C(Q/2) + O(S/Q) \\
 &= (\$0.04)(Q/2) + (\$200)(5,000/Q)
 \end{aligned}$$

Q	HC	OC	TC
1,000	\$ 20	\$1,000	\$1,020
2,000	40	500	540
3,000	60	333	393
4,000	80	250	330
5,000	100	200	300
6,000	120	167	287
7,000*	140	143	283
8,000	160	125	285



b. Approximately 7,000 units, or 7,071 to be exact.

10.

Level of Safety Stock (In Gallons)	Cost of Carrying Safety Stock	Incremental Cost	Incremental Stockout Cost Savings
5,000	\$ 3,250	—	—
7,500	4,875	\$1,625	\$12,000
10,000	6,500	1,625	7,000
12,500	8,125	1,625	4,000
15,000*	9,750	1,625	2,000
17,500	11,375	1,625	1,000

The level of safety stock should be increased to 15,000 gallons from 5,000 gallons. Beyond that point incremental costs are larger than incremental benefits.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. Old receivable turnover	=	360/45	=	8 times
New receivable turnover	=	360/75	=	4.8 times
Profitability of additional sales	=	$0.2 \times \$9,000,000$	=	\$1,800,000
Additional receivables associated with the new sales	=	$\$9,000,000/4.8$	=	\$1,875,000
Investment in additional receivables associated with the new sales	=	$0.8 \times \$1,875,000$	=	\$1,500,000
Level of receivables before credit period change	=	$\$60,000,000/8$	=	\$7,500,000
New level of receivables associated with original sales	=	$\$60,000,000/4.8$	=	\$12,500,000
Investment in additional receivables associated with original sales	=	$\$12.5M - \$7.5M$	=	\$5,000,000
Total investment in additional receivables	=	$\$1.5M + \$5.0M$	=	\$6,500,000
Required before-tax return on additional investment	=	$0.20 \times \$6.5M$	=	\$1,300,000

As the profitability on additional sales, \$1,800,000, exceeds the required return on the investment in additional receivables, \$1,300,000, the company should lengthen its credit period from 30 to 60 days.

2. As the bad-debt loss ratio for the high-risk category exceeds the profit margin of 22 percent, it would be desirable to reject orders from this risk class if such orders could be identified. However, the cost of credit information as a percentage of the average order is $\$4/\$50 = 8$ percent, and this cost is applicable to all new orders. As the high-risk category is one-fifth of sales, the comparison would be 5×8 percent = 40 percent relative to the bad-debt loss of 24 percent. Therefore, the company should not undertake credit analysis of new orders.

An example can better illustrate the solution. Suppose that new orders were \$100,000, the following would then hold:

	ORDER CATEGORY		
	Low Risk	Medium Risk	High Risk
Total orders	\$30,000	\$50,000	\$20,000
Bad-debt loss	900	3,500	4,800

$$\text{Number of orders} = \$100,000/\$50 = 2,000$$

$$\text{Credit analysis cost} = 2,000 \times \$4 = \$8,000$$

To save \$4,800 in bad-debt losses by identifying the high-risk category of new orders, the company must spend \$8,000. Therefore, it should not undertake the credit analysis of new orders. This is a case where the size of order is too small to justify credit analysis. After a new order is accepted, the company will gain experience and can reject subsequent orders if its experience is bad.

3. a.

$$Q^* = \sqrt{\frac{2(O)(S)}{C}} = \sqrt{\frac{2(\$40)(20)}{100}} = 4 \text{ (thousand-unit) lots}$$

The optimal order size would be 4,000 filters, which represents five orders a month.

(Note: carrying costs (C) per 1,000-unit lot = $\$0.10 \times 1,000 = \100)

- b.

$$Q^* = \sqrt{\frac{2(O)(S)}{C}} = \sqrt{\frac{2(\$40)(20)}{50}} = 5.66 \text{ (thousand-unit) lots}$$

Since the lot size is 1,000 filters, the company would order 6,000 filters each time. The lower the carrying cost, the more important ordering costs become relatively, and the larger the optimal order size.

- c.

$$Q^* = \sqrt{\frac{2(O)(S)}{C}} = \sqrt{\frac{2(\$10)(20)}{100}} = 2 \text{ (thousand-unit) lots}$$

The lower the order cost, the more important carrying costs become relatively, and the smaller the optimal order size.

4. Inventories after change	=	\$48 million/6	=	\$8 million
Present inventories	=	\$48 million/8	=	<u>\$6 million</u>
		Additional inventories	=	\$2 million
Opportunity cost	=	\$2 million × 0.15	=	\$300,000

The opportunity cost, \$300,000, is greater than the potential savings of \$260,000. Therefore, the new production plan should not be undertaken.