Instructor's Manual

Fundamentals of Financial Management

twelfth edition

James C. Van Horne
John M. Wachowicz JR.

ISBN 0 273 68514 7

FT Prentice Hall
FINANCIAL TIMES

An imprint of Pearson Education
Harlow, England • London • New York • Boston • San Francisco • Toronto • Sydney • Singapore • Hong Kong
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Essex CM20 2JE
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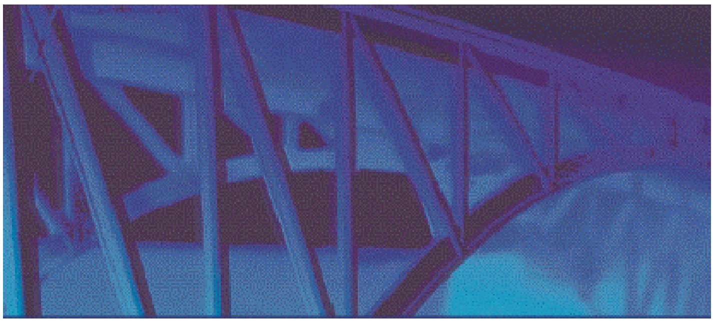
Previous editions published under the Prentice-Hall imprint
Twelfth edition published under the Financial Times Prentice Hall imprint 2005

ISBN: 0 273 68514 7



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 will 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 site 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.booksites.net/wachowicz - will also allow you access to **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.booksites.net/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.

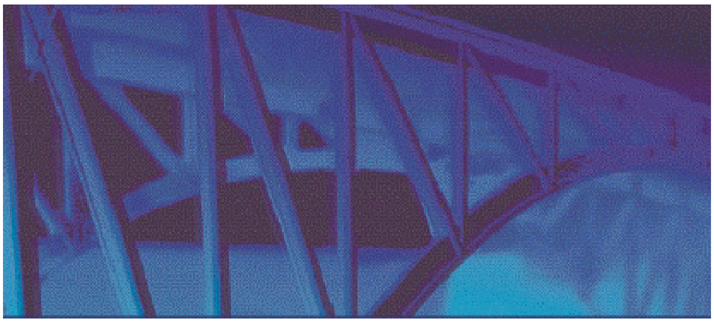
We hope that Fundamentals of Financial Management contributes to your students' understanding of finance and imparts a sense of excitement in the process. We thank you for choosing our textbook and welcome your comments and suggestions (please E-mail: jwachowi@utk.edu).

JAMES C. VAN HORNE ***Palo Alto, California***

JOHN M. WACHOWICZ, JR. ***Knoxville, Tennessee***

Part 1

Introduction to Financial Management



1
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.

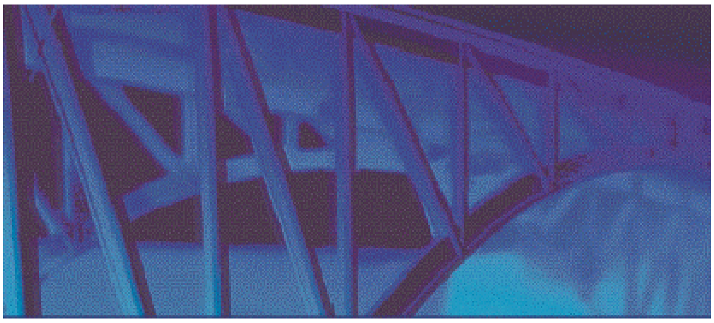
10. In competitive and efficient markets, greater rewards can be obtained only with greater risk. The financial manager is constantly involved in decisions involving a trade-off between the two. For the company, it is important that it do well what it knows best. There is little reason to believe that 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. Boards review and approve 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 Subchapter S occurs when investors have outside income against which to use losses by the company. Even with no outside income, stockholders still may find Subchapter S to be advantageous. If dividends are paid, the stockholder under Subchapter S 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 should 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. The lower the coupon rate, the greater the price volatility of a bond, all other things the same, and generally the 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 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 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 demarkation 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

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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.

		Equipment	Machine
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		3,052.80
		$28,000.00	$53,000.00

3.

	Payment	Percent Subject to Taxes	Amount Subject to Taxes	Taxes
Interest	$180,000	100%	$180,000	$61,200
Pfd. Div.	300,000	30%	90,000	30,600
				$91,800

4.

Year	Profit	Taxes	
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 20X5 = $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	921.60
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.

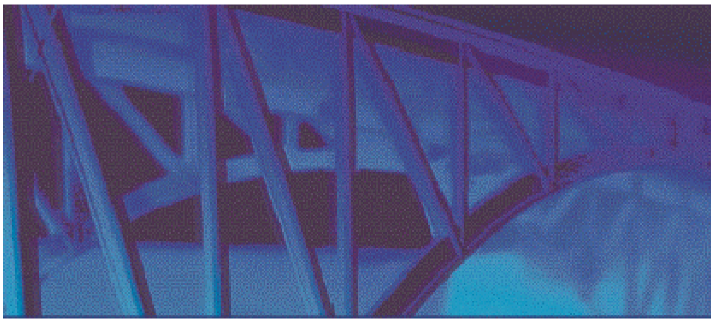
b. Before-tax profit of 1 percent on $100 million in loans equals **$1 million**.

4. a. The premium attributable to default risk and lower marketability is 9% - 7.25% = **1.75%**.

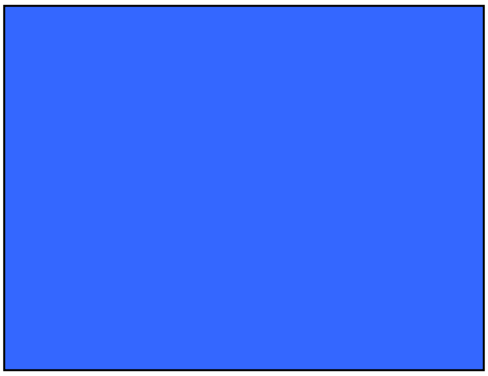
   b. The premium attributable to maturity is 7.25% - 6% = **1.25%**. In this case, default risk is held constant and marketability, for the most part, is also held constant.

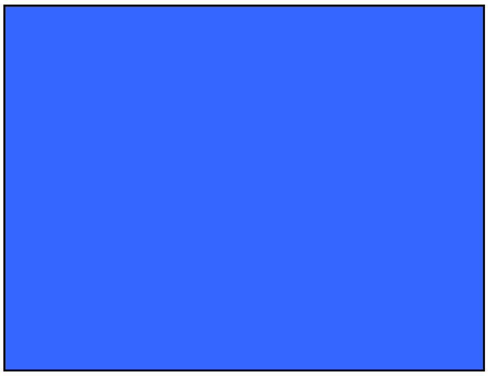
Part 2

Valuation



3
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 <u>money doubling</u> 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 toward 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

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

   $FVA_5 = \$100[([1.10]^5 - 1)/(.10)] = \$100(6.105) = 610.50$

   $\$1,416.00$

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

   $FVA_5 = \$100[([1.05]^5 - 1)/(.05)] = \$100(5.526) = 552.60$

   $\$1,190.60$

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

   $FVA_5 = \$100(5)^* = 500.00$

   $\$1,000.00$

   *[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

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

$1,557.55

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

$FVAD_5 = \$100[([1.05]^5 - 1)/(.05)] \times [1.05] =$
$\$100(5.526)(1.05) =$ 580.23

$1,250.23

(iii) $FV_6 = \$500(1.0)^6 = \$500(1) =$ $ 500.00
$FVAD_5 = \$100(5) =$ 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) $FV_3 = \$100(1 + [.10/4])^{12} = \$100(1.345) = \$\ 134.50$

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) $\$100(1 + [.10/1])^{10} = \$100(2.594) = \$259.40$
(ii) $\$100(1 + [.10/2])^{20} = \$100(2.653) = \$265.30$
(iii) $\$100(1 + [.10/4])^{40} = \$100(2.685) = \$268.50$
(iv) $\$100(2.71828)^1 = \$271.83$

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

(i) $\$100[1/(2)^3] = \$100(.125) = \$12.50$
(ii) $\$100[1/(1.10)^3] = \$100(.751) = \$75.10$
(iii) $\$100[1/(1.0)^3] = \$100(1) = \$100$

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

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

(ii) $\$500[(1 - [1/(1 + .25)^3])/.25] = \$500(1.952) = \$\ \ 976.00$

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

(i)	$\$\ \ 100[1/(1.04)^1]$ =	$\$\ \ 100(.962)$ =	$ 96.20
	$500[1/(1.04)^2]$ =	$500(.925)$ =	462.50
	$1,000[1/(1.04)^3]$ =	$1,000(.889)$ =	889.00
			$1,447.70

(ii)	$\$\ \ 100[1/(1.25)^1]$ =	$\$\ \ 100(.800)$ =	$ 80.00
	$500[1/(1.25)^2]$ =	$500(.640)$ =	320.00
	$1,000[1/(1.25)^3]$ =	$1,000(.512)$ =	512.00
			$ 912.00

d)

(i)	$\$1,000[1/(1.04)^1]$ =	$\$1,000(.962)$ =	$ 962.00
	$500[1/(1.04)^2]$ =	$500(.925)$ =	462.50
	$100[1/(1.04)^3]$ =	$100(.889)$ =	88.90
			$1,513.40

(ii)	$\$1,000[1/(1.25)^1]$ =	$\$1,000(.800)$ =	$ 800.00
	$500[1/(1.25)^2]$ =	$500(.640)$ =	320.00
	$100[1/(1.25)^3]$ =	$100(.512)$ =	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. $\$50,000 = R(FVIFA_{8\%,10})(1 + .08) = R(15.645)$

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

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.

Year		Amount	Present Value Factor at 14%	Present Value
1		$1,200	.877	$1,052.40
2		2,000	.769	1,538.00
3		2,400	.675	1,620.00
4		1,900	.592	1,124.80
5		1,600	.519	830.40
	Subtotal (a)			$6,165.60
1-10	(annuity)	1,400	5.216	$7,302.40
1-5	(annuity)	1,400	3.433	-4,806.20
	Subtotal (b)			$2,496.20
	Total Present Value (a + b)			$8,661.80

10.

Amount	Present Value Interest Factor	Present Value
$1,000	$1/(1 + .10)^{10} = .386$	$386
1,000	$1/(1 + .025)^{40} = .372$	372
1,000	$1/e^{(.10)(10)} = .368$	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.

Purchase price = $10,000 X 10.380 = $103,800

b) Discount factor for 10 percent for 15 years is 7.606

Purchase price = $10,000 X 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

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. a) $PV_0 = \$8,000 = R(PVIFA_{1\%,36})$
$= R[(1 - [1/(1 + .01)^{36}])/(.01)] = R(30.108)$

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

END OF MONTH	(1) INSTALLMENT PAYMENT	(2) MONTHLY INTEREST $(4)_{t-1} \times .01$	(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	265.88*	2.63	263.25	0.00
	$9,565.73	**$1,565.73**	**$8,000.00**	

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

b) $PV_0 = \$184,000 = R(PVIFA_{10\%,25})$

$= R(9.077)$

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

END OF YEAR	(1) INSTALLMENT PAYMENT	(2) ANNUAL INTEREST $(4)_{t-1}$ x .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	20,262.76*	1,842.07	18,420.69	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) $\$5,000,000 = R[1 + (.20/1)]^{5} = R(2.488)$

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

b) $\$5,000,000 = R[1 + (.20/2)]^{10} = R(2.594)$

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

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

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

d) $\$5,000,000 = R(e)^{(.20)(5)} = R(2.71828)^{(1)}$

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

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

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

$= \mathbf{\$295,027}$

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

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

$= \mathbf{\$276,474}$

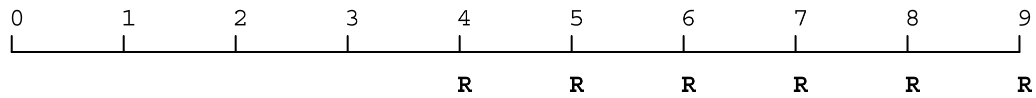
Earl's investment program is worth (\$295,027 - \$276,474) = **\$18,553** more at retirement than Ivana's program.

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:

$$
\begin{aligned}
FV_{25} &= \$1{,}000[(FVIFA_{5\%,25}) - (FVIF_{5\%,20}) - (FVIF_{5\%,18}) - (FVIF_{5\%,14})] \\
&= \$1{,}000[\ (47.727) \quad - \quad (2.653) \quad - \quad (2.407) \quad - \quad (1.980)\ ] \\
&= \$1{,}000[40.687] = \mathbf{\$40{,}687}
\end{aligned}
$$

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 ...

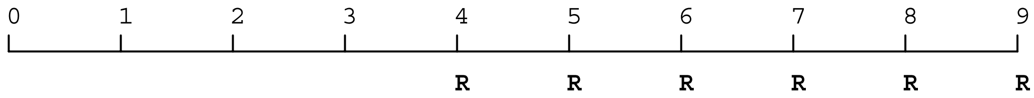
PVA_9

-- minus --

PVA_3

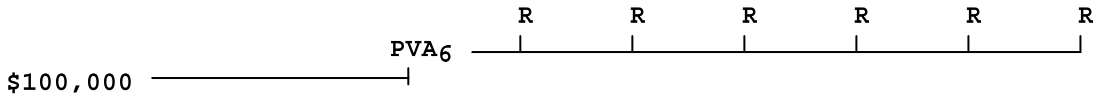
$$
\begin{aligned}
PVA_9 \quad &- \quad PVA_3 &= \$100{,}000 \\
R(PVIFA_{.05,9}) \quad &- \quad R(PVIFA_{.05,3}) &= \$100{,}000 \\
R(7.108) \quad &- \quad R(2.723) &= \$100{,}000 \\
R(4.385)& &= \$100{,}000 \\
R = \$100{,}000/(4.385)& &= \mathbf{\$22{,}805.02}
\end{aligned}
$$

Cash withdrawals at the END of year ...



Alt. #2

This above pattern is equivalent to ...



$$PVA_6 \quad x \quad (PVIF_{.05,3}) \quad = \quad \$100,000$$

$$R(PVIFA_{.05,6}) \quad x \quad (PVIF_{.05,3}) \quad = \quad \$100,000$$

$$R(5.076) \quad x \quad (.864) \quad = \quad \$100,000$$

$$R(4.386) \quad = \quad \$100,000$$

$$R \;=\; \$100,000/(4.386) \quad = \quad \mathbf{\$22,799.82}$$

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) = $(1 + [.096/1])^1 - 1$ = .0960

b. (semiannually) = $(1 + [.096/2])^2 - 1$ = .0983

c. (quarterly) = $(1 + [.096/4])^4 - 1$ = .0995

d. (monthly) = $(1 + [.096/12])^{12} - 1$ = .1003

e. (daily) = $(1 + [.096/365])^{365} - 1$ = .1007

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

f. (continuous) = $(2.71828)^{.096} - 1$ = .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.)

Alt. 1: $PVAD_{40} = (1 + .08)(\$25,000)(PVIFA_{8\%,40})$
$= (1.08)(\$25,000)(11.925) = \$321,975$

Alt. 2: $PVAD_{40} = (\$25,000)(PVIFA_{8\%,39}) + \$25,000$
$= (\$25,000)[(1 - [1/(1 + .08)^{39}])/.08] + \$25,000$

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

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 percent** (to the nearest whole percent)

ii) 72/8 = **9 percent**

iii) 72/2 = **36 percent**

For greater accuracy, we proceed as follows:

i) $(1 + i)^{14} = 2$

$(1 + i) = 2^{1/14} = 2^{.07143} = 1.0508$

i = **5 percent** (to the nearest whole percent)

ii) $(1 + i)^{8} = 2$

$(1 + i) = 2^{1/8} = 2^{.125} = 1.0905$

i = **9 percent** (to the nearest whole percent)

iii) $(1 + i)^{2} = 2$

$(1 + i) = 2^{1/2} = 2^{.5} = 1.4142$

i = **41 percent** (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	FV_5 FOR INDIVIDUAL CASH FLOWS RECEIVED AT END OF YEAR 1	2	3	4	5	TOTAL FUTURE VALUE
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 1	2	3	4	5	TOTAL PRESENT VALUE
W	$ 87.70	$153.80	$135.00	$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} Plan 1 = $500($FVIFA_{3.5\%,20}$)

= $500([(1 + .035)^{20} - 1]/[.035]) = **$14,139.84**

b. FV_{10} Plan 2 = $1,000($FVIFA_{7.5\%,10}$)

= $1,000([(1 + .075)^{10} - 1]/[.075]) = **$14,147.09**

c. Plan 2 would be preferred by a slight margin -- $7.25.

d. FV_{10} Plan 2 = $\$1{,}000(FVIFA_{7\%,10})$

$$= \$1{,}000([1 + .07]^{10} - 1]/[.07]) = \mathbf{\$13{,}816.45}$$

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 percent**.

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

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

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:

$$(1 + i)^6 = 2$$

$$(1 + i) = 2^{1/6} = 2^{.1667} = 1.1225$$

$$i = .1225 \text{ or } X\% = \mathbf{12.25\%}$$

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

b. $PV_0 = \$7{,}000(PVIFA_{8\%,20}) = \$7{,}000(19.818) = \mathbf{\$68{,}726}$

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 $(4)_{t-1} \times .14$	(3) PRINCIPAL PAYMENT (1) - (2)	(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	3,432	**421**	**3,011**	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:

```
0         1         2         3         4              19        20
|_________|_________|_________|_________|____ // _____|_________|
                 $1,000              $1,000                   $1,000
```

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.

```
0         1         2         3         4              19        20
|_________|_________|_________|_________|____ // _____|_________|
       $476.19   $476.19   $476.19   $476.19         $476.19   $476.19
```

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

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

$= (1 + [.0706/4])^{4} - 1 = .07249$ (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

$$\$10,000(1 + [.0706/4])^{2.3\overline{3}} = \$10,000(1.041669) = \mathbf{\$10,416.69}$$

8. $FVA_{65} = \$1,230(FVIFA_{5\%,65}) = \$1,230[([1 + .05]^{65} - 1)/(.05)]$

$= \$1,230(456.798) =$ **\$561,861.54**

Our "penny saver" would have been better off by (\$561,861.54 - \$80,000) = **\$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.

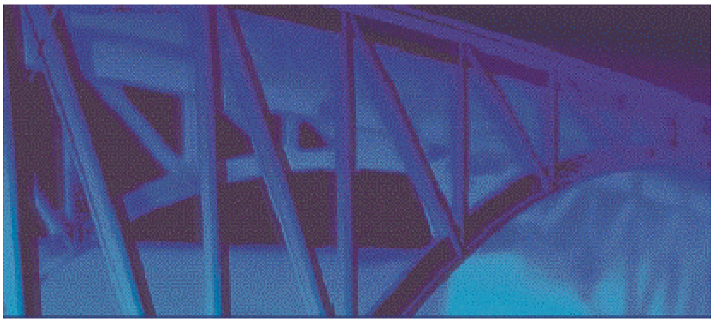
9. a. \$50,000(.08) = \$4,000 interest payment

\$7,451.47 - \$4,000 = **\$3,451.47 principal payment**

b. Total installment payments - total principal payments

= total interest payments

\$74,514.70 - \$50,000 = **\$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.

End of Year	Payment	Discount Factor (14%)	Present Value
1	$ 100	.877	$ 87.70
2	100	.769	76.90
3	1,100	.675	742.50
		Price per bond	$ 907.10

2.

End of Six-month Period	Payment	Discount Factor (7%)	Present Value
1	$ 50	.935	$ 46.75
2	50	.873	43.65
3	50	.816	40.80
4	50	.763	38.15
5	50	.713	35.65
6	1,050	.666	699.30
		Price per bond	$ 904.30

3. Current price: $P_0 = D_p/k_p$ = (.08)($100)/(.10) = $80.00

Later price: $P_0 = D_p/k_p$ = ($8)/(.12) = $66.67

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

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

= $4/$20 = 20%

5.

Phases 1 & 2: Present Value of Dividends to Be Received Over First 6 Years

	End of Year	Present Value Calculation (Dividend		x $PVIF_{18\%,t}$)		Present Value of Dividend
Phase 1	1	$\$2.00(1.15)^1 = \$2.30$	x	.847	=	\$ 1.95
	2	$2.00(1.15)^2 = 2.65$	x	.718	=	1.90
	3	$2.00(1.15)^3 =$ **3.04**	x	.609	=	1.85
Phase 2	4	**3.04**$(1.10)^1 = 3.34$	x	.516	=	1.72
	5	$3.04(1.10)^2 = 3.68$	x	.437	=	1.61
	6	$3.04(1.10)^3 = 4.05$	x	.370	=	1.50

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

Phase 3: Present Value of Constant Growth Component

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

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

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

= (\$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)/(.13 - .09) = \$37.50

   b) $P_0 = D_1/(k_e - g)$: (\$1.50)/(.16 - .11) = \$30.00

   c) $P_0 = D_1/(k_e - g)$: (\$1.50)/(.14 - .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 percent

   b) Solving for YTC by computer for the following equation

   $$\$100 = \$8/(1 + YTC)^1 + \$8/(1 + YTC)^2 + \$8/(1 + YTC)^3 + \$8/(1 + YTC)^4 + \$118/(1 + YTC)^5$$

   we get 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. $V = D_p/k_p$ = [(.09)(\$100)]/(.12) = \$9/(.12) = \$75

9. $V = (I/2)(PVIFA_{7\%,30}) + \$1,000(PVIF_{7\%,30})$

   $= \$45(12.409) + \$1,000(.131)$

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

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

    \$21 = [\$1.40(1 + g)]/(.12 - g)

    \$21(.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 = .05 or 5 percent

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

$= \$1.40(1 + .05)/\$21 = \$1.47/\$21 = .07$

c) expected capital gains yield = g = .05

11. a) P_0 = (I/2)/(semiannual yield)

$1,120 = ($45)/(semiannual yield)

semiannual yield = $45/$1,120 = .0402

b) (semiannual yield) x (2) = (nominal annual) yield

(.0402) x (2) = .0804

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

$(1 + .0402)^2 - 1 = .0820$

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

$P_0 = \$45(PVIFA_{4\%,20}) + \$1,000(PVIF_{4\%,20})$

$= \$45(13.590) + \$1,000(.456)$

$= \$611.55 + \$456 = \$1,067.55$

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

$P_0 = \$45(PVIFA_{3\%,20}) + \$1,000(PVIF_{3\%,20})$

$= \$45(14.877) + \$1,000(.554)$

$= \$669.47 + \$554 = \$1,223.47$

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

$$.01\left[\begin{array}{ll} X\left[\begin{array}{l}.03\\ \text{semiannual YTM}\end{array}\right. & \left.\begin{array}{r}\$1,223.47\\ \$1,120.00\end{array}\right]\ \$103.47 \\ \quad .15 & \$1,067.55\end{array}\right]\ \$155.92$$

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

and semiannual YTM = .03 + X = .03 + .0066 = .0366, or **3.66 percent**. (The use of a computer provides a precise semiannual YTM figure of **3.64 percent**.)

b) (semiannual YTM) x (2) = (nominal annual) YTM

(.0366) x (2) = .0732

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

$(1 + .0366)^2 - 1 = .0754$

13. a) Old Chicago's 15-year bonds should show a greater price change than Red Frog's bonds. With everything 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):

$P_0 = \$45(PVIFA_{4\%,10}) + \$1,000(PVIF_{4\%,10})$

$= \$45(8.111) + \$1,000(.676)$

$= \$365 + \$676 = \$1,041$

(Old Chicago):

$P_0 = \$45(PVIFA_{4\%,30}) + \$1,000(PVIF_{4\%,30})$

$= \$45(17.292) + \$1,000(.308)$

$= \$778.14 + \$308 = \$1,086.14$

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

a) $2(1 + .10)/(.16 - .10) = $2.20/.06 = $36.67

b) $2(1 + .09)/(.16 - .09) = $2.18/.07 = $31.14

c) $2(1 + .11)/(.16 - .11) = $2.22/.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	.572	617.76	.636	686.88
	Market value		**$800.40**		**$879.04**

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	.735	845.25
	Market value		**$1,231.80**

2.

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

	End of Year	Present Value Calculation (Dividend	x $PVIF_{16\%,t}$)		Present Value of Dividend
Phase 1	1	$\$1.60(1.20)^1 = \$1.92$	x .862	=	\$ 1.66
	2	$1.60(1.20)^2 = 2.30$	x .743	=	1.71
	3	$1.60(1.20)^3 = 2.76$	x .641	=	1.77
	4	$1.60(1.20)^4 =$ **3.32**	x .552	=	1.83
Phase 2	5	**3.32**$(1.13)^1 = 3.75$	x .476	=	1.79
	6	$3.32(1.13)^2 = 4.24$	x .410	=	1.74
	7	$3.32(1.13)^3 = 4.79$	x .354	=	1.70
	8	$3.32(1.13)^4 = 5.41$	x .305	=	1.65

$$\text{or} \quad \left[\sum_{t=1}^{8} \frac{D_t}{(1.16)^t} \right] = \mathbf{\$13.85}$$

Phase 3: Present Value of Constant Growth Component

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

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

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

$$= (\$64.33)(.305) = \mathbf{\$19.62}$$

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 x semiannual YTM). The (effective annual) YTM is equal to $(1 + \text{semiannual YTM})^2 - 1$. The problem is set up as follows:

$$\$935 = \sum_{t=1}^{20} \frac{\$40}{(1 + k_d/2)^t} + \frac{\$1,000}{(1 + k_d/2)^{20}}$$

$$= (\$40)(PVIFA_{k_d/2,20}) + MV(PVIF_{k_d/2,20})$$

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 x 4.5 percent = **9 percent**.

(ii) The (effective annual) YTM is $(1 + .045)^2 - 1$ = **9.2025 percent**.

4. a. $P_0 = FV_{20}(PVIF_{k_d/2,20})$

$(PVIF_{k_d/2,20}) = P_0/FV_{20} = \$312/\$1,000 = .312$

From Table II in the end-of-book Appendix, the interest factor for 20 periods at 6 percent is .312; therefore, the bond's semiannual yield to maturity (YTM) is **6 percent**.

b. (i) (nominal annual) YTM = 2 x (semiannual YTM)

= 2 x (.06) = **12 percent**

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

= $(1 + .06)^2 - 1$ = **12.36 percent**

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

$= ([\$1(1 + .06)]/\$20) + .06$

$= .053 + .06 = \mathbf{.113}$

b. expected dividend yield = D_1/P_0 = \$1(1 + .06)/\$20 = **.053**

c. expected capital gains yield = g = **.06**

6. a. (i) $V = (\$140/2)(PVIFA_{.06,6}) + \$1,000(PVIF_{.06,6})$

$= \$70(4.917) + \$1,000(.705)$

$= \$344.19 + \$705 = \mathbf{\$1,049.19}$

(ii) $V = (\$140/2)(PVIFA_{.07,6}) + \$1,000(PVIF_{.07,6})$

$= \$70(4.767) + \$1,000(.666)$

$= \$333.69 + \$666 =$ **\$999.69*** or **\$1,000**

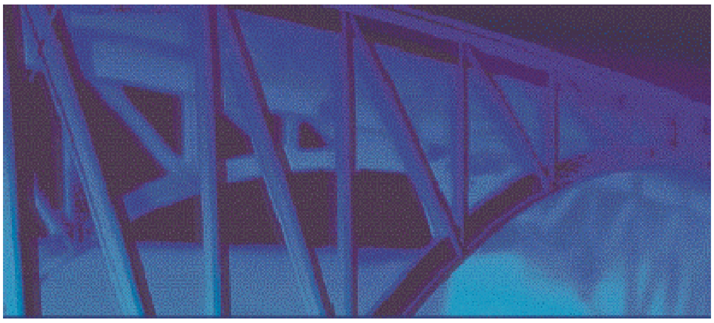
(*Value should equal \$1,000 when the nominal annual required return equals the coupon rate; our answer differs from \$1,000 only because of rounding in the Table values used.)

(iii) $V = (\$140/2)(PVIFA_{.08,6}) + \$1,000(PVIF_{.08,6})$

$= \$70(4.623) + \$1,000(.630)$

$= \$323.61 + \$630 = \mathbf{\$953.61}$

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 tradeoff 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. Req. $(R_j) = R_f + [E(R_m) - R_f]$ $Beta_j$

R_f = risk-free rate;

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 <u>only common stock</u>, 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	-.01	$(-.10 - .11)^2(.10)$
.00	.20	.00	$(.00 - .11)^2(.20)$
.10	.30	.03	$(.10 - .11)^2(.30)$
.20	.30	.06	$(.20 - .11)^2(.30)$
.30	.10	.03	$(.30 - .11)^2(.10)$
	$\Sigma = 1.00$	$\Sigma = \mathbf{.11 = \bar{R}}$	$\Sigma = \mathbf{.0129 = \sigma^2}$

$(.0129)^{.5}$ = **11.36% = σ**

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 .0968 and .0885 respectively. This means that there is **approximately a 9% 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.

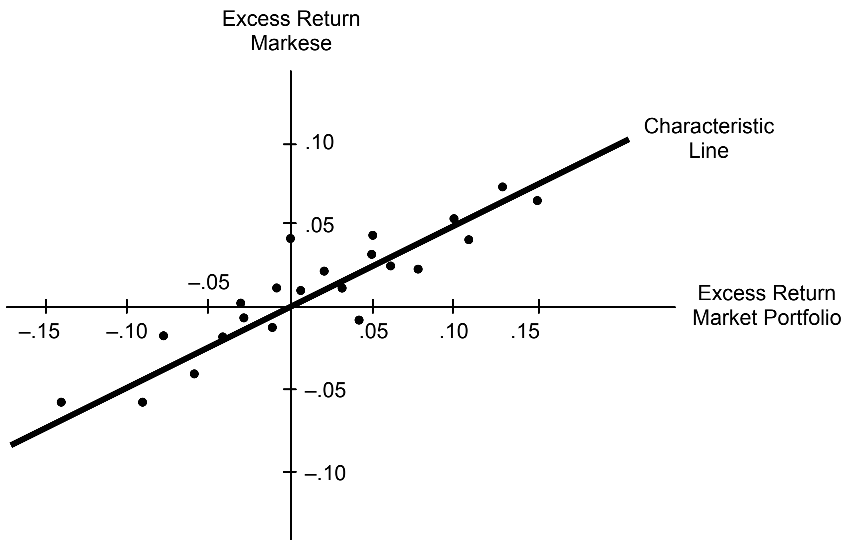
20 percent: 50 percent probability of return being above 20 percent.

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, they will not all be the 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) = .07 + (.13 - .07) (1.5) = .16

Req. (R_B) = .07 + (.13 - .07) (1.0) = .13

Req. (R_C) = .07 + (.13 - .07) (0.6) = .106

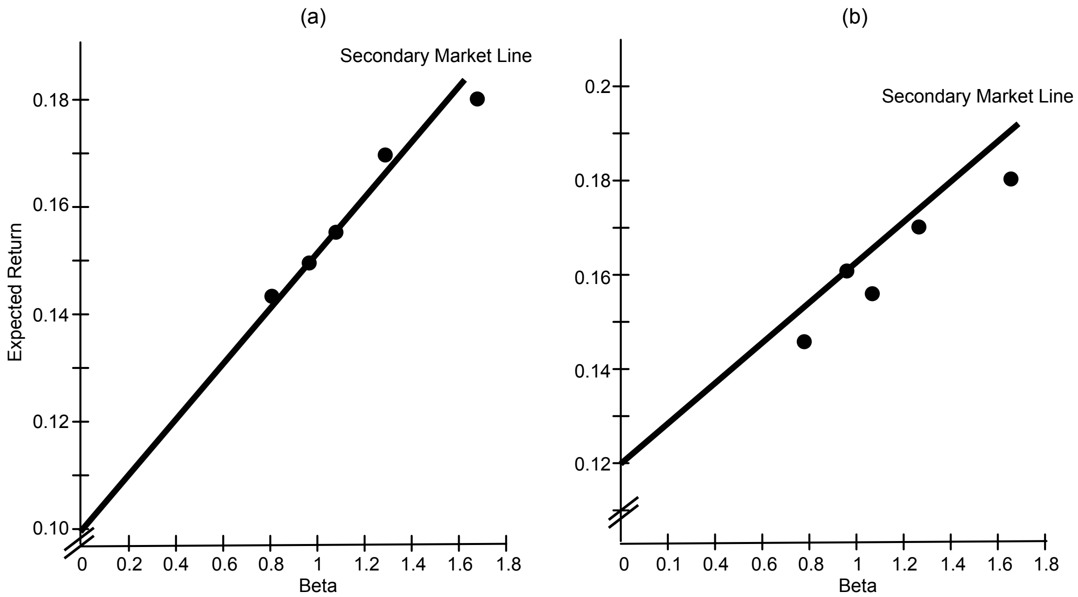
Req. (R_D) = .07 + (.13 - .07) (2.0) = .19

Req. (R_E) = .07 + (.13 - .07) (1.3) = .148

The relationship between required return and beta should be stressed.

5. Expected return = .07 + (.12 - .07)(1.67) = .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	.100	.14	.0140
KBOOM	11,000	.183	.16	.0293
JUDY	9,000	.150	.17	.0255
UPDWN	7,000	.117	.13	.0152
SPROUT	5,000	.083	.20	.0167
RINGG	13,000	.217	.15	.0325
EIEIO	9,000	.150	.18	.0270
	$60,000	1.000		**.1602**

Selena's expected return is **.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	.080	.14	.0112
KBOOM	11,000	.147	.16	.0235
JUDY	9,000	.120	.17	.0204
UPDWN	7,000	.093	.13	.0121
SPROUT	**20,000**	.267	.20	.0534
RINGG	13,000	.173	.15	.0260
EIEIO	9,000	.120	.18	.0216
	$75,000	1.000		**.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.

8. Required return = .10 + (.15 - .10)(1.08)

= .10 + .054 = .154 or 15.4 percent

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

$V = D_1/(k_e - g)$ = \$2/(.154 - .11) = \$2/.044 = **\$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	.2	.280
YUWHO	.80	.2	.160
SLURP	.60	.2	.120
WACHO	1.80	.2	.360
BURP	1.05	.1	.105
SHABOOM	.90	.1	.090
		1.0	**1.115**

The portfolio beta is **1.115**.

b) Expected portfolio return = .08 + (.14 - .08)(1.115)

= .08 + .0669 = **.1469** or **14.69%**

10. a) Required return = .10 + (.14 - .06)(1.50)

= .10 + .12 = .26 or 26 percent

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

V = D1/(ke - g) = \$3.40/(.26 - .06) = \$3.40/.20 = **\$17.00**

b) Since the common stock is currently selling for $30 per share in the marketplace, while we value it at only $17 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. $E(R_p) = (.20)(.08) + (.30)(.15) + (.50)(.12) = \mathbf{.121}$

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.

$$
\begin{array}{c c}
 & \begin{array}{ccc} \quad\text{D}\quad & \quad\text{E}\quad & \quad\text{F}\quad \end{array} \\
\begin{array}{c} \text{D} \\ \text{E} \\ \text{F} \end{array} &
\begin{bmatrix}
(.2)^2(1)(.02)^2 & (.2)(.3)(.4)(.02)(.16) & (.2)(.5)(.6)(.02)(.08) \\
(.3)(.2)(.4)(.16)(.02) & (.3)^2(1)(.16)^2 & (.3)(.5)(.8)(.16)(.08) \\
(.5)(.2)(.6)(.08)(.02) & (.5)(.3)(.8)(.08)(.16) & (.5)^2(1)(.08)^2
\end{bmatrix}
\end{array}
$$

Therefore, the standard deviation of the portfolio equals:

$$
\begin{aligned}
&[(.2)^2(1)(.02)^2 + (.3)^2(1)(.16)^2 + (.5)^2(1)(.08)^2 \\
&+ 2(.2)(.3)(.4)(.02)(.16) + 2(.2)(.5)(.6)(.02)(.08) \\
&+ 2(.3)(.5)(.8)(.16)(.08)]^{.5} = [.0073376]^{.5} = \mathbf{8.56\%}
\end{aligned}
$$

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

POSSIBLE RETURN, R_i	PROBABILITY OF OCCURRENCE, P_i	$(R_i)(P_i)$	$(R_i - \bar{R})^2(P_i)$
-.10	.10	-.010	$(-.10 - .20)^2(.10)$
.05	.20	.010	$(.05 - .20)^2(.20)$
.20	.40	.080	$(.20 - .20)^2(.40)$
.35	.20	.070	$(.35 - .20)^2(.20)$
.50	.10	.050	$(.50 - .20)^2(.10)$
	Σ = 1.00	Σ = **.200 = $\bar{R}$**	Σ = **.027 = σ^2**

$(.027)^{.5}$ = **16.43% = σ**

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 .1151 and .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% = -.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

$$P_0 = \frac{D_1}{k_e - g} = \frac{\$2(1.10)}{.1525 - .10} = \mathbf{\$41.90}$$

   c. $\bar{R} = 8\% + (13\% - 8\%).80 = \mathbf{12\%}$

$$P_0 = \frac{\$2(1.10)}{.12 - .10} = \mathbf{\$110}$$

SOLUTION TO APPENDIX A SELF-CORRECTION PROBLEM

---

3. $\bar{R}_p = (.60)(.10) + (.40)(.06) = \mathbf{8.4\%}$

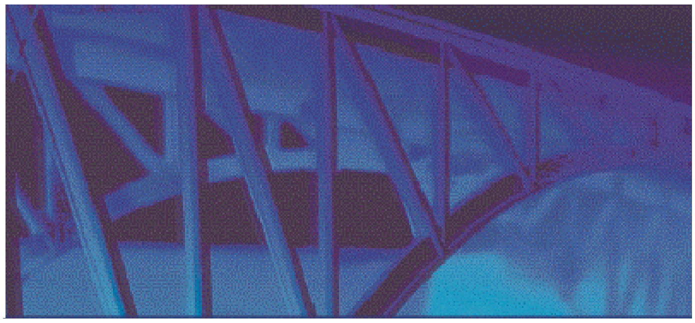
$$\sigma_p = [(.6)^2(1.0)(.05)^2 + 2(.6)(.4)(-.35)(.05)(.04) + (.4)^2(1.0)(.04)^2]^{.5}$$

In the above expression, the middle term denotes the covariance (-.35)(.05)(.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

$$\sigma_p = [.00082]^{.5} = \mathbf{2.86\%}$$

Part 3

Tools of Financial Analysis and Planning



6
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 <u>market</u> 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" (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.

Co.	(a) Total Asset Turnover	(b) Net Profit Margin	(a) x (b) Earning Power (ROI)
A	($10M/$8M) = 1.25	($.7M/$10M) = .07	.0875
B	($20M/$10M) = 2.00	($2M/$20M) = .10	.2000
C	($8M/$6M) = 1.33	($.8M/$8M) = .10	.1333
D	($5M/$2.5M) = 2.00	($.5M/$5M) = .10	.2000
E	($12M/$4M) = 3.00	($1.5M/$12M) = .125	.3750
F	($17M/$8M) = 2.125	($1M/$17M) = .0588	.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 x 365 days)/$12,680
      = 37.42 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 x Net profit margin
= $8,000 x 0.07 = $560

Profit before taxes = $560/(1 - Tax rate)
= $560/(1 - .44) = $1,000

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

Total liabilities =
(Shareholders' equity) x (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 x Current Ratio
               = $1,100 x 3 = $3,300

Net fixed assets = Total assets - Current assets
                 = $7,500 - $3,300 = $4,200

Accounts receivable =
         [(Credit sales) x (Average collection period)]/360 days
                  = [($8,000) x (45 days)]/360 days = $1,000

Inventories = Current assets - Cash - Receivables
            = $3,300 - $500 - $1,000 = $1,800

Cost of Goods Sold = (Inventories) x (Inventory turnover ratio)
                   = $1,800 x 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 - .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) $$\text{Average collection period} = \frac{\text{(average) Receivables} \times 360 \text{ days}}{\text{Annual credit sales}}$$

   45 days = ($50,000 x 360 days)/$400,000

6. a) Earning power = Sales profitability x Asset efficiency

   ROI = Net profit margin x Total asset turnover

   ROI = ($120,000/$6,000,000) x 6 = .12

   b) Total assets = Sales/Total asset turnover = $6M/6 = $1M

   "New" ROI = Net profit margin x Total asset turnover
   = .03 x ($6M/($1M x 1.2)) = .15

7. Interest on each issue:

(9-1/4s)	$2,500,000	x	.0925	=	$231,250
(12-3/8s)	$1,500,000	x	.12375	=	185,625
(10-1/4s)	$1,000,000	x	.1025	=	102,500
(14-1/2s)	$1,000,000	x	.145	=	145,000
					$664,375

EBIT/Interest expense = interest coverage ratio

$1,500,000/$664,375 = 2.26

8.

	20X1	20X2	20X3	20X4
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	100.00	105.72	107.62	121.32
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	100.00	101.85	111.08	111.99
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) (1) Current ratio = Current assets/Current liabilities
= $13M/$8M = 162.5%

(2) Acid-test ratio =
(Current assets - Inventories)/Current liabilities
= $6M/$8M = 75%

(3) Receivable turnover = Annual credit sales/Receivables
= $16M/$5M = 3.2x

(4) Inventory turnover = Cost of goods sold/Inventory
= $12M/$7M = 1.7x

(5) Long-term debt/Total capitalization
= $12M/($12M + $4M + $6M)
= $12M/$22M = 54.5%

(6) Gross profit margin = (Sales - Cost of goods sold)/Sales
= ($20M - $12M)/$20M = 40%

(7) Net profit margin = Net income after taxes/Sales
= $2M/$20M = 10%

(8)
$$\text{Return on equity} = \frac{\text{Net income after taxes} - \text{Dividends on preferred stock}}{\text{Net worth} - \text{Par value of preferred stock}}$$

= $1,760,000/($10,000,000 - $4,000,000) = 29.3%

(9) Return on assets = Net income after taxes/Total assets
= $2M/$30M = 6.7%

(10) Total asset turnover = Sales/Total assets
= $20M/$30M = 0.67x

(11) Interest coverage = EBIT/Interest charges
= $4.4M/$1.2M = 3.67x

b) (1) Ratios 1-5 uniformly indicate that liquidity is deteriorating.

(2) 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.

(3) 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).

(4) 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) (1) 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.

(2) 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	6,000,000	23.1%
	$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.

(3) 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	.43	.46	.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	.33	.32	.32
Gross profit margin	.200	.163	.132
Net profit margin	.075	.047	.026
Total asset turnover	2.80	2.76	2.24
Return on assets	.21	.13	.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. $\dfrac{\text{Long-term debt}}{\text{Equity}} = .5 = \dfrac{\text{Long-term debt}}{\$200,000}$ Long-term debt = **$100,000**

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

Total assets = **$400,000**

$\dfrac{\text{Sales}}{\text{Total assets}} = 2.5 = \dfrac{\text{Sales}}{\$400,000}$ Sales = **$1,000,000**

Cost of goods sold = (1 - gross profit margin)(Sales)
= (.9)($1,000,000) = **$900,000**

$\dfrac{\text{Cost of goods sold}}{\text{Inventory}} = \dfrac{\$900,000}{\text{Inventory}} = 9$ Inventory = **$100,000**

$$\frac{\text{Receivables x 360 days}}{\$1,000,000} = 18 \text{ days} \qquad \text{Receivables} = \mathbf{\$50,000}$$

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

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	200,000	Retained earnings	100,000
Total	$400,000	Total	$400,000

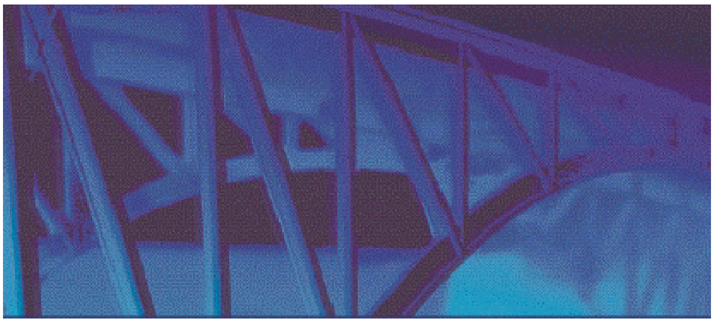
4.

COMMON-SIZE ANALYSIS (%)	**20X1**	**20X2**	**20X3**
Cash	7.9	3.8	1.7
Receivables	27.5	27.8	34.0
Inventories	28.4	25.4	27.6
Current assets	63.8	57.0	63.3
Net fixed assets	36.2	43.0	36.7
Total assets	100.0	100.0	100.0
Payables	26.1	28.6	30.4
Accruals	4.2	5.0	4.9
Bank loan	3.5	8.7	8.8
Current liabilities	33.8	42.3	44.1
Long-term debt	7.0	9.7	8.0
Shareholders' equity	59.2	48.0	47.9
Total liabilities and shareholders' equity	100.0	100.0	100.0
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	0.6	1.3	1.2
Profit before taxes	8.2	7.8	8.2
Taxes	3.3	3.0	3.5
Profit after taxes	4.9	4.8	4.7

INDEX ANALYSIS (%)	20X1	20X2	20X3
Cash	100.0	69.0	36.0
Receivables	100.0	146.2	206.4
Inventories	100.0	128.7	161.8
Current assets	100.0	128.9	165.5
Net fixed assets	100.0	171.6	169.1
Total assets	100.0	144.3	166.8
Payables	100.0	158.1	194.0
Accruals	100.0	171.4	195.0
Bank loan	100.0	360.0	420.0
Current liabilities	100.0	180.7	217.6
Long-term debt	100.0	200.0	190.0
Shareholders' equity	100.0	117.0	135.1
Total liabilities and shareholders' equity	100.0	144.3	166.8
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	100.0	257.5	273.9
Profit before taxes	100.0	119.7	137.2
Taxes	100.0	115.9	147.7
Profit after taxes	100.0	122.2	130.2

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 percentage 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 planning 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 planning 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, 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 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	$ 3
Depreciation	5	Additions to fixed assets	10
Decrease, other assets	3	Increase, accounts receivable	7
Increase, accounts payable	3	Increase, inventories	3
Increase, accrued taxes	2	Decrease, notes payable	20
Increase, long-term debt	15		
Increase, common stock	6		
Decrease, cash and equivalents	**2**		
	$43		$43

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 and cash equivalents	$ (2)
Cash and cash equivalents, December 31, 20X1	5
Cash and cash equivalents, December 31, 20X2	$ 3

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 and equivalents	**1**
	$21		$21

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	$ 14
CASH FLOW FROM INVESTING ACTIVITIES:	
Additions to fixed assets	$ (3)
Net cash provided (used) by investing activities	$ (3)
CASH FLOW FROM FINANCING ACTIVITIES:	
Dividends paid	(10)
Net cash provided (used) by financing activities	$(10)
Increase (decrease) in cash and cash equivalents	$ 1
Cash and cash equivalents, December 31, 20X1	4
Cash and cash equivalents, December 31, 20X2	$ 5

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%	30.0	30.0	35.0	40.0	50.0	50.0
Total sales, 100%	$ 60.0	$ 60.0	$ 70.0	$ 80.0	$100.0	$100.0
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			15.0	15.0	17.5	
Total cash receipts			$ 65.0	$ 72.5	$ 87.5	

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.**	$ 42.0	$ 42.0	$ 49.0	$ 56.0	$ 70.0	$ 70.0
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			4.2	4.2	4.9	
Total disbursements for cost of goods mfd.			$ 42.0	$ 48.3	$ 55.3	
Frame C: **Cash Disbursements for Selling, General, and Administrative Expenses**						
100% of current month's expense			$ 17.0	$ 18.0	$ 20.0	
Total disbursements for all operating expenses			$ 59.0	$ 66.3	$ 75.3	

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	$ 59.0	$106.3	$145.3

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	59.0	106.3	145.3
Net cash flow	6.0	(33.8)	(57.8)
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	$ 26.0	$ 20.0	$ 20.0

5.

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

	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE
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%	$350.0	$400.0	$150.0	$200.0	$200.0	$300.0	$250.0	$200.0
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			318.75	233.75	203.75	221.25	257.5	245.0

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						30.0
Total cash disbursements	$192.0	$202.0	$299.5	$302.0	$202.0	$314.5

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	192.0	202.0	299.5	302.0	202.0	314.5
Net cash flow	126.75	31.75	(95.75)	(80.75)	55.5	(69.5)
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	0.0	0.0	0.0	20.0*	(20.0)	35.0*
Ending cash balance with additional financing	$226.75	$258.5	$162.75	$102.0	$107.5	$103.0

*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)

			Assumptions and/or sources of information
Net sales		$1,300.0	■ Based on schedule of estimates.
Cost of goods sold		1,040.0	■ 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	284.5	■ Based on schedule of estimates.
Profit (loss) before taxes		(24.5)	

7.

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

Assets	Actual 12-31-X1	Change	Forecast 6-30-X2	Assumptions
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	$ 977.5	+ 10.5	$ 988.0	

Liabilities	Actual 12-31-X1	Change	Forecast 6-30-X2	Assumptions
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	$ 977.5	+ 10.5	$ 988.0	

Solutions to Appendix Problems:

8. a)

$$SGR = \frac{.60(.07)(1.50)}{.40 - [(.60)(.07)(1.50)]} = 18.69\%$$

b)

$$SGR = \left[\frac{(40-5)(1.45)(2\ \ .381)}{1-[(.06)(1.4\ \ 5)(2.381)}\right] \times \left[\frac{1}{150}\right] - 1 = 1.60\%$$

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)

$$\frac{S}{A} = \frac{(1.35)(30)}{[1.60][12 + 0.5 + (.08)(1.35)(30)]} = 1.6082$$

$A/S = 1/(S/A) = 1/(1.6082) = .6218$

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

c)

$$\frac{D}{E} = \frac{(1.35)30}{[12 + 0.5 + (.08)(1.35)(30)][1.4925]} - 1 = .724$$

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	$474
	$361		
Decrease, marketable securities	87	Increase, accounts receivable	182
Increase, accounts payable	214	Increase, inventories	251
Increase, accrued expenses	88		
Increase, bank borrowings	135		
Decrease, cash and equivalents	**22**		
	$907		$907

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	$ 230
CASH FLOW FROM INVESTING ACTIVITIES:	
Additions to fixed assets	$(474)
Decrease, marketable securities	87
Net cash provided (used) by investing activities	$(387)
CASH FLOW FROM FINANCING ACTIVITIES:	
Increase in short-term bank borrowings	$ 135
Net cash provided (used) by financing activities	$ 135
Increase (decrease) in cash and cash equivalents	$ (22)
Cash and cash equivalents, December 31, 20X1	53
Cash and cash equivalents, December 31, 20X2	$ 31

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 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 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	$500	$600	$600	$1,000	$650	$750
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			$590	$680	$890	
Purchases		$360	$600	$390	$450	
Cash disbursements for purchases and operating expenses						
100% of last month's purchases			$360	$600	$390	
Labor costs			150	200	160	
Other expenses paid			100	100	100	
Total cash disbursements			$610	$900	$650	
Cash receipts less cash disbursements			$(20)	$(220)	$240	

b.

	DEC	JAN	FEB	MAR
Beginning bank borrowings		$400	$420	$ 640
Additional borrowings		20	220	(240)
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 labor 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 12-31	Change	Forecast 3-31	Assumptions
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	1,836	- 24	1,812	■ Depreciation expected to be $24.
Total assets	$2,961	+156	$3,117	

Liabilities	Actual 12-31	Change	Forecast 3-31	Assumptions
Bank borrowings	$ 400	0	$ 400	■ Previous balance plus zero additional financing needed.
Accounts payable	360	+ 90	450	■ 100% March purchases.
Accrued expenses	212	0	212	■ 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	1,439	+ 66	1,505	■ Change in retained earnings equals sales, minus payment for purchases, minus labor costs, depreciation, and other expenses, for Jan.-Mar.
Total liabilities and shareholders' equity	$2,961	+156	$3,117	

3.

Forecast income statement (in thousands)

		Assumptions and/or sources of information
Net sales	$2,400	■ Based on sales forecast.
Cost of goods sold	1,440	■ Forecast at 60% of net sales.
Gross profit	960	
Expenses	576	■ 24% of net sales; required to produce 16% before-tax profit margin (see below).
Profit before taxes	384	■ 16% of net sales; based on an 8% net profit margin and 50% tax rate.
Taxes	192	■ Forecast at 50%.
Profit after taxes	**$ 192**	■ Forecast at 8% of net sales.
Dividends	0	■ None expected.
Increase in retained earnings	$ 192	■ Carried to forecast balance sheet.

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	$ 676	
Net fixed assets	500	■ $500,000 at beginning of year and capital expenditures expected to equal depreciation charge for the year.
Total assets	$1,176	

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	$ 159	
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	$1,176	

SOLUTIONS TO APPENDIX SELF-CORRECTION PROBLEMS

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4. a.

$$SGR = \frac{.75(.04)(1.6667)}{.6667 - [.75(.04)(1.6667)]} = \mathbf{8.11\%}$$

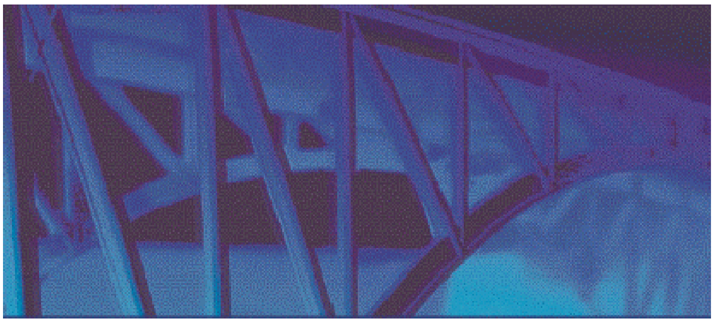
b.

$$SGR = \left[\frac{(12 + 1 - 0.3)(1.80)(1.6129)}{1 - [(.05)(1.80)(1.6129)]}\right] \times \left[\frac{1}{30}\right] - 1 = 43.77\%$$

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.

Part 4

Working Capital Management



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Overview of Working Capital Management

Every noble acquisition is attended with risk; 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. "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

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1. a) Total asset turnover $= \dfrac{\$\ 280{,}000}{\$\ 150{,}000} = \mathbf{1.867}$

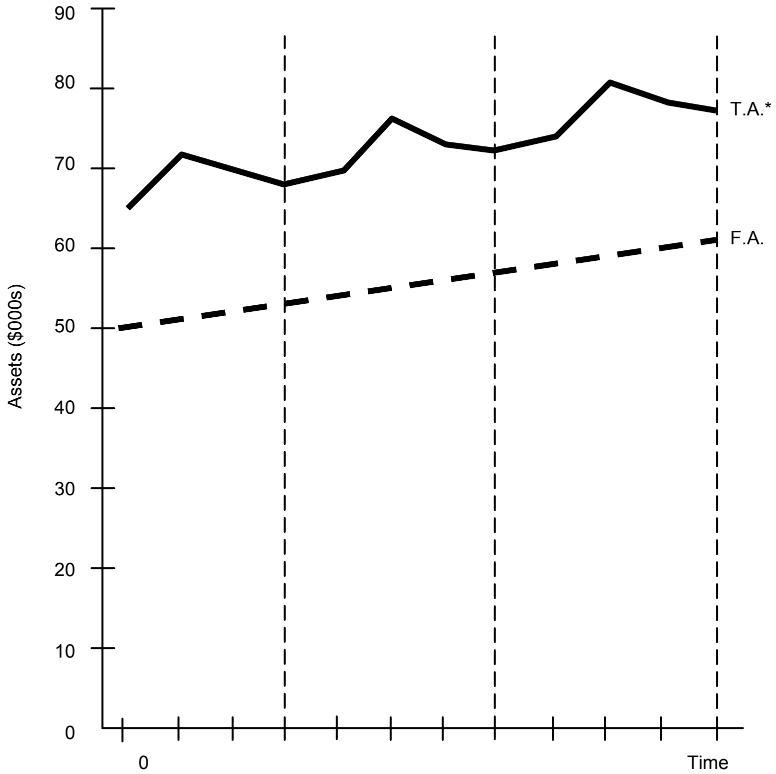
Return on assets before taxes $= \dfrac{\$\ \ 28{,}000}{\$\ 150{,}000} = \mathbf{18.67\%}$

b)

Profit	Current Assets	Fixed Assets	Total Assets	Return on Assets
$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.

2. a)



* 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
Alternative 1:					
Incremental borrowings	$300,000	$1,000,000	$1,400,000	$500,000	
Bank loan cost*	9,000	30,000	42,000	15,000	$96,000
Alternative 2:					
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		42,000
					$109,500
Alternative 3:					
Term Loan Cost	($1,000,000 at 13.5%)				135,000
Incremental borrowings	0	0	$400,000	0	
Bank Loan Cost*			12,000		12,000
					$147,000

* (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.

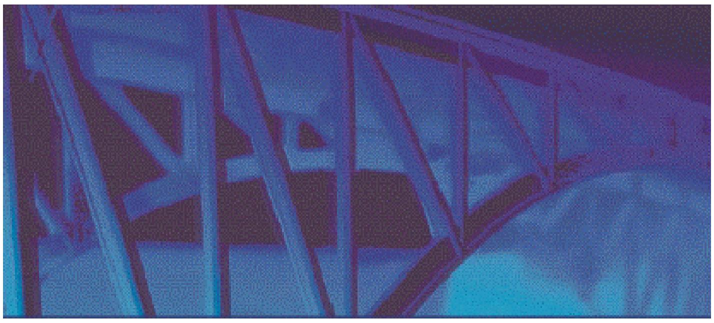
	POLICY		
	EXISTING	**2**	**3**
Sales (millions)	$10.0	$10.0	$10.0
EBIT (millions)	1.2	1.2	1.2
Total assets (millions)	3.2	3.5	3.8
Total asset turnover	3.125	2.857	2.632
Before-tax return on assets	37.5%	34.3%	32.6%
Before-tax net profit margin	12.0%	12.0%	12.0%

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. <u>Compensating balances</u> 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. <u>Net float</u> 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) <u>transactions</u> to meet ordinary payments; 2) <u>precautionary</u> to maintain a safety cushion or buffer against unexpected cash drains; and 3) <u>speculative</u> 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 lockbox 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.

SOLUTIONS TO PROBLEMS

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1. a) $420,000 x 6 = **$2,520,000**.

   b) Funds released = $420,000 x 2 = $840,000

   Value of funds released on an annual basis =

   $840,000 x 9 percent = $75,600

   The company should not inaugurate the plan.

   c) Value of funds released on an annual basis =

   $420,000 x 9 percent = $37,800

   The company should undertake the plan.

2. a)

$3M a day x 0.5 days =	$ 1.5M	saved in collections
$2M + $1M - $2M =	1.0M	increased balances
	$ 0.5M	net saving in cash
	x .07	opportunity cost
	$35,000	**annual saving**

b) $2M x .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 the buffer that will be needed.

4. a) $5,000 x 41 stores x 6 days = **$1,230,000**

b) $15,000 x 41 = $615,000

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

c) Interest earned = $615,000 x 10% = $61,500

Cost = 250 transfers x 41 stores x $7 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

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1. a. Total time savings = 2.5 + 1 = **3.5 days**

Time savings	X	daily average collection	=	cash released
3.5	X	$500,000	=	**$1,750,000**

b. 5% X $1,750,000 = **$87,500**

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

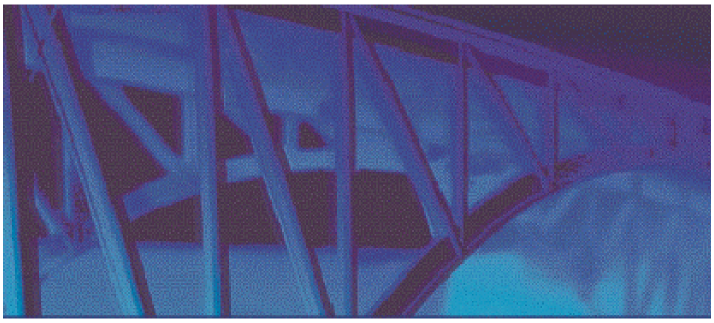
2.

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 - .70)(.30) = .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 jewelry or audio equipment dealers) are very happy to sell to almost any "deadbeat" because their margins are <u>very</u> 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 less 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.
    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.
    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 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) x (incremental sales)

[2](360 days/new average collection period)

[3](incremental sales/new receivable turnover)

[4](0.9) x (additional receivables)

[5](.30) x (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) x (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) x (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) x ([.8] x [$10,000,000]) = $1,333,333

New policy investment in accounts receivable =

(40/360) x ([.8] x [$10,000,000]) = $ 888,889

Investment reduction = $1,333,333 - $888,889 = $444,444

Profit from change = (.12) x ($444,444) = $53,333

Cost of change = (.02) x ($8,000,000) x (.60) = $96,000

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

5.

	Present Program	New Program Assuming 20% Opportunity Cost	New Program Assuming 10% Opportunity Cost
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) x (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, 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% 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
(1X):	$1(5,000/2)	+	$100(5,000/5,000)	=	$2,600
(2X):	$1(2,500/2)	+	$100(5,000/2,500)	=	$1,450
(5X):	$1(1,000/2)	+	$100(5,000/1,000)	=	$1,000
(10X):	$1(500/2)	+	$100(5,000/500)	=	$1,250
(20X):	$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 x 12 = 1,800,000

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

b) TC = C(Q/2) + O(S/Q)

= $8(9,487/2) + $200(1,800,000/9,487)

= $37,948 + $37,947 = $75,895

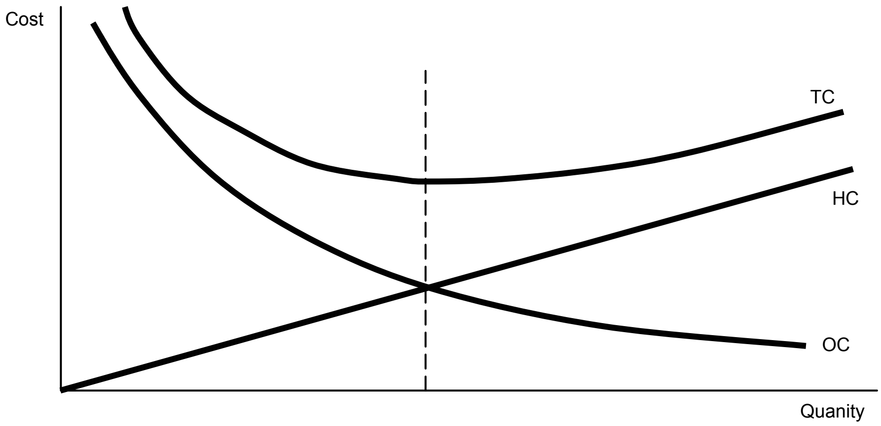
c) 1,800,000/9,487 = (approx.) 190 times a year, or every 2 days

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

= ($.04)(Q/2) + ($200)(5,000/Q)

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)



c) 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	=	.2 x $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	=	.8 x $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	=	.20 X $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%, and this cost is applicable to all new orders. As the high-risk category is one-fifth of sales, the comparison would be 5 X 8% = 40% relative to the bad-debt loss of 24%. 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

Number of orders = $100,000/$50 = 2,000

Credit analysis cost = 2,000 X $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.

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

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

(Note: carrying costs (C) per 1,000-unit lot = $.10 X 1,000 = $100)

b.

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

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.

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

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

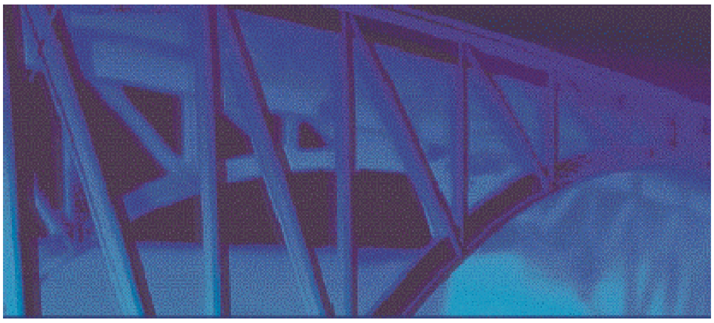
4. Inventories after change = $48 million/6 = $8 million

Present inventories = $48 million/8 = $6 million

Additional inventories = $2 million

Opportunity cost = $2 million X .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.



11
Short-Term Financing

Creditors have better memories than debtors, and creditors are a superstitious sect—great observers of set days and times.

BENJAMIN FRANKLIN

ANSWERS TO QUESTIONS

1. Trade credit from suppliers is spontaneous because there is no formal negotiation for the funds. By merely purchasing merchandise on credit, funds are acquired.

2. The reasons trade credit from suppliers is used to finance temporary working capital are as follows:
   a) Firms may be erroneously calculating the cost of this financing for, say, 60 days as the annual cost. Therefore, "2/10, net 60" is calculated as only 2% rather than (2/98)(365/50) = 14.9%.
   b) It may be that firms prefer the convenience of spontaneous funds.
   c) Seasonal dating and stretching payables may reduce the financing cost to a level competitive with short-term bank loans.

3. Stretching payables creates problems for suppliers since their ability to forecast cash flows is substantially impaired. The more uncertain the cash projections, the higher the level of protective liquidity a firm must hold. Also, investors may perceive a higher degree of risk for the supplier, thus increasing the supplier's cost of capital. Methods of preventing the stretching of payables include severe penalties for late payment (such as a 10% late charge), friendly reminders to the customers, and other acceptable collection procedures.

4. The firm could expect its liquidity to be improved. The cost to the firm's customers of not taking cash discounts has risen drastically (from 9.3% to 37.2%). Thus, customers will tend to borrow money from banks and other sources in order to receive the cash discount. This will tend to increase the selling firm's turnover, and decrease the firm's investment in accounts receivable, thereby increasing the firm's liquidity. Of course the customer's position is exactly reversed.

5. There is far less ability to change the amount of financing provided by accrued expenses than there is with trade credit. The amount largely depends on the amount of wages and profits.

6. The rate on commercial paper is lower than the prime rate since the high quality borrower, who is able to issue commercial paper, can get the prime rate at the bank. Lenders can buy treasury bills; therefore, to induce lenders to buy commercial paper, a higher rate must be paid. To induce borrowers to issue commercial paper, a rate lower than prime, but more than the T-bill rate, must be available.

7. The commercial paper market is not available to all firms. Also, the market is very impersonal compared to a bank.

8. For the most part, commercial paper is restricted to large, high quality industrial companies, finance companies, and utilities. Whereas the purpose originally was to support seasonal borrowings,

and this still remains an important purpose, a good deal of the commercial paper issued today represents permanent financing. It is simply rolled over at maturity.

9. While both represent money-market, short-term instruments, a bankers' acceptance has a viable secondary market whereas commercial paper does not. Bankers' acceptances are associated with a specific shipment of goods or storage of goods. With this instrument, the acceptance of the draft by a bank substitutes the bank's credit for that of the parties involved. Similarly, if commercial paper is "bank supported," a bank provides a letter of credit guaranteeing the obligation. With "stand alone" commercial paper, the company often must have backup lines of credit from banks. Both instruments are rated as to quality by independent rating agencies.

10. A line of credit is an informal lending arrangement, usually for one year, where the bank expresses a willingness to lend up to some specified amount of funds at an interest rate related to the prime rate or to the bank's cost of funds. A revolving credit agreement is a legal commitment to extend credit up to some maximum amount anytime a company wishes to borrow. Usually the commitment is for multiple years, often three. Also, the company must satisfy certain restrictions (called protective covenants) specified in the agreement. If satisfied, however, the loan cannot be denied whereas it can be legally denied under a line of credit should the company evolve itself into financial difficulty.

11. Because interest is subtracted from the amount advanced, a discount note has a higher effective rate of interest than a note where interest is collected at the end (everything else being equal). Therefore, a borrower will prefer a collect note and the lender a discount note, all other things the same.

12. The quality of the borrower and its cash flow ability to service debt largely determine whether a lender is willing to make an unsecured loan. If the lender does not have a very high degree of confidence in the ability of the borrower to repay, it will insist on some type of secured lending arrangement.

13. The percentage advanced depends on the marketability of the collateral, the synchronization of its life with that of the loan, and the basic riskiness of the collateral. With respect to the latter, the lender is concerned with fluctuations in market price.

14. The analysis should be on the basis of costs and benefits. Typically, the factoring arrangement will be more costly as a method of financing. However, the sale of receivables eliminates clerical and credit costs the company would otherwise have to bear. For the small company, these can be significant on a relative basis and more than offset the difference in financing costs. Also, because of economies of scale, the factor may be able to do a better job of credit analysis and record keeping.

15. No answer suggested.

16. a) Industries whose products are relatively standard, easily disposed of, and physically suitable for storage are often financed by terminal or field warehousing.

    b) Smaller, undercapitalized firms frequently resort to accounts receivable assignment or to factoring, depending upon their ability to, and the relative costs of, maintaining an independent credit analysis department.

    c) Due to capital market restrictions, international companies may seek to raise funds outside their domestic countries. Eurodollar loans may be an attractive source for such companies.

    d) Trust receipt loans are used frequently in the automotive industry because it relieves the dealer of extensive inventory carrying costs, and affords the manufacturer greater product exposure.

17. In determining an appropriate composition of short-term financing, such things as the relative cost of funds, the availability of different types of financing, whether or not the type of financing requires security, the timing of the borrowing in the money market or from a private lender, and the flexibility associated with the various types of potential financing should be considered. All of these things can change over time with changing financial market conditions.

SOLUTIONS TO PROBLEMS

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1. a) Mr. Blunder is confusing the percentage cost of using funds for five days with the cost of using funds for a year. These costs are clearly not comparable. One must be converted to the time scale of the other.

   b) (2/98)(365/5) = 149.0%

   c) Assuming the firm has made the decision not to take the cash discount, it makes no sense to pay before the due date. In this case, payment 30 days after purchases are received rather than 15 would reduce the annual interest cost to 36.7%.

2.

	Alt. #1: Discount in $	or	Alt. #2: Discount as %
a)	($5/$495)(365/10) = 36.9%		(1/99)(365/10) = 36.9%
b)	($20/$980)(365/30) = 24.8%		(2/98)(365/30) = 24.8%
c)	($2/$98)(365/5) = 149.0%		(2/98)(365/5) = 149.0%
d)	($7.50/$242.50)(365/20) = 56.4%		(3/97)(365/20) = 56.4%

3. No. Assume credit terms of "2/10, net 30." For a $100 invoice, the annual interest cost would be:

   ($2/$98)(365/20) = 37.2%

   For a $500 invoice, the annual cost would be the same:

   ($10/$490)(365/20) = 37.2%

4.

	Alt. #1: Discount in $		or	Alt. #2: Discount as %	
a)	($5/$495)(365/20)	= 18.4%		(1/99)(365/20)	= 18.4%
b)	($20/$980)(365/40)	= 18.6%		(2/98)(365/40)	= 18.6%
c)	($2/$98)(365/15)	= 49.7%		(2/98)(365/15)	= 49.7%
d)	($7.50/$242.50)(365/30)	= 37.6%		(3/97)(365/30)	= 37.6%

- The major advantage of stretching is the substantial reduction effected in annual interest cost.
- The major disadvantages of stretching are the cost of the cash discount foregone and the possible deterioration in credit rating.

5. i) ($5,000,000)(.60)(.10) = $300,000 in interest

($5,000,000)(.40)(.005) = 10,000 in commitment fees

$310,000 in annual dollar cost

ii) $$\frac{\$310,000 \text{ in annual dollar cost}}{\$3,000,000 \text{ in useable funds}} = 10.33\%$$

iii) With 20 percent utilization we have:

($5,000,000)(.20)(.10) = $100,000 in interest

($5,000,000)(.80)(.005) = 20,000 in commitment fees

$120,000 in annual dollar cost

$$\frac{\$120,000 \text{ in annual dollar cost}}{\$1,000,000 \text{ in useable funds}} = 12\%$$

The annual dollar cost goes down, while the annual percentage cost goes up as less of the total revolving credit agreement is utilized. Declining interest costs, rising commitment fees, and declining useable funds combine to produce this result.

6. a) $$\frac{(\$100{,}000 \times .08) \text{ in interest}}{(\$100{,}000 - \$8{,}000 - \$10{,}000) \text{ in useable funds}} = 11.1\%$$

b) $$\frac{(\$100{,}000 \times .09) \text{ in interest}}{(\$100{,}000 - \$9{,}000 - \$10{,}000) \text{ in useable funds}} = 11.1\%$$

c) $$\frac{(\$100{,}000 \times .105) \text{ in interest}}{\$100{,}000 \text{ in useable funds}} = 10.50\%$$

Alternative (c) is best because it has the lowest effective interest cost.

7. a)

Interest cost ($200,000 x .10)(90/365)	=	$ 4,932
Warehousing cost	=	3,000
Efficiency cost	=	4,000
Total 90-day cost		$11,932

b) Interest cost ($200,000 x .23)(90/365) = $11,342

Alternative (b), the floating lien loan, is preferred.

8. Factoring costs (monthly):

- Purchase of receivables
  (.02)(.70)($500,000) = $7,000

- Lending arrangement
  (.015)($100,000) = 1,500

  $8,500

Banking financing costs (monthly):

Interest (.15/12)($100,000)	=	$1,250
Processing (.02)($100,000)	=	2,000
Credit department expense	=	2,000
Bad-debt expense (.01)(.70)($500,000)	=	3,500
		$8,750

The firm should continue its factoring arrangement -- it's cheaper.

9. Differential interest cost (Finance company minus Bank) =

7.5 percent - 2.5 percent = 5 percent. Quarterly differential =

5 percent/4 = 1.25 percent.

Interest cost savings:

Quarter	Inventories	Inventories x 1.25%
1	$1,600,000	$ 20,000
2	2,100,000	26,250
3	1,500,000	18,750
4	3,200,000	40,000
	Annual savings	$105,000

Annual servicing costs of the trust receipt loan =

$20,000 x 4 = $80,000. As the savings exceed the increased costs, the company should utilize the trust receipt financing arrangement.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1.
a.	1/10, net/30	(1/99)(365/20)	=	**18.4%**
b.	2/10, net/30	(2/98)(365/20)	=	**37.2%**
c.	3/10, net/30	(3/97)(365/20)	=	**56.4%**
d.	10/30, net/60	(10/90)(365/30)	=	**135.2%**
e.	3/10, net/60	(3/97)(365/50)	=	**22.6%**
f.	2/10, net/90	(2/98)(365/80)	=	**9.3%**
g.	3/10, net/90	(3/97)(365/80)	=	**14.1%**
h.	5/10, net/100	(5/95)(365/90)	=	**21.3%**

2. Annualized costs are as follows:

   a. Trade credit: (3/97)(365/20) = **56.47%**

   b. Bank financing: ($5,000,000 x .15)/($4,400,000) = **17.05%**

   c. Commercial paper: ($300,000/$4,400,000) x 2 = **13.64%**

   The bank financing is approximately 3.4 percent more expensive than the commercial paper; therefore, commercial paper should be issued.

3. Annualized costs are as follows:

   a. Trade credit: If discounts are not taken, up to $97,000 (i.e., 97% x $50,000 per month x 2 months) can be raised after the second month. The cost would be

   (3/97)(365/60) = **18.8%**

b. Bank loan: Assuming that the compensating balance would not otherwise be maintained, the cost would be

($106,000 x .13)/($106,000 x .90) = **14.4%**

c. Factoring: Factor fee for the year would be 2% x ($150,000 x 12) = $36,000. The savings effected, however, would be $30,000, giving a net factoring cost of $6,000. Borrowing $95,000 on the receivables would thus cost approximately

([.12 x $95,000] + $6,000)/$95,000 = **18.3%**

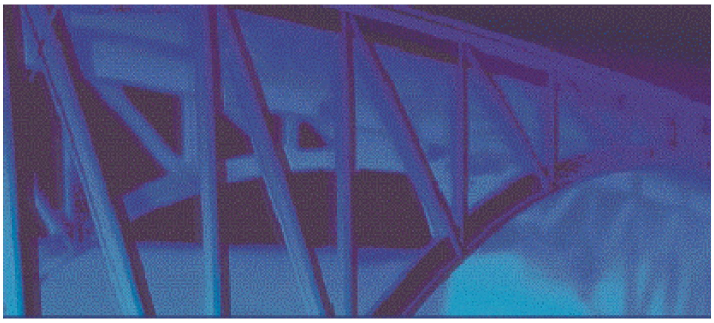
Bank borrowing would thus be the cheapest source of funds.

4.	a.	12% of 80 percent of $400,000 for 6 months	$19,200
		Terminal warehousing cost for 6 months	7,000
		Six-month cost of cash discount foregone to extend payables from 10 days to 40 days:	
		(2/98)(365/30)($80,000)(1/2 year)	
		= .2483 x $80,000 x .5	9,932
		Total six-month cost	**$36,132**
	b.	$400,000 x 20% x 1/2 year	**$40,000**
	c.	10% of 70 percent of $400,000 for 6 months	$14,000
		Field warehousing cost for 6 months	10,000
		Six-month cost of cash discount forgone to extend payables from 10 days to 40 days:	
		(2/98)(365/30)($120,000)(1/2 year)	
		= .2483 x $120,000 x .5	14,898
		Total six-month cost	**$38,898**

The terminal warehouse receipt loan results in the lowest cost.

Part 5

Investment in Capital Assets



12
Capital Budgeting and Estimating Cash Flows

"Data! data! data!" he cried impatiently. "I can't make bricks without clay."

SHERLOCK HOLMES
IN *THE COPPER BEECHES*

ANSWERS TO QUESTIONS

1. Tax depreciation is a noncash charge against operating income that lowers taxable income. So we need to deduct it as we determine the incremental effect that the project has on taxable income. However, we ultimately add it back to the net change in income after taxes so as not to understate the project's effect on cash flow.

2.

	Initial Cash Outflow	Depreciable Basis
a) Market value of old machine	Subtract (if sold); any taxes due to sale of old machine would be added	Ignore
b) Additional investment in inventory	Add	Ignore
c) Shipping	Add	Add
d) Concrete foundation	Add	Add
e) Training of machine operators	Add after-tax cost	Ignore

3. Sunk costs must be ignored because they do not affect incremental cash flows. With capital budgeting, one is concerned with the net cash flows that occur presently and in the future. The occurrence of past costs should not enter into the decision process.

4. If the required return is the cost of capital where the expectation of investors includes an increment for protection of purchasing power, then the benefits to be generated by a project should include the higher price of the product over time as a result of inflation. Otherwise, a bias would be introduced into the decision-making process.

5. Implied is that a project is regarded as more important, the larger it is. As a result, increasing levels of approval are necessary and more information frequently is required as well. This procedure is used by many companies under the implicit assumption that management time is valuable and must be rationed. Consequently, smaller projects frequently are approved at a low level with little scrutiny. Whether this is appropriate or not depends on the situation. There is a trade-off between the efficiency of reviewing projects and the economic gains of more sophisticated, and time consuming, analysis.

6. The product expansion project will produce new future cash revenues but will also involve higher future cash operating costs. An equipment replacement project usually involves only a reduction in costs. Both projects require an investment.

SOLUTIONS TO PROBLEMS

1. Relevant cash flows:

	0
a. Initial cash outflow	**($60,000)**

	1	2	3	4	5
b. Savings	$20,000	$20,000	$20,000	$20,000	$20,000
c. Depreciation, new	19,998	26,670	8,886	4,446	0
d. Profit change before tax (b) - (c)	2	(6,670)	11,114	15,554	20,000
e. Taxes (d) x (38%)	1	(2,535)	4,223	5,911	7,600
f. Profit change after tax (d) - (e)	1	(4,135)	6,891	9,643	12,400
g. Net cash flow (f) + (c) or (b) - (e)	**$19,999**	**$22,535**	**$15,777**	**$14,089**	**$12,400**

2. a) Relevant cash flows:

	0
a. Initial cash outflow	**($60,000)**

	1	2	3	4	5
b. Savings	$20,000	$21,200	$22,472	$23,820	$25,250
c. Depreciation, new	19,998	26,670	8,886	4,446	0
d. Profit change before tax (b) - (c)	2	(5,470)	13,586	19,374	25,250
e. Taxes (d) x (38%)	1	(2,079)	5,163	7,362	9,595
f. Profit change after tax (d) - (e)	1	(3,391)	8,423	12,012	15,655
g. Net cash flow (f) + (c) or (b) - (e)	**$19,999**	**$23,279**	**$17,309**	**$16,458**	**$15,655**

b) Relevant cash flows: (Note: net cash flows for years 1-4 remain the same as in part a) above.)

	0
a. Cost	$60,000
b. Working capital	10,000
c. Initial cash outflow - [(a) + (b)]	**($70,000)**

	5
a. Net cash flow for terminal year before project wind-up considerations	$15,655
b. Working capital recovered	10,000
c. Terminal year net cash flow (a) + (b)	**$25,000**

3. a) b)

Time of cash outflow	Amount of cash outflow: Rockbuilt	Bulldog	Net cost savings of Rockbuilt over Bulldog truck
0	($74,000)	($59,000)	($15,000)
1	(2,000)	(3,000)	1,000
2	(2,000)	(4,500)	2,500
3	(2,000)	(6,000)	4,000
4	(2,000)	(22,500)	20,500
5	(13,000)	(9,000)	(4,000)
6	(4,000)	(10,500)	6,500
7	(4,000)	(12,000)	8,000
8	5,000*	(8,500)**	13,500

* $4,000 maintenance cost plus salvage value of $9,000.

** $13,500 maintenance cost plus salvage value of $5,000.

4. Incremental cash inflows:

	END OF YEAR			
	1	2	3	4
a. Savings	$12,000	$12,000	$12,000	$12,000
b. Depreciation, new	19,998	26,670	8,886	4,446
c. Depreciation, old	4,520	0	0	0
d. Incremental depreciation (b) - (c)	15,478	26,670	8,886	4,446
e. Profit change before tax (a) - (d)	(3,478)	(14,670)	3,114	7,554
f. Taxes (e) x (40%)	(1,391)	(5,868)	1,246	3,022
g. Profit change after tax (e) - (f)	(2,087)	(8,802)	1,868	4,532
h. Operating cash flow change (g) + (d) **or** (a) - (f)	13,391	17,868	10,754	8,978
i. Incremental salvage value* x (1 - .40)	0	0	0	7,800
j. Net cash flow (h) + (i)	**$13,391**	**$17,868**	**$10,754**	**$16,778**

* ($15,000 - $2,000) = $13,000

	Cost of "new" machine	$60,000
-	Current salvage value of "old" machine	(8,000)
+	Taxes due to sale of "old" machine ($8,000 - $4,520)(.40)	1,392
=	Initial cash outflow	**$53,392**

5. Incremental cash inflows:

	END OF YEAR			
	1	2	3	4
a. Savings	$12,000	$12,000	$12,000	$12,000
b. Depreciation, new	20,665	27,559	9,182	4,594
c. Depreciation, old	4,520	0	0	0
d. Incremental depreciation (b) - (c)	16,145	27,559	9,182	4,594
e. Profit change before tax (a) - (d)	(4,145)	(15,559)	2,818	7,406
f. Taxes (e) x (40%)	(1,658)	(6,224)	1,127	2,962
g. Profit change after tax (e) - (f)	(2,487)	(9,335)	1,691	4,444
h. Operating cash flow change (g) + (d) **or** (a) - (f)	13,658	18,224	10,873	9,038
i. Incremental salvage value* x (1 - .40)	0	0	0	7,800
j. Net cash flow (h) + (i)	**$13,658**	**$18,224**	**$10,873**	**$16,838**

* ($15,000 - $2,000) = $13,000

	Cost of "new" machine	$60,000
-	Current salvage value of "old" machine	(3,000)
+	Taxes due to sale of "old" machine ($4,520 - $3,000)(.40)	(600)
=	Initial cash outflow	**$56,400**

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. Incremental cash inflows:

	END OF YEAR			
	1	2	3	4
1. Savings	$100,000	$100,000	$100,000	$100,000
2. Depreciation, new	96,000	153,600	92,160	55,296
3. Depreciation, old	34,560	34,560	17,280	0
4. Incremental depreciation (2) - (3)	61,440	119,040	74,880	55,296
5. Profit change before tax (1) - (4)	38,560	(19,040)	25,120	44,704
6. Taxes (5) x (40%)	15,424	(7,616)	10,048	17,882
7. Profit change after tax (5) - (6)	23,136	(11,424)	15,072	26,822
8. Operating cash flow change (7) + (4) **or** (1) - (6)	84,576	107,616	89,952	82,118
9. Salvage value x (1 - .40)	0	0	0	0
10. Net cash flow (8) + (9)	**$ 84,576**	**$107,616**	**$ 89,952**	**$ 82,118**

	END OF YEAR			
	5	6	7	8
1. Savings	$100,000	$100,000	$100,000	$100,000
2. Depreciation, new	55,296	27,648	0	0
3. Depreciation, old	0	0	0	0
4. Incremental depreciation (2) - (3)	55,296	27,648	0	0
5. Profit change before tax (1) - (4)	44,704	72,352	100,000	100,000
6. Taxes (5) x (40%)	17,882	28,941	40,000	40,000
7. Profit change after tax (5) - (6)	26,822	43,411	60,000	60,000
8. Operating cash flow change (7) + (4) **or** (1) - (6)	82,118	71,059	60,000	60,000
9. Salvage value x (1 - .40)	0	0	0	24,000
10. Net cash flow (8) + (9)	**$ 82,118**	**$ 71,059**	**$ 60,000**	**$ 84,000**

Incremental cash outflow at time 0 (i.e., initial cash outflow):

Cost - Sale of old machines - Tax savings on book loss

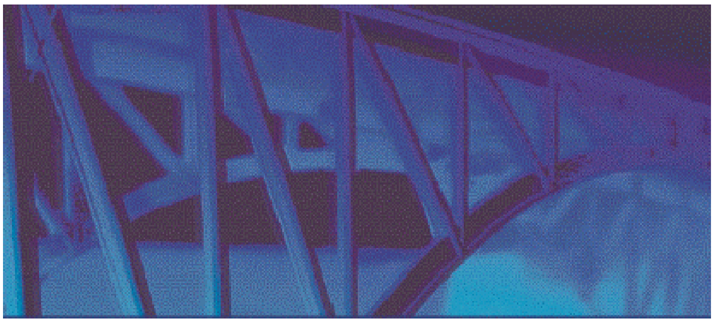
$480,000 - $70,000 - (.40)($86,400 - $70,000) = **$403,440**

2. Incremental cash inflows:

	END OF YEAR			
	1	**2**	**3**	**4**
1. Labor savings	$150,000	$150,000	$150,000	$150,000
2. Incremental maintenance	6,000	6,000	6,000	6,000
3. Depreciation	166,650	222,250	74,050	37,050
4. Profit change before tax (1) - (2) - (3)	(22,650)	(78,250)	69,950	106,950
5. Taxes (4) x (40%)	(9,060)	(31,300)	27,980	42,780
6. Profit change after tax (4) - (5)	(13,590)	(46,950)	41,970	64,170
7. Operating cash flow change (6) + (3) **or** (1) - (2) - (5)	153,060	175,300	116,020	101,220
8. Salvage value x (1 - .40)	0	0	0	30,000
9. Net cash flow (7) + (8)	**$153,060**	**$175,300**	**$116,020**	**$131,220**

Incremental cash outflow at time 0 (i.e., initial cash outflow):

$500,000 (in this case, simply the cost of the project)



13
Capital Budgeting Techniques

"These hieroglyphics have evidently a meaning. If it is a purely arbitrary one, it may be impossible for us to solve it. If, on the other hand, it is systematic, I have no doubt that we shall yet get to the bottom of it."

SHERLOCK HOLMES
IN *THE ADVENTURE OF THE DANCING MEN*

ANSWERS TO QUESTIONS

1. The time value of money refers to the fact that money has an opportunity cost, i.e., its reinvestment rate. Given a positive interest rate, a dollar invested today will yield more that one dollar in the future. Thus, capital budgeting systems such as payback, which equate the bird in the hand with one in the bush (rather than more than one) do not accurately reflect either the investment opportunities of society, or a shareholder preference for current, rather than future, consumption. As such, they are nonoptimal.

2. If the payback period is used as the criterion for assigning priorities to investment projects, the highest priority will be assigned to projects with the shortest payback period. Funds available for investment may be unavailable for long-term projects if short-term projects are acquired first.

3. It is often the case that larger projects will provide greater absolute dollar increases in the value of the firm than smaller projects simply because of the scale of the projects. This is not a problem for ranking projects unless the firm may be faced with a capital rationing constraint. For example, when faced with a single-period constraint, profitability index rankings will prove more useful in project selection.

4. The internal rate of return (IRR) is the discount rate that makes the present value of the benefits generated by a project equal to the investment. The net present value (NPV) is the difference between the present value of the benefits discounted at the required return (or cost of capital) and the investment. One essential difference between the two approaches is the implied rate of return on the reinvestment of the cash flows. The IRR assumes that the cash flows are reinvested at the IRR while the NPV assumes reinvestment at the required rate of return. Under conditions of capital rationing, or mutually exclusive projects, and of sharply rising cost of capital, this difference is very important since only one assumption is correct. In addition, problems in rankings can occur because of differences in the scale of investment and project life.

5. The payback period is unsound because the time value of money is ignored. Also, the cash flows after payback are ignored. Finally, the payback period of, say, three years may or may not be adequate to satisfy a cost of capital of, say, 10 percent. It is a popular profitability measure because of its simplicity and practicality. In a limited sense, the payback is a measure of risk. It emphasizes short-term cash flows that are important for small growing concerns. It emphasizes those cash flows that can be predicted with greatest accuracy. When used in conjunction with the NPV method, the payback can improve the decision-making process.

6. A project is mutually exclusive with another if acceptance of one rules out acceptance of the other. A dependent or contingent project depends on the acceptance of another project before it can be accepted.

7. If the use of capital budgeting techniques is widespread, capital will be allocated to the most efficient uses in society. Savings in the economy will be channeled to the most promising investment opportunities. As a result, economic growth and want satisfaction will be maximized. All of this depends on the accurate measurement of the benefits to be realized from an investment.

8. Capital rationing is done to facilitate the approval process. A division may be given an annual budget for smaller projects, with larger projects having to be approved on a project-by-project basis. In other words, capital rationing may not apply to all projects, but only to smaller ones. Beyond the desire to facilitate the administration of capital budgeting, many companies ration capital because they do not want to go to the external market for financing. While this is suboptimal if projects are available that provide returns in excess of those required, we should recognize that this reason for capital rationing frequently prevails.

9. Problems may result if the reinvestment rate available to the company differs sharply from the internal rate of return (usually

it is lower then the IRR), and the life of the project is fairly long. For example, we should not be overly concerned with a three-year project where the IRR is 16 percent but the reinvestment rate is only 13 percent. However, we should be concerned if the IRR of a 20-year project is 32 percent but the reinvestment rate is only 13 percent.

10. Yes, it should bother you. For a conventional project (i.e., a project whose cash-flow stream changes signs only once), if the discounted payback period is less than the projects useful life, the project will have a positive net present value (NPV). The projects NPV would, in fact, be equal to the present value of all cash flows occurring after the projects discounted payback period. If we reject this independent project, we would not be maximizing the value of the firm. Thus, if a firm not subject to capital rationing sets a single maximum discounted payback period as a cutoff for all independent projects, it runs the real risk of rejecting long-lived, but still positive-NPV projects.

    The discounted payback period method overcomes one shortcoming of the traditional payback period method. It accounts for the time value of money (and risk) by discounting cash flows at the cost of capital. However, it fails to consider cash flows occurring after the expiration of the discounted payback period; consequently, we cannot regard it as a measure of profitability. In addition, the maximum acceptable discounted payback period, which serves as the cutoff standard, is a purely subjective choice.

The NPV method holds several advantages over the discounted payback period method. For example, the NPV method considers all cash flows for a project, reveals the absolute dollar value added to the firm by project acceptance, and handles correctly even unconventional cash-flow patterns.

SOLUTIONS TO PROBLEMS

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1. Payback period (PBP):

	PROJECT A	
YEAR	Cash Flows	Cumulative Inflows
0	(\$9,000)(-b)	--
1	5,000	\$ 5,000
2(a)	4,000	9,000(c)
3	3,000(d)	12,000

PBP = a + (b - c)/d
= 2 + (\$9,000 - \$9,000)/\$3,000 = **2 years**

	PROJECT B	
YEAR	Cash Flows	Cumulative Inflows
0	(\$12,000)(-b)	--
1	5,000	\$ 5,000
2(a)	5,000	10,000(c)
3	8,000(d)	18,000

PBP = a + (b - c)/d
= 2 + (\$12,000 - \$10,000)/\$8,000 = **2.25 years**

	PROJECT A		
YEAR	Cash Flow	Present Value Discount Factor (15%)	Present Value
0	$(9,000)	1.000	$(9,000)
1	5,000	.870	4,350
2	4,000	.756	3,024
3	3,000	.658	1,974
		Net present value =	**$ 348***

*(Note: using a computer, rather than a present value table, we get **$346**.)

	PROJECT B		
YEAR	Cash Flow	Present Value Discount Factor (15%)	Present Value
0	$(12,000)	1.000	$(12,000)
1	5,000	.870	4,350
2	5,000	.756	3,780
3	8,000	.658	5,264
		Net present value =	**$ 1,394***

*(Note: using a computer, rather than a present value table, we get **$1,389**.)

Profitability index:

Project A = ($4,350 + $3,024 + $1,974)/$9,000 = 1.039

Project B = ($4,350 + $3,780 + $5,264)/$12,000 = 1.116

2. The payback method (1) ignores cash flows occurring after the expiration of the payback period, (2) ignores the time value of money, and (3) makes use of a crude acceptance criterion, namely, a subjectively determined cutoff point.

3. a) 7.18 percent

   b) 23.38 percent

   c) 33.18 percent

   d) IRR = $130/$1,000 = 13 percent (a perpetuity)

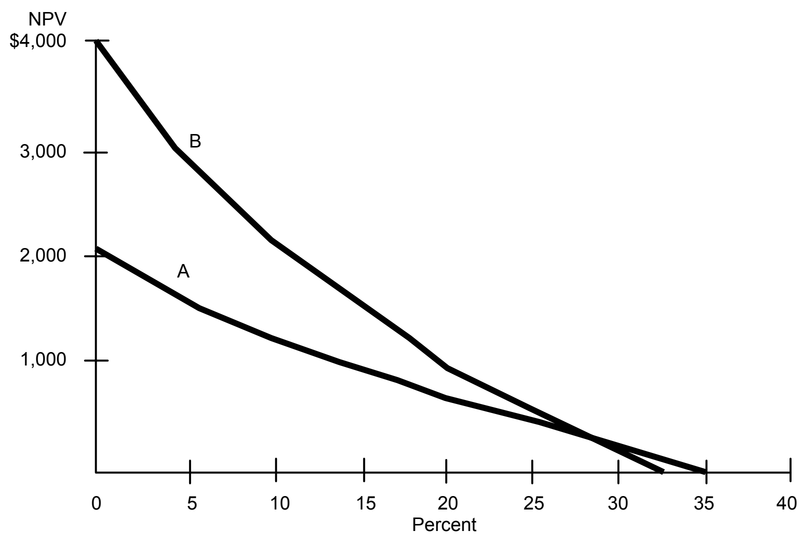
4. a) The IRR for project A is 34.90 percent.

   The IRR for project B is 31.61 percent.

   b)

Required return	NPV_A	NPV_B
0%	$2,000	$4,000
5	1,546	2,936
10	1,170	2,098
20	589	894
30	166	101
35	-3	-194

   c)



d) The superior project will be the one having the highest NPV at the required rate of return. Below about 28 percent, B dominates; at about 28 percent and above, A dominates. We are assuming that the required rate of return is the same for each project and that there is no capital rationing.

5. Cash Flows:

Project A

Savings	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000	$8,000
Depr.	(5,600)	(8,960)	(5,376)	(3,226)	(3,225)	(1,613)	0
PBT	2,400	(960)	2,624	4,774	4,775	6,387	8,000
Taxes (34%)	816	(326)	892	1,623	1,624	2,172	2,720
Cash flow (Savings - Taxes)	7,184	8,326	7,108	6,377	6,376	5,828	5,280

Project B

Savings	$5,000	$5,000	$6,000	$6,000	$7,000	$7,000	$7,000
Depr.	(4,000)	(6,400)	(3,840)	(2,304)	(2,304)	(1,152)	0
PBT	1,000	(1,400)	2,160	3,696	4,696	5,848	7,000
Taxes (34%)	340	(476)	734	1,257	1,597	1,988	2,380
Cash flow (Savings - Taxes)	4,660	5,476	5,266	4,743	5,403	5,012	4,620

a)

	PROJECT A	
YEAR	Cash Flows	Cumulative Inflows
0	($28,000)(-b)	--
1	7,184	$ 7,184
2	8,326	15,510
3(a)	7,108	22,618(c)
4	6,377(d)	22,995

PBP = a + (b - c)/d
 = 3 + ($28,000 - $22,618)/$6,377 = **3.84 years**

	PROJECT B	
YEAR	Cash Flows	Cumulative Inflows
0	($20,000)(-b)	--
1	4,660	$ 4,660
2	5,476	10,136
3(a)	5,266	15,402(c)
4	4,743(d)	20,145

PBP = a + (b - c)/d
= 3 + ($20,000 - $15,402)/$4,743 = **3.97 years**

b)

	PROJECT A		
YEAR	Cash Flow	Present Value Discount Factor (14%)	Present Value
0	$(28,000)	1.000	$(28,000)
1	7,184	.877	6,300
2	8,326	.769	6,403
3	7,108	.675	4,798
4	6,377	.592	3,775
5	6,376	.519	3,309
6	5,828	.456	2,658
7	5,280	.400	2,112
		Net present value =	**$ 1,355***

*(Note: using a computer, rather than a present value table, we get **$1,358.51**.)

	PROJECT B		
YEAR	Cash Flow	Present Value Discount Factor (14%)	Present Value
0	$(20,000)	1.000	$(20,000)
1	4,660	.877	4,087
2	5,476	.769	4,211
3	5,266	.675	3,555
4	4,743	.592	2,808
5	5,403	.519	2,804
6	5,012	.456	2,285
7	4,620	.400	1,848
		Net present value =	**$ 1,598***

*(Note: using a computer, rather than a present value table, we get **$1,599.83**.)

c) PI project A = $29,355/$28,000 = 1.05

PI project B = $21,598/$20,000 = 1.08

d) IRR project A = 15.68 percent

IRR project B = 16.58 percent

6. Relevant cash flows:

	0				
a. Initial cash outflow	**($60,000)**				
	1	**2**	**3**	**4**	**5**
b. Savings	$20,000	$20,000	$20,000	$20,000	$20,000
c. Depreciation, new	19,998	26,670	8,886	4,446	0
d. Profit change before tax (b) - (c)	2	(6,670)	11,114	15,554	20,000
e. Taxes (d) x (38%)	1	(2,535)	4,223	5,911	7,600
f. Profit change after tax (d) - (e)	1	(4,135)	6,891	9,643	12,400
g. Net cash flow (f) + (c) or (b) - (e)	**$19,999**	**$22,535**	**$15,777**	**$14,089**	**$12,400**

YEAR	CASH FLOW	PRESENT VALUE DISCOUNT FACTOR (15%)	PRESENT VALUE
0	$(60,000)	1.000	$(60,000)
1	19,999	.870	17,399
2	22,535	.756	17,036
3	15,777	.658	10,381
4	14,089	.572	8,059
5	12,400	.497	6,163
		Net present value =	**$ (962)**

The net present value of the project at 15 percent = - $962. The project is not acceptable.

7. a) Relevant cash flows:

	0				
a. Initial cash outflow	**($60,000)**				
	1	**2**	**3**	**4**	**5**
b. Savings	$20,000	$21,200	$22,472	$23,820	$25,250
c. Depreciation, new	19,998	26,670	8,886	4,446	0
d. Profit change before tax (b) - (c)	2	(5,470)	13,586	19,374	25,250
e. Taxes (d) x (38%)	1	(2,079)	5,163	7,362	9,595
f. Profit change after tax (d) - (e)	1	(3,391)	8,423	12,012	15,655
g. Net cash flow (f) + (c) or (b) - (e)	**$19,999**	**$23,279**	**$17,309**	**$16,458**	**$15,655**

YEAR	CASH FLOW	PRESENT VALUE DISCOUNT FACTOR (15%)	PRESENT VALUE
0	$(60,000)	1.000	$(60,000)
1	19,999	.870	17,399
2	23,279	.756	17,599
3	17,309	.658	11,389
4	16,458	.572	9,414
5	15,655	.497	7,781
		Net present value =	**$ 3,582**

Net present value of project at 15 percent = $3,582

The project is now acceptable where before it was not. This assumes the discount rate is the same as before, 15 percent, and does not vary with inflation.

b) Cash outflow at time 0 = $60,000 + $10,000 = $ -70,000

Present value of cash inflows from Part (7a) = 63,582

Present value of $10,000 received at the end of year 5 (working capital recovered)
$10,000(PVIF$_{15\%,5}$) = $10,000(.497) = 4,970

Net present value $ - 1,448

8. a) Selecting those projects with the highest profitability index values would indicate

Project	Amount	PI	Net Present Value
1	$500,000	1.22	$110,000
3	350,000	1.20	70,000
	$850,000		$180,000

However, utilizing "close to" full budgeting will be better.

Project	Amount	PI	Net Present Value
1	$ 500,000	1.22	$110,000
4	450,000	1.18	81,000
	$ 950,000		$191,000

b) No. The resort should accept all projects with a positive NPV. If capital is not available to finance them at the discount rate used, a higher discount rate should be used that more adequately reflects the costs of financing.

9. a)

Time of cash outflow	8% discount factor	Amount of cash outflow: Rockbuilt	Bulldog	Incremental savings of Rockbuilt over Bulldog truck
0	1.000	$(74,000)	$ (59,000)	$(15,000)
1	.926	(2,000)	(3,000)	1,000
2	.857	(2,000)	(4,500)	2,500
3	.794	(2,000)	(6,000)	4,000
4	.735	(2,000)	(22,500)	20,500
5	.681	(13,000)	(9,000)	(4,000)
6	.630	(4,000)	(10,500)	6,500
7	.583	(4,000)	(12,000)	8,000
8	.540	5,000*	(8,500)**	13,500
Present value of cash flows at 8%		$(91,626)	$(111,266)	$ 19,637

* $4,000 maintenance cost plus salvage value of $9,000.
** $13,500 maintenance cost plus salvage value of $5,000.

The Rockbuilt bid should be accepted as the lower maintenance and rebuilding expenses more than offset its higher cost.

b)

Time of cash outflow	15% discount factor	Amount of cash outflow: Rockbuilt	Bulldog	Incremental savings of Rockbuilt over Bulldog truck
0	1.000	$(74,000)	$ (59,000)	$(15,000)
1	.870	(2,000)	(3,000)	1,000
2	.756	(2,000)	(4,500)	2,500
3	.658	(2,000)	(6,000)	4,000
4	.572	(2,000)	(22,500)	20,500
5	.497	(13,000)	(9,000)	(4,000)
6	.432	(4,000)	(10,500)	6,500
7	.376	(4,000)	(12,000)	8,000
8	.327	5,000*	(8,500)**	13,500
Present value of cash flows at 15%		$(87,770)	$(98,130.5)	$ 10,360.5

* $4,000 maintenance cost plus salvage value of $9,000.

** $13,500 maintenance cost plus salvage value of $5,000.

No. With a higher discount rate, more distant cash outflows become less important relative to the initial outlay. But, the lower maintenance and rebuilding expenses related to the Rockbuilt bid continue to more than offset its higher cost.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

YEAR	CASH FLOW	PRESENT VALUE DISCOUNT FACTOR (15%)	PRESENT VALUE
0	$ (700,000)	1.000	$(700,000)
1	(1,000,000)	.870	(870,000)
2	250,000	.756	189,000
3	300,000	.658	197,400
4	350,000	.572	200,200
5-10	400,000	2.164*	865,600**
		Net present value =	**$(117,800)**

* PVIFA of 5.019 for 10 years minus PVIFA of 2.855 for 4 years.
** Total for years 5-10.

As the net present value is negative, the project is **unacceptable**.

b. The internal rate of return is **13.21 percent**. If the trial-and-error method were used, we would have the following:

YEAR	CASH FLOW	14% DISCOUNT FACTOR	14% PRESENT VALUE	13% DISCOUNT FACTOR	13% PRESENT VALUE
0	$ (700,000)	1.000	$(700,000)	1.000	$(700,000)
1	(1,000,000)	.877	(877,000)	.885	(885,000)
2	250,000	.769	192,250	.783	195,750
3	300,000	.675	202,500	.693	207,900
4	350,000	.592	207,200	.613	214,550
5-10	400,000	2.302*	920,800**	2.452*	980,800**
		Net present value	$ (54,250)		$ 14,000

* PVIFA for 10 years minus PVIFA for 4 years.
** Total for years 5-10.

To approximate the actual rate, we **interpolate** between 13 and 14 percent as follows:

$$.01\left[\begin{array}{ll} X\left[\begin{array}{ll} .13 & \$\ 14,000 \\ \text{IRR} & 0 \end{array}\right] & \$14,000 \\ \quad .14 \qquad \$(54,240) & \end{array}\right] \$68,250$$

$$\frac{X}{.01} = \frac{\$14,000}{\$68,250} \qquad \text{Therefore, } X = \frac{(.01)\ x\ (\$14,000)}{\$68,250} = .0021$$

and IRR = .13 + X = .13 + .0021 = .1321, or **13.21 percent**. As the internal rate of return is less than the required rate of return, the project would not be acceptable.

c. The project would be **acceptable**.

d. Payback period = **6 years**. (-$700,000 - $1,000,000 + $250,000 + $300,000 + $350,000 + $400,000 + $400,000 = 0)

2.

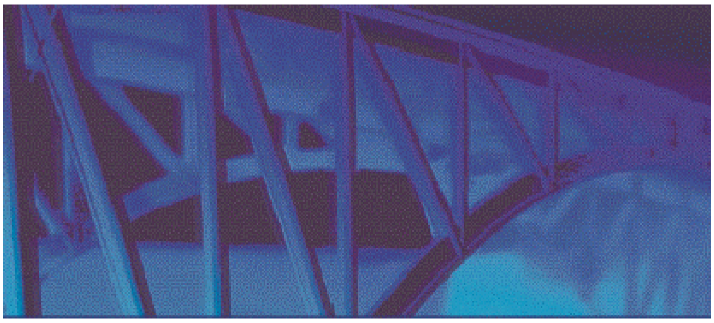
YEAR	CASH FLOW	PRESENT VALUE DISCOUNT FACTOR (14%)	PRESENT VALUE
0	$(404,424)	1.000	$(404,424)
1	86,890	.877	76,203
2	106,474	.769	81,879
3	91,612	.675	61,838
4	84,801	.592	50,202
5	84,801	.519	44,012
6	75,400	.456	34,382
7	66,000	.400	26,400
8	92,400	.351	32,432
		Net present value =	**$ 2,924**

As the net present value is positive, the project is **acceptable**.

3.

PROJECT	INVESTMENT REQUIRED	PRESENT VALUE OF FUTURE CASH FLOWS	NET PRESENT VALUE
1	$200,000	$290,000	$ 90,000
2	115,000	185,000	70,000
3	270,000	400,000	130,000
1,2	315,000	475,000	160,000
1,3	**440,000**	**690,000**	**250,000**
2,3	385,000	620,000	235,000
1,2,3	680,000	910,000	230,000

Projects 1 and 3 should be chosen as they provide the highest net present value.



14
Risk and Managerial (Real) Options in Capital Budgeting

"Risk? Risk is our business. That's what this starship is all about. That's why we're aboard her!"

JAMES T. KIRK,
CAPTAIN OF THE STARSHIP ENTERPRISE

ANSWERS TO QUESTIONS

1. Investment projects with different risks can affect the valuation of the firm by suppliers of capital. A project that provides a 20 percent expected return may add so much risk as to more than offset the expected return. In other words, the company's overall capitalization rate rises sufficiently to more than offset the incremental expected return. Either the cash flows or the required rate must be evaluated to bring the risk level of different projects into the analysis. The focus of the chapter is on how to develop information on project risk.

2. The standard deviation is a measure of the absolute dispersion of the probability distribution. It is an appropriate measure of risk for a relatively symmetrical distribution, provided the person using the measure associates risk with dispersion.

   (To the extent that a distribution is skewed and a person is concerned with skewness, a between measure might be the semi-variance. The semivariance is the variance of the distribution to the left of the expected value and may be thought of as representing a measure of downside risk. If a person is concerned with risk in a particular state of the world, a state preference approach may be best. However, the standard deviation continues as the most widely used measure of risk. One reason is that it can be calculated mathematically in a relatively easy manner. Higher moments of a probability distribution cannot be determined so easily.)

One alternative measure that is easy to use is the coefficient of variation (CV). Mathematically, it is defined as the ratio of the standard deviation of a distribution to the expected value of the distribution. This measure of relative dispersion is an index of risk per unit of expected value.

3. To standardize the dispersion of a probability distribution, one takes differences from the expected value (mean) of the distribution and divides them by the standard deviation. The difference could be associated with the NPV of zero or less or any other stated NPV or IRR. The standardized value obtained is then used to determine the probability of greater (lesser) differences occurring or not occurring. These probabilities are found in Table V at the end of the textbook. They are based on the normal, bell-shaped distribution. As long as the distribution is unimodal, the probabilities are reasonably accurate even though the distribution may not be normal. By determining the probabilities that various NPVs or IRRs will occur, one obtains a better understanding of the risk of the project.

4. For the riskless project the probability distribution would have no dispersion. It would be a straight line that touched the horizontal axis at the expected value of return for the project. The extremely risky project would be characterized by a probability distribution that was quite wide.

5. The coefficients of variation for the two projects are:

CV_A = \$400/\$200 = 2.00; and CV_B = \$300/\$140 = 2.14.

On the basis of relative risk alone, we would say that project B was the more risky.

6. The initial probabilities are those for outcomes in the first period. Conditional probabilities are those for outcomes in subsequent periods conditional on the outcome(s) in the previous period(s). For a particular branch, the conditional probabilities for the next period associated with the various sub branches must total 1.00. A joint probability is the joint product of multiplying the initial probability and all subsequent conditional probabilities for a particular branch times each other. This gives the probability of the overall (complete) branch occurring.

7. The risk-free rate is used to discount future cash flows so as not to double count for risk. If a premium for risk, particularly a large premium, is included in the discount rate, a risk adjustment occurs in the discounting process. The larger the premium, the narrower the distribution of NPVs -- that is, the lower the

standard deviation of the probability distribution of NPVs. Risk would then be evaluated in a comparison of the standard deviation with the expected value. To avoid the double evaluation of risk, a risk-free rate should be used in discounting.

8. Simulation gives the analyst an idea of the dispersion of likely returns from a project as well as the shape of the distribution. However, the results are only as good as the assumptions used in the model. In other words, the results follow from assumptions regarding cash flows, probabilities, and interrelationships between cash flows.

9. The greater the correlation of net present values among projects, the greater the standard deviation of the portfolio of projects, all other things the same. By acquiring assets with low degrees of correlation with each other, the standard deviation of risk of a portfolio can be reduced relative to its expected value. (Whether this company-provided diversification is a thing of value to investors in the company's stock is questionable, as we take up in Chapter 15.) The effect of the correlation coefficient on the standard deviation of a portfolio of projects is shown in Equations (14-6) and (14-7) in the chapter.

10. A portfolio of assets dominates another if it has a higher expected return and the same or lower level of risk (e.g., standard deviation), or a lower level of risk and the same or a higher

expected value. Using the concept of dominance, some combinations of assets can be dismissed because they are dominated by one or more others.

11. When a decision maker decides on a portfolio of assets, that determines the acceptance or rejection of investment projects under consideration. New projects included in the portfolio are accepted; those excluded are rejected.

12. A managerial option has to do with management's flexibility to make a decision after a project is accepted that will alter the project's subsequent expected cash flows and/or its life. It also includes the option to postpone. With uncertainty about the future, the presence of managerial options (flexibility) enhances the worth of an investment project. This worth is equal to the net present value of the project, determined in the traditional way, plus the value of any option(s).

13. The present value of a managerial option is determined by the likelihood that it will be exercised and the magnitude of the resulting cash-flow benefit. The greater the uncertainty or volatility of possible outcomes, the greater the value of the option. It is the same as with a financial option -- the driving force to option valuation is the volatility of the associated asset's price.

14. Managerial options include 1) the option to expand production in the future if things turn out well (or to contract if conditions do not turn out well), 2) the option to abandon a project, and 3) the option to postpone a project's acceptance or launch. Options 1 and 2 require that the project must first be accepted before the option becomes available. Options 1 and 2 are related in that if a project turns sour, management will want to contract production and/or abandon the project entirely if the abandonment value is sufficient. For option 3, the option would most likely consist of investing now or waiting, although in some cases a firm might invest now and still have the option to defer actual implementation. Option value enhances the worth of a project.

SOLUTIONS TO PROBLEMS

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1. a) Simply by looking, project B looks less risky.

   b) $E(CF_A) = (.2)(\$2,000) + (.3)(\$4,000) + (.3)(\$6,000) + (.2)(\$8,000) = \$5,000$

   $\sigma_A = [(.2)(\$3,000)^2 + (.3)(\$1,000)^2 + (.3)(\$1,000)^2 + (.2)(\$3,000)^2]^{.5} = (4,200,000)^{.5} = \$2,049$

   $CV_A = \$2,049/\$5,000 = .410$

$E(CF_B) = (.1)(\$2,000) + (.4)(\$4,000) + (.4)(\$6,000) + (.1)(\$8,000) = \$5,000$

$\sigma_B = [(.1)(\$3,000)^2 + (.4)(\$1,000)^2 + (.4)(\$1,000)^2 + (.1)(\$3,000)^2]^{.5} = (2,600,000)^{.5} = \$1,612$

$CV_B = \$1,612/\$5,000 = .322$

B clearly dominates A since it has lower risk for the same level of return.

2. a)

Project	E(NPV)	σ_{NPV}	CV_{NPV}
A	\$10,000	\$20,000	2.00
B	10,000	30,000	3.00
C	25,000	10,000	0.40
D	5,000	10,000	2.00
E	75,000	75,000	1.00

On the basis of E(NPV) and standard deviation of NPV, ...

-- C dominates A, B, and D;

-- A dominates B and D; and

-- E neither dominates nor is dominated by any project.

On the basis of E(NPV) and coefficient of variation of NPV, ...

-- C dominates A, B, and D;

-- E dominates A, B, and D; and

-- A dominates B and D.

b)

Project	Z-score $(0 - E(NPV))/\sigma_{NPV}$	Probability (NPV < 0)
A	- .50	.3085
B	- .33	.3707
C	-2.50	.0062
D	- .50	.3085
E	-1.00	.1577

3. The general formula to use is:

$$Z \text{ (the Z-score)} = (NPV^* - \overline{NPV}) / \sigma_{NPV}$$

- For zero or less, Z = (0 - \$20,000)/\$10,000 = -2.0
- For \$30,000 or more, Z = (\$30,000 - \$20,000)/\$10,000 = 1.0
- For \$5,000 or less, Z = (\$5,000 - \$20,000)/\$10,000 = -1.5

From a normal distribution table found in most any statistics text (or from Table V at the end of the textbook), one finds that these Z-scores (standardized differences) correspond to probabilities of .0228, .1577, and .0668 respectively.

4. a)

Year 1		Year 2		Year 3		Overall
Initial Prob.	Net Cash Flow	Cond. Prob.	Net Cash Flow	Cond. Prob.	Net Cash Flow	Joint Prob.
0.5	$ 0	0.4	-$ 300	1.0	$ 0	0.20
		0.6	$ 0	1.0	$ 0	0.30
		1.0				
0.5	$1,000	0.2	$1,000	0.5	$ 800	0.05
				0.5	$1,200	0.05
				1.0		
		0.6	$1,400	0.5	$1,200	0.15
				0.5	$1,600	0.15
				1.0		
		0.2	$1,800	0.5	$1,600	0.05
				0.5	$2,000	0.05
		1.0		1.0		1.00

NOTE: Initial investment at time 0 = \$1,000.

b)

(1) CASH FLOW SERIES	(2) NET PRESENT VALUE	(3) JOINT PROBABILITY OF OCCURRENCE	(4) (2) X (3)
1	-$1,272	.20	-$254.40
2	- 1,000	.30	- 300.00
3	1,550	.05	77.50
4	1,896	.05	94.80
5	2,259	.15	338.85
6	2,604	.15	390.60
7	2,967	.05	148.35
8	3,313	.05	165.65
		Weighted average =	**$661.35 = NPV**

c) The expected value of net present value of the project is found by multiplying together the last two columns above and totaling them. This is found to be $661 (after rounding).

d) The standard deviation is:

$$[.20(-\$1,272 - \$661)^2 + .30(-\$1,000 - \$661)^2$$
$$+ .05(\$1,550 - \$661)^2 + .05(\$1,896 - \$661)^2$$
$$+ .15(\$2,259 - \$661)^2 + .15(\$2,604 - \$661)^2$$
$$+ .05(\$2,967 - \$661)^2 + .05(\$3,313 - \$661)^2]^{.5} = \$1,805$$

Thus, the dispersion of the probability distribution of possible net present values is very wide. In addition to the distribution being very wide, there is also a 50 percent probability of NPV being less than zero.

5. Expected net present value:

1 and 2 = \$10,000 + \$8,000 = \$18,000

1 and 3 = 10,000 + 6,000 = 16,000

2 and 3 = 8,000 + 6,000 = 14,000

Standard deviation of net present value:

$$1 \text{ and } 2 = [(\$4{,}000)^2 + (2)(.6)(\$4{,}000)(\$3{,}000) + (\$3{,}000)^2]^{.5} = \$6{,}277$$

$$1 \text{ and } 3 = [(\$4{,}000)^2 + (2)(.4)(\$4{,}000)(\$4{,}000) + (\$4{,}000)^2]^{.5} = \$6{,}693$$

$$2 \text{ and } 3 = [(\$3{,}000)^2 + (2)(.5)(\$4{,}000)(\$3{,}000) + (\$4{,}000)^2]^{.5} = \$6{,}083$$

Coefficient of variation of net present value:

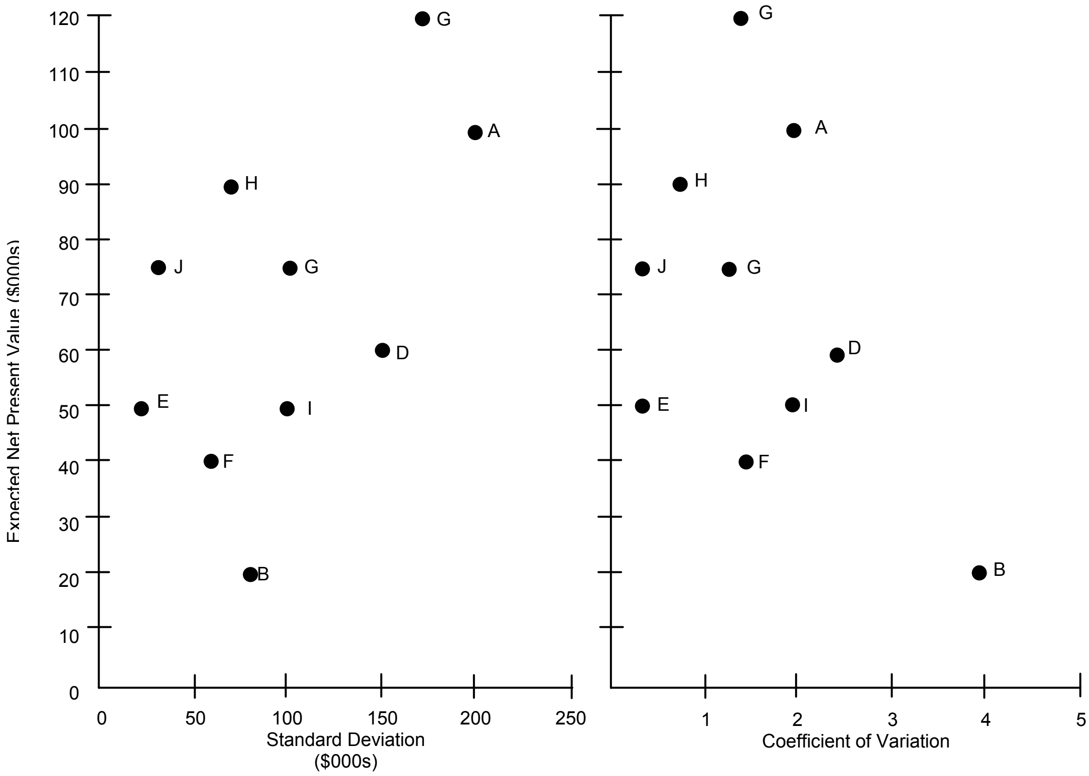
1 and 2 = \$6,277/\$18,000 = 0.35

1 and 3 = \$6,693/\$16,000 = 0.42

2 and 3 = \$6,083/\$14,000 = 0.43

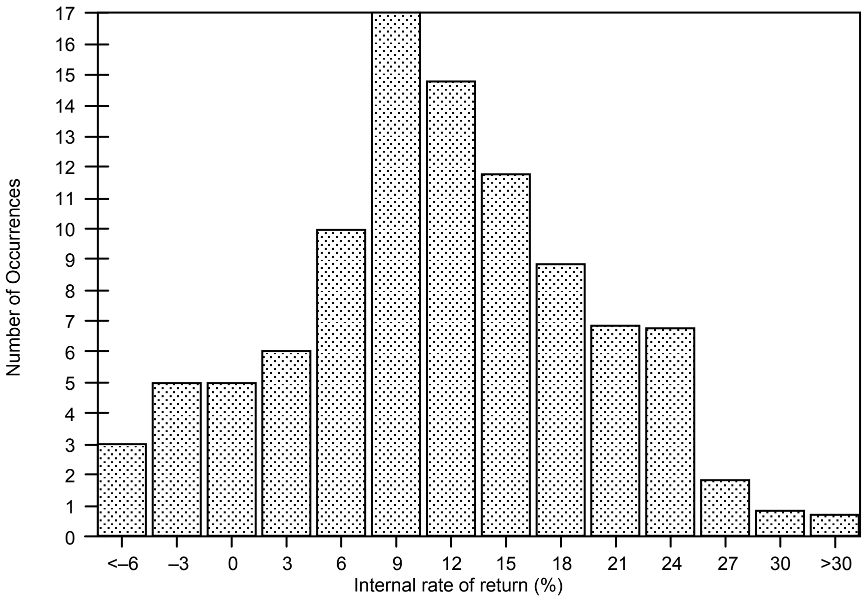
Combination 1 and 2 dominates the other two combinations on the basis of expected net present value and coefficient of variation of net present value.

6. a)



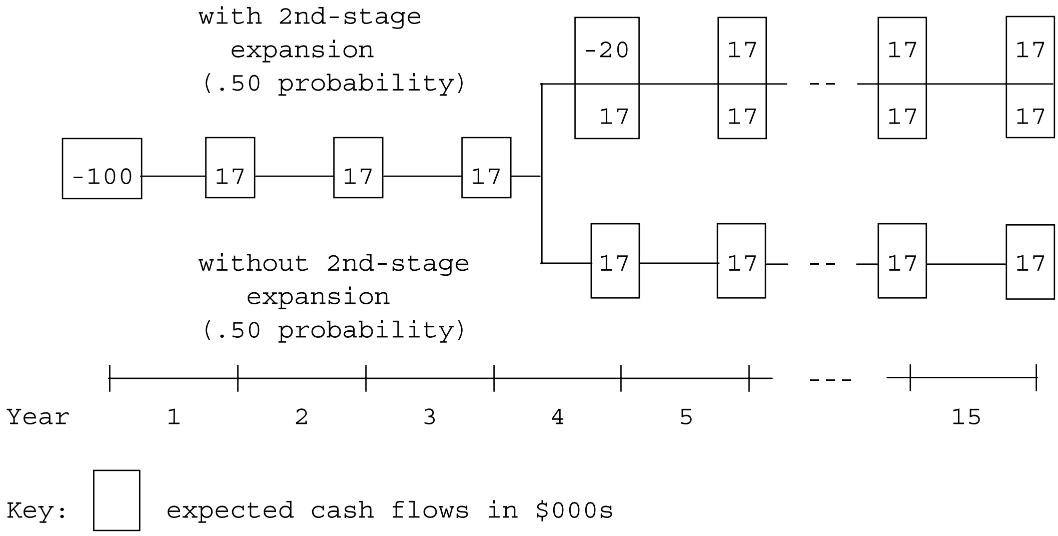
b) Projects E, J, H, and G dominate the rest on the basis of mean-standard deviation. On the basis of mean-coefficent of variation, projects J, H, and G dominate the rest. Unless one were extremely risk averse, it would seem the H and G dominate in a practical sense. [As an aside, the mean-coefficient of variation (MCV) efficient set will always be a subset of the mean-standard deviation (MSD) efficient set.]

7. a) Each simulation will differ somewhat, so there is no exact answer to this problem. A simulation involving 100 runs resulted in the following IRR distribution:



b) The most likely IRR was in the 7 to 9 percent range -- a relatively modest return. As can be seen, the distribution shows a high probability of relatively low (even negative) returns.

8.



a. NPV of initial project at 18 percent required rate of return equals

$$(PVIFA_{18\%,15})(\$17,000) - \$100,000 = \mathbf{-\$13,436}.$$

The initial project is not acceptable because it has a negative net present value.

b. If the location proves favorable, the NPV of the second-stage (expansion) investment at the end of year 4 will be

$$(PVIFA_{18\%,11})(\$17,000) - \$20,000 = \$59,152.$$

When this value is discounted to the present at 18 percent, the NPV at time 0 is $(PVIF_{18\%,4})(\$59,152) = \$30,522$. The mean of the distribution of possible NPVs associated with the option is $(0.5)(\$30,522) + (0.5)(\$0) =$ **$15,261**.

Project worth = -$13,436 + $15,261 = **$1,825**

The value of the option enhances the project sufficiently to make it acceptable.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

	BRANCH						
	1	2	3	4	5	6	Total
Joint probability	**.12**	**.16**	**.12**	**.24**	**.24**	**.12**	1.00

b. At a risk-free rate of 10 percent (i) the net present value of each of the six complete branches and (ii) the expected value and standard deviation of the probability distribution of possible net present values are as follows (with rounding):

YEAR 0	YEAR 1	YEAR 2	BRANCH	NPV
		$ 826	1	-$ 810
	$1,364	1,240	2	- 396
		1,653	3	17
-$3,000				
		1,653	4	926
	2,273	2,066	5	1,339
		2,479	6	1,752

$\overline{\text{NPV}}$ = .12(-$810 +.16(-$396) + .12($17) + .24($926) + .24($1,339) + .12($1,752) = **$595**

S.D. = $[.12(-\$810 - \$595)^2 + .16(-\$396 - \$595)^2 + .12(\$17 - \$595)^2 + .24(\$926 - \$595)^2 + .24(\$1{,}339 - \$595)^2 + .12(\$1{,}752 - \$595)^2]^{.5}$
= **$868**

c. Standardizing the difference from zero, we have -\$595/\$868 = -.685. Looking in Table V in the Appendix at the end of the textbook, we find that -.685 corresponds to an area of approximately .25. Therefore, there is approximately one chance out of four that the net present value will be zero or less.

2. a. Expected net present value = \$16,000 + \$20,000 + \$10,000 = **\$46,000**

Standard deviation = $[(\$8,000)^2 + (2)(.9)(\$8,000)(\$7,000) + (2)(.8)(\$8,000)(\$4,000) + (\$7,000)^2 + (2)(.84)(\$7,000)(\$4,000) + (\$4,000)^2]^{1/2} = [\$328,040,000]^{.5}$ = **\$18,112**

b. Expected net present value = \$46,000 + \$12,000 = **\$58,000**

Standard deviation = $[\$328,040,000 + (\$9,000)^2 + (2)(.4)(\$9,000)(\$8,000) + (2)(.2)(\$9,000)(\$7,000) + (2)(.3)(\$9,000)(\$4,000)]^{1/2} = [\$513,440,000]^{.5}$ = **\$22,659**

The coefficient of variation for existing projects ($\sigma/\overline{NPV}$) = \$18,112/\$46,000 = .39. The coefficient of variation for existing projects plus puddings = \$22,659/\$58,000 = .39. While the pudding line has a higher coefficient of variation (\$9,000/\$12,000 = .75) than existing projects, indicating a higher degree of risk, the correlation of this product line with existing lines is sufficiently low as to bring the coefficient of variation for all products including puddings in line with that for only existing products.

3. a.

YEAR 0	YEAR 1	YEAR 2	BRANCH	NPV
		$20,000	1	-$17,298
	$60,000	30,000	2	- 8,724
		40,000	3	- 151
		40,000	4	9,108
-$90,000	70,000	50,000	5	17,682
		60,000	6	26,255
		60,000	7	35,514
	80,000	70,000	8	44,088
		80,000	9	52,661

Expected NPV = (.30)(.30)(-$17,298) + (.30)(.50)(-$8,724) + (.30)(.20)(-$151) + (.40)(.30)($9,108) + (.40)(.40)($17,682) + (.40)(.30)($26,255) + (.30)(.20)($35,514) + (.30)(.50)($44,088) + (.30)(.30)($52,661) = **$17,682**

b. We should abandon the project at the end of the first year if the cash flow in that year turns out to be $60,000. The reason is that given a $60,000 first-year cash flow, the $29,000 expected value of possible second-year cash flows (i.e., (.30)($20,000) + (.50)($30,000) + (.20)($40,000) = $29,000), when discounted to the end of year 1 only yields $26,854, and this value is less than the $45,000 abandonment value at the end of year 1. If the cash flow in year 1 turns out to be either $70,000 or $80,000, however, abandonment would not be worthwhile because in both instances the expected values of possible cash flows in year 2 discounted to the end of year 1 exceed $45,000.

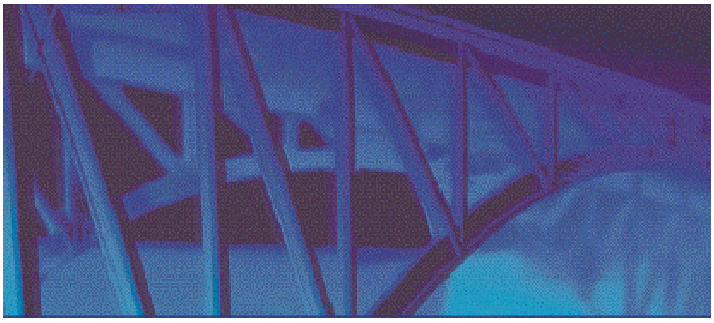
When we allow for abandonment, the original projected cash flows for branches 1, 2, and 3 are replaced by a single branch having a cash flow of $105,000 ($60,000 plus $45,000 abandonment value) in year 1 and resulting NPV of $7,230. Recalculating the expected net present value for the proposal, based upon revised information, we find it to be

(.30)($7,230) + (.40)(.30)($9,108) + (.40)(.40)($17,682) + (.40)(.30)($26,255) + (.30)(.20)($35,514) + (.30)(.50)($44,088) + (.30)(.30)($52,661) = **$22,725**.

Thus, the expected net present value is increased when the possibility of abandonment is considered in the evaluation. Part of the downside risk is eliminated because of the abandonment option.

Part 6

The Cost of Capital, Capital Structure, and Dividend Policy



15

Required Returns and the Cost of Capital

To guess is cheap. To guess wrong is expensive.

CHINESE PROVERB

ANSWERS TO QUESTIONS

1. If the weights used in the calculations do not correspond to the proportions of financing the firm intends to use, the computed weighted-average cost will be a biased estimate of the real cost of capital of the firm.

2. The principal qualification to its use is that existing as well as new investment proposals are alike with respect to risk. In other words, the proposal being judged should not alter the risk complexion of the firm as perceived by the suppliers of capital. Also, the costs of the individual components of financing must be measured accurately and the weights must be marginal in the sense of corresponding to the proportions with which the firm intends to finance.

3. Yes, these funds have a cost. In most cases, however, the cost is ignored because these sources represent "built-in" financing of current assets. As current assets grow, payables and accruals tend to grow as well.

4. The tax shield associated with the use of debt funds would be lost, at least until profits were restored. As a result, we would no longer multiply the before-tax cost of debt by one minus the tax rate. The explicit cost of debt would be the before-tax cost or

yield on the debt instrument, which is considerably higher than the after-tax cost. Without the tax advantage, other methods of financing like leasing and preferred stock will become more attractive in a relative sense.

5. Dividends per share are estimated out into the future, preferably out to infinity. The discount rate necessary to equate the present value of the expected future stream of dividends with the present share price is determined. This is taken to be the cost of equity capital. The critical factor in the model is the growth rate of future dividends. The pattern of growth specified must correspond to the pattern expected by investors at the margin that leads them to pay so many dollars for a share of stock.

6. The critical assumption is that capital markets are perfect and that only the systematic risk of the firm is important. With market imperfections, such as bankruptcy costs, the total risk of the firm may take on a degree of importance. For example, the possibility of bankruptcy would be important to equityholders because the external drain of bankruptcy costs should the firm become insolvent would adversely affect them. As a result, investors would be concerned with both systematic and unsystematic risk. The greater the importance of total risk the less relevant is the capital-asset pricing model approach.

7. The firm's before-tax cost of debt is used as a base to which a risk premium is added. The risk premium is the difference in required return between stocks and bonds. For companies overall, this premium averages about 3 percent. However, it will vary by the company. If a company could borrow at 13 percent, and the premium were 3 percent, the required return on equity would be 16 percent. The before-tax cost of debt funds will exceed the risk-free rate due to the presence of risk of default in corporate bonds.

8. Proxy companies are used in place of the project or group of projects under consideration. The idea is to find a group of proxy companies that closely parallel the business represented by the project or group. These companies must be publicly traded and stand alone in the sense that they do not carry on other activities. One then takes some type of average of their betas (a median or modal value is perhaps best), and this average is used as a proxy for the beta of the project or group. The required return on equity is then solved for in the usual way when employing the capital-asset pricing model. If debt is involved, it is blended in through a weighted-average cost approach.

9. A project-specific required return refers to the hurdle rate for a specific project as derived with the capital-asset pricing model approach. A group-specific required return is for a division or some other subgroup of the firm where there is an aggregation of assets of roughly the same risk.

10. Management determines the acceptability of the project on the basis of the project's expected return in relation to the probability distribution of possible returns. The usual information is the mean and the standard deviation of the probability distribution. On the basis of this information and management's risk preferences, a decision is reached. The link with share price is indirect. It depends on how perceptive management is in determining the trade-off of investors between profitability and risk. Moreover, systematic risk as opposed to total risk is likely to be the important thing, and this is not brought into play.

11. The RADR approach to project selection calls for "adjusting" the required return, or discount rate, upward (downward) from the firm's overall cost of capital for projects or groups showing greater (less) than "average" risk. The CAPM approach could be considered as a special type of "risk-adjusted" method, but with any adjustment taking place relative to a risk-free return base. The RADR approach, unlike the CAPM approach, generally relies on relatively informal, subjective ways of determining the required risk adjustment.

12. For a group of projects, the correlation between returns of the various projects must be taken into account when computing the standard deviation. (See Chapter 14.) In other words, the diversification effect of projects is recognized. In the absence of perfect correlation, the total risk of the group will be less than the sum of the parts.

13. Empirically, companies in the same industry tend to have similar betas and required rates of return. However, there are many exceptions. It depends on how similar the industry definition, the diversity of product lines of companies classified in the industry, and the variation in financial risk of companies in the industry. One difficulty is with classifying a multiproduct company like General Electric. Aluminum companies, on the other hand, all do about the same thing so industry comparisons are very valid. Again, the key is the similarity of business and financial risk among companies, particularly the former.

14. No. Eventually the equity base will need to be rebuilt and this will require retained earnings or common stock financing, both of which have a higher cost than debt funds. To use the cost of debt funds as the required return ignores this eventual need and in so doing makes no provision for a premium for the business risk associated with the project.

15. An increase in bankruptcy costs would increase the required rate of return for companies. The change should make companies more conscious of avoiding bankruptcy and analyzing the risk associated with the particular project. In a capital-asset pricing model context, it will work to make unsystematic risk more important. In other words, companies would need to pay some attention to the effect of a project on the overall or total risk of the company (systematic plus unsystematic), not just the impact on systematic risk.

16. If the divisions have significantly different risks, a company should use different costs of capital for them. One approach is the capital-asset pricing model context using outside companies in about the same types of businesses as proxies for risk. Required rates of return are determined for these proxy companies (based on stock-return data) and these rates are used as costs of capital for the divisions. In many, perhaps most, situations, multi-division companies have multiple risks. Therefore, the use of a company-wide cost of capital is inappropriate as an acceptance criterion.

17. Value is created when projects are accepted whose expected returns exceed the required returns established by the financial markets. Returns in excess of what the financial markets expect, and require, are economic rents and will lead to a share price increase, all other things the same.

18. Through investment in assets, value is created by industry attractiveness and competitive advantage. These are largely the sources of value and allow a company to earn excess returns, at least for a while.

SOLUTIONS TO PROBLEMS

1.

	(1) Cost	(2) Proportion of Total Financing	(1) x (2) Weighted Cost
Bonds	k_i	B/(B+S)	k_i[B/(B+S)]
Common Stock	k_e	S/(B+S)	k_e[S/(B+S)]
Totals		100%	k_i[B/(B+S)]+k_e[S/(B+S)]

Thus, $k_o = k_i[B/(B+S)] + k_e[S/(B+S)]$

or alternatively written

$$k_o = \left[\frac{k_i(B) + k_e(S)}{(B+S)} \right]$$

2. $k_i = (k_d)(1 - t) = (.14)(.6) = 8.4$ percent

$$k_e = \frac{D_1}{P_0} + g = \frac{(\#\text{ of shares})(D_1)}{(\#\text{ of shares})(P_0)} + g$$

$$= \frac{\$500{,}000}{\$7{,}000{,}000} + .11 = .0714 + .11 = 18.14 \text{ percent}$$

$k_o = k_i[B/(B+S)] + k_e[S/(B+S)]$

$= (.084)(\$3M/\$10M) + (.1814)(\$7M/\$10M)$

$= (.084)(.3) + (.1814)(.7) = 15.22$ percent

3. (January 20X1)

$$k_e = \frac{D_1}{P_0} + g = \frac{\$3}{\$300} + .20 = 21 \text{ percent}$$

(January 20X2)

$$P_0 = \frac{D_1}{(k_e - g)} = \frac{\$3.45}{(.21 - .15)} = \$57.50$$

4.

End of Year	Dividend Per Share	Present Value at 12 Percent	Present Value at 13 Percent
1	\$2.240	\$ 2.000	\$ 1.982
2	2.509	2.000	1.965
3	2.810	2.000	1.947
4	2.979	1.893	1.827
5	3.158	1.792	1.714
6 to ∞	3.347	15.826*	13.976**
		\$25.511	\$23.411

$$.01\left[\begin{array}{lll} X\left[\begin{array}{l} .12 \\ k_e \end{array}\right. & \begin{array}{l} \$25.511 \\ \$25 \end{array}\left.\right] & \$0.511 \\ \quad .13 & \$23.411 & \end{array}\right] \$2.10$$

$$\frac{X}{.01} = \frac{\$0.511}{\$2.10} \qquad \text{Therefore, } x = \frac{(.01)(\$0.511)}{\$2.10} = .0024$$

$$k_e = .12 + X = .12 + .0024 = 12.24 \text{ percent}$$

---

* Implied Value of Stock at End of Year 5 $= \dfrac{D_6}{(.12 - g)} = \dfrac{\$3.347}{(.12 - 0)} = \$27.89$

Present Value of \$27.89 at End of Year 5 $= (\$27.89)(PVIF_{12\%,5})$

$= (\$27.89)(.56743) = \$15.826$

**Implied Value of Stock at End of Year 5 $= \dfrac{D_6}{(.13 - g)} = \dfrac{\$3.347}{(.13 - 0)} = \$25.75$

Present Value of \$25.75 at end of Year 5 $= (\$25.75)(PVIF_{13\%,5})$

$= (\$25.75)(.54276) = \$13.976$

5.

	(1) After-tax Cost	(2) Proportion of Total Financing	(1) x (2) Weighted Cost
Debentures	7.8%	37.5%	2.93%
Preferred Stock	12.0	12.5	1.50
Common Stock	17.0	50.0%	8.50
		100.0%	12.93% = k_o

6. Flotation costs of debt = \$200,000 x .02 = \$ 4,000

Flotation costs of stock = \$200,000 x .15 = 30,000

\$34,000

$$NPV = \frac{\$90,000}{.145} - \$600,000 - \$34,000 = -\$13,310$$

The proposal should be rejected. Without flotation costs, however, the net present value would have been positive and the proposal acceptable.

7. a) Cost of equity = .12 + (.18 - .12)1.28 = 19.68 percent

Cost of debt = 8 percent (given)

Weighted-average required return for the project
= .4(8%) + .6(19.68%) = 15 percent.

b) The approach assumes that unsystematic risk is not a factor of importance, which may or may not be the case. It assumes also that the average beta for the oil drilling equipment companies is a good surrogate for the systematic risk of the prospect. Finally, the estimates of the likely return on stocks in general and of the risk-free rate must be accurate. If these assumptions hold, the figure obtained will be a realistic estimate of the project's required rate of return.

8. a) Required Return = .10 + (.15 - .10)(1.10) = 15.5 percent

b) Minimum Required Return = .10 + (.15 - .10)(1.00) = 15 percent

Maximum Required Return = .10 + (.15 - .10)(1.40) = 17 percent

c) Required Return
for beta of 1.20 = .10 + (.15 - .10)(1.20) = 16 percent

Required Return
for beta of 1.30 = .10 + (.15 - .10)(1.30) = 16.5 percent

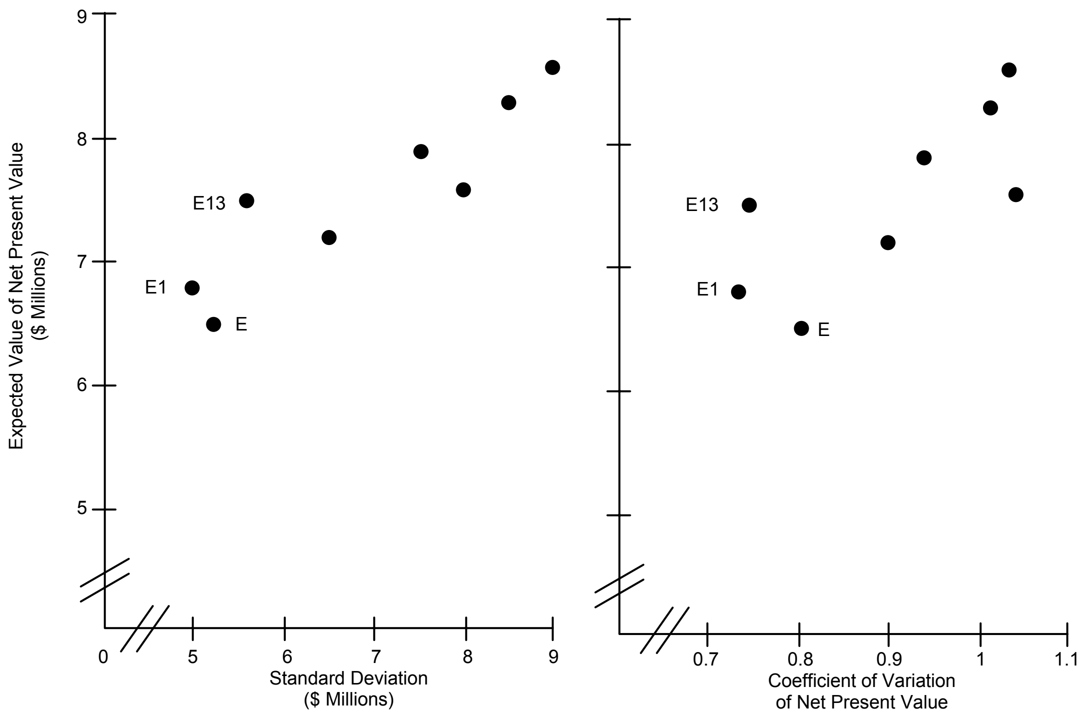
Expected value of required rate of return
= (.2)(.15) + (.3)(.155) + (.2)(.16) + (.2)(.165) + (.1)(.17)
= 15.85 percent

9. Using the RADR approach we would calculate the project's net present value at the management-determined risk-adjusted discount rate:

	(1)	(2)	(1) x (2)
Year	Expected Cash Flow	Discount Factor at 15%	Present Value
0	$-400,000	1.0000	$-400,000
1	50,000	.8695	43,480
2	50,000	.7561	37,805
3	150,000	.6575	98,625
4	350,000	.5718	200,130
			$ -19,960

Since the NPV is negative ($-19,960) we would reject the project. Alternatively, we could calculate the project's IRR and compare it to the RADR, which we would use as a hurdle rate. In this case, the project's IRR of 13.17 percent is less than the RADR of 15 percent, so we would, once again, reject the project.

10. The selection will depend on the risk preferences of the individual. Graphs of the plots are shown below. For the reasonable risk averter, the selection will probably be combination E13, which has an expected value of net present value of $7,500 and a standard deviation of $5,600. (The E(NPV) vs. CV of NPV graph reinforces the implied preference for E13.) In this case, proposals #1 and #3 would be accepted and proposal #2 would be rejected. It should be noted that the combination of proposal #1 with existing investment projects results in an actual lowering of the standard deviation. This implies negative correlation between the proposal and existing projects.



Solution to Appendix A Problem:

11. a)

$$\text{Peerless unlevered beta} = \frac{ß_j}{[1 + (B/S)(1 - T_C)]}$$

$$= \frac{1.15}{[1 + (.25)(1 - .4)]} = \frac{1.15}{1.15} = 1.00$$

Adjusted beta for Willie Sutton using its debt-to-equity ratio of .75 $= ß_{ju}\ [1 + (B/S)(1 - T_C)]$

$= 1.00[1 + (.75)(1 - .4)]$

$= 1.00[1.45] = 1.45$

An adjusted beta of 1.45 is appropriate for the new venture if the assumptions of the capital-asset pricing model hold, except for corporate taxes.

b) $k_i = k_d(1 - T_C) = .15(1 - .4) = .09$

$k_e = R_f + (\bar{R}_m - R_f)ß = .13 + (.17 - .13)1.45 = .188$

Since B/S = .75 and (B+S) = 1.00, then

B/(B+S) = (.75)S/(1.75)S = (.75/1.75) and

S/(B+S) = S/(1.75)S = (1.00/1.75)

Therefore, $k_o = (k_i)(B/(B+S)) + (k_e)(S/(B+S))$

$= (.09)(.75/1.75) + (.188)(1.00/1.75)$

= 14.6 percent

Solution to Appendix B Problem:

12. a)

Schedule for determining the present value of the interest tax-shield benefits related to the new snow plow truck

END OF YEAR	(1) DEBT OWED AT YEAR END $(1)_{t-1}$ - \$3,000	(2) ANNUAL INTEREST $(1)_{t-1}$ x .12	(3) TAX-SHIELD BENEFITS (2) x .30	(4) PV OF BENEFITS AT 12%
0	\$18,000	--	--	--
1	15,000	\$2,160	\$648	\$ 579
2	12,000	1,800	540	430
3	9,000	1,440	432	308
4	6,000	1,080	324	206
5	3,000	720	216	122
6	0	360	108	55
				\$1,700

To an all-equity financed firm, the net present value of the project's after-tax operating cash flows would be

$$NPV = \sum_{t=1}^{6} \frac{\$10,000}{(1 + .16)^t} - \$30,000 = \$6,850$$

while the adjusted present value would be

$$APV = \$6,850 + \$1,700 - \$1,000 = \$7,550$$

The project is acceptable.

b) If the cash flows are \$8,000 per year instead of \$10,000, the net present value of the project's after-tax operating cash flows becomes -\$520, while the adjusted present value becomes

$$APV = -\$520 + \$1,700 - \$1,000 = \$180$$

The project is still acceptable -- but, barely.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a. $k_e = D_1/P_0 + g$ $D_1 = D_0(1.12) = \$1(1.12) = \$1.12$

$k_e = \$1.12/\$20 + 12\% =$ **17.6%**

b. Through the trial-and-error approach illustrated in Chapters 3 and 4, one ends up determining that the discount rate necessary to discount the cash dividend stream to $20 must fall somewhere between 18 and 19 percent as follows:

END OF YEAR	DIVIDEND PER SHARE	PRESENT VALUE AT 18%	PRESENT VALUE AT 19%
1	$1.20	$1.02	$1.01
2	1.44	1.03	1.02
3	1.73	1.05	1.03
4	2.07	1.07	1.03
5	2.49	1.09	1.04
Present value, years 1-5		$5.26	$5.13

Year 6 dividend = $2.49(1.10) = $2.74

Market prices at the end of year 5 using a constant growth dividend valuation model: $P_5 = D_6/(k_e - g)$

$P_5 = \$2.74/(.18 - .10) = \$34.25$, $P_5 = \$2.74/(.19 - .10) = \$30.44$

Present value at time 0 for amounts received at end of year 5:

$34.25 at 18% = $14.97, $30.44 at 19% = $12.76

	18%	19%
Present value of years 1-5	$ 5.26	$ 5.13
Present value of years 6-∞	14.97	12.76
Present value of all dividends	$ 20.23	$ 17.89

Therefore, the discount rate is closer to 18 percent than it is to 19 percent. Interpolating, we get

.01	X	.18	$20.23	$0.23	$2.34
		k_e	$20.00		
		.19	$17.89		

$$\frac{X}{.01} = \frac{\$0.23}{\$2.34} \quad \text{Therefore, } X = \frac{(.01)(\$0.23)}{\$2.34} = .0010$$

and k_e = .18 + X = .18 + .0010 = **18.10 percent**, which is the estimated return on equity that the market requires.

2.

SITUATION	EQUATION: $R_f + (\bar{R}_m - R_f)ß$	REQUIRED RETURN
1	10% + (15% - 10%)1.00	**15.0%**
2	14% + (18% - 14%)0.70	**16.8**
3	8% + (15% - 8%)1.20	**16.4**
4	11% + (17% - 11%)0.80	**15.8**
5	10% + (16% - 10%)1.90	**21.4**

The greater the risk-free rate, the greater the expected return on the market portfolio, and the greater the beta, the greater will be the required return on equity, all other things being the same. In addition, the greater the market risk premium $(\bar{R}_m - R_f)$, the greater the required return, all other things being the same.

3. Cost of debt = 15%(1 - .4) = 9%
Cost of preferred stock = 13%

Cost of equity for Health Foods division
= .12 + (.17 - .12).90 = 16.5%

Cost of equity for Specialty Metals division
= .12 + (.17 - .12)1.30 = 18.5%

Weighted-average required return for Health Foods division
= 9%(.3) + 13%(.1) + 16.5%(.6) = **13.9%**

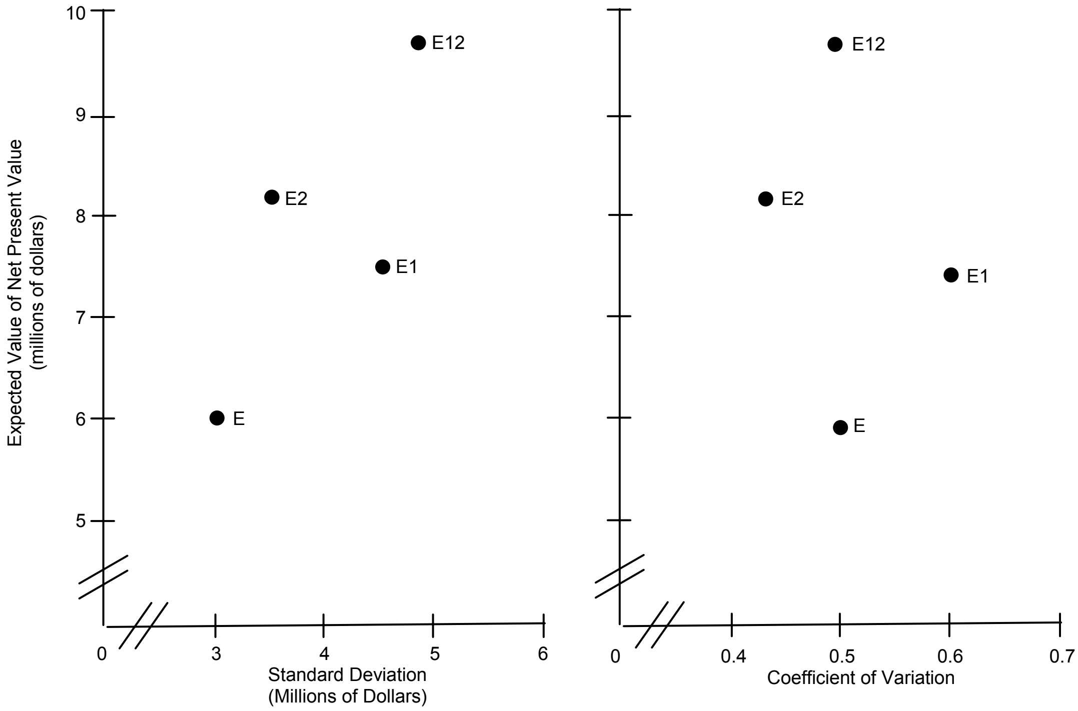
Weighted average required return for Specialty Metals division
= 9%(.3) + 13%(.1) + 18.5%(.6) = **15.1%**

As mentioned in the text, a conceptual case can be made for adjusting the nonequity costs of financing of the two divisions for differences in systematic risks. However, we have not done so.

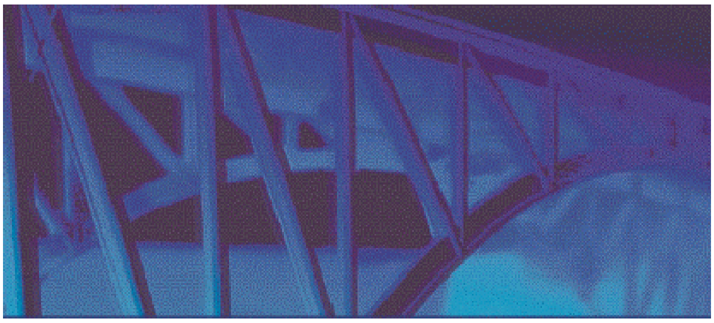
4. a. The coefficients of variation (standard deviation/$\overline{\text{NPV}}$) for the alternatives are as follows:

Existing projects (E)	.50
Plus project 1 (E1)	.60
Plus project 2 (E2)	.43
Plus project 1 and 2 (E12)	.49

Graphs of risk versus return are shown below. A moderately risk-averse decision maker will probably prefer the existing projects plus both new projects to any of the other three possible combinations. If this is the case, both new projects will be accepted. The actual decision will depend on your risk preferences. A very risk-averse individual might prefer the existing projects plus only project 2. Presumably, these preferences will be influenced by the presence of bankruptcy costs.



b. If the CAPM approach leads to a different decision, the key to deciding would be the importance of market imperfections. As indicated earlier, if a company's stock is traded in imperfect markets, if the possibility of insolvency is substantive, and if bankruptcy costs are significant, more reliance should be placed on a total variability approach because it recognizes unsystematic plus systematic risk. If things point to minimal market imperfections, more reliance should be placed on the CAPM results.



16
Operating and Financial Leverage

It does not do to leave a live dragon out of your calculations, if you live near him.

J.R.R. TOLKIEN, *THE HOBBIT*

ANSWERS TO QUESTIONS

1. Operating Leverage is the use of fixed operating costs associated with the production of goods or services. The degree of operating leverage (DOL) is the percentage change in a firm's operating profit (EBIT) resulting from a 1 percent change in output (sales). DOL is used to study the sensitivity of the variability in EBIT to the variability in sales. The DOL provides a quantitative measure of this sensitivity that is caused by the presence of operating leverage.

2. a) Fixed; b) Variable; c) Variable;
   d) Fixed -- but, variable at management's discretion;
   e) Fixed -- but, variable at management's discretion;
   f) Variable; g) Variable;
   h) Fixed -- but, somewhat variable at management's discretion;
   i) Fixed -- but, variable at management's discretion;

   All costs are variable in the long run.

3. Students may find Eqs. (16-3) and (16-4) of help in explaining the probable effect of a change in a firm's operations on the break-even point. Of course, an increase in any cost will raise the break-even point.
   a) Lower the break-even point.
   b) Raise the break-even point.
   c) Raise the break-even point.
   d) Will not affect the break-even point.
   e) The break-even point would not be affected unless the quality of A/R deteriorates. If the quality of A/R deteriorates, the total cost curve would shift up, resulting in a higher break-even point.

4. All businesses have at least some business risk even if they have no financial risk.

5. No, this is not always the case. It is true that the presence of fixed operating costs will cause a change in the volume of sales to result in a more than proportional change in operating profits. But, even firms with large fixed costs will have a low sensitivity to changes in sales (i.e., a low DOL) if they operate well-above their respective break-even points.

6. You can have a high DOL and still have low business risk if sales and the production cost structure are stable. You can have a low DOL and high business risk if sales and/or the production cost structure are/is volatile.

7. Financial leverage is the use of fixed-cost financing. The degree of financial leverage (DFL) is the percentage change in the firm's earnings per share (EPS) resulting from a 1 percent change in operating profit (EBIT). DFL is used to study the sensitivity of the variability in EPS to the variability in EBIT. The DFL provides a quantitative measure of this sensitivity caused by the presence of financial leverage.

8. Both operating and financial leverage involve the use of fixed costs. The former is due to fixed operating costs associated with the production of goods or services, while the latter is due to the existence of fixed financing costs. Both types of leverage affect the level and variability of the firm's after-tax earnings and, hence, the firm's overall risk and return. However, while financial leverage is acquired by choice, operating leverage often is not. Operating leverage is often dictated by the physical requirements of the firm's operations.

9. Yes. Eq. (16-14) shows that the degree of financial leverage is a function of the level of EBIT and the fixed charges of financing.

10. The objective of business firms is not to maximize EPS. It is to maximize shareholder wealth. A high EPS often requires incurring high risk. Stock price may decrease as a result of the high level of financial risks required to increase EPS.

11. An electric utility has much higher fixed costs in a relative sense than does the typical manufacturing company. Also, its revenues are much more stable and predictable. Despite a high amount of operating leverage, overall business risk is relatively low. As a result, electric utilities are able to take on significant financial risk. The typical manufacturing company has higher business risk and balances this with lower financial risk.

12. Whether or not the debt-to-equity ratio is a good proxy for the cash flow ability of the firm to service debt depends on the situation. There should be a rough correspondence between the two. However, the debt-to-equity ratio tells us nothing about the level or variability of cash flows. While there is certainly a close association between the debt-to-equity ratio and the magnitude of debt payments, differences in maturity and times in the past when various debt instruments were issued make the relationship not one-to-one. As a result, the debt-to-equity ratio must be regarded as an index approximation of financial risk. Still, it is frequently used.

13. The chapter has provided analytical tools to evaluate the financial structure of the firm. The EBIT-EPS chart, cash flow available to service debt, comparison of debt ratios to industry norms, the evaluation of the attitudes of creditors and stockholders, and the effect on security ratings can be used to determine the debt-to-equity ratio that will maximize the value of the firm.

14. Coverage ratios should be compared with those of other companies in similar lines of business. Where significant deviations occur, the reasons should be carefully explored. If the average coverage ratio for the industry is used as a target, the firm could determine the amount of debt to employ by applying this ratio to the firm's earnings. However, it is important to determine the appropriateness of the industry average to the situation. A coverage ratio is based on expected earnings or cash flow. It tells nothing about the probability of earnings or cash flow falling. The probability of cash insolvency should be analyzed as well.

15. While earnings per share will increase as long as the firm is able to earn more on the employment of the funds than their interest or preferred-dividend cost, risk to the common shareholders increases as well. After a point, the increased risk more than offsets the increase in expected earnings per share. At that point, market price per share declines with financial leverage. Clearly this is undesirable.

16. An increase in the debt of a company will increase the amount of periodic interest and principal payments. The additional cash obligation for each increment in debt can be determined for each future period. The next step is to determine a probability distribution of possible ending cash balances for various future periods. Such distributions are based on cash flows together with the beginning cash balance. It is then an easy matter to see at

what point further increments in debt result in the probability of running out of cash exceeding some limit tolerance, such as 5 percent.

17. Most companies are concerned with the effect a debt decision will have on its bond ratings, both for prestige reasons and because of the interest rate they will have to pay on borrowings. Moreover, if a rating is lowered below Baa, the company's bonds no longer are considered "investment grade" and no longer appeal to institutional investors. The rating agencies look at the debt ratio and the cash-flow coverage ratios. If these ratios deteriorate, the rating agencies may well lower the company's rating in the credit and capital markets. Some companies will not issue further debt if by so doing the bond rating is lowered. While this is not sufficient grounds to stop issuing debt, as other things should be considered, a company cannot ignore the effect of a financial leverage decision on its security ratings.

SOLUTIONS TO PROBLEMS

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1. a) $Q = \$880,000/\$200 = 4,400$ units

$\$24,000 = [Q(P - V) - FC](1 - t)$

$\$24,000 = [4,400(\$200 - \$150) - FC](.60)$

$\$24,000 = \$132,000 - FC(.60)$

$FC = \$180,000$

b) $Q_{BE} = \$180,000/(\$200 - \$150) = 3,600$ units

$S_{BE} = 3,600(\$200) = \$720,000$ -- or, alternatively --

$S_{BE} = \$180,000/[1 - (\$150/\$200)] = \$720,000$

c) $DOL_{4,000 \text{ units}} = 4,000/(4,000 - 3,600) = 10.0$

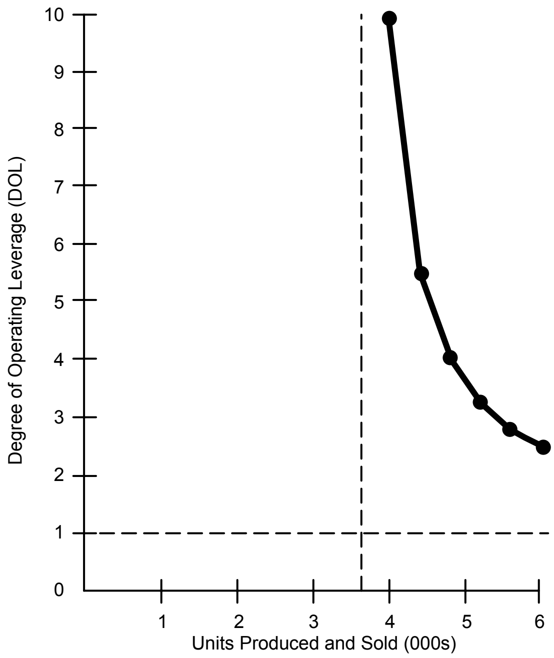
$DOL_{4,400 \text{ units}} = 4,400/(4,400 - 3,600) = 5.5$

$DOL_{4,800 \text{ units}} = 4,800/(4,800 - 3,600) = 4.0$

$DOL_{5,200 \text{ units}} = 5,200/(5,200 - 3,600) = 3.25$

$DOL_{5,600 \text{ units}} = 5,600/(5,600 - 3,600) = 2.8$

$DOL_{6,000 \text{ units}} = 6,000/(6,000 - 3,600) = 2.5$



d) The graph shows that the sensitivity of a firm's operating profit to changes in sales decreases the further that the firm operates above its break-even point. The company is operating close to its break-even point. Therefore, at its current monthly sales level of 4,400 units its sensitivity to sales changes is quite high. Its DOL at 4,400 units is 5.5 -- meaning any percent change in operating profits will be 5.5 times as large as the percent change in sales that causes it.

2. a) Q_{BE} = \$180,000/(\$250 - \$150) = 1,800 units

b) Q_{BE} = \$160,000/(\$200 - \$150) = 3,200 units

c) Q_{BE} = \$240,000/(4200 - \$140) = 4,000 units

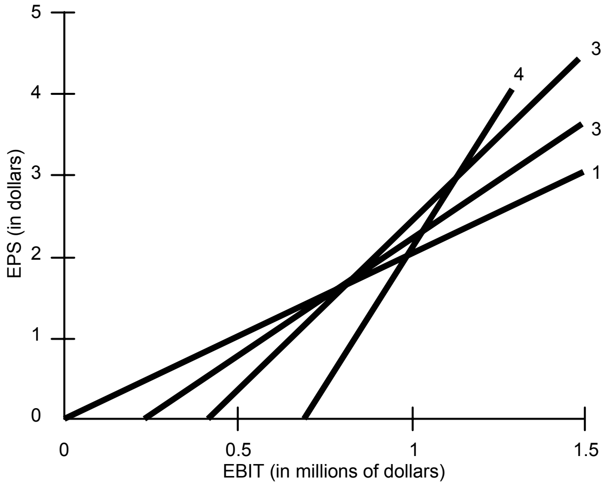
3. a) Q_{BE} = \$1,200/(\$100 - \$20) = 15 horses

b) EBIT = 40(\$100 - \$20) - \$1,200 = \$2,000

4. a) Using an expected level of EBIT of \$1 million, the earnings per share are:

	Plan 1	Plan 2	Plan 3	Plan 4
EBIT (in thousands)	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000
Interest	0	240	400	400
EBT	\$ 1,000	\$ 760	\$ 600	\$ 600
Taxes	500	380	300	300
EAT	\$ 500	\$ 380	\$ 300	\$ 300
Preferred dividends	0	0	0	150
EACS	\$ 500	\$ 380	\$ 300	\$ 150
Number of shares	250	175	125	75
EPS	\$ 2.00	\$ 2.17	\$ 2.40	\$ 2.00

The intercepts on the horizontal axis for the four plans are \$0, \$240,000, \$400,000, and \$700,000 respectively. With this information, the EBIT-EPS indifference chart is:



b) The "dominant" financing plans are #1, #3, and #4. For the EBIT indifference point between Plans #1 and #3, we have:

$(EBIT_{1,3} - 0)(.5)/250,000 = (EBIT_{1,3} - \$400,000)(.5)/125,000$

$(.5)(EBIT_{1,3})(125,000) =$

$(.5)(EBIT_{1,3})(250,000) - (.5)(\$400,000)(250,000)$

$-(62,500)(EBIT_{1,3}) = -\$50,000,000,000$

$EBIT_{1,3} = \$800,000$

For the indifference point between Plans #3 and #4, we have:

$(EBIT_{3,4} - \$400,000)(.5)/125,000 =$

$[(EBIT_{3,4} - \$400,000)(.5) - \$150,000]/75,000$

$(.5)(EBIT_{3,4})(75,000) - (.5)(\$400,000)(75,000) =$

$(.5)(EBIT_{3,4})(125,000) - (.5)(\$400,000)(125,000)$
$- (\$150,000)(125,000)$

$$(37{,}500)(EBIT_{3,4}) - \$15{,}000{,}000{,}000 = (62{,}500)(EBIT_{3,4}) - \$43{,}750{,}000{,}000$$

$$-(25{,}000)(EBIT_{3,4}) = -\$28{,}750{,}000{,}000$$

$$EBIT_{3,4} = \$1{,}150{,}000$$

c) Plan #1 (all equity) dominates up to $800,000 in EBIT, Plan #3 (half debt, half equity) from $800,000 to $1,150,000 in EBIT, and Plan #4 (debt, preferred, and equity) after $1,150,000 in EBIT. The best plan depends upon the likely level of EBIT and the likelihood of falling below an indifference point.

5. a) (000s omitted)

		Additional-financing Plans			
		(1)	(2)	(3)	(4)
	Present Capital Structure	All Common	All 8% Bonds	All Preferred	Half Common and Half Bonds
EBIT	$1,000	$1,000	$1,000	$1,000	$1,000
Interest	120	120	360	120	240
EBT	$ 880	$ 880	$ 640	$ 880	$ 760
Taxes	440	440	320	440	380
EAT	$ 440	$ 440	$ 320	$ 440	$ 380
Pref. Stk. Dividend	---	---	---	210	---
EACS	$ 440	$ 440	$ 320	$ 230	$ 380
Shares outstanding	100	150	100	100	125
EPS	$ 4.40	$ 2.93	$ 3.20	$ 2.30	$ 3.04

b) The important thing in graphing the alternatives is to include the \$120,000 in interest on existing bonds in all of the additional-financing plans. The mathematical formula for determining the indifference point is:

$$\frac{(EBIT_{1,2} - I_1)(1 - t) - PD_1}{NS_1} = \frac{(EBIT_{1,2} - I_2)(1 - t) - PD_2}{NS_2}$$

where $EBIT_{1,2}$ = the EBIT indifference point between the two alternative financing methods that we are concerned with -- in this case, methods 1 and 2;

I_1, I_2 = annual interest paid under financing methods 1 and 2;

PD_1, PD_2 = annual preferred stock dividend paid under financing methods 1 and 2;

t = corporate tax rate;

NS_1, NS_2 = number of shares of common stock to be outstanding under financing methods 1 and 2;

Comparing Plan #1 (all common) with Plan #2 (all bonds), we have:

$$\frac{(EBIT_{1,2} - \$120,000)(.5)}{150,000} = \frac{(EBIT_{1,2} - \$360,000)(.5)}{100,000}$$

$$(.5)(EBIT_{1,2})(100,000) - (.5)(\$120,000)(100,000) =$$

$$(.5)(EBIT_{1,2})(150,000) - (.5)(\$360,000)(150,000)$$

$$(50,000)(EBIT_{1,2}) - (75,000)(EBIT_{1,2}) =$$

$$\$6,000,000,000 - \$27,000,000,000$$

$$- (25,000)(EBIT_{1,2}) = - \$21,000,000,000$$

$$EBIT_{1,2} = \$840,000$$

Above \$840,000 in EBIT, debt is more favorable (in terms of EPS); below \$840,000 in EBIT, common is more favorable.

Comparing Plan #1 (all common) with Plan #3 (all preferred), we have:

$$\frac{(EBIT_{1,3} - \$120,000)(.5)}{150,000} = \frac{(EBIT_{1,3} - \$120,000)(.5) - \$210,000}{100,000}$$

$$(.5)(EBIT_{1,3})(100,000) - (.5)(\$120,000)(100,000) =$$
$$(.5)(EBIT_{1,3})(150,000) - (.5)(\$120,000)(150,000)$$
$$- (\$210,000)(150,000)$$

$$(50,000)(EBIT_{1,3}) - (75,000)(EBIT_{1,3}) =$$
$$\$6,000,000,000 - \$9,000,000,000 - \$31,500,000,000$$

$$- (25,000)(EBIT_{1,3}) = - \$34,500,000,000$$

$$EBIT_{1,3} = \$1,380,000$$

Above \$1,380,000 in EBIT, Plan #3 (all preferred) is more favorable (in terms of EPS); below \$1,380,000 in EBIT, Plan #1 (all common) is more favorable.

Comparing Plan #1 (all common) with Plan #4 (half common, half bonds) we have:

$$\frac{(EBIT_{1,4} - \$120,000)(.5)}{150,000} = \frac{(EBIT_{1,4} - \$240,000)(.5)}{125,000}$$

$$(.5)(EBIT_{1,4})(125,000) - (.5)(\$120,000)(125,000) =$$
$$(.5)(EBIT_{1,4})(150,000) - (.5)(\$240,000)(150,000)$$

$(62{,}500)(EBIT_{1,4}) - (75{,}000)(EBIT_{1,4}) =$

$\$7{,}500{,}000{,}000 - \$18{,}000{,}000{,}000$

$-(12{,}500)(EBIT_{1,4}) = -\$10{,}500{,}000{,}000$

$EBIT_{1,4} = \$840{,}000$ (the same figure as under the Plan #1 vs. Plan #2 comparison)

Above $840,000 in EBIT, Plan #4 (half common, half bonds) is more favorable (in terms of EPS); below $840,000 in EBIT, Plan #1 (all common) is more favorable.

For the Plan #2 (all bonds) versus Plan #3 (all preferred) comparison, the bond alternative dominates the preferred alternative by $0.90 per share throughout all levels of EBIT.

For the Plan #2 (all bonds) versus Plan #4 (half common, half bonds) comparison, the indifference point is again $840,000 in EBIT.

For the Plan #3 (all preferred) versus Plan #4 (half common, half bonds) comparison, we have:

$$\frac{(EBIT_{3,4} - \$120{,}000)(.5) - \$210{,}000}{100{,}000} = \frac{(EBIT_{3,4} - \$240{,}000)(.5)}{125{,}000}$$

$(.5)(EBIT_{3,4})(125{,}000) - (.5)(\$120{,}000)(125{,}000)$

$-(\$210{,}000)(125{,}000) =$

$(.5)(EBIT_{3,4})(100{,}000) - (.5)(\$240{,}000)(100{,}000)$

$(62{,}500)(EBIT_{3,4}) - (50{,}000)(EBIT_{3,4}) =$

$\$7{,}500{,}000{,}000 + \$26{,}250{,}000{,}000 - \$12{,}000{,}000{,}000$

$(12,500)(EBIT_{3,4}) = \$21,750,000,000$

$EBIT_{3,4} = \$1,740,000$

Above \$1,740,000 in EBIT, preferred is more favorable (in terms of EPS); below \$1,740,000 in EBIT, half common and half bonds is more favorable.

These exact indifference points can be used to check graph approximations.

6. a) The level of expected EBIT is only moderately above the indifference point of \$840,000. Moreover, the variance of possible outcomes is great and there is considerable probability that the actual EBIT will be below the indifference point. A two-thirds probability corresponds to one standard deviation on either side of the mean of a normal distribution. If the distribution is approximately normal, F = \$1,000,000 - \$600,000 = \$400,000. The standardized difference from the mean to the indifference point is:

$$(\$840,000 - \$1,000,000)/\$400,000 = -0.4$$

Looking at a normal distribution table found in most any statistics text, we find that this corresponds to a 34.5 percent probability that the actual EBIT will be below \$840,000. While the choice of alternatives depends upon one's risk preferences, the level and variability of EBIT point to the "all-common stock" alternative.

b) Here the level of expected EBIT is significantly above the indifference point and the variability is less. If the distribution is approximately normal, s = \$1,500,000 - \$1,300,000 = \$200,000. The standardized difference from the mean to the indifference point is:

(\$840,000 - \$1,500,000)/\$200,000 = - 3.3

The probability of actual EBIT falling below the indifference point is negligible. The situation in this case favors the "all bond" alternative.

7. a)

	Additional-financing Alternatives		
	Common	Debt	Preferred
EBIT (000s omitted)	\$6,000	\$6,000.0	\$6,000
Interest on existing debt	800	800.0	800
Interest on new debt	0	550.0	0
Earnings before taxes	5,200	4,650.0	5,200
Taxes	1,820	1,627.5	1,820
Earnings after taxes	3,380	3,022.5	3,380
Dividends on existing preferred stock	0	0.0	0
Dividends on new preferred stock	0	0.0	500
Earnings available to common shareholders	\$3,380	\$3,022.5	\$2,880
Number of common shares outstanding	1,350	1,100.0	1,100
Earnings per share (EPS)	\$ 2.50	\$ 2.75	\$ 2.62

b) (1)

	Additional-financing Alternatives		
	Common	Debt	Preferred
EBIT (000s omitted)	$3,000	$3,000.0	$3,000
Interest on existing debt	800	800.0	800
Interest on new debt	0	550.0	0
Earnings before taxes	2,200	1,650.0	2,200
Taxes	770	577.5	770
Earnings after taxes	1,430	1,072.5	1,430
Dividends on existing preferred stock	0	0.0	0
Dividends on new preferred stock	0	0.0	500
Earnings available to common shareholders	$1,430	$1,072.5	$ 930
Number of common shares outstanding	1,350	1,100.0	1,100
Earnings per share (EPS)	$ 1.06	$ 0.98	$ 0.85

b) (2)

	Additional-financing Alternatives		
	Common	Debt	Preferred
EBIT (000s omitted)	$4,000	$4,000.0	$4,000
Interest on existing debt	800	800.0	800
Interest on new debt	0	550.0	0
Earnings before taxes	3,200	2,650.0	3,200
Taxes	1,120	927.5	1,220
Earnings after taxes	2,080	1,772.5	2,080
Dividends on existing preferred stock	0	0.0	0
Dividends on new preferred stock	0	0.0	500
Earnings available to common shareholders	$2,080	$1,722.5	$1,580
Number of common shares outstanding	1,350	1,100.0	1,100
Earnings per share (EPS)	$ 1.54	$1.57	$ 1.44

b) (3)

	Additional-financing Alternatives		
	Common	Debt	Preferred
EBIT (000s omitted)	$8,000	$8,000.0	$8,000
Interest on existing debt	800	800.0	800
Interest on new debt	0	550.0	0
Earnings before taxes	7,200	6,650.0	7,200
Taxes	2,520	2,327.5	2,520
Earnings after taxes	4,680	4,322.5	4,680
Dividends on existing preferred stock	0	0.0	0
Dividends on new preferred stock	0	0.0	500
Earnings available to common shareholders	$4,680	$4,322.5	$4,180
Number of common shares outstanding	1,350	1,100.0	1,100
Earnings per share (EPS)	$ 3.47	$ 3.93	$ 3.80

c) (1)

	Additional-financing Alternatives		
	Common	Debt	Preferred
EBIT (000s omitted)	$6,000	$6,000	$6,000
Interest on existing debt	800	800	800
Interest on new debt	0	550	0
Earnings before taxes	5,200	4,650	5,200
Taxes	2,392	2,139	2,392
Earnings after taxes	2,808	2,511	2,808
Dividends on existing preferred stock	0	0	0
Dividends on new preferred stock	0	0	500
Earnings available to common shareholders	$2,808	$2,511	$2,308
Number of common shares outstanding	1,350	1,100	1,100
Earnings per share (EPS)	$ 2.08	$ 2.28	$ 2.10

c) (2)

	Additional-financing Alternatives		
	Common	Debt	Preferred
EBIT (000s omitted)	$6,000	$6,000	$6,000
Interest on existing debt	800	800	800
Interest on new debt	0	400	0
Earnings before taxes	5,200	4,800	5,200
Taxes	1,820	1,680	1,820
Earnings after taxes	3,380	3,120	3,380
Dividends on existing preferred stock	0	0	0
Dividends on new preferred stock	0	0	350
Earnings available to common shareholders	$3,380	$3,120	$3,030
Number of common shares outstanding	1,350	1,100	1,100
Earnings per share (EPS)	$ 2.50	$ 2.84	$ 2.75

c) (3)

	Additional-financing Alternatives		
	Common	Debt	Preferred
EBIT (000s omitted)	$6,000	$6,000.0	$6,000
Interest on existing debt	800	800.0	800
Interest on new debt	0	550.0	0
Earnings before taxes	5,200	4,650.0	5,200
Taxes	1,820	1,627.5	1,820
Earnings after taxes	3,380	3,022.5	3,380
Dividends on existing preferred stock	0	0.0	0
Dividends on new preferred stock	0	0.0	500
Earnings available to common shareholders	$3,380	$3,022.5	$2,880
Number of common shares outstanding	1,225	1,100.0	1,100
Earnings per share (EPS)	$ 2.76	$ 2.75	$ 2.62

8. (000s omitted)

<u>Boehm-Gau</u>: Interest Coverage = $5,000/$1,600 = 3.13

$$\text{Debt-service Coverage} = \frac{\$5{,}000}{\$1{,}600 + \dfrac{\$2{,}000}{(1 - .40)}} = 1.01$$

<u>Northern California</u>: Interest Coverage = $100,000/$45,000 = 2.22

$$\text{Debt-service Coverage} = \frac{\$100{,}000}{\$45{,}000 + \dfrac{\$35{,}000}{(1 - .36)}} = 1.00$$

The question of with which company one feels more comfortable depends on the business risk. Inasmuch as an electric utility has stable cash flows and Northern California is large, it is no doubt the safer loan despite the lower coverage ratios. The fact that the debt service coverage ratio is 1.0 means that some of the debt will probably have to be renewed or "rolled over" at maturity. However, this is typical for an electric utility.

9. Matching, we get

Company	TD/TA	LTD/Total Cap.	Industry
A	.56	.43	Chemical
B	.64	.66	Airline
C	.47	.08	Supermarket
D	.42	.26	Apparel Maker

The supermarket is likely to have the highest portion of total debt in the form of accounts payable, a short-term liability, because purchases make up a large portion of total costs. Therefore, we would expect it to have the greatest disparity between the two debt ratios. The airline would be expected to have the highest debt ratio, most of which is long-term debt used to finance aircraft. Here the ratio of total debt to total assets is slightly less than the ratio of long-term debt to total capitalization. An apparel maker will have a sizeable amount of accounts payable, but will also have some long-term debt used to finance fixed assets. Finally, the chemical company is determined largely by elimination. Such a company has current liabilities, but relies heavily on long-term debt to finance fixed assets.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

$$Q_{BE} = \frac{\$3M}{(\$2.00 - \$1.75)} = \textbf{12 million half pints}$$

$$S_{BE} = \frac{\$3M}{1 - (\$1.75/\$2.00)} = \textbf{\$24 million in annual sales}$$

b.

$$Q_{BE} = \frac{\$3M}{(\$2.00 - \$1.68)} = \textbf{9.375 million half pints}$$

c.

$$Q_{BE} = \frac{\$3.75M}{(\$2.00 - \$1.75)} = \textbf{15 million half pints}$$

d.

$$DOL_{16 \text{ million units}} = \frac{16M}{(16M - 12M)} = \mathbf{4}$$

e. (15 percent) x 4 = **60% increase in EBIT**

2. a. (Percent change in sales) x DOL = Percent change in EBIT

(20 percent) x 2 = 40% change in EBIT

Therefore, \$1,000 x (1 + .40) = **\$1,400**

b.

$$DOL_{10{,}000 \text{ units}} = \frac{10{,}000}{10{,}000 - Q_{BE}} = 2$$

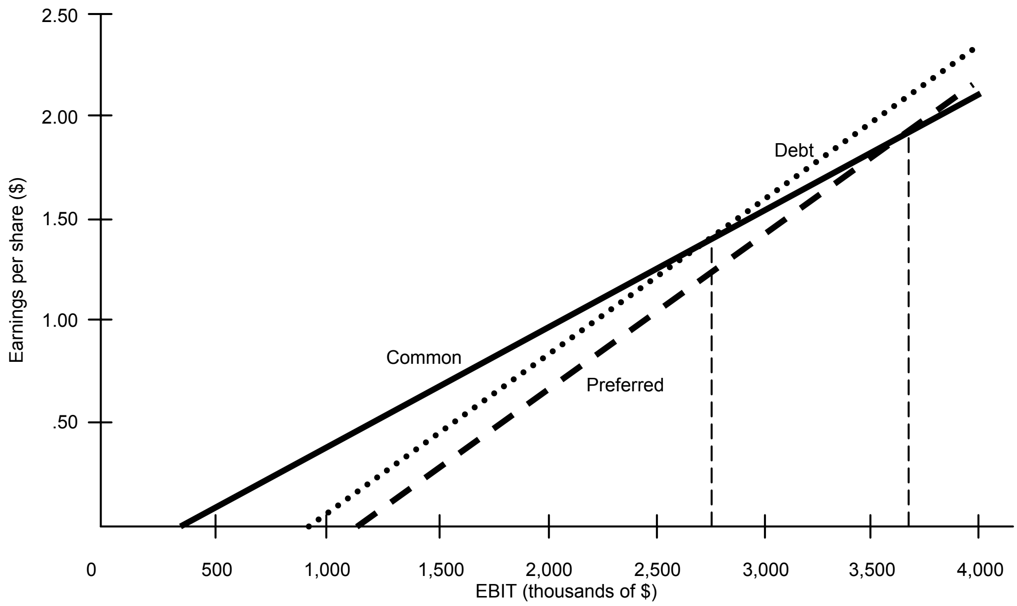
Therefore, Q_{BE} must equal 5,000 units.

$$DOL_{12{,}000 \text{ units}} = \frac{12{,}000}{12{,}000 - 5{,}000} = \mathbf{1.7}$$

3. a. (000s omitted)

	DEBT	PREFERRED STOCK	COMMON STOCK
Operating profit (EBIT)	$1,500	$1,500	$1,500
Interest on existing debt	360	360	360
Interest on new debt	560	----	---
Profit before taxes	$ 580	$1,140	$1,140
Taxes	232	456	456
Profit after taxes	$ 348	$ 684	$ 684
Preferred stock dividend	---	480	---
Earnings available to common shareholders	$ 348	$ 204	$ 684
Number of shares	800	800	1,050
Earnings per share	**$ .435**	**$ .255**	**$ .651**

b.



Approximate indifference points:

Debt (1) and common (3): **$2.7 million in EBIT**

Preferred (2) and common (3): **$3.7 million in EBIT**

Debt dominates preferred by the same margin throughout. There is no indifference point between these two alternative financing methods.

Mathematically, the indifference point between debt (1) and common (3), with 000s omitted, is

$$\underset{\textbf{Debt (1)}}{\frac{(EBIT_{1,3} - \$920)(1 - .40) - 0}{800}} = \underset{\textbf{Common Stock (3)}}{\frac{(EBIT_{1,3} - \$360)(1 - .40) - 0}{1{,}050}}$$

Cross-multiplying and rearranging, we obtain

$$(EBIT_{1,3})(.60)(1{,}050) - (\$920)(.60)(1{,}050) = (EBIT_{1,3})(.60)(800) - (\$360)(.60)(800)$$

$$(EBIT_{1,3})(630) - (\$579{,}600) = (EBIT_{1,3})(480) - (\$172{,}800)$$

$$(EBIT_{1,3})(150) = \$406{,}800$$

$$EBIT_{1,3} = \mathbf{\$2{,}712}$$

Note that for the debt alternative, the total before-tax interest is **$920**, and this is the intercept on the horizontal axis. For the preferred stock alternative, we divide $480 by (1 - .4) to get $800. When this is added to $360 in interest on existing debt, the intercept becomes **$1,160**.

c. Debt (1):

$$\text{DFL}_{\text{EBIT of \$1.5M}} = \frac{\$1{,}500{,}000}{\$1{,}500{,}000 - \$920{,}000} = \mathbf{2.59}$$

Preferred (2):

$$\text{DFL}_{\text{EBIT of \$1.5M}} = \frac{\$1{,}500{,}000}{\$1{,}500{,}000 - \$360{,}000 - [\$480{,}000/(1 - .40)]}$$

$$= \mathbf{4.41}$$

Common (3):

$$\text{DFL}_{\text{EBIT of \$1.5M}} = \frac{\$1{,}500{,}000}{\$1{,}500{,}000 - \$360{,}000} = \mathbf{1.32}$$

d. For the present EBIT level, common is clearly preferable. EBIT would need to increase by $2,712,000 - $1,500,000 = **$1,212,000** before an indifference point with debt is reached. One would want to be comfortably above this indifference point before a strong case for debt should be made. The lower the probability that actual EBIT will fall below the indifference point, the stronger the case that can be made for debt, all other things the same.

4.

$$\text{DOL}_{Q \text{ units}} = \frac{\text{Percentage change in operating profit (EBIT)}}{\text{Percentage change in output (or sales)}} = \frac{\left[\dfrac{\Delta Q(P - V)}{Q(P - V) - FC}\right]}{\Delta Q/Q}$$

Which reduces to: $\text{DOL}_{Q \text{ units}} = \dfrac{Q(P - V)}{Q(P - V) - FC}$

Dividing both the numerator and denominator by (P - V) produces

$$\text{DOL}_{Q \text{ units}} = \frac{Q}{Q - [FC/(P - V)]} = \frac{Q}{Q - Q_{BE}}$$

5. a. Total annual interest is determined as follows:

15% of $2.4 million =	$ 360,000
13% of $3.0 million =	390,000
18% of $2.0 million =	360,000
	$1,110,000

Interest coverage ratio = $2,000,000/$1,110,000 = **1.80**

Total annual principal payments = $100,000 + $150,000 = $250,000

$$\text{Debt-service coverage ratio} = \frac{\$2{,}000{,}000}{\$1{,}110{,}000 + [\$250{,}000/(1 - .50)]} = \mathbf{1.24}$$

b. Required deviation of EBIT from its mean value before ratio in question becomes 1 : 1:

Interest coverage: $1,110,000 - $2,000,000 = -$890,000

Debt-service coverage: $1,610,000 - $2,000,000 = -$390,000

Standardizing each deviation from the mean produces the following Z-scores:

$$\text{Interest coverage: } \frac{-\$890{,}000}{\$1{,}500{,}000} = -.593 \text{ standard deviations (left of the mean)}$$

$$\text{Debt-service coverage: } \frac{-\$390{,}000}{\$1{,}500{,}000} = -.260 \text{ standard deviations (left of the mean)}$$

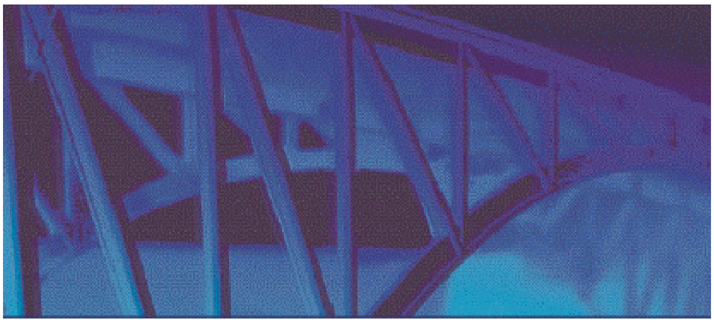
Table V in the Appendix at the end of the book can be used to determine the proportion of the area under the normal curve that is Z-standard deviations left of the mean. This proportion corresponds to the probability that an EBIT figure will occur that produces coverage ratios lower than 1 : 1.

For interest coverage and debt-service coverage ratios less than 1 : 1 these probabilities are approximately 28 percent and 40 percent, respectively. These probabilities assume that the distribution of possible EBITs is normal.

c. There is a substantial probability, 40 percent, that the company will fail to cover its interest and principal payments. Its debt ratio (using either book or market values) is much higher than the industry norm of .47. Although the information is limited, based on what we have, it would appear that Archimedes has too much debt. However, other factors, such as liquidity, may mitigate against this conclusion.

6. Aberez has a lower debt ratio than its industry norm. Vorlas has a higher ratio relative to its industry. Both companies exceed modestly their industry norms with respect to interest coverage. The lower debt/equity ratio and higher interest coverage for Vorlas's industry suggest that its industry might have more business risk than the industry of which Aberez is a part. The liquidity ratio of Aberez is higher than the industry norm while that for Vorlas is lower than the industry norm. Although all three financial ratios for Vorlas are better than are those for Aberez, they are lower relative to the industry norm. Finally, the bond rating of Aberez is much better than is that of Vorlas, being an Aa grade and higher than the industry norm. The bond rating of Vorlas is one grade below the very lowest grade for investment-

grade bonds. It is also lower than the typical company's bond rating in the industry. If the industry norms are reasonable representations of underlying business and financial risk, we would say that Vorlas had the greater degree of risk.



17
Capital Structure Determination

When you have eliminated the impossible, whatever remains, however improbable, must be the truth.

SHERLOCK HOLMES
IN *THE SIGN OF THE FOUR*

ANSWERS TO QUESTIONS

1. The net operating income (NOI) approach and the Modigliani-Miller (M&M) approach, in the absence of taxes, are identical in form. The only difference is that M&M specify the behavioral characteristics that cause the average cost of capital to remain constant. M&M provide a set of assumptions necessary to show the mechanism of arbitrage equilibrating returns from similar investments.

2. The optimal capital structure would differ from one industry to another because each industry has a different level of business risk. The higher the level of business risk, the lower the amount of financial risk that might be incurred and vice versa. Even within an industry, the competitive position of a firm, the growth potential, and the caliber of management may cause a higher degree of business risk.

3. Many factors influence the interest rate a firm must pay for debt funds. Some factors are external to the firm. For example, the expected inflation rate, the Federal Reserve's activity in the capital and money markets, and the productivity of capital, are external to the firm. Other factors such as the magnitude and variability of earnings, the stability of management, the debt-to-equity ratio, type and quality of assets, bond rating, the maturity

of the bonds, etc., are internal factors that affect the rate paid on debt funds.

4. The total-value principle states that a corporation is valued on the basis of its earnings potential and its business risk. The total "pie" of value stays the same regardless of how it is sliced. Therefore, no matter how the pie is divided between debt, equity, and other claims, the total value of the firm stays the same. There is a conservation of investment value so that the sum of the parts equals the whole and the whole does not change with changes in financial leverage.

5. Arbitrage implies that an identical product cannot sell for different prices in different markets. If it does, arbitragers will buy in one market and sell in another to earn an arbitrage profit with no risk to them. These actions will cause the price of one asset to rise and the price of the other to fall until equilibrium is achieved, at which time there will be no further opportunity for arbitrage profit. As applied to capital structure, if two companies are said to be the same other than one is levered while the other is not, arbitrage supposedly would cause the total value of the two firms to be the same. With market imperfections, however, this need not be the case, though the elimination of arbitrage profits is central to market equilibration as it applies, among other things, to the issue of capital structure.

6. Without financial-market imperfections, variation in capital structure would have no impact on share price. Capital structure decisions would be irrelevant, as suggested by Modigliani-Miller. Market imperfections take us away from a frictionless world and reduce the effectiveness of arbitrage. As a result, different financial liabilities and common stock can have different costs on a certainty-equivalent basis. The two most important imperfections with respect to capital structure are probably income taxes and bankruptcy costs. Their joint impact was taken up in the chapter. Other imperfections include agency costs, transaction costs on the sale of stocks and bonds by investors, flotation costs to the corporation, legal restrictions governing investor behavior, and restrictions on margin loans and short sales.

7. Bankruptcy costs include out-of-pocket expenses to lawyers, accountants, appraisers, trustees, and others as well as the loss of economic value that often occurs as a company approaches bankruptcy and is not able to operate efficiently. Agency costs include costs of shareholders monitoring the actions of management and lenders monitoring the actions of a company. Auditing fees, appraiser fees, bonding fees, and the cost of protective covenants are examples of agency costs. These costs tend to increase at an increasing rate beyond some point of financial leverage. Therefore, bankruptcy and agency costs eventually offset the net tax benefit associated with the employment of debt funds by the

corporation. They bound the solution so that there is an optimal capital structure.

8. For reasons of prudence as well as legal reasons, institutional investors will not lend money to a company that has excessive financial leverage. Both under state regulations and ERISA, these investors cannot take excessive risks. Therefore, there comes a point in financial leverage where they will not extend loans even though the firm may be willing to pay a higher interest rate. The judgment of whether financial leverage is excessive is usually made after studying debt ratios as well as the cash-flow ability of the company to service debt. Often, regulators rely on the rating agencies to determine whether a company is too risky when the debt is publicly held.

9. Without the payment of taxes, the corporate tax-shield due to debt disappears and so too does the major economic argument to the use of debt. As a result, the optimal capital structure would entail much less debt than if a company were to pay taxes at the full corporate tax rate.

10. Debt financing would decrease on a relative basis, all other things the same. The tax advantage associated with debt would be reduced. Equity financing would increase on a relative basis, all other things the same.

11. The tax effect associated with debt and equity financing would be the same, as opposed to the tax advantage presently enjoyed by debt financing. As a result, equity financing would increase relative to debt financing. Corporations as a whole would move toward lower debt-to-equity ratios.

12. If there is asymmetric information between management and investors, the former might signal via capital structure. The implication is that management would not bind itself to the debt-servicing schedule unless it believed the company had operating cash flows in the future to adequately service such debt. The capital-structure change represents an explicit statement about expected future earnings. In this context, the issuance of debt is "good news," whereas the issuance of equity would be regarded as "bad news" by investors.

SOLUTIONS TO PROBLEMS

1. a)

O	Net operating income	$10,000,000
I	Interest on debt	1,400,000
E	Earnings available to common shareholders (O - I)	$ 8,600,000
k_e	Equity capitalization rate	÷ .125
S	Market value of stock (E/k_e)	$68,800,000
B	Market value of debt	20,000,000
V	Total value of firm (B + S)	$88,800,000
k_o	Implied overall capitalization rate [$k_i(B/V) + k_e(S/V)$] or alternatively (O/V)	.1126126

b)

O	Net operating income	$10,000,000
k_o	Overall capitalization rate	÷ .1126126
V	Total value of firm (B + S)	$88,800,000
B	Market value if debt	30,000,000
S	Market value of stock (V - B)	$58,800,000
O	Net operating income	$10,000,000
I	Interest on debt	2,100,000
E	Earnings available to common shareholders (O - I)	$ 7,900,000
k_e	Implied equity capitalization rate (E/S)	.13435

2. a) (1) Sell your Gottahave stock for $22,500.

(2) Borrow $20,000 at 12 percent interest. This personal debt is equal to 1 percent of Gottahave debt.

(3) Buy 1 percent of the stock of the Wannabee Company for $40,000 and still have $22,500 + $20,000 - $40,000 = $2,500 left over for other investments.

Return on investment in Wannabee	$6,000
Less: interest paid ($20,000 x .12)	2,400
Net return	$3,600

Your net dollar return, $3,600, is the same as it was for your investment in Gottahave. However, your personal cash outlay of $20,000 ($40,000 less personal borrowings of $20,000) is $2,500 less than your previous $22,500 investment in Gottahave.

b) When there is no further opportunity for employing fewer funds and achieving the same total dollar return the arbitrage process will cease. At this point, the total value of the two firms must be the same, as must their average costs of capital.

3. a) \$400,000 in debt. The market price per share of common stock is highest at this amount of financial leverage.

b) (000s omitted)

# shares	B	EBIT	I	EBT	EAT
100	\$ 0	\$250	\$ 0.0	\$250.0	\$125.00
90	100	250	10.0	240.0	120.00
80	200	250	20.0	230.0	115.00
70	300	250	31.5	218.5	109.25
60	400	250	44.0	206.0	103.00
50	500	250	60.0	190.0	95.00
40	600	250	84.0	166.0	83.00

k_i	EPS	P	k_e = EPS/P	S = (# shares) x P	V = B + S
---	\$1.25	\$10.00	12.5%	\$1,000.0	\$1000.0
5.00%	1.33	10.00	13.3	900.0	1000.0
5.00	1.44	10.50	13.7	840.0	1040.0
5.25	1.56	10.75	14.5	752.5	1052.5
5.50	**1.72**	**11.00**	**15.6**	**660.0**	**1060.0**
6.00	1.90	10.50	18.1	525.0	1025.0
7.00	2.08	9.50	21.8	380.0	980.0

k_i(B/V)	+	k_e(S/V)	=	k_o
		(12.5%)($1,000/$1,000.0)	=	12.50%
(5.00%)($100/$1,000.0)	+	(13.3%)($900.0/$1,000.0)	=	12.47
(5.00%)($200/$1,040.0)	+	(13.7%)($840.0/$1,040.0)	=	12.03
(5.25%)($300/$1,052.5)	+	(14.5%)($752.5/$1,052.5)	=	11.86
(5.50%)($400/$1,060.0)	**+**	**(15.6%)($660.0/$1,060.0)**	**=**	**11.79**
(6.00%)($500/$1,025.0)	+	(18.1%)($525.0/$1,025.0)	=	12.20
(7.00%)($600/$980.0)	+	(21.8%)($380/$980.0)	=	12.74

c) Yes. The optimal capital structure -- the one possessing the lowest overall cost of capital -- involves $400,000 in debt.

4. a)

	All equity	Debt and Equity
EBIT	$1,000,000	$1,000,000
Interest to debtholders	0	450,000
EBT	$1,000,000	$ 550,000
Taxes (.40)	400,000	220,000
Incomes available to common shareholders	$ 600,000	$ 330,000
Income to debtholders plus income available to shareholders	$ 600,000	$ 780,000

b) Present value of tax-shield benefits
$= (B)(t_c) = (\$3,000,000)(.40) = \$1,200,000$

c) Value of all-equity financed firm
$= EAT/k_e = \$600,000/(.20) = \$3,000,000$

Value of recapitalized firm
$= \$3,000,000 + \$1,200,000 = \$4,200,000$

5. (in millions)

(1) Debt	(2) Value of Unlevered Firm	(3) PV of tax-shield benefits (1) x .22	(4) PV of Bankruptcy Costs	(5) Value of Levered Firm (2) + (3) - (4)
$0	$10	$0.00	$0.00	$10.00
1	10	0.22	0.00	10.22
2	10	0.44	0.05	10.39
3	10	0.66	0.10	10.56
4	10	0.88	0.20	10.68
5	**10**	**1.10**	**0.40**	**10.70***
6	10	1.32	0.70	10.62
7	10	1.54	1.10	10.44
8	10	1.76	1.60	10.16

*The optimal amount of debt would be $5 million.

6. a) without bankruptcy costs

$[k_i \times (B/V)] + [k_e \times (S/V)] = k_o$

(10.00%)(1.00) = 10.000%

(4.00%)(.10) + (10.50%)(.90) = 9.850%

(4.00%)(.20) + (11.00%)(.80) = 9.600%

(4.25%)(.30) + (11.50%)(.70) = 9.325%

(4.50%)(.40) + (12.25%)(.60) = 9.150%

(5.00%)(.50) + (13.25%)(.50) = 9.125%

(5.50%)(.60) + (14.50%)(.40) = 9.100%

(6.25%)(.70) + (16.00%)(.30) = 9.175%

(7.50%)(.80) + (18.00%)(.20) = 9.600%

b) with bankruptcy costs

$[k_i \times (B/V)] + [k_e \times (S/V)] = k_o$

		(10.00%)(1.00)	=	10.000%
(4.00%)(.10)	+	(10.50%)(.90)	=	9.850%
(4.00%)(.20)	+	(11.25%)(.80)	=	9.800%
(4.25%)(.30)	+	(12.00%)(.70)	=	9.675%
(4.50%)(.40)	+	(13.00%)(.60)	=	9.600%
(5.00%)(.50)	+	(14.50%)(.50)	=	9.750%
(5.50%)(.60)	**+**	**(16.25%)(.40)**	**=**	**9.800%**
(6.25%)(.70)	+	(18.50%)(.30)	=	9.925%
(7.50%)(.80)	+	(21.00%)(.20)	=	10.200%

With bankruptcy costs, the optimal capital structure is 40 percent debt in contrast to 60 percent bankruptcy costs.

7. According to the notion of asymmetric information between management and investors, the company should issue the overvalued security, or at least the one that is not undervalued in its mind. This would be debt in the situation described in the problem. Investors would be aware of management's likely behavior and would view the event as "good news." The stock price might rise, all other things the same, if this information was not otherwise conveyed.

In contrast, if the common stock were believed to be overvalued, management would want to issue common stock. This assumes it wishes to maximize the wealth of existing stockholders. Investors would regard this announcement as "bad news," and the stock price might decline. Information effects through financing assume that the information is not otherwise known by the market. Management usually has a bias in thinking that the common stock of the company is undervalued.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

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1. a. Qwert Typewriter Company:

O	Net operating income	$ 360,000
k_o	Overall capitalization rate	÷ .18
V	Total value of the firm (B + S)	$2,000,000
B	Market value of debt (50%)	1,000,000
S	Market value of stock (50%)	$1,000,000
O	Net operating income	$ 360,000
I	Interest on debt (13%)	130,000
E	Earnings available to common shareholders (O - I)	$ 230,000

2% of $230,000 = **$4,600**

Implied equity capitalization rate, k_e = E/S = $230,000/$1,000,000

= **23 percent**

b. Yuiop Typewriters, Inc.:

O	Net operating income	$ 360,000
k_o	Overall capitalization rate	÷ .18
V	Total value of the firm (B + S)	$2,000,000
B	Market value of debt (20%)	400,000
S	Market value of stock (80%)	$1,600,000
O	Net operating income	$ 360,000
I	Interest on debt (13%)	52,000
E	Earnings available to common shareholders (O - I)	$ 308,000

Implied equity capitalization rate, k_e = E/S = $308,000/$1,600,000

= **19.25 percent**

Yuiop has a lower equity capitalization rate than Qwert because Yuiop uses less debt in its capital structure. As the equity capitalization rate is a linear function of the debt-to-equity ratio when we use the net operating income approach, the decline in equity capitalization rate exactly offsets the disadvantage of not employing so much in the way of "cheaper" debt funds.

2. Value of firm if unlevered:

Earnings before interest and taxes	$ 3,000,000
Interest	0
Earnings before taxes	$ 3,000,000
Taxes (40 percent)	1,200,000
Earnings after taxes	$ 1,800,000
Equity capitalization rate, k_e	÷ .18
Value of the firm (unlevered)	**$10,000,000**

Value with $4 million in debt:

Value of levered firm = Value of firm if unlevered + Present value of tax-shield benefits of debt

= $10,000,000 + ($4,000,000)(.40)

= **$11,600,000**

Value with $7 million in debt:

= $10,000,000 + ($7,000,000)(.40)

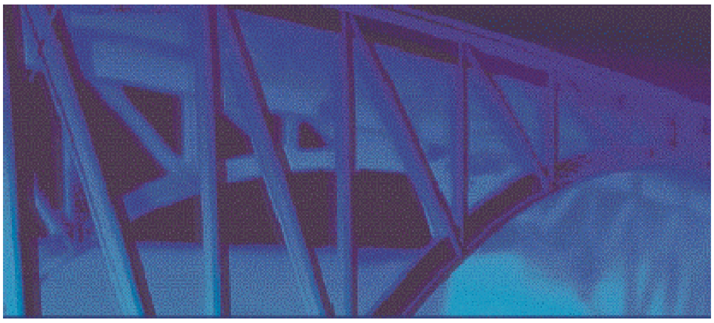
= **$12,800,000**

Due to the tax subsidy, the firm is able to increase its value in a linear manner with more debt.

3. (In millions):

(1) LEVEL OF DEBT	(2) FIRM VALUE UNLEVERED	(3) PV OF TAX-SHIELD BENEFITS OF DEBT (1) x .20	(4) PV OF BANKRUPTCY, AGENCY & INCREASED INTEREST COSTS	VALUE OF FIRM (2)+(3)-(4)
$ 0	$15	$0	$0.0	$15.0
5	15	1	0.0	16.0
10	15	2	0.6	16.4
15	15	3	1.2	16.8
20*	**15**	**4**	**2.0**	**17.0**
25	15	5	3.2	16.8
30	15	6	5.0	16.0

*The market value of the firm is maximized with $20 million in debt.



18
Dividend Policy

"Contrariwise," continued Tweedledee, "if it was so, it might be; and if it were so, it would be; but as it isn't, it ain't. That's logic."

LEWIS CAROL,
THROUGH THE LOOKING GLASS

ANSWERS TO QUESTIONS

1. With a passive dividend-payout policy, the company pays out as cash dividends any earnings it has left over after funding all worthwhile investment opportunities. It is passive in the sense that there is an automatic decision rule. With an active dividend policy, a company may pay out more in dividends, or conceivably less, in the belief that dividends are relevant in their effect on share value.

2. The investor manufactures "homemade" dividends by selling shares of stock if the dividend paid is less than the investor's consumption desires and by buying shares if consumption desires are less than the dividend paid. Imperfections impeding such actions include the problem of divisibility of shares, taxes to the investor, transaction costs, and inconvenience costs. In the absence of these factors, the action of a number of investors manufacturing "homemade" dividends is to make the percentage of dividend payout of a company irrelevant from the standpoint of valuation.

3. Taxes affect the after-tax return to different investors, which range from tax-free pension funds to wealthy individuals and corporations that pay taxes at the full rate. As stock-price appreciation is subject to more favorable tax treatment (in present-value terms) than dividends, taxable investors may prefer

the company to retain earnings as opposed to pursuing an active dividend-payout policy. However, there are arguments for a neutral effect as well. The empirical evidence is mixed as to whether a tax effect exists. Some evidence supports this notion, while other evidence is consistent with a neutral effect.

4. For a company whose growth in assets is great, there typically is a need to finance externally. In addition to debt, the equity base must be built up -- either through retention of earnings or the sale of common stock. With flotation costs, retention is usually "cheaper," which argues for a low dividend-payout ratio. For a slow growing firm, there frequently is a lack of suitable investments, so external financing needs are relatively low. Given this situation, the firm is justified in paying out a high proportion of its earnings.

5. Financial signaling implies that concrete actions like a cash dividend increase, a stock dividend or stock split, and the repurchase of common stock convey positive information to investors about management's belief that the company is undervalued in the marketplace. These actions are said to be more convincing than a press announcement of the favorable earnings picture. Empirical evidence is consistent with a financial signaling or informational effect.

6. A company with high liquidity and ready access to lines of credit or the public marketplace for new securities offerings has financial flexibility. It is likely to be more inclined to pay a dividend, all other things the same. There is far less risk of a cash shortfall should things turn bad in contrast to the company with little liquidity or ability to borrow.

7. Neither policy, if strictly interpreted, recognizes variations in the firm's investment opportunities or cash flows. While a constant dollar payout gives some recognition to those investors seeking a stable income, it ignores the wishes of those investors who would prefer 100-percent retention. This same criticism can be made of the constant dividend-payout ratio policy only in reverse. A policy of a constant regular dividend supplemented when funds for investments are unneeded would appear to combine the better features of both policies. Investors would have a fairly stable minimum amount of income, and the corporation would retain most of its investment flexibility.

8. A <u>target dividend-payout ratio</u> is a percent of earnings the company pays out over time. The target might be 30 percent, for example, and the company would endeavor to pay out this ratio not every year but, say, over several years. The actual dividend is raised only when the firm feels confident that it can maintain the new, higher level. An <u>extra dividend</u> is over and above the regular quarterly dividend, typically in a good earnings period. It is not a permanent increase.

9. A stock dividend is a payment of additional shares of stock to shareholders. It is often used in place of or in addition to a cash dividend. A stock split is an increase in the number of shares outstanding by reducing the par value of the stock. In both cases, the shareholder simply receives more certificates. His or her proportional ownership of the corporation stays the same. Theoretically, nothing of value occurs. In fact, the cost of administration is a cash outflow from the standpoint of shareholders. However, there may be a favorable signaling effect, and indeed empirical evidence suggests such an effect. However, the underlying cause for the share-price improvement is better earnings, not the stock dividend or stock split.

10. In theory, stock dividends are not a thing of value. While the stock may respond favorably to their announcement, it must be remembered that there is an information effect. Usually the information is a confirmation of an upward trend in earnings. Otherwise the firm supposedly would not pay a stock dividend that causes dilution. In "practice," the stock dividend itself may have some "psychological" value to shareholders and some value in making the sale of a small number of shares easier. However, the effect of these factors will be slight if at all. We are inclined to feel that they have no effect. Empirical tests are not sensitive enough to pick up a slight effect.

11. The reverse stock split will raise share price, but like a straight split the shareholder maintains his/her proportional ownership. Reverse splits may have a negative information effect, as most companies who undertake them are in financial difficulty. This need not be the case, but investors may well assume the worst.

12. With full disclosure to the investor of the company's intentions, it would seem that open-market purchases would be preferred to self-tender offers, because of the higher transactions cost to the firm of the latter. However, it may be argued that the self-tender offer is more effective.

13. The Internal Revenue Service will not allow the substitution of stock repurchase for regular cash dividends because of the possible loss of tax revenue. Therefore, a company must view the repurchase of stock as a one-shot affair to distribute excess liquidity. This vehicle cannot be used on a steady basis, or it will be subject to taxation.

14. Companies are reluctant to cut their dividends because of the belief that investors value dividend stability. As a result, boards of directors want to make sure the reduction in earnings is more than a temporary aberration before they take action.

15. Dividends represent a reduction in cash which in turn represents a reduced ability of a company to make payments on its loan. Lenders wish to safeguard this ability through a protective covenant dealing with dividends. This covenant usually restricts dividends to a percent of cumulative earnings.

16. With a dividend reinvestment plan (DRIP), the company invests the dividend in more shares of stock in the shareholder's behalf. The share purchase is subject to full taxation to the shareholder, the same as if the cash dividend had been paid. The advantage to the shareholder is the convenience of investing and lower transactions cost than what would occur if the investor bought a few shares of stock in the open market.

17. Dividend policy is a type of financing decision. Dividends foregone mean, of course, that earnings are retained, and retained earnings represent an important source of business financing.

SOLUTIONS TO PROBLEMS

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1. a)
   - a 15 percent stock dividend amounts to 150,000 additional shares (1,000,000 x .15)
   - treat as a "small-percentage stock dividend"
   - (150,000 shares) x ($7) = $1,050,000

Common stock ($5 par; 1.15 million shares)	$ 5,750,000
Additional paid-in capital	5,300,000
Retained earnings	13,950,000
Total shareholders' equity	$ 25,000,000

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b)
   - a 25 percent stock dividend amounts to 250,000 additional shares (1,000,000 x .25)
   - treat as a "large-percentage stock dividend"
   - (250,000 shares) x ($5) = $1,250,000

Common stock ($5 par; 1.25 million shares)	$ 6,250,000
Additional paid-in capital	5,000,000
Retained earnings	13,750,000
Total shareholders' equity	$ 25,000,000

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c)

Common stock ($5 par; 1.25 million shares)	$ 5,000,000
Additional paid-in capital	5,000,000
Retained earnings	15,000,000
Total shareholders' equity	$ 25,000,000

2. a) Dividends = $500,000

   b) Dividends = $0

   c) Dividends = $0. Company should raise an additional $1 million through a new issue of common stock if a capital budgeting analysis (in which flotation costs are treated as outlays) proves favorable.

3. The answers assume all things are held constant other than the item in question.

   a) Low dividend-payout ratio. Highly taxed owners will probably want to realize their returns through capital gains.

   b) Low dividend-payout ratio. There will be no residual funds.

   c) Medium or high dividend-payout ratio. There are likely to be funds left over after funding capital expenditures. Moreover, the liquidity and access to borrowing give the company considerable financial flexibility.

   d) Medium or high dividend-payout ratio. Unless the company cuts its dividend, which probably is unlikely in the short run, its dividend-payout ratio will rise with the drop in earnings.

e) Low dividend-payout ratio. The company will probably wish to retain earnings to build its financial strength in order to offset the high business risk.

4. We would expect Jumbo to have the higher dividend-payout ratio. As a percent of expected annual cash flows, the two companies have the following ratios:

	Jumbo	Giant
Standard deviation	0.60	0.71
Capital expenditures	0.84	1.14
Cash & marketable securities	0.10	0.20
Long-term debt	2.00	2.43
Unused bank lines	0.50	0.29

Jumbo has a lower relative standard deviation of cash flows, lower relative capital expenditures, lower relative long-term debt, and greater relative unused bank lines. Its expected capital expenditures are less than its expected cash flow, which would imply residual funds, whereas the opposite occurs for Giant. Finally, Giant has a higher cost associated with floating common stock in order to replace dividends than does Jumbo. For all of these reasons, we would expect Jumbo to have a higher dividend payout. The only factor working in the other direction is the fact that Giant has a higher relative as well as absolute level of liquidity.

5. a) The market seems to evaluate both of these stocks in terms of dividend payments. The average dividend for both firms is approximately the same. Nevertheless, the average market price of Harpo (about $4.38) has been about 13% higher than the average market price for Oprah (about $3.88). The market has capitalized the dividends of Oprah at a higher rate than Harpo, hence giving the stock of Oprah a lower price. This might result from the constant dividend-payout ratio policy of Oprah, which has produced a volatile dividend stream.

   b) Neither of these companies seems to be a growth company. In fact, one would wonder whether the retention of earnings is justified for either company. Since both of these firms appear to be evaluated in terms of dividend yield, increased stock prices might ensue from higher dividend payouts.

6. a) $50. The value of the stock adjusts downward on the record date. This sale occurs before that date.

   b) 160 shares x 1.25 = 200 shares

   c) $50/1.25 = $40

   d) Before: $50 x 160 = $8,000

   After: $40 x 200 = $8,000

   The stock dividend in itself does not affect the value of the company.

   e) The stock dividend would likely be regarded as a positive signal and the total value of your holdings would increase.

7. a) 3% x 1,000,000 shares = 30,000 shares

30,000 shares x $5 = $150,000

Common stock ($1 par; 1.03 million shares)	$ 1,030,000
Additional paid-in capital	420,000
Retained earnings	1,550,000
Total shareholders' equity	$ 3,000,000

b) $300,000/1,000,000 = $.30 $150,000/1,000,000 = $.15

c) $300,000/1,030,000 = $.2913 $150,000/1,030,000 = $.1456

d) $5(1 - (1.00/1.03)) = $5(.029) = $.146

$5.000 - $.146 = $4.854

8. a) (1)

	Original Condition.	Stock Dividend .
Common stock	$ 4,800,000	$ 5,376,000
Additional paid-in capital	5,900,000	15,692,000
Retained earnings	87,300,000	76,932,000
Total shareholders' equity	$98,000,000	$98,000,000
Number of shares	2,400,000	2,688,000
Par value of common	$2.00	$2.00

a) (2)

	Original Condition.	Stock Dividend .
Common stock	$ 4,800,000	$ 6,000,000
Additional paid-in capital	5,900,000	5,900,000
Retained earnings	87,300,000	86,100,000
Total shareholders' equity	$98,000,000	$98,000,000
Number of shares	2,400,000	3,000,000
Par value of common	$2.00	$2.00

a) (3)

	Original Condition.	Stock Dividend .
Common stock	$ 4,800,000	$ 5,040,000
Additional paid-in capital	5,900,000	9,980,000
Retained earnings	87,300,000	82,980,000
Total shareholders' equity	$98,000,000	$98,000,000
Number of shares	2,400,000	2,520,000
Par value of common	$2.00	$2.00

b) (1)

	Original Condition.	Stock Split .
Common stock	$ 4,800,000	$ 4,800,000
Additional paid-in capital	5,900,000	5,900,000
Retained earnings	87,300,000	87,300,000
Total shareholders' equity	$98,000,000	$98,000,000
Number of shares	2,400,000	3,600,000
Par value of common	$2.00	$1.33

b) (2)

	Original Condition.	Stock Split .
Common stock	$ 4,800,000	$ 4,800,000
Additional paid-in capital	5,900,000	5,900,000
Retained earnings	87,300,000	87,300,000
Total shareholders' equity	$98,000,000	$98,000,000
Number of shares	2,400,000	4,800,000
Par value of common	$2.00	$1.00

b) (3)

	Original Condition.	Stock Split .
Common stock	$ 4,800,000	$ 4,800,000
Additional paid-in capital	5,900,000	5,900,000
Retained earnings	87,300,000	87,300,000
Total shareholders' equity	$98,000,000	$98,000,000
Number of shares	2,400,000	7,200,000
Par value of common	$2.00	$0.67

c) (1)

	Original Condition.	Reverse Split.
Common stock	$ 4,800,000	$ 4,800,000
Additional paid-in capital	5,900,000	5,900,000
Retained earnings	87,300,000	87,300,000
Total shareholders' equity	$98,000,000	$98,000,000
Number of shares	2,400,000	600,000
Par value of common	$2.00	$8.00

c) (2)

	Original Condition.	Reverse Split .
Common stock	$ 4,800,000	$ 4,800,000
Additional paid-in capital	5,900,000	5,900,000
Retained earnings	87,300,000	87,300,000
Total shareholders' equity	$98,000,000	$98,000,000
Number of shares	2,400,000	400,000
Par value of common	$2.00	$12.00

9. a) $2($1,000,000)/$72 = 27,778 shares

b) If taxes are ignored, it should make little difference other than perhaps if there is a difference in the information content of cash dividends and the information content of the repurchase of stock.

c) Taxes create an incentive for repurchase, for the reasons illustrated in the chapter. However, the Internal Revenue Service will challenge a steady program of repurchase in lieu of dividends.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

YEAR	INCOME AVAILABLE FOR DIVIDENDS (in thousands)	DIVIDENDS PER SHARE	EXTERNAL FINANCING REQUIRED (in thousands)
1	$1,000	$1.00	$ 0
2	0	0	0
3	500	.50	0
4	800	.80	0
5	0	0	200
	$2,300		$200

b. (in thousands)

YEAR	(1) NET INCOME	(2) DIVIDENDS	(3) CAPITAL EXPENDITURES	(4) EXTERNAL FINANCING REQUIRED (2) + (3) - (1)
1	$2,000	$1,000	$1,000	0
2	1,500	1,000	1,500	$1,000
3	2,500	1,000	2,000	500
4	2,300	1,000	1,500	200
5	1,800	1,000	2,000	1,200
		$5,000		$2,900

c.

YEAR	(1) NET INCOME (in 000s)	(2) DIVIDENDS (in 000s)	(3) DIVIDENDS PER SHARE	(4) CAPITAL EXPENDITURES (in 000s)	(5) EXTERNAL FINANCING REQUIRED (2) + (4) - (1) (in 000s)
1	$2,000	$1,000	$1.00	$1,000	$ 0
2	1,500	750	.75	1,500	750
3	2,500	1,250	1.25	2,000	750
4	2,300	1,150	1.15	1,500	350
5	1,800	900	.90	2,000	1,100
		$5,050			$2,950

d. Aggregate dividends are highest under Alternative C, which involves a 50 percent dividend-payout ratio. However, they are only slightly higher than that which occurs under Alternative B. External financing is minimized under Alternative A, the residual dividend policy.

2. a.

YEAR	POLICY 1	POLICY 2	POLICY 3
1	$ .68	$ .80	$ .68
2	.73	.80	.68
3	.58	.80	.68
4	.75	.80	.80
5	.87	.87	.80
6	.93	.93	.80
7	.74	.80	.80
8	.89	.89	1.00
9	1.00	1.00	1.00
10	1.09	1.09	1.00

Other dividend streams are possible under Policy 3. This solution is but one.

b. Policy 1 and, to a much lesser degree, Policy 2 result in fluctuating dividends over time, as the company is cyclical. Because of the $.80 minimum regular dividend, Policy 2 results in an average payout ratio in excess of 40 percent. Shareholders may come to count on the extra dividend and be disappointed when it is not paid, such as in year 7. To the extent that investors value stable dividends and periodic rising dividends over time, and 40 percent is an optimal average payout ratio, dividend Policy 3 would be preferred and would likely maximize share price.

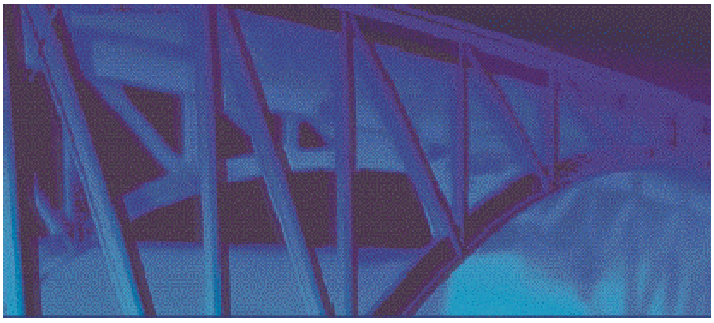
3. a. Present number of shares = $2,000,000/$8 par value = 250,000.

	(1) STOCK DIVIDEND		(2) STOCK SPLIT		(3) REVERSE SPLIT	
Common stock (par)	$ 2,200,000	($8)	$ 2,000,000	($4)	$ 2,000,000	($16)
Additional paid-in capital	2,900,000		1,600,000		1,600,000	
Retained earnings	6,900,000		8,400,000		8,400,000	
Total shareholders' equity	$12,000,000		$12,000,000		$12,000,000	
Number of shares	275,000		500,000		125,000	

b. The total market value of the firm before the stock dividend is $60 X 250,000 shares = $15 million. With no change in the total value of the firm, market price per share after the stock dividend should be $15,000,000/275,000 shares = **$54.55 per share**. If there is a signaling effect, the total value of the firm might rise and share price be somewhat higher than $54.55 per share. The magnitude of the effect would probably be no more than several dollars a share, based on empirical findings.

PART 7

Intermediate and Long-Term Financing



19
The Capital Market

"Mr. Morgan, will the market go up or down?" "Yes."

EXCHANGE BETWEEN A JOURNALIST AND J.P.MORGAN

ANSWERS TO QUESTIONS

1. A public issue of securities is to multiple investors, sometimes in the hundreds or thousands. The Securities and Exchange Commission, as well as state securities offices on occasion, oversee the public offering. A private placement of securities is to one or a limited number of investors. Few regulations pertain to the offering, other than those which cause a bank or institutional investor to be prudent. The SEC is not concerned with such issues. The private issue usually can be arranged more quickly and with fewer out-of-pocket costs.

2. With a traditional (firm commitment) underwriting, a syndicate of investment bankers is usually formed either to bid on an issue or to underwrite the issue on a negotiated basis. The issue must go through normal registration processes with the SEC, and these take around 40 days. Under a shelf registration, a company files an amendment to an underlying, detailed filing with the SEC. The company is able to get approval to sell securities "off the shelf" in a day or two. In other words, it has very quick access to the public market. As mostly large companies are involved, they are able to play underwriters off against each other to secure a low flotation cost. For a bond issue, the costs are likely to be only several dollars a bond. The use of shelf registrations has grown enormously, and has had a profound effect on the securities industry.

3. In a best efforts offering, the investment banker agrees only to do its best in selling the issue. There is no guarantee of sale, as there is in an underwriting where the investment bank hands you a check. Most companies that use a best efforts offering have been refused an underwriting by investment banks. In other words, the decision to use it is usually at the insistence of the investment bank, which because of risk or size of the issuing company, is unwilling to underwrite the issue.

4. Private debt issues have similar advantages to similar such stock issues. The flexibility obtained in terms, speed, and disclosure requirements is very important. Again, the firm avoids high flotation costs especially on small issues. Disadvantages stem from the limited capacity of private markets and the fact that interest rates are generally higher than those of public placements. Public placement of debt issues allows the firm to take advantage of the investment banker's experience in capital markets. The public market also has a greater capacity to absorb large issues. The firm must consider the size of the planned issue, market conditions, and its own capital structure, and weigh these factors against the advantages and disadvantages of either type of issue.

5. Since many of the costs associated with the flotation of an issue are basically fixed, the larger the issue, the less their cost as a percentage of the issue size.

6. In certain cases, forcing a company to sell securities through a rights offering would work to the disadvantage of shareholders. Where existing shareholders do not have the funds or desire to subscribe further, a rights offering will not be successful and the company will have to go to a public offering anyway. Time will be lost and unnecessary expenses incurred by the preemptive right. Nonetheless, the preemptive right exists for many companies and must be adhered to unless shareholders revoke it.

7. The usual reasons cited for the popularity of rights offerings include a cheaper flotation cost (as the underwriting syndicate is used at most in a standby capacity), a reduced marketing cost (as the company taps investors familiar with the firm's operations) and a decreased probability of single investors acquiring large holdings for use in proxy fights and/or takeover bids.

   Some other reasons include the possible speculative appeal of rights due to their leverage effect on the common stock and the fact that the market may not always fully compensate for the full dilution of the rights offering.

   Finally, many observers feel that rights offerings are used because they are well-received by shareholders who irrationally interpret the offering as an "extra" dividend rather than either a preemptive stock offering or, in the event of the rights' sale, a return of capital.

8. The subscription price and its discount from current share price determine the success of the rights offering. As long as the market price of the stock remains comfortably above the subscription price, the rights offering is likely to be successful from the standpoint of it being heavily subscribed to by shareholders. Thus, the subscription price is the principal selling tool.

9. In a standby arrangement, the rights offering is underwritten by an investment bank that agrees to purchase any leftover shares. With an oversubscription privilege, shareholders are given the opportunity to buy any shares that are left over by other shareholders. Both methods are used to enhance the success of the offering. In the case of the former, the success is guaranteed, for a fee. With the latter, there is no guarantee, but the odds of success are improved. The standby arrangement is used far more often than an oversubscription privilege.

10. The Securities and Exchange Commission (SEC) is the principal regulatory authority overseeing the issuing of securities to the public. Its role is to assure that full and fair material information is provided the investor. The idea is to make sure that the investor has the information necessary to make an informed investment decision with respect to risk and return. The SEC does not recommend. It polices security offerings and tries to eliminate fraudulent sales.

11. a) Public.
    b) Private.
    c) Could well be a private placement involving project financing.
    d) Private.

12. The costs of a private placement are twofold: initial fixed costs, and ongoing interest costs. The same type of costs applies to an underwriting. The initial costs usually are less with a private placement than they are with an underwritten debt issue, while interest costs are more. The differential interest rate usually is 1/2 to 1 percent, though the differential varies with the circumstances.

13. With shelf registrations, larger companies are able to quickly tap the public market while incurring low flotation costs. The quick access to credit was previously a principal advantage of private placements. Since the start of shelf registrations in 1981, the proportion of debt that is privately placed by corporations has declined dramatically.

14. The venture capitalist hopes that a portion of his/her investments will be very successful. That is, company profits will evolve to where profits are in the millions of dollars and there is the prospect for even more growth. Such a company eventually will be able to sell common stock to the general public, and the price will be many times the price paid for it by the venture capitalist. Usually at the time of the first public offering, the venture

capitalist will liquidate part but not all of his/her investment. In a venture capitalist's portfolio of, say, ten companies, typically only one or two will be successful in the sense defined above. Several more will enjoy partial success in that eventually a public offering of common stock occurs. However, the venture capitalist does not realize a return anywhere near that achieved with the really successful venture. Several more investments might be defined as the "living dead." They do not go out of business, but struggle along and do not evolve into a situation where a public sale of stock is possible within seven or so years. Finally, a couple or even several companies will be failures and go out of business. In these situations, the venture capitalist loses all of his/her investment. The distribution of company returns then is highly skewed to the right.

There is no liquidity in the new venture investment until the company goes public. For the successful venture, this usually takes at least five years from the time the company is organized. The only way a venture capitalist can have some liquidity in his/her overall portfolio is to make investments over time so that they are of different vintage. However, the ability to go public is not only a function of the age and success of the company, but also of the tone of the stock market for new issues. This tone varies over time such that new issues tend to come in waves when the market is receptive. For these reasons, the venture capitalist must be patient.

15. The common stock price reaction to a security offering announcement is due to an information effect. The information may have to do with future cash-flow expectations. More likely, the effect is due to asymmetric (unequal) information between investors and management. If the company's common stock is truly undervalued, management is more likely to issue debt. As a result, a new debt issue will be regarded as "good news." On the other hand, a new common stock issue is interpreted as conveying that the stock is overvalued. It is regarded as "bad news."

SOLUTIONS TO PROBLEMS

1. a) (1) Number of bonds issued = \$1.8 billion/\$1,000 = 1,800,000 bonds

Total underwriting spread =
1,800,000 bonds x \$7.50 = \$13,500,000

Total out-of-pocket expenses =
6 underwritings x \$350,000 = \$2,100,000

Total flotation costs =
\$13,500,000 + \$2,100,000 = \$15,600,000

(2) Total underwriting spread =
1,800,000 bonds x \$3.00 = \$5,400,000

Total out-of-pocket expenses =
24 underwritings* x \$40,000 = \$960,000
(*NOTE: \$1.8 billion/\$75 million = 24 times)

Total flotation costs =
\$5,400,000 + \$960,000 = \$6,360,000

b) The shelf registration method.

2. a)

$$\frac{\text{800,000 shares outstanding}}{\text{200,000 new shares}} = \text{4 rights per share}$$

b)

$$R_O = \frac{P_O - S}{N + 1} = \frac{\$50 - \$40}{4 + 1} = \frac{\$10}{5} = \$2$$

c)

$$P_X = \frac{(P_O)(N) + S}{N + 1} = \frac{(\$50)(4) + \$40}{4 + 1} = \frac{\$240}{5} = \$48$$

3. a) $$R_O = \frac{P_O - S}{N + 1} = \frac{\$50 - \$40}{5 + 1} = \frac{\$10}{6} = \$1.67$$

b) $$P_X = \frac{(P_O)(N) + S}{N + 1} = \frac{(\$50)(\$5) + \$40}{6} = \frac{\$290}{6} = \$48.33$$

c) $$R_X = \frac{P_X - S}{N} = \frac{\$50 - \$40}{5} = \frac{\$10}{5} = \$2$$

4. a) Company Y has the larger issue relatively. It is issuing 1 new share for each 4 old shares that are outstanding, or an increase of 25 percent. Company X is issuing 1 new share for each 14 old shares that are outstanding which represents an increase of 7.14 percent. One cannot say whether Company Y has the larger offering in absolute terms. That depends on the number of shares it has outstanding relative to the number of shares for Company X. For example, if Company Y had 1 million shares outstanding while Company X had 4 million shares outstanding, we would have the following:

Company X = (4 million old shares)(1/14) = 285,714 new shares

Company Y = (1 million old shares)(1/4) = 250,000 new shares

b) The theoretical value of one share of stock when it goes "ex-rights" is:

$$\text{Company X} = \frac{(\$48)(14) + \$42}{14 + 1} = \$47.60$$

$$\text{Company Y} = \frac{(\$48)(4) + \$41.50}{4 + 1} = \$46.70$$

The lower theoretical value of Company Y is due to its having a larger relative offering. Its "ex-rights" theoretical value is somewhat closer to the subscription price, $46.70 - $41.50 = $5.20, than is the case for Company X, $47.60 - $42.00 = $5.60. If all other things were the same, there would be a greater risk of the market price falling below the subscription price for Company Y than for Company X.

5. No solution recommended. The type of analysis required will vary with the situation chosen. The problem points to certain directions that might be taken.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a. $$R_O = \frac{P_O - S}{N + 1} = \frac{\$150 - \$125}{9 + 1} = \frac{\$25}{10} = \mathbf{\$2.50}$$

b. $$P_X = \frac{(P_O)(N) + S}{N + 1} = \frac{(\$150)(9) + \$125}{9 + 1} = \frac{\$1,475}{10} = \mathbf{\$147.50}$$

c. $$R_X = \frac{P_X - S}{N} = \frac{\$143 - \$125}{9} = \frac{\$18}{9} = \mathbf{\$2}$$

2. a. Public issue:

Number of $1,000-face-value notes to be issued to raise $6 million (to nearest note) = $600,000,000/$990 = 6,061 or $6,061,000 in notes.

Total interest cost = $6,061,000 x 15% x 6 years = $5,454,900

Total costs = $5,455,000 + $195,000 = **$5,649,900**

Private placement:

Total interest cost = $6,000,000 x 15.5% x 6 years = $5,580,000

Total costs = $5,580,000 + $20,000 = **$5,600,000**

The public issue has the higher total costs. As the interest payments are spread out over the 6 years, the time value of money effect would act to enhance the private placement. The differential out-of-pocket expense occurs at the beginning.

b. Public issue:

Total interest cost = $6,061,000 x 15% x 12 years = $10,909,800

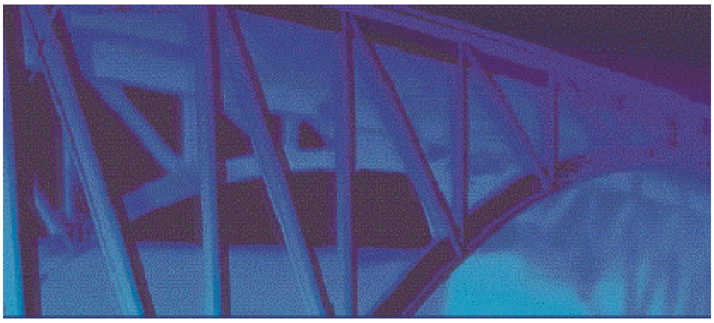
Total costs = $10,909,800 + $195,000 = **$11,104,800**

Private placement:

Total interest cost = $6,000,000 x 15.5% x 12 years = $11,160,000

Total costs = $11,160,000 + $20,000 = **$11,180,000**

The private placement has the higher total costs. With a longer-term loan, the differential in interest rate becomes more important.



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Long-Term Debt, Preferred Stock, and Common Stock

An investment in knowledge always pays the best interest.

BENJAMIN FRANKLIN

ANSWERS TO QUESTIONS

1. Serial bonds mature periodically as opposed to sinking-fund bonds which all mature on the same date. Although some sinking-fund bonds are retired before their maturity date, retirement is random. Serial bonds retire according to a predetermined schedule. The investor can therefore select the maturity best suited to his/her needs.

2. With an income bond, the payment of interest is dependent on the company's earnings. Like a preferred stock, the fixed return is not assured. In contrast, a mortgage bond involves a legal commitment to pay periodic interest, regardless of the earnings. Failure to do so results in default where the trustee enters the scene in behalf of bondholders. Also, the mortgage-bond issue is secured by real property, whereas no security is involved with an income bond. The mortgage-bond issue is a much more binding obligation of the company.

3. The bank is concerned with protecting its position as a senior-debt holder. If the bank fails to insist on subordination of such debt, upon liquidation of the company the bank's claims to assets are only equal to those of the principal shareholder. In effect the bank has become a shareholder. Since the bank does not wish to

share the equity-risk of the enterprise, it insists on the subordination of all debt, which represents in its view a residual equity claim to assets.

4. "Junk bonds" by definition are speculative-grade bonds, which are rated BA or lower by Moody's, or BB or lower by Standard and Poor's. Over 90 percent of the publicly held companies in the United States would be classified as speculative grade if they were to issue bonds. For these companies, the junk-bond market offers a way to tap the public marketplace for debt instruments as opposed to banks and private placements. Junk bonds are also used in some leveraged buyouts.

5. <u>Railroads</u>: equipment trust certificates and mortgage bonds.
   <u>Public utilities</u>: mortgage bonds.
   <u>Strong industrial firms</u>: debentures.

6. The investor must be compensated for the risk of having his/her bonds called and being able to reinvest only at a lower interest rate. The yield differential varies over time. When interest rates are high and expected to fall, the differential will be much larger than when interest rates are low and expected to rise.

7. To the firm:

   a) The security provides leverage as does debt but cannot drive the firm into bankruptcy.

   b) Issuance of preferred stock does not ordinarily endanger the control of the firm.

   c) The preferred stock has no set maturity. It may also strengthen the firm's credit position.

   To the investor:

   a) A prior claim (before common shareholders) on income may also be combined with a participating income feature.

   b) The existence of a preferred stock sinking fund may stabilize and/or raise the market price of outstanding shares.

   c) The possibility of conversion into common stock may be advantageous.

   d) To the corporate investor, the 70% (or 80%) intercorporate dividend tax exclusion clause is beneficial.

   Utilities may use preferred stock because they wish to increase their leverage above the SEC recommended 60% straight-debt limit or because they can pass on the higher explicit costs of preferred stock financing in rate increases (public utility commissions base rates on the overall measured cost of capital, not on an optimum cost of capital).

8. The call feature provides the corporation flexibility in its financing. With a preferred stock issue, the instrument would be outstanding forever without a call feature. If interest rates should decline or if management simply wants to rid itself of

certain obligations associated with the preferred stock, it is able to eliminate or replace the issue if it contains a call privilege.

9. Money-market preferred (MMP) stock adjusts in rate every 49 days with a new auction. Sometimes a ceiling rate of interest is specified. Regular preferred stock has a stipulated or fixed dividend rate that does not change over time. Therefore, it fluctuates considerably in price whereas MMP does not. Both instruments allow exemption of 70 (or 80) percent of the dividend to the corporate investor. Therefore, they tend to sell for a yield less than a comparable debt issue. However, the dividend payment is not deductible by the issuer as an expense for tax purposes. The MMP is held by the corporate investor as a marketable security, whereas straight preferred stock is clearly a long-term investment.

10. Investors demand a cumulative feature in order to protect themselves. Otherwise a company might never pay a preferred stock dividend and still pay common stock dividends. The preferred stockholder would hold a perpetual security with no prospect for cash payment. While the company would be better off with this increased flexibility, it simply cannot sell such a security.

11. For a "typical" preferred stock, one would find a cumulative feature, no participating feature, no voting rights, a call feature, and a claim on assets before common shareholders but after all others.

12. The use of dual-class common stock financing enables a company to raise funds but give up less control than it would with a straight common stock issue. By splitting the common stock into two classes, some common stock will have more voting power than other common stock. In order to sell an issue with less voting power, it is important that the issue be superior with respect to other qualities -- usually right to dividends and right in the case of liquidation. Dual-class common stock issues are common in new ventures where promotional stock is given to the founders. In general, these founders pay less for their common stock than subsequent investors.

13. If stockholders purchase new shares below their par value, they may be liable for the difference if the company is unable to satisfy its obligations. In order to avoid this contingent liability, it is desirable from the standpoint of investors that the stock have a low par value, a low assigned value, or be no par.

14. In terms of return, it means that the claim to income comes after all creditors and preferred stockholders are paid the fixed amount owed them. A common stockholder's return is variable. It depends on what is left over. As a result, the risk, as depicted by the variability of return, is greater than the risk or uncertainty borne by lenders or preferred stockholders.

15. Management has the use of mailings to stockholders, legal counsel, and other things of this sort whose costs are borne by the company.

In addition, there is an apathy among stockholders that works to the advantage of the incumbents. In general, things must really be bad before stockholders will vote out existing management.

16. The amount of preferred and common stock financing would be expected to rise dramatically and the amount of debt financing would decline. As a form of leverage, preferred stock would be more attractive than debt owing to the discretionary nature of the obligation to pay dividends.

Answers to Appendix Questions:

17. The refunding decision from the firm's standpoint is a riskless investment project. Investors include a default risk premium in the market rate of return they require. This sensitivity of the rate of the critical variables in the decision makes the after-tax cost of debt the appropriate discount rate for the refunding decision. The use of the average cost of capital for the discount factor would cause the firm to reject profitable opportunities for the refunding of issues.

18. Refundings occur only when the interest rates decline significantly from previous levels. Typically, refundings occur in waves at the troughs in interest-rate cycles. However, the bonds must be out from under deferred-call protection. If interest rates rise secularly and a trough occurs three years after a peak, bonds issued during the peak will not be able to be called because they are protected by the deferment period.

SOLUTIONS TO PROBLEMS

1. If the yield to maturity is 12.21 percent, the bonds will sell at a sizable premium. (Without the maturity date being given, one cannot calculate the magnitude of the premium.) As a result, the company should deliver $1 million in cash to the trustee. If the yield is 14.60 percent, the bonds will sell at a discount from their face value. Here the company should buy bonds in the market and deliver these to the trustee, as the outlay involved to purchase 1,000 bonds will be less than $1 million. This assumes that accumulators do not squeeze the company.

2. a) $\$990 = \$100(PVIFA_{r\%,5}) + \$1,060^{*}(PVIF_{r\%,5})$

*NOTE: Call price = $1,100 - [(4)($10)] = $1,060

For r% = 12%:

P.V. of interest payments	= $100 x 3.605	=	$360.50
P.V. of call price	= $1,060 x .567	=	601.02
			$961.52

For r% = 11%:

P.V. of interest payments	= $100 x 3.696	=	$369.60
P.V. of call price	= $1,060 x .593	=	628.58
			$998.18

Interpolating:

$998.18 - $990.00 = $ 8.18
$998.18 - $961.52 = $36.66

$8.18/$36.66 = .223

r% = 11% + .223% = 11.22% (Note: solving by computer, **11.23%**)

b)

End of year	0	1-5	5	6-25	25
			+\$1,060		
			- 1,000		
Cash flows	-\$990	+\$100	+\$ 60	+\$80	+\$1,000

\$990 = \$100(PVIFA$_{r\%,5}$) + (\$1,060 - \$1,000)(PVIF$_{r\%,5}$)

+ \$80[(PVIFA$_{r\%,25}$) - (PVIFA$_{r\%,5}$)] + \$1,000(PVIF$_{r\%,25}$)

For r% = 10%:

P.V. of first interest payments	= \$100 x 3.791	=	\$379.10
P.V. of (\$1,060 - \$1,000)	= \$60 x .621	=	37.26
P.V. of second interest payments =			
	\$80(9.077 - 3.791)	=	422.88
P.V. of principal payment	= \$1,000 x .092	=	92.00
			\$931.24

For r% = 9%:

P.V. of first interest payments	= \$100 x 3.890	=	\$ 389.00
P.V. of (\$1,060 - \$1,000)	= \$60 x .650	=	39.00
P.V. of second interest payments =			
	\$80(9.823 - 3.890)	=	474.64
P.V. of principal payment	= \$1,000 x .116	=	116.00
			\$1,018.64

Interpolating:
\$1,018.64 - \$990.00 = \$28.64
\$1,018.64 - \$931.24 = \$87.40

\$28.64/\$87.40 = .328

r% = 9% + .328% = 9.33% (Note: solving by computer, **9.31%**)

Next, we need to compare this 9.33% return to the yield on the bonds had they not been called. To do this we must determine the yield implicit in the following cash-flow pattern:

End of year	0	1-25	25
Cash flows	-\$990	+\$100	+\$1,000

$\$990 = \$100(PVIFA_{r\%,25}) + (\$1,000)(PVIF_{r\%,25})$

For r% = 11%:

P.V. of interest payments	= \$100 x 8.422	=	\$842.20
P.V. of principal payment	= \$1,000 x .074	=	74.00
			\$916.20

For r% = 10%:
Since 10% is the coupon rate for these bonds, the present value of the interest payments and the principal payment must equal the bond's face value. = \$1,000

Interpolating:
\$1,000 - \$990.00 = \$10.00
\$1,000 - \$916.20 = \$83.80

\$10.00/\$83.80 = .119

r% = 10% + .119% = 10.12% (Note: solving by computer, **10.11%**)

The 9.33% return that we determined earlier compares unfavorably with a yield of 10.12% if the original bonds could be held to maturity. The point to be made is that the investor suffers an opportunity loss in having to invest in a bond providing a lower return.

3. a) Total interest payments for the noncallable bonds = \$10 million x 11.40% x 10 = \$11.4 million.

Interest payments for callable bonds the first five years = \$10 million x 12% x 5 = \$6 million.

Interest payments for the next five years:

(a) Interest Rate	(b) 5-year cost (millions)	(c) Issuing Expenses (millions)	(d) (b) + (c) (millions)	(e) Probability	(f) (d) x (e) (millions)
9%	$4.5	$0.2	$4.7	0.1	$0.47
10	5.0	0.2	5.2	0.2	1.04
11	5.5	0.2	5.7	0.4	2.28
12*	6.0	0.0	6.0	0.2	1.20
13*	6.0	0.0	6.0	0.1	0.60
Expected value of interest payments and issuing expenses =					$5.59

*NOTE: The company would not call its bonds and would continue to pay 12 percent interest on the original issue.

Expected value of total interest and other costs over the ten years for the callable bonds = $6.0 million + $5.59 million = $11.59 million.

As this total cost exceeds that for the noncallable bonds ($11.59 million vs. $11.4 million), the company should issue noncallable bonds.

b)

(a) Interest Rate	(b) 5-year cost (millions)	(c) Issuing Expenses (millions)	(d) (b) + (c) (millions)	(e) Probability	(f) (d) x (e) (millions)
7%	$3.5	$0.2	$3.7	0.2	$0.74
9	4.5	0.2	4.7	0.2	0.94
11	5.5	0.2	5.7	0.2	1.14
13*	6.0	0.0	6.0	0.2	1.20
15*	6.0	0.0	6.0	0.2	1.20
Expected value of interest payments and issuing expenses =					$5.22

*NOTE: The company would not call its bonds and would continue to pay 12 percent interest on the original issue.

Expected value of total interest and other costs over the ten years = $6.0 million + $5.22 million = $11.22 million.

As this total cost is less than that for the noncallable bonds ($11.2 million vs. $11.4 million), the company should issue callable bonds.

The problem illustrates that the greater the variance of future interest rates, the greater the value of the call option to the corporate issuer. (The expected value of interest rates five years hence stays the same at 11 percent.) The analysis ignores the time value of money. Different results might be expected if interest payments plus the issuing expenses were discounted at the firm's cost of capital.

4. No particular solution recommended.

5. a) $8.00/.09 = $88.89

b) Gross amount that must be raised to net the railroad $9.5 million:

$9.5 million/(1 - .05) = $10 million

$10 million/$88.89 = 112,499 shares

6.

		Preferred	Common	
a)	(1)	$ 5.00	$ 0.00	
	(2)	3.00	0.00	
	(3)	13.00	0.40	(cumulative feature effect)
b)	(1)	$ 7.00	$ 0.60	
	(2)	7.00	1.00	
	(3)	8.00	3.00	(participating feature effect)
c)	(1)	$ 5.00	$ 0.00	
	(2)	9.00	0.70	(cumulative feature effect)
	(3)	8.50	4.00	(participating feature effect)

7. a) 500,001 shares

   b) [(1,000,000 x 1)/(10 + 1)] + 1 = 90,910 shares

   c) (1) 500,001 shares
      (2) [(1,000,000 x 1)/(5 + 1)] + 1 = 166,668 shares

Solution to Appendix Problem:

8.

Cost of calling old bonds (call price 114)		$57,000,000
Net proceeds of new issue ($990 per bond)		49,500,000
Difference		$ 7,500,000
Expenses:		
Issuing of new bonds	$ 200,000	
Interest expense of old bonds during overlap period	583,333	$ 783,333
Gross cash outlay		$ 8,283,333
Less: Tax savings		
Interest expense on old bonds during overlap period	583,333	
Call premium	7,000,000	
Unamortized discount on old bonds	1,000,000	
Unamortized issuing expenses on old bonds	100,000	
Total	$8,683,333	
Tax savings (40% of $8,683,333)		3,473,333
Net cash outflow		$4,810,000

Annual net cash outflow of old bonds is ...

Interest expense, coupon rate 14%		$7,000,000
Less: Tax savings		
Interest expense	$7,000,000	
Amortization of bond discount ($1,000,000/25)	40,000	
Amortization of issuing expense ($100,000/25)	4,000	
Total	$7,044,000	
Tax savings (40% of $7,044,000)		2,817,600
Annual net cash outflow of old bonds		$4,182,400

Annual net cash outflow of new bonds is ...

Interest expense, 12% coupon rate		$6,000,000
Less: Tax savings		
Interest expense	$6,000,000	
Amortization of bond discount ($500,000/25)	20,000	
Amortization of issuing expense ($200,000/25)	8,000	
Total	$6,028,000	
Tax savings (40% of $6,028,000)		2,411,200
Annual net cash outflow of new bonds		$3,588,800

Difference in annual cash flow =
$4,182,400 - $3,588,800 = $593,600

The discount rate is 12% x (1 - .4) = 7.2%. The present value of $593,600 for 25 years at a 7.2% rate of discount is

$$\$593,600(\text{PVIFA}_{7.2\%,25}) = \$593,600[(1 - 1/(1 + .072)^{25})/.072]$$

$$= \$593,600[11.4466] = \$6,794,702.$$

As this amount exceeds the cash outflow of $4,810,000, the refunding is worthwhile.

NPV = $6,794,702 - $4,810,000 = $1,984,702

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. (dollars in millions) Let X = the number of millions of dollars of new debt that can be issued.

a. $$\frac{[\$2/(1 - .40] + [\$8(.10)]}{[\$8(.10)] + [(.10)X]} = 4$$

$$\frac{\$3.33 + \$.80}{\$.80 + (.10)X} = \frac{\$4.13}{\$.80 + (.10)X} = 4$$

$$4(\$.80) + (4)(.10)X = \$4.13$$

$$(.40)X = \$.93$$

$$X = \$.93/.40 = \mathbf{\$2.325}$$

b. $$\frac{\$30 + (.5)X}{\$8 + X} = 2$$

$$2(\$8) + 2(X) = \$30 + (.5)X$$

$$(1.5)X = \$14$$

$$X = \$14/(1.5) = \mathbf{\$9.33}$$

c. $$\frac{\$8 + X}{\$40} = .5$$

$$\$8 + X = (.5)(\$40)$$

$$X = \$20 - \$8 = \mathbf{\$12}$$

Condition (a) is binding, and it limits the amount of new debt to $2.325 million.

2. a. After-tax cost:

Preferred stock = **12%**
Bonds = 14%(1 - .40) = **8.40%**

b. The dividend income to a corporate investor is generally either 70 or 80 percent exempt from taxation. With a corporate tax rate of 40 percent, we have for the preferred stock either

after-tax return = 12%(1 - [(.30)(.40)]) = **10.56%** or

12%(1 - [(.20)(.40)]) = **11.04%**

For the bonds,

after-tax return = 14%(1 - .40) = **8.40%**

3. a.

Issued shares	1,532,000
Treasury shares	63,000
Outstanding shares	**1,469,000**

b.

Authorized shares	1,750,000
Outstanding shares	1,469,000
Available shares	281,000

281,000 shares x $19 = **$5,339,000**

c.

Common stock ($1 par)	$ 1,750,000
Additional paid-in capital*	10,372,000

*Consists of $18 x 281,000 shares plus $5,314,000

4. a. Number of shares necessary to elect one director =

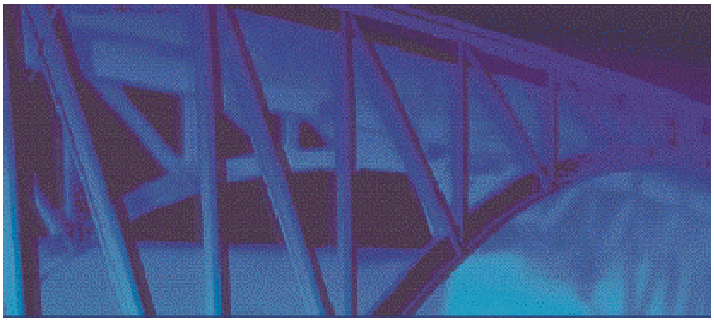
$$\frac{2{,}000{,}000 \text{ x } 1}{(9 + 1)} + 1 = 200{,}001$$

Therefore, she can elect two directors.

b. Number of shares necessary to elect one director =

$$\frac{2{,}000{,}000 \text{ x } 1}{(3 + 1)} + 1 = 500{,}001$$

She can elect no directors.



21
Term Loans and Leases

Rough winds do shake the darling buds of May. And summer's lease hath all too short a date…

WILLIAM SHAKESPEARE, *SONNET XVIII*

ANSWERS TO QUESTIONS

1. The demand for intermediate-term loans arises from the needs of many firms to finance assets with relatively short and uncertain life expectancies.
   a) These assets are financed with intermediate debt rather than long-term funds because the firm is uncertain that the assets represent a permanent funds requirement, because it wishes to avoid raising funds in the impersonal capital markets, and because the explicit cost of frequently floating small amounts of debt in the bond markets is very high (higher than intermediate financing).
   b) The use of short-term debt is also undesirable if the firm is unable to generate cash quickly enough to ensure debt repayment within one year, or if the firm's credit standing is significantly lowered by the adverse effect of short-term debt on the current ratio.

2. Because of the long-term nature and stability of their liabilities, insurance companies prefer to invest in assets of like maturity. This reduces the problem of reinvestment of income cash flows. Competition with banks for short- and intermediate-term loans would not only aggravate the insurance company's reinvestment problem by increasing their yearly cash inflows, but would also reduce their profits if the interest rates charged for shorter term loans are below those of long-term debt.

3. Protective covenants are designed to safeguard the borrower's ability to repay the loan with a reasonable degree of safety. Particular emphasis is placed on preserving liquidity. If the borrower should default under any of the covenants, the lender can come in legally and take remedial steps whereas otherwise it would have to wait until maturity.

4. A revolving credit agreement is a legal agreement whereby the lender must loan the company money upon proper notice. An upper limit is set and the number of years for which the agreement holds is specified. Also, the agreement contains protective covenants that trigger default. The line of credit is an understanding whereby the lender will lend up to a specified amount over a period of time, usually a year. It is not legally binding in that the lender need not lend money, although certainly it is a moral obligation. Also, protective covenants are not involved in the line of credit.

5. The lender wishes to preserve the liquidity of a borrower but at the same time does not want to be so restrictive as to seriously affect the borrower's profitability. The two restrictions limit the ability of the borrower to invest in long-term assets or otherwise use its liquid assets. It is important that the lender recognize any seasonal element that affects working capital. Also, some cushion should be allowed for unforeseen fluctuations. The lender wants the borrower to be cautious, but being too cautious may hurt profitability and the ability of the company to pay off

the loan. With respect to the capital expenditure restriction, it is customary to limit capital spending to depreciation or depreciation plus some additional percent or some additional dollar amount.

6. The borrower will wish to negotiate hard on those covenants that may be binding and not so hard on those covenants that will not be binding. On the working capital covenant, the borrower should insist on a reasonable cushion for uncertainty. Also, if there are seasonal or cyclical patterns to working capital, the borrower should insist that these patterns be recognized and the covenant liberalized. On the capital expenditure restriction, the borrower will want a sufficiently liberal restriction to allow for necessary capital expenditures. Also, some cushion for unforeseen capital needs is desirable. It is important to recognize that the lender and borrower approach the loan agreement from different perspectives. The final product is usually a compromise.

7. Commercial banks are perhaps the most important source of intermediate-term financing. Other sources include finance companies, leasing companies, and insurance companies.

8. A chattel mortgage is a lien against a borrower's equipment. With a conditional sales contract, the seller retains title to the equipment until the buyer makes all payments under the contract. At satisfactory completion of payments, title goes to the buyer.

With a chattel mortgage arrangement, the buyer obtains title upon purchase, the equipment being subject to a lien, however.

9. If the investment decision and the financing decision cannot be separated, decisions may be made that are not optimal. By coupling the decision to use leasing with a highly profitable investment, the leasing cost may be camouflaged. As the text suggests, there are various methods to deal with the lease versus term-loan financing decision. The student may develop a model analyzing the cash flows of the combined decisions discounted at a rate commensurate with the risk. Alternatively, a model may be developed that evaluates the differential cash flow of the lease option and the term-loan option.

10. A <u>financial lease</u> is longer term than an <u>operating lease</u>. The financial lease is also noncancellable with lease payments being required until the lease's expiration. The payments must amortize the entire cost of the asset over its life and return the lessor a return on investment. An operating lease, such as that for office space, does not amortize the value of the asset over the initial term of the lease. In certain cases, the operating lease can be cancelled, but this often is not the case. In a <u>full-service (or maintenance) lease</u>, repairs, taxes and insurance are paid by the lessor. With a <u>net lease</u> these expenses are paid by the lessee.

11. In a sale-and-leaseback, the asset is sold and leased back by the company. The company receives the sales price in cash to be employed elsewhere in the business. However, it contracts to make periodic lease payments whereas no payments were required before. With a direct lease, the company acquires use of a new asset that it leases either from a manufacturer or from a financial intermediary.

12. The capitalized value of a financial lease is shown on the balance sheet as an asset and the associated liability is shown on the right-hand side of the balance sheet. The amortization of the lease, together with the annual interest embodied in the lease payment, are treated as an expense for accounting purposes. With debt financing, the debt obligation is shown on the right-hand side of the balance sheet and the amount of annual interest is treated as an expense. There is a fundamental difference between the two treatments if an operating as opposed to a capital lease is involved. With an operating lease, disclosure is only in a footnote.

13. a) Higher liquidity ratios.
    b) Probable higher return on investment -- especially if not treated as a capital lease.
    c) Probable higher return on equity -- especially if not treated as a capital lease.

d) Higher risk class.

e) Depends on what is done with proceeds from the sale of the asset and on shareholder reactions.

14. This argument is illogical. On financial leases, for example, the lessor will receive the purchase price plus a cost of capital during the noncancellable portion of the lease. Thus, the lessee is paying for the machine regardless of who has title to it.

15. a) The tax rate increase would be neutral in the sense that each tax deductible dollar under either alternative would be equally affected.

b) Faster accelerated depreciation should favor borrowing as a larger tax shield would result. Note, however, that the lessor may be able to utilize and pass along these same tax savings.

c) This would tend to favor borrowing, especially if the market value of the asset financed rose faster than the price level. If the price level did not increase smoothly, the alternative favored would depend upon how the pattern of the differential cash flows coincided with the pattern of price-level fluctuations.

d) Borrowing would be favored, as residual value goes to the owner.

e) If the interest rate rise affected both lessor and lender equally, the effect would tend to be neutral in the sense of (a) above. Again, however, the alternative with a larger proportion of the after-tax cash payments postponed until later in the future (probably borrowing) would be favored. Note also that if interest rates decline in the future, a bond issue may be refunded whereas a lease may not.

SOLUTIONS TO PROBLEMS

1. Discount factor for five annual payments at 14 percent = 3.4331

Annual payment = $600,000/(3.4331) = $174,769

Schedule of debt payments

END OF YEAR	(a) LOAN PAYMENT	(b) PRINCIPAL AMOUNT OWING AT END OF YEAR $(b)_{t-1}$ - (a) + (c)	(c) ANNUAL INTEREST $(b)_{t-1}$ x (.14)
0	$ 0	$600,000	$ 0
1	174,769	509,231	84,000
2	174,769	405,754	71,292
3	174,769	287,791	56,806
4	174,769	153,313	40,291
5	174,777*	0	21,464

* Difference due to rounding and the fact that the discount factor is only four places to the right of the decimal point.

2. Balance Sheet Under Growth Assumptions (000s omitted)

	Now (after financing)	Years in Future (at December 31) 1	2	3	4
Current assets*	$10,000	$12,400	$15,376	$19,066	$23,642
Fixed assets*	10,000	12,400	15,376	19,066	23,642
Total assets*	$20,000	$24,800	$30,752	$38,132	$47,284
Current liabilities**	$ 3,000	$ 6,300	$10,502	$15,882	$25,784
Long-term debt	8,000	8,000	8,000	8,000	5,000
Shareholders' equity***	9,000	10,500	12,250	14,250	16,500
Total L & S.E.	$20,000	$24,800	$30,752	$38,132	$47,284

* Will show a 24% growth rate starting in year 1.
** The current liabilities row is a residual and is found by subtracting long-term debt and shareholders' equity from total assets. In the 4th year, the term loan becomes a current liability.
*** Increased by the amount of expected profits.

Protective Covenant	Now (after financing)	Years in Future (at December 31) 1	2	3	4
Net working capital	$7,000	$6,100	$4,874	$3,184	-$2,142*
Total liabilities to total assets	.550	.577	.602*	.626*	.651*

* In violation of covenant.

Long-term debt does not increase. All growth is financed with short-term liabilities and retained earnings.

	Years in Future (at December 31) 1	2	3	4
Net addition to fixed assets	$2,400	$2,976	$3,690	$ 4,576
Plus depreciation	3,100	3,844	4,767	5,911
Capital expenditures	$5,500	$6,820	$8,457	$10,487
Depreciation	$3,100	$3,844	$4,767	$5,911
Plus $3 million	3,000	3,000	3,000	3,000
Total available	$6,100	$6,844	$7,767	$8,911

The company will breach the total-liabilities-to-total-assets ratio restriction in the second, third, and fourth year, the capital expenditures restriction in the third and fourth year, and the net working capital requirement in the fourth year. This is a classic example of a company that wishes to grow at a rate faster than the growth in its retained earnings. The protective covenants will definitely restrict this growth. Apart from the three binding covenants, there is a serious question of whether the company can obtain the large amount of additional short-term debt that is necessary to finance the growth.

3. a) $\$260,000 = X + (PVIFA_{13\%,4})X = X + (2.974)X$

$X = \$260,000/(3.974)$

$X = \$65,425$

b) $\$138,000 = X + (PVIFA_{6\%,8})X + (PVIF_{6\%,9})(\$20,000)$

$\$138,000 = X + (6.210)X + (.592)\$20,000$

$X = (\$138,000 - \$11,840)/(7.210)$

$X = \$17,498$

c) $\$773,000 = X + (PVIFA_{9\%,9})X = X + (5.995)X$

$X = \$773,000/(6.995)$

$X = \$110,508$

4. a) $\$18,600 = X + (PVIFA_{12\%,7})X = X + (4.564)X$

$X = \$18,600/(5.564) = \$3,343$

b) $\$18,600 = X + (PVIFA_{12\%,7})X + (PVIF_{12\%,8})(\$4,000)$

$\$18,600 = X + (4.564)X + (.404)(\$4,000)$

$\$18,600 = (5.564)X + \$1,616$

$X = \$16,984/(5.564) = \$3,052$

5. Schedule of cash flows for the leasing alternative

END OF YEAR	(a) LEASE PAYMENT	(b) TAX-SHIELD BENEFITS $(a)_{t-1}$ x (.35)	(c) CASH OUTFLOW AFTER TAXES (a) - (b)	(d) PRESENT VALUE OF CASH OUTFLOWS (at 7.8%)
0	$16,000	$ 0	$16,000	$16,000
1-7	16,000	5,600	10,400	54,519*
8	0	5,600	($5,600)	(3,071)
				$67,448

* Total for years 1-7.

The discount rate of 7.8 percent is the product of the cost of borrowing of 12 percent times one minus the tax rate of 35 percent. For the lease alternative, the present value of cash outflows is $67,448.

Annual debt payments are found using a generalized version of Eq. (21-2):

$$\$100,000 = X + X(PVIFA_{12\%,7}) = X(5.564)$$

$$X = \$100,000/(5.564) = \$17,973$$

Schedule of debt payments

END OF YEAR	(a) LOAN PAYMENT	(b) PRINCIPAL AMOUNT OWING AT END OF YEAR $(b)_{t-1}$ - (a) + (c)	(c) ANNUAL INTEREST $(b)_{t-1}$ x (.12)
0	$17,973	$82,027	$ 0
1	17,973	73,897	9,843
2	17,973	64,792	8,868
3	17,973	54,594	7,775
4	17,973	43,172	6,551
5	17,973	30,380	5,181
6	17,973	16,053	3,646
7	17,979	0	1,926

The principal amount of $100,000 is reduced by the initial debt payment of $17,973 to get the principal amount owing at time 0 of $82,027. Interest on this amount in year 1 is found by multiplying it by 12 percent. The debt payment in the last year is slightly larger due to previous rounding.

Schedule of cash flows for the debt alternative

END OF YEAR	(a) DEBT PAYMENT	(b) ANNUAL INTEREST	(c) ANNUAL DEPRECIATION	(d) TAX-SHIELD BENEFITS (b+c).35	(e) AFTER-TAX CASH FLOW (a)-(d)	(f) PV OF CASH FLOWS (at 7.8%)
0	$17,973	$ 0	$ 0	$ 0	$17,973	$17,973
1	17,973	9,843	20,000	10,445	7,528	6,983
2	17,973	8,843	32,000	14,304	3,669	3,157
3	17,973	7,775	19,200	9,441	8,532	6,811
4	17,973	6,551	11,520	6,325	11,648	8,625
5	17,973	5,181	11,520	5,845	12,128	8,331
6	17,973	3,646	5,760	3,292	14,681	9,355
7	17,979	1,926	0	674	17,305	10,229
8	(20,000)*		0	(7,000)@	(13,000)	(7,128)
			$100,000			$64,336

* Salvage value.

@ Tax due to recapture of depreciation, ($20,000)(.35) = $7,000.

Present value of cash outflows at 7.8 percent = $64,336

Because the present value of debt payments, $64,336, is less than the present value of lease payments, $67,448, the debt alternative is preferred. However, some would argue that we should apply a discount rate higher than the lessee's after-tax cost of debt (i.e., 7.8%) to the residual value because of the greater uncertainty to this cash flow. A discount rate of roughly 15.8 percent* or more -- applied to the residual value -- would now make the present value of cash outflows greater for the debt alternative than for the leasing alternative. In this situation, we would prefer the leasing alternative.

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*In order for the present value of cash outflows for the leasing alternative ($67,448) to be less than the present value of cash outflows for the debt alternative ([$64,336 + $7,128] - [$13,000/$(1 + X)^8$]), the discount rate (X) must be roughly 15.8 percent or more.

6. Schedule of cash flows for the leasing alternative

END OF YEAR	(a) LEASE PAYMENT	(b) TAX-SHIELD BENEFITS $(a)_{t-1} \times (.30)$	(c) CASH OUTFLOW AFTER TAXES (a) - (b)	(d) PRESENT VALUE OF CASH OUTFLOWS (at 7%)
0	$17,000	---	$17,000	$17,000
1-4	17,000	$5,100	11,900	40,308*
5	---	5,100	($5,100)	(3,636)
				$53,672

*Total for years 1-4.

The discount rate of 7 percent is the product of the cost of borrowing (10%) times one minus the tax rate of 30 percent. The present value of cash outflows is $53,672.

Annual debt payments are found using a generalized version of Eq. (21-2):

$$\$80,000 = X + (PVIFA_{10\%,4})X = X + (3.170)X$$

$$X = \$80,000/(4.170) = \$19,185$$

Schedule of debt payments

END OF YEAR	(a) LOAN PAYMENT	(b) PRINCIPAL AMOUNT OWING AT END OF YEAR $(b)_{t-1}$ - (a) + (c)	(c) ANNUAL INTEREST $(b)_{t-1} \times (.10)$
0	$19,185	$60,815	$ 0
1	19,185	47,712	6,082
2	19,185	33,298	4,771
3	19,185	17,443	3,330
4	19,187	0	1,744

The principal amount of $80,000 is reduced by the amount of the first payment of $19,185 to give $60,815 at time 0. The last debt payment is slightly higher due to rounding.

Schedule of cash flows for the debt alternative

END OF YEAR	(a) DEBT PAYMENT	(b) ANNUAL INTEREST	(c) ANNUAL DEPRECIATION	(d) TAX-SHIELD BENEFITS (b+c).30	(e) AFTER-TAX CASH FLOW (a)-(d)	(f) PV OF CASH FLOWS (at 7%)
0	$19,185	$ 0	$ 0	$ 0	$19,185	$19,185
1	19,185	6,082	26,664	9,824	9,361	8,749
2	19,185	4,771	35,560	12,099	7,086	6,189
3	19,185	3,330	11,848	4,553	14,632	11,944
4	19,187	1,744	5,928	2,302	16,885	12,881
5	(16,000)*	0	0	(4,800)@	(11,200)	(7,985)
			$80,000			$50,963

* Residual value.
@ Tax due to recapture of depreciation, ($16,000)(.30) = $4,800.

Present value of cash outflows at 7 percent = $50,963

Because the present value of debt payments, $50,963, is less than the present value of lease payments, $53,672, the debt alternative is preferred. However, some would argue that we should apply a discount rate higher than the lessee's after-tax cost of debt (i.e., 7%) to the residual value because of the greater uncertainty to this cash flow. A discount rate of roughly 16.3 percent* or more -- applied to the residual value -- would now make the present value of cash outflows greater for the debt alternative than for the leasing alternative. In this situation, we would prefer the leasing alternative.

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*In order for the present value of cash outflows for the leasing alternative ($53,672) to be less than the present value of cash outflows for the debt alternative ([$50,963 + $7,985] - [$11,200/$(1 + X)^5$]), the discount rate (X) must be roughly 16.3 percent or more.

Solution to Appendix Problem:

7. a) After the initial lease payment, there are five remaining payments. The lower cost discount rate is the 11 percent cost of borrowing. The present-value discount factor for an even stream of cash flows for five years at 11 percent is 3.696.

   Capitalized value = \$30,000 x 3.696 = \$110,880

   b) Principal amount during the first year for accounting purposes = \$110,877

Interest expense = \$110,880 x 11%	=	\$12,197
Amortization expense	=	16,332
First-year accounting lease expense		\$28,529

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a. b. (in thousands)

	YEAR					
	Revolving Credit			Term Loan		
	1	2	3	4	5	6
Amount borrowed during year	$ 1,400	$ 3,000	$ 3,000	$ 3,000	$ 2,000	$ 1,000
Unused portion	1,600	0	0	0	1,000	2,000
Commitment fee (.005)	**8**	**0**	**0**	**0**	**5**	**10**
Interest cost above prime (1% first 3 years and 1.5% in last 3)	**14**	**30**	**30**	**45**	**30**	**15**

2. A generalized version of Eq. (21-2) as the formula is used throughout.

a. $\$46,000 = X + X(\text{PVIFA}_{11\%,5})$

$\$46,000 = X + X(3.696) = X(4.696)$

$X = \$46,000/4.696 = \mathbf{\$9,796}$

b. $\$210,000 = \$47,030/(1 + \text{PVIFA}_{X,5})$

$\$210,000/\$47,030 = (1 + \text{PVIFA}_{X,5}) = 4.465$

Subtracting 1 from this gives $\text{PVIFA}_{X,5} = 3.465$. Looking in Table IV (in the Appendix at the end of the book) across the year 4 row, we find that 3.465 is the figure reported for 6 percent. Therefore, the implied interest rate, X, is **6 percent**.

c. $X = \$16,000(1 + PVIFA_{8\%,6})$

$X = \$16,000(1 + 4.623) =$ **$89,968**

d. $\$165,000 = \$24,412(1 + PVIFA_{10\%,X})$

$\$165,000/\$24,412 = (1 + PVIFA_{10\%,X}) = 6.759$

Subtracting 1 from this gives 5.759. Looking in Table IV in the 10% column, we find that 5.759 corresponds to the 9-period row. Therefore, the lease period is 9 + 1, or **10 years**.

3. **Schedule of cash flows for the leasing alternative**

END OF YEAR	(a) LEASE PAYMENT	(b) TAX-SHIELD BENEFITS $(a)_{t-1} \times (.40)$	(c) CASH OUTFLOW AFTER TAXES (a) - (b)	(d) PRESENT VALUE OF CASH OUTFLOWS (at 8.4%)
0	$16,000	---	$16,000	$16,000
1-7	16,000	$ 6,400	9,600	49,305*
8	---	6,400	(6,400)	(3,357)
				$61,948

*Total for years 1-7.

The discount rate is the before-tax cost of borrowing times 1 minus the tax rate, or (14 percent)(1 - .40) = 8.4%.

Annual debt payment:

$$\$100,000 = X(1 + PVIFA_{14\%,7})$$

$$\$100,000 = X(1 + 4.288) = X(5.288)$$

$$X = \$100,000/5.288 = \$18,910$$

Schedule of debt payments

END OF YEAR	(a) LOAN PAYMENT	(b) PRINCIPAL AMOUNT OWING AT END OF YEAR $(b)_{t-1}$ - (a) + (c)	(c) ANNUAL INTEREST $(b)_{t-1}$ x (.14)
0	$18,910	$81,090	$ 0
1	18,910	73,533	11,353
2	18,910	64,917	10,295
3	18,910	55,096	9,088
4	18,910	43,899	7,713
5	18,910	31,135	6,146
6	18,910	16,584	4,359
7	18,906*	0	2,322

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

Schedule of cash flows for the debt alternative

END OF YEAR	(a) DEBT PAYMENT	(b) ANNUAL INTEREST	(c) ANNUAL DEPRECIATION	(d) TAX-SHIELD BENEFITS (b+c).40	(e) AFTER-TAX CASH FLOW (a)-(d)	(f) PV OF CASH FLOWS (at 8.4%)
0	$18,910	$ 0	$ 0	$ 0	$18,910	$18,910
1	18,910	11,353	20,000	12,541	6,369	5,875
2	18,910	10,295	32,000	16,918	1,992	1,695
3	18,910	9,088	19,200	11,315	7,693	5,962
4	18,910	7,713	11,520	7,693	11,217	8,124
5	18,910	6,146	11,520	7,066	11,844	7,913
6	18,910	4,359	5,760	4,048	14,862	9,160
7	18,906	2,322		929	17,977	10,222
8	(24,000)*			(9,600)**	(14,400)	(7,553)
			$100,000			$60,309

* Salvage value.
** Tax due to recapture of depreciation, ($24,000)(.40) = $9,600.

As the debt alternative has the lower present value of cash outflows, it is preferred. However, some would argue that we should apply a discount rate higher than the lessee's after-tax cost of debt (i.e., 8.4%) to the residual value because of the greater uncertainty to this cash flow. A discount rate of roughly 11.8 percent* or more -- applied to the residual value -- would now make the present value of cash outflows greater for the debt alternative than for the leasing alternative. In this situation, we would prefer the leasing alternative.

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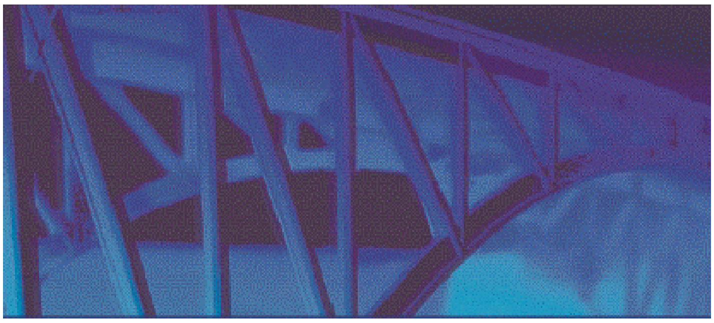
*In order for the present value of cash outflows for the leasing alternative ($61,948) to be less than the present value of cash outflows for the debt alternative ([$60,309 + $7,553] - [$14,400/(1 + X)^8]), the discount rate (X) must be roughly 11.8 percent or more.

PART 8

Special Areas of Financial Management



22
Convertibles, Exchangeables, and Warrants

You pays your money and you takes your choice.

PUNCH

ANSWERS TO QUESTIONS

1. The conversion price and the conversion ratio are reciprocals of each other. The conversion ratio tells how many shares of common stock will be received for each $1,000 debenture. $1,000 divided by the conversion price equals the conversion ratio. The conversion value of a convertible security is the value of the security in terms of the common stock into which the security can be converted. (Conversion value = conversion ratio x market price per share of common.) The premium-over-conversion value (conversion premium) is the amount by which the market value of the convertible debenture exceeds its conversion value. The premium-over-straight-bond value is the amount by which the market price of a convertible bond exceeds the value of the debenture as a straight bond.

2. With the advantage of hindsight and on the assumption that the firm did not require any of the funds until the date of conversion and that equity flotation costs were less than convertible flotation costs, the firm would have been better off to have waited. However, in order to have low-cost capital during a construction period, or perhaps even to raise the capital at all (if the firm were small and rapidly growing) the sale of convertible securities may well have been in the best interest of the stockholders.

3. The company issues straight debt to avoid diluting the EPS and to gain the beneficial effects of increased financial leverage. Convertibles are merely a form of delayed equity financing, while the firm's optimal capital structure will in all likelihood include some permanent component of debt. Thus the firm will issue some straight debt in spite of the lower explicit costs of convertibles.

4. Warrants allow the investor to obtain a high degree of personal leverage when buying securities. The capital gains potential, coupled with the loss limitation, explains the reason for a warrant selling at a positive price even when its theoretical value is zero.

5. The question is purposely broad to encourage discussion of the relative advantages of warrants and convertibles. The student may favor either alternative but convertible financing at this time may be more favorable for the following reasons:
   a) Use of convertibles gives the firm greater control over the timing of future capital structure changes.
   b) Upon conversion, convertibles typically expand the equity base more than warrants do. Thus additional debt capacity for future funds requirements is obtained from convertibles. This may be particularly important in light of the firm's high debt ratio.

c) If the price of the firm's stock rises and then falls prior to the expiration date of the warrants, the warrants may lose their value and not be exercised. The firm would then not receive the injection of equity funds it seems to need. Note in this situation that the firm may have been able to force conversion of the convertible if the initial common stock price rise had been great enough.

Offsetting these advantages are the increased dilution and possible problems with maintaining control upon the conversion of the convertible issue to common stock.

6. The bondholder might convert to obtain an attractive common stock dividend, to avoid an increase in the conversion price, or to avoid the termination of the conversion feature.

7. Warrants are used by these firms as "sweeteners" to lower the explicit interest rate on debt and/or to avoid restrictive provisions in the indenture or loan agreement. In many cases, lenders are unwilling to lend money without an "equity kicker." Thus, the firm with relatively little history may be able to obtain debt financing only if it gives warrants.

8. It is valued more highly because of its upside potential to the investor. The greater the potential fluctuation in the market price of the common stock, the more valuable the option. In essence, the investor puts up less money and participates in upside fluctuations

in the market price of the common stock, whereas downward fluctuations are buffered by the fact that the warrant can only decline in value to zero. The option pricing theory suggests that there is an exact relationship between the price of the common stock and the price of the option that is assured by the possibility of arbitrage. In equilibrium, prices of common stocks and options are such that the expected return on a fully hedged position of owning the common stock and writing so many options, or vice versa, is the risk-free rate.

9. This event probably has been discounted in the price of the common stock. Accounting income must be reported on a fully diluted basis. Therefore, we would expect little or no effect.

10. A "step-up" in conversion price will prompt holders of the convertible security to convert before a "step-up" occurs, assuming the conversion value is in excess of the instrument's straight-bond value. However, the presence of sharp and frequent "step-ups" will make the selling of the convertible security much more difficult. After a point, the convertible will not find acceptance in the market price.

11. For roughly the same amount of upside movement in price, the investor has a lower net investment than he/she would in the common stock. Because the option requires less net investment, percentage movements in warrant prices will be greater than percentage

movements in common stock prices. While the risk is greater, this risk, as represented by the underlying volatility of the common stock, is what gives the warrant value over its theoretical value.

12. The attractiveness of warrants depends on the exercise price, the time to expiration, and the potential of the common stock. Again it is the upside potential that is important. If a company is in a stable business with little prospect of significant growth, chances are that the warrants will have little value. As a result, the lender will make the loan on the basis of straight-credit considerations. If the company involved has significant possibility for upside performance but considerable risk, the lender will regard the warrants as attractive. In some cases, warrants make the difference between making the loan and not making it.

13. The investor achieves leverage, so that percentage changes in warrant value exceed percentage changes in share price, while being protected on the downside. This skewed distribution of possible returns finds favor with certain market participants. The more volatile the share price, the more the potential for upside gain and the greater the value of the warrant, all other things the same. In fact, the Appendix shows that the principal factor affecting the valuation of an option is the volatility of the associated asset, in our case the common stock.

14. No. The company must give an option on the common stock that may cause dilution. There is uncertainty when, if ever, the option will be exercised, and this may represent an opportunity cost to the company. The overhanging convertible security or the unexercised warrant creates uncertainty in the financial community and affects the ability of the firm to engage in other forms of financing.

15. Both the convertible bond and the exchangeable bond are options on common stock and both pay a fixed interest rate until the option is exercised. However, with the convertible the common stock option is on the issuer. That is the common stock into which the security may be converted. With an exchangeable bond, the option pertains to the common stock of another corporation.

16. Both securities are hybrids, having valuation features of bonds and common stock options. There are diversification properties with the exchangeable bonds, because the option is on the common stock of a company other than that which issues the bonds. This may benefit the exchangeable versus the convertible. The key is the volatility of the two common stocks. Whichever is more volatile will have a higher common stock option value, holding constant the conversion price.

SOLUTIONS TO PROBLEMS

1. a)

EPS	$3.00
P/E ratio	x 8.333
Price per share	$25.00
Premium (20%)	5.00
Conversion price	$30.00

b)

Face per bond	$1,000.00
Divided by conversion price	÷ 30.00
	33.333 shares per bond

c) Initial conversion value: (33.333) x ($25) = $833.325

d) (10,000 debentures) x (33.333 shares per debenture) = 333,333 new shares

e)

	Originally	Before Conversion	After Conversion
Operating earnings	$5,000,000	$6,000,000	$6,000,000
Less: Interest	0	900,000	0
Net income before tax	$5,000,000	$5,100,000	$6,000,000
Less: Taxes (40%)	2,000,000	2,040,000	2,400,000
Net income	$3,000,000	$3,060,000	$3,600,000
Less: Dividends (60%)	1,800,000	1,836,000	2,160,000
To retained earnings	$1,200,000	$1,224,000	$1,440,000
Shares outstanding	1,000,000	1,000,000	1,333,333
EPS	$3.00	$3.06	$2.70

2.

Operating earnings	$6,000,000
Interest	1,200,000
Net income before taxes	$4,800,000
Less: Taxes (40%)	1,920,000
Net income	$2,880,000
Less: Dividends (60%)	1,728,000
To retained earnings	$1,152,000
Shares outstanding	1,000,000
EPS	$2.88

3. a) Premiums:

	Observations				
	1	2	3	4	5
Market Price Per Share	$ 40	$ 45	$ 32	$ 23	$ 18
Mkt. Price of Convertible	1,065	1,140	890	740	640
Conversion Value (Share price x 25)	1,000	1,125	800	575	450
Premium-over-conver. value	$ 65	$ 15	$ 90	$ 165	$ 190
Straight-bond value	$ 690	$ 700	$ 650	$ 600	$ 550
Premium-over-straight-bond value	$ 375	$ 440	$ 240	$ 140	$ 90

b) At high common stock prices, the convertible debenture sells at a substantial premium over its straight-bond value, but at only a slight premium over its conversion value. Here the convertible sells mainly for its common stock attraction, and the bond feature is of negligible importance. Also, there is the danger of a call, where the security will be worth only its conversion value. As share price declines from a high of $45, the premium-over-conversion value increases. The option feature remains a factor, but increasingly the straight-bond value becomes important as the premium-over-straight-bond value declines. As share price drops, particularly below $32, the bond value falls in keeping with greater default risk. At an $18 share price, the premium-over-straight-bond value is relatively small. The security sells in an important way for its bond value, as evidenced by the premium-over-straight-bond value. All of this is in accord with the discussion in the chapter.

4. At $10 a share, the conversion value is $250 and the premium- over-conversion value is $190. The premium-over-straight-bond value is $30. As the common stock price has weakened, due to probable financial difficulty, the bond value floor has fallen. Much less downside protection is given. While some of the variation in bond value may be due to changing interest rates in the bond market, most is due to changing perceptions of default risk. At $10 a share, the convertible sells mainly for its bond feature. The stock option has some value, but $30 is a very small premium over the security's straight-bond value.

5. a) (000s omitted)

	Capitalization				
		Convertible Debentures		Deb. with Warrants	
	Before Financing	Before Conversion	After Conversion	Before Exercise	After Exercise
Debentures	$ 0	$10,000	$ 0	$10,000	$10,000
Com. Stock	$ 5,000	5,000	$ 6,000	5,000	5,200
Add. paid-in cap.	10,000	10,000	19,000	10,000	11,800
Retained earnings	15,000	15,000	15,000	15,000	15,000
Com. Stk. Equity	$30,000	$30,000	$40,000	$30,000	$32,000
Total Cap.	$30,000	$40,000	$40,000	$40,000	$42,000
No. of shares	1,000	1,000	1,200	1,000	1,040

b) Earnings

Net income before int. and taxes	$ 6,000	$ 8,000	$ 8,000	$ 8,000	$ 8,400
Less: Interest	0	800	0	1,000	1,000
Net income before taxes	$ 6,000	$ 7,200	$ 8,000	$ 7,000	$ 7,400
Less: Taxes	3,000	3,600	4,000	3,500	3,700
Net income	**$ 3,000**	**$ 3,600**	**$ 4,000**	**$ 3,500**	**$ 3,700**
No. of shares	÷ 1,000	÷ 1,000	÷ 1,200	÷ 1,000	÷ 1,040
EPS	$ 3.00	$ 3.60	$ 3.33	$ 3.50	$ 3.56

c) Theoretical value of warrant =

$$(N)(P_S) - E = (4)(\$75) - \$200 = \underline{\$100}$$

6. The exchange price is $1,000/16.666 = $60

Premium-over-exchange value (as a percent) = ($60/$50) - 1 = 20%

If Malaysian Palm Oil stock is more volatile than that of Singapore Enterprises, the option value will be greater with an exchangeable offering than it will be with a convertible issue. If the two companies are unrelated, diversification of bond value and common stock value may hold advantage as well.

7. $TV = (N)(P_S) - E$

a) TV = (5)($100) - $400 = $100

b) TV = (10)($10) - $60 = $ 40

c) TV = (2.3)($4) - $10 = ($0.80) or zero

d) TV = (3.54)($27.125) - $35.40 = $60.62

8. a) 34.7 x $43 = $1,492.10. This assumes the bonds sell for their conversion value -- i.e., there is no premium.

b) $1,492.10 - $1,060 = $432.10

$432.10/$1,492 = 29 percent

9. a) (3)($18) - $60 = -$6, or zero as the warrant cannot have a negative value.

b) (.15)($16) + (.20)($18) + (.30)($20) + (.20)($22) + (.15)($24) = $20

c) For market prices per share of $20 or less, the theoretical value of the warrant will be zero. Therefore, the expected value of theoretical value of the warrant six months hence is:

(.15)(0) + (.20)(0) + (.30)(0) + (.20)($66 - $60) + (.15)($72 - $60) = $3.00

d) As this amount is positive, we would expect the warrant to sell at some positive price, presumably less than $3. In other words, the investor has the possibility of the warrant having some positive stock-equivalent value six months hence -- a 0.20 probability for a $6 value and a 0.15 probability for a $12 value. Therefore, the warrant is worth more than its current theoretical value of zero.

10. a)

$$r = \frac{\$1 + (\$50 - \$26)}{\$26} = 96.2\%$$

b) Theoretical value now = (2)($26) - $45 = $7

Market price now = $7 + $10 = $17

Theoretical value one year hence = (2)($50) - $45 = $55

Market value one year hence = $55 + $2 = $57

$$r = \frac{\$57 - \$17}{\$17} = 235.3\%$$

c) The greater leverage associated with the lesser investment in the warrants results in a substantially higher return in terms of percentage.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a. Conversion value = Conversion ratio x market price per share

   = 2 x $21 = **$42**

   b. Premium-over-conversion value = $50 - $42 = **$8**

   (or, expressed as a percent = $8/$42 = 19.05%)

   c. Earnings per share:

Total after-tax earnings ($3 x 500,000 shares)	$1,500,000
Preferred stock dividend	140,000
Earnings available to common shareholders	$1,360,000
Number of shares	÷ 500,000
Basic earnings per share	**$2.72**
Total after-tax earnings	$1,500,000
Number of shares (500,000 + 80,000)	÷ 580,000
Diluted earnings per share	**$2.59**

   d. Earnings per share after profit increase:

Total after-tax earnings	$2,500,000
Preferred stock dividend	140,000
Earnings available to common shareholders	$2,360,000
Number of shares	÷ 500,000
Basic earnings per share	**$4.72**
Total after-tax earnings	$2,500,000
Number of shares (500,000 + 80,000)	÷ 580,000
Diluted earnings per share	**$4.31**

2. a. Conversion price = $36 x 1.12 = $40.32

   Call price per share the first 10 years =
   $40.32 x 1.06 = $42.74

Price to which the common must rise before company will be in a position to force conversion $42.74 x 1.15 = $49.15

Increase from present price = ($49.15/$36) - 1 = 36.5%

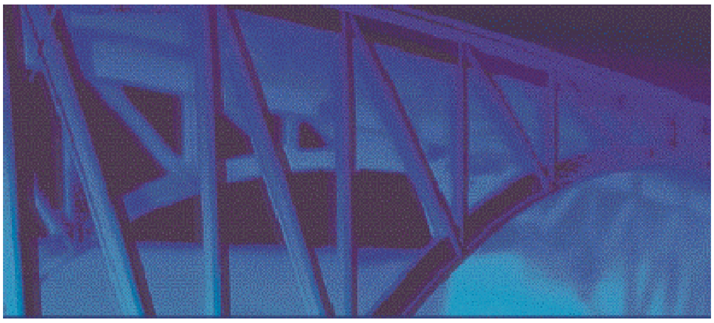
At an 8 percent compound growth rate, earnings per share will grow by 36 percent in 4 years -- this is simply $(1.08)^4 - 1$. If the price/earnings ratio stays the same, it will take approximately **four years** before the company will be in a position to force conversion.

b. This period is somewhat longer than the two to three years that market participants have come to expect for the convertible security. Still it is not far out of line, and the company may wish to go ahead. However, if uncertainty as to earnings per share increases with the length of time in the future, there may be considerable risk of an "overhanging" issue. This may cause the company to reconsider.

3. Market price of warrant and theoretical value at various common stock prices (in ascending order):

Common stock	$18	$20	$24	$27	$32	$38
Warrant price	3	5	8	12	20	29
Theoretical value	0	0	0	6	16	28

When plotted, the relationship is of the same pattern as shown in Fig. 22-1. The maximum premium-over-theoretical value occurs when share price is $24, and the warrant has a theoretical value of zero. Here the greatest leverage occurs, and since volatility is what gives an option value, the premium-over-theoretical value tends to be greatest at this point.



23
Mergers and Other Forms of Corporate Restructuring

In the takeover business, if you want a friend, you buy a dog.

CARL ICAHN

ANSWERS TO QUESTIONS

1. Generally, synergy in a merger means that the earnings of the surviving company will be larger than the sum of pre-merger earnings of the separate parts. This is often achieved through the operating economies realized from the merger.

2. When the P/E multiple of the acquiring firm is greater than the P/E multiple paid for the acquired company, the shareholders of the acquired company will suffer a dilution in EPS. However, reported earnings per share of the new corporation will be greater than before. This occurs because increases or decreases in EPS after merger are a function of the ratio of P/E multiples and the relative size (measured in earnings) of the two firms. The larger the earnings of the acquired company relative to the acquiring company, the greater the increase in EPS.

3. Both methods of analysis should be used. A free-cash-flow analysis emphasizes the long run with respect to valuation. The future incremental cash flows are discounted to present value. An earnings-per-share analysis emphasizes the short run. At the most, only five years of EPS are considered. There are the usual problems with earnings per share as a goal of the firm. The cash-flow method is more comprehensive in getting at the long-run growth of the company and is much more fundamental. If only one method of analysis is to be used, a strong case can be made for its use.

4. Mergers are often consummated with stock and there is a marked tendency for more mergers to take place when stock prices are high than when they are low. Because stock prices are highly correlated with changes in business activity, we observe considerably more mergers in periods of prosperity than we do during recessions.

5. As earnings would no doubt be less than perfectly correlated, a merger would result in less variability relative to earnings. Therefore, risk could be reduced. If the stocks are both publicly traded, however, shareholders would be able to reduce such risk on their own simply by reducing their holdings in one stock and investing in the other. Therefore, the companies are unlikely to be able to do something for investors that they cannot do for themselves. As a result, the merger <u>per</u> <u>se</u> would not be a thing of value for the diversification it provides. With significant market imperfections, however, diversification could be a thing of value.

6. Usually it means growth in earnings per share. Sometimes acquiring companies seek growth in total earnings or increased growth in sales. More important is growth in earnings per share. Unless an acquisition is underpriced or unless there is synergy, increased growth can be achieved only with taking on increased relative risk. In turn, this will result in a higher equity capitalization rate which may negate the improvement in earnings per share. If capital markets are relatively efficient, it would be difficult to find companies that are underpriced. Consequently, the key factor in a merger is the possibility of synergy. This is the thing that is of value, not necessarily growth <u>per</u> <u>se</u>.

7. So many acquisition opportunities look good because the acquirer frequently looks at the situation with "rose-tinted" glasses. Potential problems in personnel, products, production, and bringing about economies are sometimes overlooked or, as is more frequently the case, they are simply taken too casually. Unless an acquiring company has expertise in the business it is acquiring, it is foolish to think that serious and unforeseen problems will not arise.

8. Too often the acquiring company thinks that merger targets are bargains, but in reality the situations are priced fairly or overpriced. After all, no one wants to sell out at a bargain price. If the market for companies is reasonably efficient, and most of what we know would suggest that it is efficient, then other acquiring companies will compete vigorously for any true bargain. This competition will drive up the price. While it may be possible to find situations that are underpriced in the case of small companies, one should not expect to find such situations in the case of larger companies.

9. Capital expenditures are deducted in a cash-flow analysis because one should be concerned with the cash flows that are expected to arise from the merger. If capital expenditures always equalled depreciation, earnings might be a reasonable proxy for cash flows. However, if significantly higher capital spending is required, earnings forecasts as opposed to cash flow forecasts will bias upward the value placed on the potential acquisition.

10. The *current* purchase treatment method treats the acquired company as an investment. This method requires that tangible assets be reported at fair market value. As a result, it may be possible for the buyer to write up the acquired company's tangible assets. Any premium over fair asset value, or goodwill, must appear on the buyer's balance sheet.

The *old* purchase treatment method (i.e., pre-2001 in the United States) handled the initial recording of the acquisition the same way as described above. The two methods differ only in their subsequent treatment of goodwill. Under the *old* treatment, goodwill had to be written off against future income. An estimate was made of the life of goodwill, and goodwill was amortized against this period, which could not exceed 40 years for "financial accounting purposes." The *current* purchase treatment method is governed by the 2001 issuance in the United States of *Statement of Financial Accounting Standards (SFAS) 142*. *SFAS 142* eliminates mandatory periodic amortization of goodwill for financial accounting purposes, but requires an impairment test (at least annually) to goodwill.

11. With a cash acquisition, the selling company's shareholders must immediately recognize any capital gain. With a stock acquisition, the acquired company shareholders recognize any capital gain only when they sell the stock they receive. With a cash acquisition, the buying company can write up any assets acquired to their fair market values. As a result, it is able to claim higher

depreciation charges, a cash-flow benefit. This is not possible with a stock acquisition.

12. There are two schools of thought. The managerial entrenchment hypothesis suggests it will work to the detriment of stockholders, and that good offers will be thwarted. The shareholders' interest hypothesis argues that management will be better motivated and productive with these devices. Empirical evidence is mixed as to the effect on shareholder wealth. Specific devices include staggering director terms, changing the incorporation state, a supermajority merger approval provision, a fair merger price provision, a lockup provision, and management contracts or "golden parachutes."

13. This question asks an opinion, so there is no right answer. Many economists believe that the threat of tender offers is healthy, resulting in more efficient management and management being more in tune with the maximization of shareholder wealth. However, some people feel merger mania has gone too far and that management is overly distracted by the possibility of takeover.

14. The two-tier tender offer is designed to get shareholders to tender their shares early in order to get the higher price. The higher price is for control, with the second-tier offer for the remaining stock.

15. The sources of possible value creation are many. The most important are sales enhancement and operating economies, management

improvement, frequently through better incentives, information effects where concrete actions reduce asymmetric information between management and investors, wealth transfers between debtholders and equityholders, tax reasons, and leverage gains. These are described in detail in the chapter.

16. With a partial sell-off a business unit is sold to someone else. A spin-off involves the separation of the business unit from the company as an entirely separate company, owned by the shareholders of the previous parent. The stock in this new company is "spun out" to the shareholders. After the spin-off, the business unit has no affiliation with the company. With an equity carve-out, stock in a business unit is sold to the public. However, the company retains a stock ownership position, usually majority control. Only in the last case does the company retain managerial control.

17. Liquidation of an entire company makes sense when the individual assets have a higher value than the present value of the expected cash-flow stream emanating from them. Under these circumstances, the company is worth more dead than alive.

18. The motivations for going private are several. The costs of being a publicly held company are eliminated. The company no longer needs to concern itself with short-run earnings and can concentrate more on the long term. With a private company it may be possible

to better structure management incentives. These must be evaluated against the cost of going public.

19. The leveraged buyout (LBO) is controversial. It is a means for transferring ownership and, perhaps, getting better incentives for management. As a result of an LBO, management would have a significant wealth stake in the enterprise. However, a great deal of debt is added. The pressure to service this debt will lead to efficiencies, but it may also cause the company to focus too much on the short run. If interest rates rise and/or a steep recession occurs, many LBOs will be in trouble. There are repercussions not only for stakeholders in the company, but for the economy overall.

20. For the senior lender(s), the incentive to provide financing for the leveraged buyout is a higher interest rate than on most business loans. Usually this rate is 1.5 to 2.5 percent (or more) over prime. The incentive for the junior subordinated lender(s) is the warrants to purchase common stock. If the company lives up to expectation, this lender will have a valuable option. The risk with a highly levered company is that business risk is magnified. After the equityholders, the junior subordinated lender will be hurt if the company doesn't make it. This lender had no security. While the senior lender has security, there usually is little margin of safety if things turn sour. In such cases, the assets frequently cannot be liquidated for amounts sufficient to cover the senior loan.

SOLUTIONS TO PROBLEMS

1. a) Shares offered of Company A = 1 million

	PRE-MERGER	
	Company A	Company B
Present earnings (in millions)	$ 20	$ 4
Shares outstanding (in millions)	10	1
P/E ratio	18	10
EPS	$ 2.00	$ 4.00
Price per share	$36.00	$40.00

	SURVIVING COMPANY A
Total earnings (in millions)	$ 24
Shares outstanding (in millions)	11
EPS	$2.18

Shareholders in Company A experience an improvement in earnings per share ($2.18 vs. $2.00) while former shareholders in Company B experience a substantial reduction ($2.18 vs. $4.00).

Market value exchange ratio = ($36 x 1)/$40 = 0.9

As Company B is being offered stock worth only 90 percent of the current market value of its stock, there is virtually no chance that it will accept the offer.

b) Shares offered of Company A = 2 million

	SURVIVING COMPANY A
Total Earnings (in millions)	$ 24
Shares outstanding (in millions)	12
EPS	$ 2.00

Company A's shareholders have the same earnings per share as before.

Effective earnings per share for former Company B shareholders = (2)($2.00) = $4.00, the same as before.

Market value exchange ratio = ($36 x 2)/$40 = 1.8

This represents a substantial (80 percent) premium to pay for Company B. Unless Company B has great growth potential and/or synergistic prospects (and its price/earnings ratio would suggest it does not), Company A would not likely find the merger to be attractive on these terms.

c) Shares offered of Company A = 1.5 million

	SURVIVING COMPANY A
Total Earnings (in millions)	$ 24
Shares outstanding (in millions)	11.5
EPS	$ 2.087

Company A's shareholders experience a modest increase in earnings per share.

Effective earnings per share for former Company B shareholders = (1.5)($2.087) = $3.13. This is significantly less than the $4.00 EPS of the old Company B.

Market value exchange ratio = ($36 x 1.5)/$40 = 1.35

The merger provides a significant (35 percent) premium in market price to Company B shareholders. It would seem that the merger would be worthwhile from their standpoint. While EPS improves for Company A stockholders, the ultimate benefit will depend on future earnings and likely synergistic effects. Depending on whether they exist, a merger might take place on these terms.

d) No particular solution recommended.

2. a)

Price per Stevens share	$60
Add 25% premium	15
Value in Schoettler shares	$75
Divide by market value of Schoettler shares	÷ 100
Exchange ratio: shares of Schoettler per Stevens share	.75
Times number of Stevens shares	x 500,000
New Schoettler shares needed	375,000
Add old Schoettler shares	1,000,000
New total Schoettler shares	1,375,000

	SURVIVING (SCHOETTLER) COMPANY
Total earnings	$8,000,000
Shares outstanding	1,375,000
EPS	$ 5.818

Note: i) old Schoettler EPS = $5M/$1M = $5.00
ii) old Stevens EPS = $3M/$500,000 = $6.00
iii) effective EPS for former Stevens shareholders = (.75)($5.818) = $4.364

b)

$$\$75 = X - .28(X - \$14)$$

$$\$75 = .72(X) + \$3.92$$

$$\$71.08 = .72(X)$$

$$X = \$71.08/.72 = \$98.72$$

3. a) Exchange ratio = $75/$100 = .75 of a share of Schoettler for each share of Stevens

b)

	Before	After
Earnings per Stevens share	$ 6.00	$ 4.364*
Earnings per Schoettler share	$ 5.00	$ 5.818

* (5.818)(.75) = $4.364 = earnings per share on each share of old Stevens stock

Schoettler has fared better. This issue is discussed in the answer to Question 2.

c) The original P/E differential could be due to many factors. Typically, good growth prospects or high quality and moderate growth prospects would cause a high P/E ratio. The prospect of little growth and/or mediocre management would cause a lower P/E ratio. If the low P/E of Stevens was due to the above causes, it is probable that the P/E of Schoettler will decline upon merger.

d) Initially, the above discussion will still hold. Eventually, however, the market will perceive the declining growth rate and react accordingly.

e) Such increases in earnings are purely financial and must be accompanied by economies of scale or real growth in some form before the company can maintain the financial growth. If the company composition, through merger, shifts toward less growth, investors will eventually realize this and their actions will cause the P/E ratio and stock prices to fall.

4. a)

	Copper Clapper	**Surviving Company**
Annual earnings	$10 million	$12 million
Shares outstanding	4 million	5.2 million
Earnings per share	$2.50	$2.31

b) Because Copper Clapper pays a higher P/E ratio for Brass Bell than its own, ($36/$2.00 = 18 times versus $30/$2.50 = 12 times), there is an immediate and significant drop in earnings per share. However, the expected growth rates are different. If we treat the expected earnings of the surviving company as a weighted average of those of Copper Clapper with a 5 percent compound annual rate of growth and those of Brass Bell with a 10 percent annual rate of growth, we obtain the following for the next ten years:

(a) Years in Future	(b) Total Earnings Copper Clapper w/o Merger (in millions)	(c) Copper Clapper EPS	(d) Total Earnings Brass Bell w/o Merger (in millions)	(e) Total Earnings Survivor (b) + (d) (in millions)	(f) Survivor EPS (e)/5.2M Shares
Now	$ 10	$ 2.50	$ 2	$ 12	$ 2.31
1	10.5	2.63	2.2	12.7	2.44
2	11.025	2.76	2.42	13.445	2.59
3	11.576	2.89	2.662	14.238	2.74
4	12.155	3.04	2.928	15.083	2.90
5	12.763	3.19	3.221	15.984	3.07
6	13.401	3.35	3.543	16.944	3.26
7	14.071	3.52	3.897	17.968	3.46
8	14.775	3.69	4.287	19.062	3.67
9	15.513	3.88	4.716	20.229	3.89
10	16.289	4.07	5.187	21.476	4.13

As seen, earnings per share of the surviving company finally catch up and surpass those of Copper Clapper without the merger in the 9th year. However, that is a long way out. Based on this information, the fact that there is no synergy, and the likelihood of the merger increasing the relative risk of Copper Clapper,* the merger opportunity should probably be declined.

____

*This would follow if the systematic risk of a stock and growth in earnings are highly correlated. In turn, we would expect such a relationship in efficient markets.

5.

Period	Avg. Annual Cash Flow (millions)	P.V. Factor @ 16%	P.V.
1- 5	$ 8	3.274	$ 26.192
6-10	10	1.559	15.590
11-15	10	.742	7.420
16-20	5	.354	1.770
			$ 50.972

6. a) Present value without the acquisition using the perpetual growth model = $600,000/(.14 - .06) = $7,500,000

Present value with the acquisition =

($600,000 + $100,000)/(.15 - .06) = $7,777,777

Difference = $7,777,777 - $7,500,000 = $277,777

As this amount is less than the acquisition price, Mountain Creamery, Inc. should not be acquired. It raises the required rate of return not only for the incremental cash flows but for the cash flows before the merger as well.

b) ($600,000 + $100,000)/(.14 - .06) = $8,750,000

Difference = $8,750,000 - $7,500,000 = $1,250,000

Under these circumstances, the acquisition would be worthwhile.

c) $600,000 + $100,000/(.15 - .08) = $10,000,000

Difference = $10,000,000 - $7,500,000 = $2,500,000

The acquisition would be very worthwhile if this increase in growth occurred.

7.

	Purchase
Tangible assets	$15.0 million
Goodwill	1.0
Total assets	$16.0
Liabilities	6.0
Shareholder's equity	10.0
Total L and SE	$16.0

8. There is likely to be a wealth transfer from old debt holders to equity holders. The former will be worse off and the latter better off. The new company is assuming only $5 million of the old debt, which with $20 million in equity value gives a debt-to-total market value ratio of .20. The debt-to-total market value ratio for the company as a whole is .40. Therefore, the old, remaining debt holders of the Leonardo Company lose a portion of the collateral value of the company as the debt ratio of the company increases. With the greater default risk, the value of the remaining debt will decline. Holding total firm value constant, equity value will increase.

9. With a 12 percent required return, the present value of $1 million forever is:

PV = $1 million/.12 = $8.333 million

This is the value of the subsidiary to Lorzo-Perez. The investment of an additional $10 million would provide a present value of cash inflows of only $8.333 million, resulting in a negative net present value. It should be rejected.

The offer of $10 million from Exson corporation is more than the value of the subsidiary to Lorzo-Perez. The offer should be accepted. Here is a case of a business unit being worth more to someone else than it is to the company.

10. After-tax profit increase associated with not being a public corporation = $800,000 x (1 - .30) = $560,000.

After-tax profit increase associated with improved management = $9 million x .10 = $900,000.

Total after-tax profit increase = $560,000 + $900,000 = $1,460,000.

Present market price per share =
($9 million x 12 PE)/10 million shares = $10.80.

Maximum price that might be paid to take the company private =
[($9,000,000 + $1,460,000) x 12]/10 million shares = $12.55.

Maximum premium = $12.55 - $10.80 = $1.75, or

($1,460,000 x 12)/10 million shares = $1.75.

11. Before-tax profits necessary to service annual principal payments on senior debt (in thousands) = $1,400/(1 - .3333) = $2.100.

Before-tax profits necessary to service principal payment at the end of year 6 on the junior subordinated debt = $2,000/(1 - .3333) = $3,000.

a) 12 percent prime rate.

	Year (in thousands of dollars)					
Debt service before taxes:	1	2	3	4	5	6
Senior debt principal	2,100	2,100	2,100	2,100	2,100	--
Interest (Prime + 2%)	980	784	588	392	196	--
Junior debt principal	--	--	--	--	--	3,000
Interest (15%)	300	300	300	300	300	300
Total	3,380	3,184	2,988	2,792	2,596	3,300
EBIT	3,400	3,400	3,400	3,700	3,700	3,700

The debt can be properly serviced at this level of interest rates. It assumes, however, that the company achieves the EBIT performance forecasted. If this does not occur, there could be a shortfall because the margins of safety in the first several years and the last year are thin.

b) 12 percent prime rate going to 20 percent in year 2.

	Year (in thousands of dollars)					
Debt service before taxes:	1	2	3	4	5	6
Senior debt principal	2,100	2,100	2,100	2,100	2,100	--
Interest (Prime + 2%)	980	1,232	924	616	308	--
Junior debt principal	--	--	--	--	--	3,000
Interest (15%)	300	300	300	300	300	300
Total	3,380	3,632	3,324	3,016	2,708	3,300
EBIT	3,400	3,400	3,400	3,700	3,700	3,700

The enterprise would default in the second year if there were a sharp rise in the prime rate. Moreover, the cushion in the third year would be very thin. The problem illustrates the risks associated with high leverage. With business risk, the situation is even riskier than illustrated.

Solutions to Appendix Problems:

12. Out of the $5 million, the trustee's fee of $200,000 and the back taxes of $300,000 must first be paid, leaving $4.5 million for distribution to creditors. The mortgage bondholders would receive $1 million from the sale of the mortgaged equipment and become general creditors for the balance owed them of $1 million. However, there are sufficient proceeds to pay all mortgage bondholders and general creditors, but this leaves only $750,000 to pay subordinated debt holders. Stockholders would receive nothing. In summary, the distribution is as shown in the following table:

	ORIGINAL CLAIM	DISTRIBUTION
Trustee	$ 200,000	$ 200,000
Property taxes	300,000	300,000
General creditors	1,750,000	1,750,000
Mortgage bonds	2,000,000	2,000,000
Long-term subordinated debt	1,000,000	750,000
Common stock	5,000,000	0
	$10,250,000	$ 5,000,000

13.

EBIT	$ 1,500,000
Divide: Debenture coverage	÷ 5
Debenture interest	$ 300,000
Divide: Debenture coupon	÷ .10
Debentures	$ 3,000,000

EBIT	$ 1,500,000
Divide: Overall income bond coverage	÷ 2
Total interest	$ 750,000
Less: Debenture interest	- 300,000
Income bond interest	450,000
Divide: Income bond coupon	÷ .12
Income bonds	$ 3,750,000

EBIT	$ 1,500,000
Less: Total interest	- 750,000
NIBT	$ 750,000
Less: Taxes (40%)	- 300,000
NI before preferred dividends	$ 450,000
Divide: Preferred coverage	÷ 3
Preferred dividend	150,000
Divide: Preferred return	÷ .10
Preferred stock	$ 1,500,000

Net income before preferred dividends	$ 450,000
Less: Preferred dividends	150,000
Net income to common	$ 300,000
Multiply: Proposed P/E	x 12
Common stock	$ 3,600,000

Capital structure:

Debentures	$ 3,000,000
Income bonds	3,750,000
Preferred stock	1,500,000
Common	3,600,000
	$11,850,000

14.

a) Overall value of company = $800,000 x 5 = $4,000,000. From this amount, court costs of $200,000 must be subtracted to give a total valuation of $3,800,000.

b) The bank loan and first-mortgage bonds are secured, so they simply will be continued as they are. Given bankruptcy rules, accrued wages must be paid as a priority item. Consequently, they will be carried forward in their entirety. Trade creditors (accounts payable) are general creditors. However, these claims come before the subordinated debentures, preferred stock, and common stock. To obtain future trade credit as an ongoing concern, it is important that these creditors be paid on a timely basis and that they not receive a lower-priority security. Therefore, their claims will be carried forward in their entirety.

The maximum amount of capital notes that can be issued is

EBIT	$800,000
Less: Bank loan interest	72,000
Adjusted EBIT	$728,000
Divide by coverage ratio	÷ 4
Interest on long-term debt	$182,000
Less: Interest on 13% first-mortgage bonds	-65,000
Capital note interest	$117,000
Divide by interest rate	÷ .15
Maximum capital notes	$780,000

The maximum amount of preferred stock that can be issued according to the coverage ratio is ...

EBIT	$ 800,000
Less: Bank loan interest	72,000
Less: Capital note interest	117,000
EBT	$ 611,000
Less: Taxes (40%)	- 244,400
EAT	$ 366,600
Divide by coverage ratio	÷ 2
Preferred stock dividend	$ 183,300
Divide by preferred rate	÷ .13
Maximum preferred stock	$1,410,000

If these maximum amounts were employed, we would have the following for the reorganized company (in thousands):

Current liabilities	$1,300
13% first-mortgage bonds	500
Capital notes	780
Preferred stock	1,410
	$3,990

As this amount exceeds the total valuation of $3.8 million, it obviously is not feasible. Something must give, and the most likely candidate is preferred stock, owing to preferred dividends coming after taxes. To provide a 30 percent equity base, .3 x $3.8 million = $1,140,000 in common stock is needed. Using preferred stock as the slack variable, we have

Current liabilities	$1,300,000
13% first-mortgage bonds	500,000
Capital notes	780,000
Preferred stock	80,000
Common stock	1,140,000
	$3,800,000

c) Allocation of these securities in keeping with the rules of absolute priority would result in the following:

	OLD CLAIM	NEW POSITION	
Accounts payable	$ 500,000	$ 500,000	same
Accrued wages	200,000	200,000	same
Bank loan	600,000	600,000	same
13% first-mortgage bonds	500,000	500,000	same
		780,000	Capital notes
15% subordinated debentures	1,700,000	80,000	Preferred stk.
		840,000	Common stk.
Common stock	920,000	300,000	Common stk.
	$4,420,000	$3,800,000	

Only the subordinated debenture holders receive securities different from what they previously held. The common stockholders, as residual owners, receive less common stock ownership than they had before.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a.

	YABLONSKI	YAWITZ
Earnings per share	$2.00	$1.25
Price/earnings ratio	12	8
Market price per share	$24	$10

Offer to Yawitz shareholders in Yablonski stock
(including the premium) = $10 x 1.20 = $12 per share

Exchange ratio = $12/$24 = **.5**, or one-half share of Yablonski stock for every share of Yawitz stock.

Number of new shares issued = 800,000 shares x .5 = **400,000 shares**.

b.

Surviving company earnings (in thousands)	$5,000
Common shares outstanding (in thousands)	2,400
Earnings per share	**$2.0833**

There is an increase in earnings per share by virtue of acquiring a company with a lower price/earnings ratio.

c. Market price per share: $2.0833 x 12 = **$25.00**

Market price per share: $2.0833 x 11 = **$22.92**

In the first instance, share price rises, from $24, due to the increase in earnings per share. In the second case, share price falls owing to the decline in the price/earnings ratio. In efficient markets, we might expect some decline in the price/earnings ratio if there was not likely to be synergy and/or improved management.

2. With an exchange ratio of 1.5, Groove would issue 300,000 new shares of stock with a market value of $28 x 300,000 = **$8.4 million** for the common stock of Tongue. This exceeds the shareholders' equity of Tongue by $1.4 million. With the purchase method, Tongue's fixed assets will be written up by $400,000 and goodwill of Groove by $1 million. The balance sheet after the merger under the purchase method of accounting is (in millions):

	PURCHASE
Current assets	$25.0
Fixed assets (net)	37.4
Goodwill	3.0
Total	$65.4
Current liabilities	$12.0
Long-term debt	17.0
Shareholders' equity	36.4
Total	$65.4

3. a., b.

YEAR	CASH FLOW	INVESTMENT	NET CASH FLOW	**PRESENT VALUE OF** NET CASH FLOW (18%)
1	$2,300,000	$1,000,000	$1,300,000	$1,101,100
2	2,645,000	"	1,645,000	1,181,110
3	3,041,750	"	2,041,750	1,243,426
4	3,498,013	"	2,498,013	1,288,975
5	4,022,714	"	3,022,714	1,320,926
6	4,626,122	"	3,626,122	1,341,665
7	5,320,040	"	4,320,040	1,356,493
8	6,118,046	"	5,118,046	1,361,400
9	7,035,753	"	6,035,753	1,358,044
10-25	8,091,116	"	7,091,116	8,254,059*
			Total present value =	$19,807,198

*Total for years 10-25

The maximum price that is justified is approximately **$19.81 million**. It should be noted that these calculations use present value tables. To arrive at the discount rate for cash flows going from years 10-25, we subtract the discount factor for 9 years of annuity payments, 4.303, from that for 25 years, 5.467. The difference, 5.467 - 4.303 = 1.164, is the discount factor for cash flows for an annuity starting in year 10 and going through year 25. If a present value function of a calculator is used, a slightly different total may be given due to our having rounded to three decimal points.

4. a.

	50,001 shares x $65	=	$3,250,065
	49,999 shares x $50	=	2,499,950
	Total purchase price	=	**$5,750,015**
Total value of stock before =	100,000 shares x $50	=	5,500,000
	Increment to Passive shareholders	=	**$ 250,015**

The total value of the economies to be realized is $1,500,000. Therefore, Passive shareholders receive only a modest portion of the total value of the economies. In contrast, Aggressive shareholders obtain a large share.

b. With a two-tier offer, there is a great incentive for individual shareholders to tender early, thereby ensuring success for the acquiring firm. Collectively, Passive shareholders would be better off holding out for a larger fraction of the total value of the economies. They can do this only if they act as a cartel in their response to the offer.

c. By instigating antitakeover amendments and devices, some incentives may be created for individual shareholders to hold out for a higher offer. However, in practice it is impossible to achieve a complete cartel response.

d.

50,001 shares x $65	=	$3,250,065
49,999 shares x $40	=	1,999,960
Total purchase price	=	$5,250,025

This value is lower than the previous total market value of $5,500,000. Clearly, shareholders would fare poorly if in the rush to tender shares the offer were successful. However, other potential acquirers would have an incentive to offer more than Aggressive, even with no economies to be realized. Competition among potential acquirers should ensure counterbids, so that Aggressive would be forced to bid no less than $5,500,000 in total, the present market value.

5. a. Shares owned by outsiders = 5 million x .79 = 3,950,000

Price to be offered = $20 x 1.40 = $28 per share

Total buyout amount = 3,950,000 shares x $28 = $110,600,000.

Senior debt = $110,600,000 x .80 = $88,480,000

Annual principal payment = $88,480,000/5 = $17,696,000.

Junior debt = $110,600,000 x .20 = $22,120,000

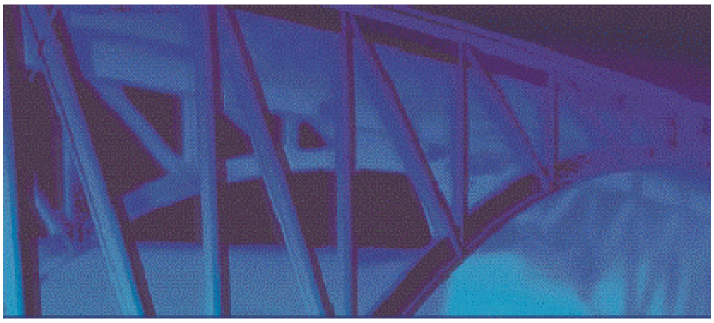
Annual EBIT to service debt:

Senior debt interest: $88,480,000 x .12 =	$10,617,600
Senior debt principal:	17,696,000
Junior debt interest: $22,120,000 x .13 =	2,875,600
Total EBIT necessary:	$31,189,200

During the first five years, EBIT of $25 million will not be sufficient to service the debt.

b. $88,480,000 x .10 = $8,848,000, which with the two other amounts above, comes to $29,419,600. **Expected EBIT will still not be sufficient to service the debt.**

c. **$31,189,200** is the minimal EBIT necessary to service the debt.



24
International Financial Management

Where profit is, loss is hidden nearby.

JAPANESE PROVERB

ANSWERS TO QUESTIONS

1. A number of environmental factors make the international investment different from a domestic investment, not in principle, but in fact. Such things as taxes, accounting treatment, political risks, foreign-exchange risk, restrictions imposed by a foreign government on capital and on labor relations, legal documentation, and financing instruments are different. Because of these factors, partial segmentation in the product and financial markets may exist. As a result, it is possible to achieve better diversification internationally than it is domestically and sometimes higher returns.

2. A joint venture gives the company a partner in the foreign country. The relationship is usually beneficial in reducing political risk. Also, the foreign nationals better understand the markets, the traditions, the sources of supply, the legal system, and many other things. This understanding and ability to work in the foreign environment should enhance the profitability of the foreign operation.

3. The wisdom of particular restrictions placed on multinationals by the various countries depends upon whether you value corporate or national sovereignty and the impact of such restrictions upon the economy of the country. In a given situation, such a restriction

could defer needed investment. On the other hand, a country may be in such a bargaining position that a firm would accept such control to enter the venture.

4. It depends on the relative tax rates. If the foreign branch is taxed at a rate equal to or lower than the U.S. parent, the parent receives a tax credit for all of the foreign income taxes paid. However, if the foreign branch pays taxes at a higher rate, the U.S. parent receives a tax credit equal to the earnings times the effective tax rate. In the former case, the overall tax effect is neutral. In the latter case, it is detrimental.

5. The three types of risk exposure to changes in exchange rates between two countries are: 1) translation exposure; 2) transactions exposure; and 3) economic exposure. The first is the change in accounting statements caused by a change in exchange rates. The second has to do with a specific transaction, such as the billing of a receivable, where one exchange rate prevailed at the time of billing and another when it is paid. The third, economic exposure, concerns the value of the company, via expected future cash flows, when there is an unanticipated change in exchange rates.

6. The "functional currency" determines the translation process. With a local currency, all assets and liabilities are translated at the current rate of exchange. Such translation gains or losses do not appear in the income statement, only in the owners' equity account. With the dollar as the functional currency, gains or losses are reflected in the income statement using the temporal method. With this method, cash, receivables, liabilities, sales, expenses, and taxes are translated using current exchange rates. Inventories, plant and equipment, equity, cost of goods sold, and depreciation are translated using historical exchange rates. The use of the dollar tends to result in greater fluctuations in accounting earnings, but smaller fluctuations in balance sheet items than when the local currency is used as the functional currency.

7. Natural hedges exist when profit margins, in dollars, tend to be maintained regardless of exchange-rate movements. The key is the relationship between revenues (prices) and costs when there are exchange-rate fluctuations. When both pricing and costs are either globally determined or domestically determined, the foreign operation tends to be naturally hedged. When one is globally determined and the other domestically determined, there is exchange-risk exposure.

   It is important to determine whether a natural hedge exists before engaging in other types of hedges. If an operation has little exposure because of a natural hedge, the use of a financing or currency hedge will increase the exchange-rate risk exposure of the company. Therefore, one should determine the degree of net risk exposure after taking account of any natural hedges that might exist. The residual risk can then be hedged by other means, if that is desired.

8. With a forward discount, the foreign currency's forward price is less than its spot price. If the forward price exceeds the spot price, there is a forward premium. The Canadian dollar tends to sell at a forward discount, while the Swiss franc tends to sell at a forward premium. A company can protect itself against exchange-rate fluctuations by use of the forward market. It can lock in a fixed price in the future for exchanging one currency for another. Such a hedging operation usually involves a cost.

9. A forward contract is a "two-sided" hedge, used to offset movements in the spot market for a foreign currency. The contract involves the exchange of one currency for another at a specific future time and at a specific future price. A futures contract serves the same economic purpose, but involves a clearinghouse and each day both sides of the transaction are marked-to-market. The loser, whether it be the buyer or the seller of the contract, must come up with more money and the winner can take money away. This daily settlement differs from forward contracts where contracts are

settled only at expiration or when they are reversed. Other less important differences also exist.

A currency option is a "one-sided" hedge, where one protects against adverse currency movements. The holder has the right, but not the obligation, to buy (call) or sell (put) a specific amount of a foreign currency at some specified price until a certain (expiration) date. For this right, one pays a premium. In a currency swap, two parties exchange the obligation to pay each other's interest on debt denominated in different currencies. Only cash-flow differences are paid. Currency swaps are a longer-term hedging device.

10. In theory, purchasing-power parity should hold. This theory simply says that product markets should equilibrate internationally so that standardized goods sell at the same price in all markets, after allowing for transportation costs. However, such frictions as trade barriers, government intervention in exchange markets, legal and political red tape, and other imperfections often result in arbitrage not working to perfection. As a result, purchasing-power parity usually does not hold in the short run, but is the direction in which product prices and exchange rates should adjust in the long run.

11. The interest-rate parity theorem implies an equality between the forward and spot rate ratio and the ratio of interest rates for two countries. It is depicted by Equation (24-1) in the chapter. If there are no currency-exchange restrictions or other imperfections of this sort, interest-rate parity will approximately hold. Arbitrage works to drive exchange rates and interest rates toward this parity.

12. A degree of self insurance is usually worthwhile. The larger the company, usually the greater the degree of self insurance. Because of imperfections and incompleteness in international product and financial markets, most companies manage their currency-risk exposure to some extent. The costs of bankruptcy may be too high to self insure altogether. However, some firms over insure when it would be in the interest of shareholders to self insure to reduce costs.

13. A Eurodollar is a U.S. dollar on deposit in a bank outside the U.S., generally in Europe. The Eurodollar market serves as a means of short-term financing for multinationals. The market is truly international in that it is free from government controls. The attractiveness of this market stems from the freedom, flexibility, and lack of compensating-balance requirements.

14. The bill of lading serves as a receipt from the transporter to the exporter that certain goods have been received. Furthermore, it is a contract between them to ship and deliver the goods to a destination. The bill also gives the holder title to the goods.

15. In an import letter of credit, the importer is the borrower. Technically, the exporter is the lender but the risk has been underwritten by the importer's bank.

16. The creditworthiness of the bankers' acceptance is as good as that of the bank that accepts it. The holder of the instrument will look to the bank for payment. If not accepted by a bank, the creditworthiness of the international-trade draft is based on that of the drawee -- the party to whom the draft is addressed. The face value of the instrument is determined by the amount of the trade transaction.

17. Differences in credit information, communications, slower transportation, and complications in legal enforcement of a claim make the financing of foreign trade riskier than that of domestic trade. For these reasons, most exporters and importers use a letter of credit arrangement, where banks underwrite the risk.

SOLUTIONS TO PROBLEMS

1. a) $100 x .62 = 62 Britland ounces

   b) 50/1.90 = $26.32

   c) $40 x 6.40 = 256 Dweedish corona

   d) 200/1.50 = $133.33

   e) $10 x 1,300 = 13,000 Spamany lisos

   f) 1,000/140 = $7.14

2. a) (100,000 - 2,000) x $.55 = $53,900

   b) 100,000 x $.56 = $56,000

   c) Time value of money component:
   (100,000 - 98,000) x $.56 = $1,120

   Protection from devaluation component:
   (100,000 - 2,000) x ($.56 - $.55) = $980

3. a)

End of year(s)	0	1-3	4-6	7-9	10-19
Expected cash flow (in millions of guildnotes (G))	-26.0	3.0	4.0	5.0	6.0
Exchange rate (G/$)	1.90	1.90	1.90	1.90	1.90
Expected cash flow (in millions of dollars ($)) [line 1/line 2]	-13.68	1.58	2.11	2.63	3.16

NPV at 16% of dollar cash flows shown above = -$0.66 million.

Therefore, the project is not acceptable.

b)

End of year(s)	0	1-3	4-6	7-9	10-19
Expected cash flow (in millions of guildnotes (G))	-26.0	3.0	4.0	5.0	6.0
Exchange rate (G/$)	1.90	1.84	1.78	1.72	1.65
Expected cash flow (in millions of dollars ($)) [line 1/line 2]	-13.68	1.63	2.25	2.91	3.64

NPV at 16% of dollar cash flows shown above = $0.51 million. With the guildnote appreciating relative to the U.S. dollar, dollar cash flows are greater. The project is now acceptable, but not by a wide margin.

4. The Trance franc (TFr) strengthening by 5 percent means an exchange rate of 5.70 x .95 = 5.415 Trance francs to the dollar.

Before:	$124,000 x 5.70 =	TFr706,800
After:	124,000 x 5.415 =	671,460
Transaction loss		-TFr 35,340

The Trance franc weakening by 5 percent means an exchange rate of 5.70 x 1.05 = 5.985 Trance francs to the dollar.

Before:	$124,000 x 5.70 =	TFr706,800
After:	124,000 x 5.985 =	742,140
Transaction gain		+TFr 35,340

5. The U.S. dollar cost to purchase one bushel of Canadian Wheat = Can. \$4.56 x (1/1.2) = \$3.80. The Canadian wheat is cheaper for the U.S. buyer. Therefore, purchasing-power parity does not exist. To achieve purchasing-power parity, the price of Canadian wheat must rise relative to U.S. wheat and/or the Canadian dollar must strengthen relative to the U.S. dollar.

6. a) $F_{yen}/S_{yen} = (1 + r_{yen})/(1 + r_{\$})$

$F_{yen}/140 = (1 + (.04/4))/(1 + (.08/4)) = 1.01/1.02$

$(1.02)F_{yen} = (1.01)(140) = 141.4$

$F_{yen} = 141.4/1.02 = 138.63$

b) $F_{yen}/140 = (1 + (.04/4))/(1 + (.06/4)) = 1.01/1.015$

$(1.015)F_{yen} = (1.01)(140) = 141.4$

$F_{yen} = 141.4/1.015 = 139.31$

The implied forward exchange rate is higher.

7. Foreign Taxes:

Algerian Taxes	\$200,000 x 0.52 =	\$104,000
Swiss Taxes	\$200,000 x 0.35 =	70,000
		\$174,000

The company would be able to obtain a tax credit for the full \$70,000 paid in Swiss taxes. However, it would be able to obtain a tax credit of only .38 x \$200,000 = \$76,000 for the Algerian taxes paid because the Algerian rate exceeds the U.S. rate. Total tax credits = \$70,000 + \$76,000 = \$146,000.

U.S. Taxes:

\$400,000 x 0.38	=	\$152,000
Less tax credits	=	146,000
Total U.S. tax paid	=	\$ 6,000

Total taxes paid: \$174,000 + \$6,000 = \$180,000

This compares with \$152,000 if the company were to pay only U.S. taxes on \$400,000 in total earnings.

8. a) Principal and interest payment due in yen (¥) with annual compounding at 10 percent interest:
(¥70 million) x $(1.10)^4$ = ¥102,487,000.

Value of yen at the end of four years is 120 yen to the dollar. Dollar equivalent of payment:
¥102,487,000/120 = \$854,058.

b) Principal and interest payment due in dollars with annual compounding at 13 percent interest:
\$500,000 x $(1.13)^4$ = \$815,237.

c) Tsunami will be better off, as it makes a dollar equivalent loan of \$500,000 and receives the dollar equivalent of \$854,058, whereas McDonnoughs receives only \$815,237.

9. The approximate expected internal rate of return for the investment in the copper mining venture is:

IRR		Probability		
-100%	x	0.10	=	-10.0%
- 40%	x	0.15	=	- 6.0
0%	x	0.15	=	0
34%	x	0.60	=	20.4
		1.00	=	4.4% = Expected return

As the 4.4 percent return is less than the going rate on a risk-free investment such as Treasury Bills, the project should be rejected if one believes that the estimates of the probabilities and returns are accurate.

It is important to point out that for multi-period investments, the expected value of individual internal rates of return possibilities usually differs from the true internal rate of return on the cash flows. However, the former is a close approximation of the true internal rate of return; and the principles illustrated in the problem are not affected by this distinction.

SOLUTIONS TO SELF-CORRECTION PROBLEMS

1. a. $1,000/.100 = **10,000 lisos**

   b. 30 x $1.500 = **$45**

   c. $900/.015 = **60,000 pesos**

   d. 100 x $.13 = **$13**

   e. $50/.005 = **10,000 ben**

2.

	IN DOLLARS 12/31/X2	
	Guildnote Functional Currency	Dollar Functional Currency
	Balance Sheet	
Cash	$ 160	$ 160
Receivables	880	880
Inventories	800	741
Net fixed assets	720	600
Total	$2,560	$2,381
Current liabilities	$ 760	$ 760
Common stock	200	200
Retained earnings ($1,033 at 12/31/x1)	1,198	1,421
Cumulative translation adjustment	402	
Total	$2,560	$2,381
	Income Statement	
Sales	$3,782	$3,782
Cost of goods sold	2,308	2,222
Depreciation	109	100
Expenses	873	873
Taxes	327	327
Operating income	$ 165	$ 260
Translation gain		128
Net income	165	$ 388
Translation adjustment	$ 402	

When the guildnote is used as the functional currency, all balance sheet items except common stock and retained earnings are translated at the current exchange rate, 2.50. All income statement items are translated at the average exchange rate for the year, 2.75, except cost of goods sold, which is translated at 2.60. Net income is a residual, after deducting costs and expenses from sales. Retained earnings are net income, $165, plus retained earnings at the beginning of the year, $1,033, and total $1,198. The translation adjustment is that amount necessary to bring about an equality in the two totals on the balance sheet. It is $402. For the dollar as the functional currency, inventories and cost of goods sold are translated at the historical exchange rate of 2.70 and fixed assets and depreciation at the historical exchange rate of 3.00. Other items are translated in the same manner as with the other method. Retained earnings are a balancing factor to bring equality between the balance sheet totals. Operating income is a residual. The translation gain is that amount necessary to make net income equal to the change in retained earnings ($1,421 - $1,033 = $388) and therefore is $388 - $260 = $128. Depending on the accounting method, income is more variable with the dollar as the functional currency, whereas balance sheet totals are more variable with the guildnote as the functional currency.

3. a. It would hedge by selling marks forward 90 days. Upon delivery of 50,000 marks in 90 days, it would receive M50,000/1.70 = $29,412. If it were to receive payment today, Zike would get M50,000/1.71 = $29,240.

b. The mark is at a **forward premium** because the 90-day forward rate of marks per dollar is less than the current spot rate. The mark is expected to strengthen (fewer marks to buy a dollar).

c. [(1.70 - 1.71)/1.71] x [365 days/90 days] = $r_M - r_\$$ = **-.0237**

The differential in interest rates is -2.37 percent, which means if interest-rate parity holds interest rates in the United States should be 2.37 percent higher than in Freedonia.