

# **Capital Investment and Financial Decisions**

---

**Third Edition**

**HAIM LEVY & MARSHALL SARNAT**

29.71  
L.668=3  
cop. 1

# **Capital Investment and Financial Decisions**

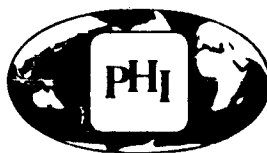
---

**Third Edition**

**HAIM LEVY & MARSHALL SARNAT**

Hebrew University of Jerusalem

**Prentice/Hall**



**International**

Englewood Cliffs, N.J.   London   Mexico   New Delhi   Rio de Janeiro  
Singapore   Sydney   Tokyo   Toronto   Wellington

*Library of Congress Cataloging-in-Publication Data*

Levy, Haim.

Capital investment and financial decisions.

Bibliography: p.

Includes indexes.

1. Capital investments. 2. Business enterprises—

Finance. I. Sarnat, Marshall. II. Title.

HG4028.C4L48 1986 658.1'5 85-16773

ISBN 0-13-114372-7

*British Library Cataloguing in Publication Data*

Levy, Haim

Capital investment and financial decisions.—

3rd ed.

1. Capital investment—Decision making

I. Title II. Sarnat, Marshall

658.1'52 HG4028.C4

ISBN 0-13-114372-7

ISBN 0-13-114364-6 PBK

© 1986 by PRENTICE-HALL INTERNATIONAL, UK., LTD

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior permission of Prentice-Hall International, UK., Ltd. For permission within the United States contact Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632.

PRENTICE-HALL, INC., *Englewood Cliffs, New Jersey*  
PRENTICE-HALL INTERNATIONAL, UK., LTD., *London*  
PRENTICE-HALL OF AUSTRALIA PTY., LTD., *Sydney*  
PRENTICE-HALL CANADA, INC., *Toronto*  
PRENTICE-HALL OF INDIA PRIVATE LIMITED, *New Delhi*  
PRENTICE-HALL OF JAPAN, INC., *Tokyo*  
PRENTICE-HALL OF SOUTHEAST ASIA PTE., LTD., *Singapore*  
EDITORA PRENTICE-HALL DO BRASIL LTDA., *Rio de Janeiro*  
PRENTICE-HALL HISPANOAMERICANA, S.A., *Mexico*  
WHITEHALL BOOKS LIMITED, *Wellington, New Zealand*

Printed in the United States of America

1098765432

## Preface

**"Some questions can be decided even if not answered"**

MR JUSTICE BRANDEIS

This book is about financial policy with special emphasis on the allocation of a firm's long-term capital resources. Investment and financing decisions, which for better or for worse, fix the future course of the firm, have a great deal in common: they refer to a highly uncertain future, they must be made on the basis of incomplete information, and only a few of the relevant variables are controllable. But perhaps the salient characteristic of such decisions is that they cannot be avoided, "No decision" is itself a "decision".

Under these circumstances, Mr. Justice Brandeis' famous dictum regarding cases before the Court, provides an appropriate motto for the financial manager, whose objective is not to answer the unanswerable, but rather to spell out an operational framework for reaching the *best attainable* financial decisions. The book is a product of our underlying conviction that the theory of finance can provide such guidelines for practical financial management. To paraphrase John Maynard Keynes (the leading economic theorist of his generation, and a highly successful investor as well), the theory of finance ... "is a method rather than a doctrine ... a technique of thinking which helps its possessor to draw correct conclusions". Accordingly, we have emphasized the practical application of financial theory in uncertain environments.

The third edition of the book reflects the changes which have taken place in recent years in the economy as well as in the theory of finance. The main changes in the third edition can be summarized as follows:

- (1) The double digit inflation rate vanished in the early eighties from the

Western world. Hence, the crucial role of inflation on decision making has lessened. Therefore, we have decided to decrease the space devoted to this topic, and Chapter 22 of the second edition, which was fully devoted to inflation and stock prices has been altogether eliminated. Yet, note that even a moderate 5 percent inflation a year may have a significant effect on projects net present value since it has a compounded effect. Hence, the analysis of the impact of inflation on capital budgeting has been kept in the third edition.

- (2) Income tax laws have been changed. In particular, the 1981 Tax Act changed the allowed depreciation system. The third edition reflects these changes in the tax laws. However, the discussion of the old accelerated depreciation methods has not been omitted, since a return to the pre-1981 Tax Act is not ruled out. Also, a comparative analysis of the 1981 Act vis-a-vis the previous system is provided.
- (3) Options are more widely used in business. Since many financial assets (stocks, bonds and some of the daily business activities (e.g. insurance) can be considered as options, we devote Chapter 22 to this topic.
- (4) Most finance text books which deal with the optimal capital structure ignore personal taxes. Ignoring personal taxes is unacceptable after Miller's 1977 presidential address. Hence Chapter 14 has been significantly expanded to incorporate personal taxes.
- (5) A summary table added to each chapter summarizes in a condensed way the main issues and key formulas discussed in the chapter.
- (6) Finally many problems have been added to the third edition. Some of the added problems are of practical orientation taken directly from the financial media, e.g., Wall Street Journal. In particular, we added a case dealing with the estimation of cost of capital of Contel Corporation. A lot can be learned from this case since the analysis is based on a non-hypothetical firm, hence many issues (e.g., the cost of deferred taxes, accounts payable, etc.), normally not dealt with in the textbooks, emerge in this case.

As was true for the first and second editions the emphasis throughout the book is on the practical application of the modern theory of finance to realistic corporate decisions. To facilitate this goal numerous problems and mini-cases have been appended at the end of each chapter. Although instructors and students differ widely in their tastes, probably everyone will want to spend some time discussing the end-of-chapter questions and problems. We have tested the problems in our own classes, but room for improvement surely remains; and we would appreciate hearing of your experience with the problems and the suggested solutions which appear in the Teachers' Manual.

The book is suitable as a core text for courses in Corporate Financial Theory and Policy. The approach reflects our belief that the "technique of thinking" called financial management can be learnt best by considering the long-term problems of capital investment, financial structure, cost of capital and dividend policy. However, in recognition of the large variance in teaching

methods and programs, the book has been designed to provide a highly flexible teaching instrument. It can be used for courses in capital budgeting, engineering economy and applied micro-economics, as well as for financial management.

Finally, a word to the student who has carelessly wandered into this preface: a finance course can be a challenging experience, as well as a lot of fun, just as writing this book has been for us. Unnecessary complexities and mathematical formulations have been ruthlessly weeded out. If you have an eye for a graph and don't have an aversion for numerical examples, you are well prepared to understand the text and perhaps, to improve it as well.

There remains the pleasant task of acknowledging the generous help of colleagues and friends. Our appreciation goes to Michael Adler, Fred Arditti, Moshe Ben-Horim, S. Benninga, Sasson Bar-Yosef, M. Brenner, Mary Broske, David Cohen, Wanda Denny, R. Dunbar, S. Ekern, D. Galai, David Goldenberg, M. Gordon, P. Geleff, G. Grundy, G.S. Hatjoulis, R. Holtgrieve, Yoram Kroll, R. Mesznik, B. Rapp, R. Rundfelt, W. Sharpe, Lata Shanker, R. Stapleton, R. Westerfield, and R. Wubbels for critical comments and suggestions on various chapters. We also wish to thank Moshe Smith, Zvi Lerman, George Szpiro, Rogelio Saenz, Jim Craig, Mates Beja, Marcia Don, Ronnie Zukerman, and Robert Brooks who provided research assistance, suggested questions and problems and prepared the solutions for the Teachers' Manual. Once again, we wish to thank Finn Jensen, Ronald Decent and Henry Hirschberg of Prentice-Hall, who by now have become experts in financial management, or at least in handling the authors of textbooks on that august subject with good humor and great skill. Finally, we would like to thank Ester Tuval, Kerry Deyoung and Jerry Graves for the excellent typing job.

H.L.  
M.S.

# Table of Contents

Preface, xi

---

## Part I – Capital Budgeting, 1

### Introduction, 2

#### 1 – The Goal of the Firm, 3

Alternative Goals for the Firm, 3. Maximizing Profits, 4. Survival, 6. Satisfactory Profits, 7. Some Empirical Evidence, 7. Wealth Maximization, 9. Summary, 11. Summary Table, 11. Questions and Problems, 12. Selected References, 14.

#### 2 – Capital Budgeting: An Overview, 16

Defining Capital Expenditures, 16. Breakdown of Plant and Equipment Expenditures, 18. The Capital Budgeting Process, 19. The Administrative Framework, 24. Summary, 25. Summary Table, 26. Questions and Problems, 27. Selected References, 28.

#### 3 – The Economic Evaluation of Investment Proposals, 29

The Time Value of Money, 29. Net Present Value (NPV), 33. The Internal Rate of Return, 38. An Economic Rationale for the IRR Rule, 41. Measuring the Return on Money Under Inflationary Conditions, 42. Summary 45. Summary Table, 45. Questions and Problems, 47. *Appendix 3A* – Continuous Compounding and Discounting, 51. Questions and Problems 54, Selected References, 55.

#### 4 – Net Present Value Versus Internal Rate of Return, 57

NPV vs IRR: Independent Projects, 57. NPV vs IRR: Dependent Projects, 59. Differences in the Scale of Investment, 61. The Timing of the Cash Flow, 66. Reinvestment Rates, 68. The Horizon Problem, 70. A Theoretical Justification for Net Present Value, 72. Nonconventional Cash Flows, 85. Summary, 90. Summary Table, 91. Questions and Problems, 92. *Appendix 4A* – Calculating the Optimal Investment-Consumption Combination in a Two-period Model, 103. Selected References, 104.

**5 – Using Cash Flows to Evaluate Investments, 107**

Incremental Cash Flows, 108. Equipment Replacement Decisions, 113.  
 Projects with Unequal Lives: The Uniform Annuity Series (UAS), 115.  
 Summary, 117. Summary Table, 117. Questions and Problems, 118. Selected  
 References, 122.

**6 – Impact of Corporate Income Taxes on Projects' Cash Flows, 123**

Formal Treatment of Taxes, 124. The Make or Buy Decision, 126. Taxes  
 and the Optimal Method of Depreciation: The Pre-1981 Period, 132.  
 Choosing the Optimal Depreciation Method by US Firms, 135. Taxes and  
 Depreciation – Post 1981: The Accelerated Cost Recovery System (ACRS),  
 138. The Canadian Depreciation Method, 140. Investment Tax Credit, 142.  
 Inflation and the Depreciation Tax Shelter, 145. Summary, 152. Summary  
 Table, 153. Questions and Problems, 154. *Appendix 6A* – Rule of Thumb  
 Calculations of Post-tax Returns, 162. Questions and Problems, 163.  
 Selected References, 164.

**7 – Capital Budgeting and Inflation, 166**

Accounting vs Economic Earnings, 167. Impact of Inflation on Reported  
 Earnings, 169. Project Evaluation Under Inflation, 177. Inflation, Taxes and  
 the Ranking of Projects, 182. Summary, 187. Summary Table, 187.  
 Questions and Problems, 188. Selected References, 195.

**8 – Traditional Measures of Investment Worth, 197**

Rules of Thumb for Project Evaluation, 197. The Historical Record, 199.  
 The Relationship Between Traditional and Modern Investment Analysis,  
 202. Reconciling Theory with Practice, 206. Summary, 209. Summary Table,  
 209. Questions and Problems, 210. *Appendix 8A* – The Post-tax  
 Relationships Between Rules of Thumb and the Internal Rate of Return,  
 213. Questions and Problems, 215. Selected References, 215.

**Part 1 – Suggestions for Further Reading, 217****Part II – Risk and Uncertainty, 219****Introduction, 220****9 – Foundations of Risk Analysis, 221**

The Essence of Risk, 221. Alternative Investment Criteria, 224. Risk and  
 Utility, 227. Alternative Attitudes Toward Risk, 229. Summary, 233.  
 Summary Table, 233. Questions and Problems, 234. Selected References,  
 239.



**10 – Measuring Risk, 241**

Measuring Risk by the Variability of Returns, 241. Covariance and the Correlation Coefficient, 244. The Mean-Variance Rule, 246. The Variance of NPV as a Measure of Risk, 247. Measuring Risk by the Coefficient of Variation, 255. Sensitivity Analysis, 258. Summary, 261. Summary Table, 262. Questions and Problems, 263. *Appendix 10A – Cumulative Distributions and Risk*, 266. Questions and Problems, 274. Selected References, 275.

**11 – Applications of Risk Analysis, 278**

Applying Risk Analysis: The Empirical Evidence, 278. Indirect Adjustment for Risk, 280. Applying Probability Measures in Practice, 285. Decision Tree, 288. Summary, 295. Summary Table, 296. Questions and Problems, 296. Selected References, 302.

**12 – Decreasing Risk by Diversification: The Portfolio Approach, 305**

Measuring the Return on Financial Investments, 305. Improving the Risk Return Relationship by Diversification, 307. The Concept of an Efficient Portfolio, 309. The Gains from Diversification, 311. The Number of Securities and the Gains from Diversification, 313. The Efficiency Frontier with Borrowing and Lending, 315. Summary, 317. Summary Table, 317. Questions and Problems, 318. Selected References, 323.

**13 – The Capital Asset Pricing Model, 326**

The Model, 326. The Capital Market Line, 328. The Optimal Investment Proportions, 329. The Security Market Line (SML), 331. Systematic and Nonsystematic Risk, 333. Calculating Beta in Practice, 336. The Characteristic Line, 338. Capital Asset Pricing Model and Capital Budgeting, 340. Application to Capital Budgeting: Imperfect Markets, 341. The Capital Asset Pricing Model: The Empirical Evidence, 343. Summary, 346. Summary Table, 347. Questions and Problems, 348. *Appendix 13A – The Derivation of the Capital Asset Pricing Model*, 354. Questions and Problems, 358. Selected References, 358.

**Part II – Suggestions for Further Reading, 363**

---

**Part III – Long-term Financial Decisions, 365****Introduction, 366****14 – Financial Leverage, 367**

Financial Leverage and Earnings, 367. Financial Leverage and Risk, 368. Business Risk vs Financial Risk, 370. Graphical Simulation, 371. Factors

Determining the Choice of Financial Structure, 373. Operating Leverage vs Financial Leverage, 380. The Actual Management Considerations, 383. Summary, 384. Summary Table, 385. Questions and Problems, 386. *Appendix 14A* – Break-even Charts and Financial Analysis, 389. Questions and Problems, 392. Selected References, 393.

## **15 – Capital Structure and Valuation, 396**

Leverage and Valuation, 397. The Modigliani and Miller Analysis, 400. The Impact of Corporate Taxes, 408. CAPM and Capital Structure, 412. The Impact of Personal Taxes, 417. Summary, 424. Summary Table, 425. Questions and Problems, 427. *Appendix 15A* – Alternative Formulations of the Goal of the Firm, 432. *Appendix 15B* – A Formal Proof of the Modigliani and Miller Propositions, 434. Proposition I: No Taxes, 434. Proposition I: With Corporate Taxes, 437. Proposition II, 438. Selected References, 439.

## **16 – Bankruptcy Risk and the Choice of Financial Structure, 443.**

The Problem of Extreme Corner Solutions, 444. Risk of Bankruptcy, 445. The Nature of Financial Failure, 446. Chapter 11 of the Bankruptcy Code, 446. Bankruptcy Risk and Optimal Capital Structure, 447. Liquidation Costs, 456. Summary, 458. Summary Table, 458. Questions and Problems, 459. Selected References, 461.

## **17 – Defining the Cost of Capital, 464**

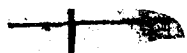
Firm's Cost of Capital vs Individual Project's Cost of Capital, 464. The Weighted Average Cost of Capital, 468. Financing a New Project in Practice, 476. Leverage and the Specific Costs of Financing, 478. Cost of Equity, 480. Changes in Long-Term Financial Policy, 484. Market Value vs Book Value, 485. Summary, 487. Summary Table, 487. Questions and Problems, 488. *Appendix 17A* – The Weighted Average Cost of Capital, 492. Selected References, 493.

## **18 – Measuring the Cost of Capital, 496**

Cost of Individual Components, 496. Specific Cost of Debt, 497. Specific Cost of Preferred Stock, 500. Cost of Equity, 503. Price Earning Ratio (P/E) and Super Growth Companies, 508. Super Growth for a Limited Period, 510. Adjusting Earnings per Share (EPS), 513. Specific Cost of Retained Earnings, 519. Calculating the Cost of Capital in Practice, 519. Security Analyst's Growth Forecasts, 523. Measuring the Cost of Capital Using the Capital Asset Pricing Model (CAPM), 524. Summary, 530. Summary Table, 531. Questions and Problems, 532. *Appendix 18A* – Estimating the Growth Rate from Historical Data, 554. Problem, 555. Selected References, 556.

## **19 – Dividend Policy, 558**

Dividends and Valuation: No External Financing, 559. Dividends and



Valuation: With External Financing, 562. Internal and External Financing: A Reconciliation, 565. Factors Affecting Dividend Decisions, 566. Taxes and Dividends, 568. Uncertainty and Dividend Policy, 572. Dividend Policy in Practice, 577. Dividends and Valuation: The Empirical Evidence, 580. The Con Edison Experience, 582. Integrating Dividend Policy and Capital Structure, 583. Summary, 584. Summary Table, 585. Questions and Problems, 586. *Appendix 19A* – Derivation of Investors Opportunity Set, 592. Selected References, 593.

## **20 – Capital Investment Decisions Under Capital Rationing, 597**

The Nature of Capital Rationing, 597. Analyzing Capital Rationing Problems: A First Approximation, 598. A Primer on Linear Programming, 599. The LP Formulation of the Capital Rationing Problem, 604. A Rule of Thumb Approximation, 606. Summary, 610. Summary Table, 611. Questions and Problems, 611. Selected References, 613.

## **21 – The Lease or Buy Decision, 615**

Importance of Leasing, 615. Possible Advantages of Leasing, 618. Defining the Cash Flow, 619. Comparing Alternatives, 621. Sale and Lease Back in an Inflationary Economy, 624. Summary, 626. Summary Table, 627. Questions and Problems, 627. *Appendix 21A* – Proof of the Equivalence of the Post-tax and Pre-tax Lease or Buy Analysis, 629. Selected References, 631.

## **22 – Options: Return Profiles and Valuation, 634**

Types of Options, 634. Option Trading, 640. Profit Profiles of Calls and Puts, 641. Leverage and Options, 644. Bounds on Option Value, 645. European vs American Calls: Early Exercise Does Not Pay, 648. Financial Assets as Options, 650. The Black and Scholes Option Valuation Formula, 654. Summary, 660. Summary Table, 661. Questions and Problems, 662. Selected References, 667.

## **Part III – Suggestions for Further Reading, 670**

---

**Appendix – Tables A–E, 673**

**Index of Names, 693**

**Index of Subjects, 699**

# **Part I**

## ***Capital Budgeting***

## ***Introduction***

Part I is devoted to the basic elements of the firm's capital budgeting process: project evaluation, the importance of the time element, and the principles underlying the composition of the cash flow. Alternative goals of the firm are discussed in Chapter 1 which also presents the arguments on behalf of our choice of wealth maximization. Chapter 2 gives an overview of the investment decision-making process; while Chapter 3 focuses attention on the crucial role played by the timing of future cash flows. Chapter 4 sets out the theoretical arguments on behalf of the Net Present Value method of appraising alternative investment proposals. Chapter 5 is devoted to a discussion of the principles underlying the firm's estimate of the relevant pre-tax cash flows of an investment project; the impact of corporate taxes and inflation on these flows is discussed in Chapter 6. Chapter 7 recasts traditional capital budgeting techniques in order to take inflation into account. Chapter 8 concludes this section of the book with a critical appraisal of the relationship of the popular rules of thumb which are often used to evaluate capital expenditures with the time-discounted measures of investment worth which were presented in the earlier chapters of this section.

## **The Goal of the Firm**

A business firm is confronted daily by many decisions — some important and others less so; some with long-run implications and some which are more amenable than others to quantification. This book is devoted to a particular group of business decisions: those which determine a firm's capital expenditures and their financing. This class of decision problems has much to recommend it. Perhaps more than any single factor, the investment strategy adopted by the firm determines its future growth and profitability. Strategic capital investment decisions, such as the decision to "go international", diversify into new product lines or pursue an important innovation, can materially change the character of even the largest of firms in a single decade. Consider, for example, the phenomenal rise of the multinational and conglomerate corporations and the (perhaps ill-fated) British-French joint venture into the development of a supersonic commercial airliner. Future success, however, depends not only on finding an appropriate investment strategy but also on the way in which that strategy is implemented. Tactical decisions, such as the decision to buy rather than to produce component parts or to lease rather than to buy warehouse space, are often no less important than even the most elaborately planned long-term strategy.

### **ALTERNATIVE GOALS FOR THE FIRM**

By its very nature financial decision-making involves purposeful behavior, which implies the existence of a goal, or what is much more likely, some combination of goals. In the absence of any objective, the firm would have no criterion for choosing among alternative investment strategies and projects. Surely there is no need to tell the firm that two million dollars is better than one. Yet even this decision is not always that simple; for example, an investment strategy which promises two million dollars accompanied by the risk of possible

bankruptcy should the venture go sour may not be preferable to a conservative strategy which offers a payoff of only one million dollars but permits the directors of the firm to sleep soundly.

Once the complexity of the financial decision-making process is recognized it is fairly easy to conjure up a large number of possible candidates for "the goal of the firm". A very partial listing of some of those which have been mentioned at one time or another would include:

- (1) maximization of profits
- (2) maximization of sales
- (3) survival of the firm
- (4) achieving a "satisfactory" level of profits
- (5) achieving a target market share
- (6) some minimum level of employee turnover
- (7) "internal peace" or no ulcers for management as this objective is often called
- (8) maximization of managerial salaries.

The listing of possible objectives for the firm is a near endless game, more likely to leave its players exhausted than enlightened. However, we think the essential point has been made; no single "goal" can express *all* of the complexities of the decision process. But despite this, we shall see in what follows that a "goal" for corporate decision making can be found which serves well as a foundation for the firm's critically important investment, financing and dividend decisions.

Since the first four goals listed are most frequently encountered, let us now subject them to closer scrutiny. Following this, we shall spell out an appropriate goal which will enable us to feel somewhat more comfortable in discussing the numerous other candidates for the title, "goal of the firm".

## MAXIMIZING PROFITS

Almost every introductory textbook in economics and especially those in price theory assume (apparently as self-evident) the goal of maximization of profits.<sup>1</sup> Though appealing to many economists, upon reflection it is clear that this highly simplified model of corporate behavior rests squarely on the assumption that future profits are known with *certainty*. Taking the maximization of profits as the corporation's objective implies that when the firm chooses among alternative strategies, it can forecast with certainty all of the relevant future

<sup>1</sup> The simplest model of this type states that the firm should seek the output  $q$  which maximizes the function:

$$\pi = qp - C(q)$$

where:  $\pi$  denotes net profit;  $q$  the number of units that the firm produces;  $C(q)$  the total production cost, which changes with the level of output; and  $p$  equals the price of each unit sold.

Applying the "maximum profit" goal, the firm should seek to produce that quantity  $q$  which maximizes its total profits,  $\pi$ .

revenues and costs, and hence profit, associated with each policy. However, reality is not so accommodating. Yet even if we are willing to accept the “certainty” assumption, the goal profit maximization is at best ambiguous. Consider, for example, the following problems.

What profit should the firm maximize? Short-run profits (say next year) or long-run profits over the next decade? To illustrate the problem, let us assume that the firm is confronted with two alternative investment strategies. If it adopts strategy “A”, the firm will earn a net profit of \$10,000 a year for ten years:

<i>Strategy A</i>						
year	1	2	3	...	9	10
net profit	10,000	10,000	10,000	...	10,000	10,000

On the other hand, adopting the alternative investment strategy, “B”, will yield the following stream of profits:

<i>Strategy B</i>										
year	1	2	3	4	5	6	7	8	9	10
net profit	0	0	0	20,000	30,000	40,000	50,000	50,000	50,000	50,000

Which strategy should the firm choose in order to maximize its profits? Since the firm is an “on-going” organization, it is almost intuitively obvious that profits in the long run (i.e. over the entire ten-year period) and not just the profits in the first year, or over some arbitrary number of years, are relevant.

The maximization of long-run profits, however, implies the need to reduce the stream of future receipts and outlays to some common denominator so that meaningful comparisons can be made. And while this is no easy task, the technique of discounting future cash flows, which will be developed in Chapters 3 and 4, provides a neat solution to this problem. In the jargon of this approach, the firm should choose that strategy which maximizes the discounted *present value* of the stream of long-run profits (see Chapter 3). However, the simplicity and elegance of the present value solution should not obscure the fact that the goal of maximizing long-run profits is neither simple nor obvious once we relax the assumption of certainty and assume a more realistic setting in which uncertainty regarding future cash flows prevails. Given the highly uncertain environment in which most firms operate, a number of alternative objective functions have been proposed — the maximization of sales or market share being perhaps the best known.

Many firms tend to state their objective solely in terms of total sales or market share.<sup>2</sup> The possible explanation for this tendency is straightforward:

<sup>2</sup> The best known theoretical proponent of this approach is William J. Baumol: see his *Business Behavior, Value, and Growth*, New York, Macmillan, 1959.



market share is often a very good “proxy” for profits, since market share and profits often move together. In a study of fifty-seven companies, Buzzell, Gale and Sultan<sup>3</sup> found a positive correlation between a firm’s market share and its profitability (see Fig. 1.1). On the average, an increase of 10% in market share was accompanied by an increase of about 5% in the pre-tax return on investment. Although one can find many possible explanations for this relationship, one thing is clear; the goals “maximum profit” and “maximum sales”, or “maximum market share”, are closely related.

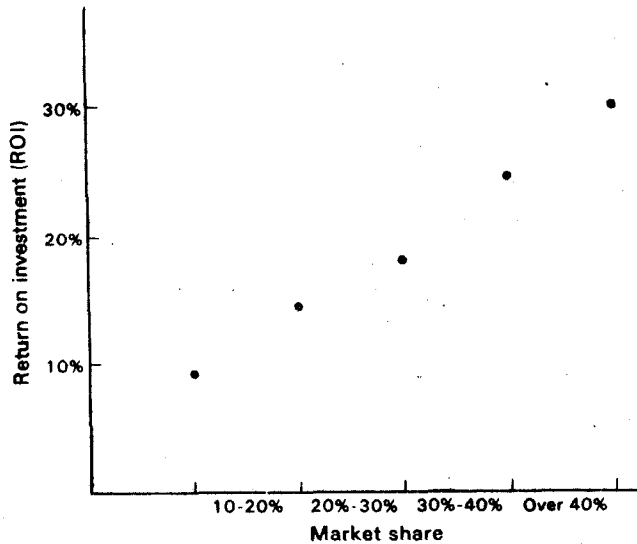


Fig. 1.1

**The Relationship Between Pre-tax Return on Investment and Market Share**

Source: Robert D. Buzzell, Bradley T. Gale and Ralph G.M. Sultan, “Market Share — a Key to Profitability”, *Harvard Business Review*, Jan — Feb 1975, p.98. Copyright © 1974 by the President and Fellows of Harvard College; all rights reserved

## SURVIVAL

“Survival” is another alternative which is often mentioned as the goal of the firm. Clearly, this objective cannot stand alone! If the firm’s goal is purely to survive, why not invest all of its resources in short-term Government securities which guarantee a perfectly certain fixed income and therefore also guarantee survival. However, when a businessman speaks of “survival” as a motivating policy goal, he is probably referring to the avoidance of “very great” risks.

<sup>3</sup> See Robert D. Buzzell, Bradley T. Gale and Ralph G.M. Sultan, “Market Share — a Key to Profitability”, *Harvard Business Review*, January — February 1975.