Capital Investment and Financial Decisions

Third Edition

HAIM LEVY & MARSHALL SARNAT

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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 guildelines 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. Hatjoullis, 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

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.

1

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.[1] 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

1 The simplest model of this type states that the firm should seek the output q which maximizes the function:

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

where: π 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, π.

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:

Strategy A

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:

Strategy B

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.[2] The possible explanation for this tendency is straightforward:

2 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[3] 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.

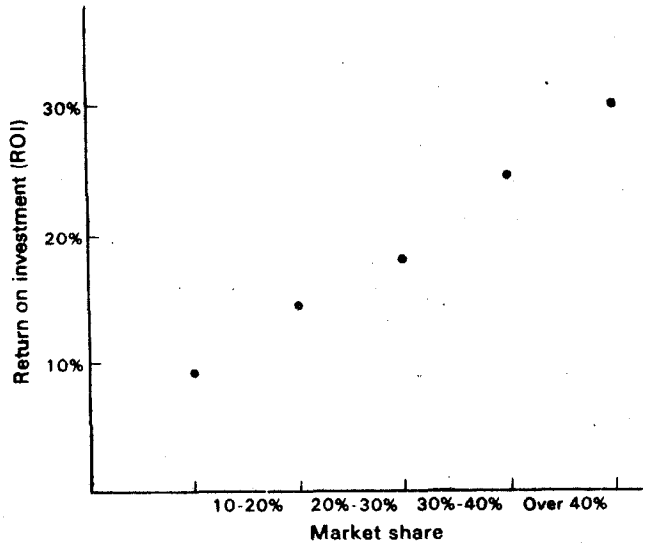

Fig. 1.1

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.

3 See Robert D. Buzzell, Bradley T. Gale and Ralph G.M. Sultan, "Market Share – a Key to Profitability", *Harvard Business Review*, January – February 1975.