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CRARY, David Truman, 1939–
AN ANALYSIS OF THE INTERRELATIONSHIPS OF LEVERAGE, TAXATION, AND THE COST OF CAPITAL.

The Ohio State University, Ph.D., 1966
Economics, finance

University Microfilms, Inc., Ann Arbor, Michigan
AN ANALYSIS OF THE INTERRELATIONSHIPS OF LEVERAGE, TAXATION, AND THE COST OF CAPITAL

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

David Truman Crary, B.Sc., M.B.A.

* * * * *

The Ohio State University
1966

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ACKNOWLEDGMENT

I wish to express my appreciation to Professors John K. Pfahl, Halbert C. Smith and Arthur D. Lynn for valuable suggestions and criticism. A special debt is acknowledged to Professor Pfahl who through his excellent teaching stimulates an intense interest in the theoretical aspects of finance. Sincere appreciation is also extended to R. Hayden Howard for his constant encouragement and many invaluable suggestions.

My wife, Sharon, deserves mention for her efforts expended in typing the several drafts of this manuscript.
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CHAPTER I
INTRODUCTION

Within the past decade, articles appearing in the financial literature seem to indicate that a great deal of confusion exists concerning the cost of capital and the ramifications of this concept for financial management.

An indication of this confusion is the disagreement in the literature concerning the cost of the various sources of funds, the optimal use of leverage, investment decisions and financing decisions. For example, in defining the cost of common stock, Soule states:

The factor which best measures the true cost of new common stock capital is the company's rate of earnings on the net sales price of the new stock.... The cost of new common stock capital is measured (at least in the eyes of the common stockholder) by its "earnings yield," i.e., earnings as a percentage of market price.¹

Weston and Brigham propose that

The cost of equity capital is defined as the minimum rate of return that must be earned on equity-financed investment to keep unchanged the value of the existing common equity.²


Another definition of the cost of common stock equity capital is that: "a price is paid for estimated future earnings."³

In connection with the cost of all sources of funds, Osborn commented in his text published in 1959 that

When investment funds are scarce in relation to demand their cost tends to be high. Conversely, the cost is likely to be low when funds are plentiful.... Under normal conditions a customary relationship of cost exists as among the various types of financing. Because of their lesser degree of risk for the lender, short-term loans have a moderately lower interest rate than long-term. Preferred stock dividends will exceed bond interest by 1 to 1½ percent. The rate of earnings on the common stock of successful corporations will be approximately twice the dividend level on preferred stock.⁴

Concerning the relationship of cost of capital and capital structure, Modigliani and Miller suggest that

...the average cost of capital to any firm is completely independent of its capital structure and is equal to the capitalization rate of a pure equity stream of its class.⁵

This approach is countered by Solomon who concludes his analysis by stating: "...the thesis that a company's cost of capital is independent of its financial structure is not valid."⁶

These statements are representative of the contradictory condition of the present literature.


Purpose

The basic purpose of this study is to develop a consistent body of theory relating the concept of the cost of capital to some of the crucial problem areas of financial management. More specifically, this study is directed toward an examination of leverage and the cost of capital and the cost of capital-leverage-corporate income taxation interrelationships.

Sources of Information

Several sources of information were utilized in this study. Investigating the antecedents of many of the concepts involved in this paper was primarily a library research project. Many texts were selected from two sources: (1) Cumulative Book Index — World List of Books in English Language and (2) Library of Congress Catalog — Books: Subject.

An extensive search of the periodical literature was made in an effort to discover the present state of knowledge on the subject of the cost of capital and its use in developing a theory of financial management. Unpublished dissertations in this area were studied. The literature of related disciplines was also reviewed. Some important contributions to the study of the cost of capital have been made in the field of economics, though few of these discoveries have been integrated into the present literature of financial management. Contributions in this area have also been made in the field of industrial engineering.

Methodology

Before presenting the nature of the methodology used in this study, it would seem useful to clarify the important relationships between the two basic types of analysis analytical research and empirical research.
It seems that analytical research has been the primary means by which principles of financial management have been developed. A principle has been defined as "a statement accepted as true in the present state of our knowledge, which sets up a meaningful relationship between cause and effect." It has also been defined as "an explanatory statement of general truth, derived from a study of the facts set up in a cause-and-effect relationship, which always applies under given conditions or assumptions." 

By using analytical generalizations of this type, one may express conclusions which logically follow from certain assumptions. An analytical principle is valid to the extent that it is logically consistent; that is, to the extent that it follows logically from the assumptions given. It is applicable in a particular real-world situation if the assumptions of the principle are in agreement with the conditions of the actual situation.

If the assumptions of a principle agree with actual conditions, then the conclusions advanced by the principle will be realized (granted its logical correctness). Apparent discrepancies between theory and practice arise from misapplications of the theory, from using it in situations for which it is not relevant.

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10Ibid., p. 21.
Recently, much attention has been given to the use of mathematics in the study of business. Except for mathematics in statistical work, which is a form of empirical research, the use of mathematics is actually another form for deducing and explaining principles of financial management. Thus, the mathematical and nonmathematical forms of analytical research represent merely "alternative techniques of exploration and alternative languages of explanation of relationships." 11

The second type of research is empirical. This is the study of relationships between observed data, which may be expressed in a generalized statement of tendency. Empirical generalizations are arrived at through the process of induction. They may be reformulated into the form of analytical principles when assumptions necessary are clarified and stated.

It is the intention of the writer of this paper to develop principles from an analytical point of view rather than taking available empirical data and building principles and theory to fit these data.

Plan of Study

The concept of risk is introduced in Chapter II. Return to suppliers of capital is defined as remuneration for the acceptance of risk. Both business risk and financial risk are discussed. The concept of trading on the equity is traced from the earliest finance literature to the present. The definition of the cost of capital in both the traditional and present finance literature is presented and contrasted. Finally, the author's concept of the cost of capital is introduced.

11 Ibid., p. 25.
Chapter III presents a comparison of the cost of capital models contained in the traditional finance literature and the present finance literature. In addition, the author's model of the cost of capital is developed.

The leverage-cost of capital relationship is explored in Chapter IV. Once again the views of the traditional finance literature, present finance literature and the author are presented and contrasted.

In Chapter V, the taxation-cost of capital relationship under varying degrees of leverage is examined. In Chapter VI, a brief summary of the findings and conclusions of this dissertation is presented.

An appendix is also provided. The Bibliography is arranged in alphabetical order.
CHAPTER II

CONCEPTS OF THE COST OF CAPITAL

Chapter II introduces some of the financial concepts crucial to the concept of the cost of capital. The concepts introduced here will be utilized throughout the remainder of this paper. The first concept to be dealt with is the one involving risk. The economic theory of risk is examined and that return to the suppliers of capital in excess of the pure rate of interest is defined as a remuneration for the acceptance of risk. Concepts of the cost of capital throughout the finance literature are then examined.

The Concept Risk

The concept of risk has been employed in many contexts and is, as a result, subject to numerous definitions. Although the concept is as old as man, academicians have not yet achieved agreement as to its meaning. The term "risk," presents a situation in which the rather loose use of a term in every-day affairs has given rise to a confusion in the terminology of an academic discipline. Risk has been defined negatively as the absence of certainty, and thus could be, and often is, used synonymously with "uncertainty."

Another commonly used concept of risk, a concept which seems to be central to the objectives of most investors, is the chance that a desired or expected future wealth position will not be attained. In
other words, given an estimate of future wealth position (the mean of the probability distribution of possible values), risk is represented by that portion of the distribution which lies below the mean. Put another way, risk could be considered as the probability that the ex ante and ex post positions of the suppliers of capital to a firm will not be in equilibrium. Specifically, risk would seem to be the probability of realized returns being below anticipated returns, whereas the uncertainty concept would include variations above the anticipated returns.

Certain scholars maintain that, in addition to the problems created by multiple definitions in everyday use, the meaning of the term risk is unduly distorted when writers use it interchangeably with uncertainty. As mentioned, much discussion has been directed toward finding an acceptable definition of these terms.

It would seem that the original idea expressed by the term risk was "hazard" or "exposure to mischance." Uncertainty, on the other hand, has always seemed to express the lack of definite knowledge about the future. Unpredictability or imperfect knowledge would seem to be the essence of uncertainty. The two words do not have identical meanings.

There does seem, however, to be some link between the two ideas in the sense that the existence of one causes the other. More specifically, the existence of uncertainty, i.e., lack of definite knowledge, causes the hazard or exposure to mischance.

The concept of risk has always been of critical importance in the major economic decisions of an individual such as the employment of the resources he controls, what occupation to follow, what entrepreneurial
activity to engage in, how to invest (nonhuman) capital, etc. Voluminous current writings notwithstanding, the interest of scholars in this question of risk is not new. Adam Smith was interested in the concept, especially in the evaluation of risk by the individual. The individual's evaluation of the risk associated with the choice of occupation seemed to perplex Smith. He commented,

The overweening conceit which the greater part of men have of their own abilities, is an ancient evil remarked by the philosophers and moralists of all ages. Their absurd presumption in their own good fortune has been less taken notice of. It is however, if possible, still more universal. There is no man living who, when in tolerable health and spirits, has not some share of it. The chance of gain is by every man more or less overvalued, and the chance of loss is by most men undervalued, and by scarce any man, who is in tolerable health and spirits valued more than it is worth.... The contempt of risk and the presumptuous hope of success, are in no period of life more active than at the age at which young people choose their professions. How little the fear of misfortune is then capable of balancing the hope of good luck, appears still more evidently in the readiness of the common people to enlist as soldiers, or to go to sea, than in the eagerness of those of better fashion to enter into what are called the liberal professions.

What a common soldier may lose is obvious enough. Without regarding the danger, however, young volunteers never enlist so readily as at the beginning of a new war....romantic hopes make the whole price of their blood. Their pay is less than that of common labourers, and in actual service their fatigues are much larger.¹

The perception and evaluation of the risk inherent in a lottery also seemed to puzzle Smith. Concerning lotteries he wrote

That the chance of gain is naturally overvalued, we may learn from the universal success of lotteries. The world neither ever saw, nor ever will see, a perfectly fair lottery; or one in which the whole gain compensated the whole loss; Because the undertaker could make nothing by it. In the state lotteries the

tickets are really not worth the price which is paid by the original subscribers, and yet commonly sell in the market for twenty, thirty, and sometimes forty percent advance. The vain hope of gaining some of the great prizes is the sole cause of this demand. The soberest people scarce look upon it as a folly to pay a small sum for the chance of gaining ten or twenty thousand pounds; though they know that even that small sum is perhaps twenty or thirty percent more than the chance is worth. In a lottery in which no prize exceeded twenty pounds, though in other respects it approached much nearer to a perfectly fair one than the common state lotteries, there would not be the same demand for tickets. In order to have a better chance for some of the great prizes, some people purchase several tickets, and other, small shares in a still greater number. There is not, however, a more certain proposition in mathematics, than that the more tickets you adventure upon, the more likely you are to be a loser. Adventure upon all the tickets in the lottery, and you lose for certain; and the greater the number of your tickets the nearer you approach to this certainty.2

In regard to entrepreneurial undertakings, he remarked,

The ordinary rate of profits always rises more or less with risk. It does not, however, seem to rise in proportion to it, or so as to compensate it completely.... The presumptuous hope of success seems to act here as upon all other occasions, and to entice so many adventurers into those hazardous trades, that their competition reduces the profit below what is sufficient to compensate the risk.3

This paper is, in part, an indication that the concept of risk still has not been completely clarified. In fact a perusal of the current economic literature could make one wonder if any advance has been made since the time of Smith. At the present time, it is not unusual to find writers viewing risk as some omnipresent phenomenon incapable of being successfully dealt with. Or as one writer put it,

2Ibid., p. 108.
3Ibid., p. 111.
The owner of wealth must, if he is rational, invest it in some productive enterprise, unless under the circumstances, he decides to consume it; and, wherever it is invested, there will be some risk that part of it will be lost by the dishonesty of others, the deterioration in value of the property in which it is embodied, or in change of value of the standard of deferred payment. If he thinks to escape by hoarding it in the shape of specie, robbery is to be feared, to say nothing of the opportunities of gain which are given up. If he decides to consume the wealth at once, he runs the risk of coming to poverty.\textsuperscript{4}

Although statements such as this are technically accurate, they can create a false impression of the importance of the unknown element in human calculations. Many risks do exist; however, many of them are of no practical consequence. The only risks which need be given consideration in any decision are those of which the outcome is significant relative to the total event of which they are a part.

In the field of corporation finance a view of risk, somewhat different from the one presented above, seems to have evolved. The common usage of the term in the financial literature is similar to this comment by Mayer.

Risk is taken to mean the probability, expressed as a fraction not exceeding unity, that the firm will fail. There are many meanings of "fail" of course, some highly legalistic, some purely economic or financial; but they all reflect, as cause or effect, cessation of the prospect of productivity.\textsuperscript{5}

The purpose of this section has been to introduce the concept of risk. One of the purposes of this paper is to determine the rate of return that is commensurate with different degrees of risk. A normative


approach is taken in the resolution of this question. The more specific question concerning return as remuneration for risk is dealt with in the next section.

This paper deals with the facet of risk confronting the suppliers of capital. In this situation risk will be defined as the possibility that the ex ante and ex post positions of the suppliers of capital to a firm will not be in equilibrium. More specifically, risk to the suppliers of capital is defined as only one segment of possible disequilibrium, that disequilibrium resulting when realized returns are less than anticipated returns. The possibility that realized returns may be more than anticipated is not defined as risk for the purpose of this paper.

The Economic Theory of Risk

The theory of distribution and more particularly of profit has been described as one of the most unsatisfactory and controversial divisions of economic doctrine. Only within the last century has the existence of profit as a really distinct share become established and the problem of its explanation given definite status. Historically, economists have viewed the rate of return on investment as the interest rate or something very similar to the interest rate.

Economic theory, as perhaps most academic disciplines whose subject matter is some area of human activity, seems to have been greatly influenced by practice. In particular, certain common terms have been used with different meanings in theory and in practice. The result has been serious confusion. One concept under consideration, the concept of profit, seems to be closely identified with a particular type of organization of industry, the corporation.
The modern concept of profit seems to be very closely tied to the concept of the corporation. In this paper the author is dealing with the distribution of returns to the suppliers of capital to the corporation. Discussion of the corporate form of business organization usually begins with the incorporation Acts of England and the United States passed in the mid-nineteenth century; however it has been stated that, "there is no definite and generally accepted explanation of the origin of the corporation. It is a product of evolution." In expanding on this statement, Burchett notes that:

Many suggestive theories may be advanced in explanation of the development of the corporation. One theory finds the origin of the corporation in the attempt to give special privileges to a few of the nobility during the Middle Ages, and finds that monopoly played an important role in the development of the corporate form of business organization. The explanation of the business use of the corporation is sometimes traced to the great trading companies of the period during which the western hemisphere was explored, colonized and exploited by the older world. There was great risk in overseas trading; vessels were often scuttled by pirates, even though they escaped the savages and the inclemencies of nature during the voyage. An expedition was expensive, and but few individuals could ever hope to carry out one single-handed. Still another hypothesis would find the origin of the corporation in the English guild. The earliest forms were apparently semi-religious. Later there seems to have been a division into purely religious and secular associations. As a final suggestion, it seems that some sort of combination of these different explanations can best account for the modern business corporation.

As Burchett indicates, this type of organization of the factors of production has been realized in different ways in different places.


7 Ibid., p. 4-5.
and times. In addition, it has undergone constant modifications and development.

At the time the English classical school of economics developed - i.e., in the late eighteenth and early nineteenth centuries - the dominant form of business organization was the sole proprietorship organized by an entrepreneur who used his own capital to hire labor and rent land from others. The corporate form was relatively unimportant, being restricted to a few trading companies and banks. While it is true that there was some lending of money at interest, it was not an important factor in industry. In this type of situation the managerial functions centered in the capitalist. One can observe that in an economy where industries are new and expanding rapidly and where competition is not highly developed, the possession of capital would seem to be the dominant factor in the situation. Only within the last century has the accumulation of capital, the development of financial intermediaries, and the growth of competition shifted the emphasis from possession of capital to business acumen and ability. Only comparatively recently has it become generally possible for able people to secure capital when not in possession of it by direct ownership. And only recently has it become common that business could operate with predominantly borrowed resources.

Given the conditions existing at the time the English classical school developed, it was logical to connect the income of the business manager with the ownership of capital, and in many of the classical works one finds the word "profit" used in this sense. It seems that a major reason for the common classical failure to distinguish between profits and interest was the failure to differentiate conceptually be-
between entrepreneur and capitalist. The earlier classical writers were confused as to the fundamental difference between the total income of the capitalist manager and contract interest. In the classical explanation of the distribution of income the only separation considered necessary was to restrict the theory of the business manager's income to the explanation of "normal profit," which was regarded as substantially equivalent to contract interest.

One must inject, however, the normal profit and interest were not held to be synonymous in the classical treatment. Many writers indicated, nonetheless, that there was "near" or "substantial" conception of the two terms.

Beginning with Adam Smith one finds the recognition that even normal profits contain an element which is not interest on capital. Smith neatly distinguishes interest from profits by stating that the share of income "derived from stock by the person who manages or employs it is called profits. That derived from it by the person who does not employ it himself, but lends it to another, is called the interest, or the use of money." 8

Smith then continues by pointing out that the reason a lender can secure interest is because the borrower can make a profit, so that "the interest of money is always a derivative revenue." In this last statement we see a second reason for the frequent post-Smith classical treatment of interest as identical with profits. When the classical writer did make a distinction between capitalist and entrepreneur, then the former could demand a return for his funds essentially equal

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8 Smith, op. cit., p. 22a.
to the profits that the capitalist was able to acquire from their use, with the result that the rate of interest would be roughly equal to the rate of profit and determined by it.

Smith was careful to explain that profits were not merely a species of wages. "The profits of stock," he observes, "it may perhaps be thought, are only a different name for the wages of a particular sort of labour, the labour of inspection and direction. They are, however, altogether different." Instead of being proportional to "the quantity, the hardship, or the ingenuity" of the "supposed labor of inspection and direction" they are proportional to the value of the stock employed. In some cases scarcely any of the work of inspection and direction is done by the owner of the capital; it is all done by "some principal clerk," who receives wages which "never bear any regular proportion to the capital of which he oversees the management," while the owner of the capital, "though he is thus discharged of almost all labor, still expects that his profits should bear a regular proportion to his capital." Profits to Smith were thus a real deduction from the natural recompense or wages of labor. They were regarded, it seems, as somehow the result of the fact that capitalists employ labor, "as soon as stock has accumulated in the hands of particular persons, some of them will naturally employ it in setting to work industrious people, whom they will supply with materials and subsistence, in order to make a sale of their work, or by what their labor adds to the value of the materials." Thus, the implication seems to be that employers would

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9 Ibid., p. 22b.
10 Ibid., p. 22a.
not employ labor at all if they did not expect some profit, some surplus over their expenditure. At the same time they would not use a great stock rather than a small one unless their profits were to bear some proportion to the extent of their stock. Men "hazard" their stock in the "adventure," a thing no sensible man would do for nothing. But as Cannan\textsuperscript{11} points out, this does not explain why the profit is actually obtained. There are many things which man will not do for nothing, and which, in consequence, remain undone. The employer-capitalist is not paid because he hazards his stock, but he hazards his stock because he is paid for it.

Profit, then, was explained by Adam Smith as a deduction from the produce of labor. It seems difficult to understand why laborers would agree to this deduction. It would seem that they could work for themselves and decline to be employed. Adam Smith seemed to think that this condition existed because the workers were necessitous:

It seldom happens that the person who tills the ground has the wherewithal to maintain himself till he reaps the harvest. His maintenance is generally advanced to his share in the produce of his labor, or unless his stock was to be replaced to him with a profit. This profit makes a second deduction\textsuperscript{*} from the produce of the labor which is employed upon land.

The produce of almost all other labor is liable to the like deduction of profit. In all arts and manufactures the greater part of the workmen stand in need of a master to advance them the materials of their work, and their wages and maintenance till it be completed.\textsuperscript{12}


\textsuperscript{*} Rent being the first.
Since this section of this study is dealing with returns, it is interesting to observe that Adam Smith's explanation of profit relates entirely to the profits of persons employing labor. His entire discussion of profit was restricted to that obtained from sums spent in paying wages or in buying materials. None of his examples deal with interest or profit on the value of plant and equipment.

The followers of Smith soon took issue with his approach to the explanation of profit. Lauterdale objected to Adam Smith's representation of profit as a deduction from the wages of labor. If Adam Smith were right, profits would be only a derivative and not an original source of revenue, "being only a transfer from the pocket of the laborer into that of the proprietor of stock."^13

From Lauterdale's point of view, profit, rather than being a deduction from the wages of labor, arose because the capital which yielded profit supplanted labor, or did what human labor could not do. In other words, profit existed because capital performed a useful service. The payment of profit was put on the same basis as the payment of wages. The owner of capital gets a part of what would have been received by the laborers supplanted or dispensed with.

Another explanation of the existence of profits was provided by David Ricardo. Ricardo considered profits to be a surplus of produce over natural wages. This surplus came to exist, he thought, because the worst land actually under cultivation, or rather the least productive agricultural labor employed, returns more produce than is re-

^13 James Maitland, (earl of Lauterdale) An Inquiry into the Means and Courses of its Increase (Edinburgh, 1804).
quired to pay wages. To him, it seemed that profit would always exist because the population or amount of labor employed and consequently the productiveness of the least productive agricultural labor, depend on the amount of capital and capital will not be accumulated to such an extent as to reduce the productiveness of the least productive agricultural labor so low that the produce would only suffice to pay the wages. The motive for accumulation would "diminish with every diminuition of profit, and will cease altogether" when profits become too low to afford the farmer and the manufacturer "an adequate compensation for their trouble, and the risk which they must necessarily encounter in employing their capital productively."

In another attempt to explain the return to suppliers of capital, Senior suggested that profits were the remuneration of the conduct or the sacrifice involved in 'abstinence.' "By the word abstinence," he says, "we wish to express that agent distinct from labor and the agency of nature, the concurrence of which is necessary to the existence of capital, and which stands in the same relation to profit as labor does to wages." Abstinence was defined by Senior as coextensive with saving and this led to the logical trap in which rich men with large expenditures for personal consumption coupled with large savings were more abstinent than men of very meager means.


Return as Remuneration for Risk

The formulation of a concept of return as the remuneration for risk assumption is of fairly recent origin in the economic literature. It was not until 1888 that the antecedents of this concept appeared. Until this time, it seems that economic theory regarded interest (sometimes equated and confused with profits) as the appropriate return to capital. The common identification of interest and profits by classical economists may, it seems be understood in the light of at least two elements in their thinking. One, as mentioned earlier, was the conceptual confusion of capitalist with entrepreneur, the other was the view that interest was after all derived from profits, and its rate was roughly determined by and equal to that of profits. This line of thinking arose, it seems, from the belief that borrowing was the only source of external capital.

Classical economic theory indicates that the returns to an owner of capital utilizing it himself should equal the interest he could earn by loaning it.

Questions soon arose concerning the returns to a borrower of capital. Once again theory indicated that the return on capital borrowed and used in production could not exceed the interest rate because investment would continue until marginal revenue equaled marginal cost, or more clearly until the earnings from the use of capital equalized the interest cost of borrowed capital.

With the realization that the earnings on invested capital were different from the interest on borrowed capital, it seemed that the followers of traditional economic theory were faced with a logical impossibility. While acknowledging that the theory needed revision,
economists were hesitant to alter it fundamentally. Instead they explained that different interest rates existed.

It seems that the first to explore this approach was Behm-Bawerk in his book The Positive Theory of Capital which was published in 1888. In it he developed a concept involving the existence of three types of interest rates. At the same time he proposed another basic idea which underlies all concepts of interest. This was the influence of time. He stated that

the most obvious fact here is that the payment of interest has some very definite connection with the time when payment is made. This suggests the general question: What is the place and influence of time on the value of goods. And the answer is: It is an empirical fact of undoubted universality that present goods are valued more highly than future goods of like kind and amount.

In stating that the essence of interest was time-preference, Behm-Bawerk thought that three causes for this could be given.

First is the difference between the circumstances of want and the provision for want in present and in future. In any case, if want is pressing and provision is scarce, value is high. But the pressure of want in the present is always with us, while as regards provision in the future it is generally true omne ignotum pro mirifico.

Thus present goods obtain a permanent importance from felt present wants, and future goods a permanent unimportance from anticipated future provision. Most men, accordingly, -- people in immediate distress and beginners of all sorts being types -- are willing to pledge their future for a really inadequate present sum. Second is the general underestimate of the future, common to humanity, and traceable to want of imagination, defect of will, or feeling of life's uncertainty. Child-

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17 Ibid., p. xi.
ren and savages are typical of the imporvidence which is more or less striking in all classes. It may be that this cause is not on the same level with the first, and tends to less importance with social progress. But, in the world as it is, it is certain that the things of the future are of less value to us simply because they are future. And, third, is the technical superiority of present goods. As we have already seen, in the hands of labour, wealth increases enormously with the extension in time of the production process. Goods available now have accordingly the promise and potency of being greatly multiplied in the future, while goods coming into our disposal only in the future must undergo another period of production before the same abundance is reaped.18

In developing his concept of three types of interest rates, Behm-Bawerk explained that the first type of interest is that paid on a loan for consumption. This is the process of exchanging a smaller amount of present money or present goods, for a larger amount of future money or goods. The second and principal form assumed by interest was that which appeared as a part of what he called the "profit of undertaking." It was explained that a capitalist hires land, buys raw material and auxiliary materials, machinery, power and labor and coordinates them in the making of a product. The price he receives for the product recoups all his expenditures plus interest. Thus interest is explained as the difference between the value of the formerly future and the value of the now present goods. The third type of interest was explained as arising from the investment in capital goods. Behm-Bawerk indicated that the distinction between a perishable and a durable good was that, while both were the sums of their respective uses or services, the durable good was a sum extending over a period of time. It was his view that later services of such a good must have a lower value than

18 Ibid., pp. xii - xiii.
the proximate services, and the total value of the good would be a sum of diminishing returns. The present value of such a good, then would be less than the sum of the values really obtained during its lifetime. In his view, the services which were originally undervalued would ripen to full present value in the hands of the owner and the difference between the past and the present values, after providing for replacement of the good was interest.

In explaining the existence of this third type of interest, Bawerk in 1888 stated one of the main concepts underlying the idea of return on investment. He explained that

...if the owner of capital throws his present wealth into the form of stone and lime, he possesses, in the durable shape of a house, a sum of future uses discounted according to their futureity. As each year passes one annual service is realized, and its value is thrown off, while each service still to be realized is one year nearer the present, and is thus one year more valuable. The house as now containing one rent less, is less valuable and this loss falls to be deducted from the gross return as wear and tear. But what is lost, be it noted, is not one annual service estimated at present value; it is the last future service of which the good is still capable, - for if all the services have moved up one step in value it is the value of the last service that drops off. The difference between the present service realized (gross rent) and the last service now deducted (economic wear and tear) is the net return of interest.\(^{19}\)

Much more recently the center of attention in the discussion of profit has shifted to two views known as the "dynamic theory" and the "risk theory."

The dynamic theory is a correlate of Professor J. B. Clark's theory of distribution in the profitless "static state." The static

\(^{19}\text{Ibid., p. xiii.}\)
state is what was described as the state of "natural" adjustments by Ricardo and the early classical writers. According to T.N. Carver in *The Distribution of Wealth*, what are "natural" or normal rates of wages, interest, and profits are in reality static rates. They are identical with those which would be realized, if a society were perfectly organized, but were free from the disturbances that progress causes. If one could reduce society to a stationary state, let industry go on with entire freedom, and make labor and capital absolutely mobile, one would realize a regime of natural values.

The static state is defined such that each factor secures what it produces, and since cost and selling price are always equal there can be no profits beyond wages for the routine work of supervision.

The prices that conform to the cost of production are, of course, those which give no clear profit to the entrepreneur. A businessman whose goods sell at such rates will get wages for whatever amount of labor he may perform, and interest for any capital that he may furnish; but he will have nothing more to show in the way of gain. He will sell his product for what the elements that compose it have really cost him, if his own labor and the use of his capital be counted among the cost. We shall see that this condition of no-profit prices exactly corresponds to the one that would result from the static adjustment of the producing groups.

Thus profits, defined as the returns to entrepreneurs in excess of the remuneration for entrepreneurial labor and interest on capital, are explained as the result exclusively of dynamic change. The type of dynamic change is invention;

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21 Ibid., pp. 68-69.
an invention makes it possible to produce something more cheaply. It first gives a profit to entrepreneurs and then... adds something to wages and interest... Let another invention be made... It also creates a profit; and this profit, like the first, is an elusive sum, which entrepreneurs grasp but cannot hold. It slips through their fingers and bestows itself on all members of society.\textsuperscript{22}

Thus the effects of any one dynamic change is to produce temporary profits.

Knight counters this approach by reasoning that if one merely assumes that all the "dynamic changes" which Professor Clark enumerates, and any others which may be named, are foreknown for a sufficient time before they take place, or that they take place continuously in accordance with laws generally and accurately known so that their course may be predicted as far into the future as occasion may require, then the whole argument based on the effects of change will fall completely to the ground.\textsuperscript{23}

Further, Knight asserts that no \textit{a priori} argument is necessary to prove that with general foreknowledge of progressive changes, no losses and no chance to make profits will arise out of them. This is explained as the first principle of speculation. The effect of any change which can be foreseen will be adequately discounted in advance.

In other words, dynamic changes give rise to a peculiar form of income only insofar as the changes and their consequences are unpredictable in character. Unpredictable fluctuations of business conditions will hinder the competitive adjustment and profits will result.

\textsuperscript{22}Ibid., p. 405.

From Knight's view, then, profit is not caused by dynamic change, any change, as such, but the divergence of actual conditions from those which have been expected and on the basis of which business arrangements have been made.

The opposing view that profit is to be explained exclusively in terms of risk has been advanced by Mr. F. B. Hawley. Hawley defines risk-taking as the primary function of the entrepreneur and therefore the basis of the entrepreneur's peculiar income.

In Hawley's presentation the entrepreneur plays a unique role. Enterprise, the function performed by entrepreneurs, is the only really productive factor. Land, labor and capital are relegated to the position of "means" of production.

Writing of profit, the reward of enterprise, Hawley states:

... the profit of an undertaking, or the residue of the product after the claims of land, capital, and labor (furnished by others or by the undertaker himself) are satisfied, is not the reward of management or coordination, but of the risks and responsibilities that the undertaker...subjects himself to. And as no one, as a matter of business, subjects himself to risk for what he believes the actuarial value of the risk amounts to -- in the calculation of which he is on the average correct -- a net income accrues to enterprise, as a whole, equal to the difference between the gains derived from the undertakings and the actual losses incurred in them. This net income, being manifestly an unpredicted residue, must be a profit, and as there cannot be two unpredicted residues in the same undertaking, profit is identified with the reward for the assumption of responsibility, especially though not exclusively, that involved in ownership.25

24Frederick Bernard Hawley, Enterprise and the Productive Process (New York: G.P. Putnam's Sons, 1907).

25Ibid., p. 74.
There are some areas of agreement between the "dynamic theory" and the "risk theory." For example, both define profit as "residual income," and both treat profit as a special income connected with the assumption of risk as an excess of payment above the actuarial value of the risk, demanded because exposure to risk is "irksome." Hawley, however, insists that residual income and uncertain income are interchangeable concepts.\textsuperscript{26} From Clark's point of view, the reward of risk-taking necessarily goes to the capitalist as such and the pure profit of the entrepreneur is a species of monopoly gain arising in connection with dynamic disturbances, and that his only income under static conditions would be wages of management or coordination plus interest on the capital invested.

Knight's contention is that

if risk were exclusively of the nature of known chance or mathematical probability, there could be no reward of risk-taking; the fact of risk could exert no considerable influence on the distribution of income in any way. For if the actuarial chance of gain or loss in any transaction is ascertainable, either by calculation \textit{a priori} or by the application of statistical methods to past experience, the burden of bearing the risk can be avoided by the payment of a small fixed cost limited to the administrative expense of providing insurance.\textsuperscript{27}

Finally, Knight states that there is a principle of truth in both the "dynamic and the "risk" theories. He concludes that profit is in fact bound up in economic change (but because change is the condition of uncertainty), and, in addition, it is clearly the result of risk, but only of a unique kind of risk, which is not susceptible of measure-


Both of these schools of thought have been criticized by those who object to the treating of all risk as a substantially homogeneous category.

One of the objectives of the author in writing this section has been to show the differentiation of profit and interest. Interest has come to be defined as the cost of borrowed capital. Anything remaining after the deduction of wages, the cost of borrowed capital and other expenses has come to be defined as remuneration to the suppliers of equity capital.

The traditional accounting definition of profit seems to bear this statement out. For example, Kohler and Morrison state:

Profit, as used by the accountant, is the increase in the owners' equities resulting from the operation of a business over a period of time, and he ordinarily does not distinguish between the portions attributable to capital invested and services performed by the owners.\(^2^9\)

In this same line of thinking Hatfield comments that

The income or profit of a given period may be defined as the increase in proprietorship which has taken place during that period, making due allowance for any part of such increment as may have been distributed.\(^3^0\)

Another of the author's objectives in this section was to present the justification for conceiving the return to suppliers of capital as remuneration for the acceptance of risk. A part of Knight's contri-

\(^2^8\) Ibid., p. 48.


Butions as well as those of his predecessors have been cited in this section. Because of the risk of loss both in an absolute sense and in an opportunity sense, a supplier of capital demands a return. The rate of return demanded is dependent on the degree of risk as perceived by the suppliers of capital. From the beginning, writers in the field of corporation finance have conceived of risk and return in this relationship. In 1897 Thomas Greene stated:

Purchasers of bonds or shares weigh the chances of success, and usually demand concessions in some way commensurate with the supposed risks before buying.\(^{31}\)

Business Risk and Financial Risk

In this chapter, the purpose of the author is to introduce the question, what should be the return to a firm's suppliers of capital? The types of capital considered are equity capital and debt capital. Thus, the writer is concerned with explaining the primary factors which affect the returns to these suppliers of capital.

On the basis of the discussion in the preceding section, it is seen that one could define return as remuneration for what in common usage has been called risk, but which has been more clearly discussed by Knight as uncertainty. The objective of this section, then, is to suggest that suppliers of capital are subjected to different types of uncertainty as the financial structure of the firm varies. As previously explained, risk exists because individuals are uncertain about the future. This uncertainty exists because of the lack of complete knowledge about the future. Thus, risk is a function of un-

certainty and uncertainty is a function of insufficient knowledge. The risks which face the suppliers of capital, it seems, can be divided into two types. The types are business risk and financial risk.

The basis for business risk seems to be the uncertainty concerning business operations. This uncertainty arises from all the factors which can affect these operations -- all the factors which Knight indicated could cause a divergence of actual conditions from those which have been expected and on the basis of which business arrangements have been made. These factors include such things as the future costs of productive factors and future shifts in consumer demand. In addition, there are uncertainties concerning the future actions of governmental authorities, population trends, and changes in technology. Complete knowledge about the future behavior of these factors cannot be determined by the firm's suppliers of capital. Business risk, however, is not affected by the manner in which the firm raises its capital but only by the economic factors which govern the success of the firm as a producing unit. Financial risk, on the other hand, arises from the uncertainty that the company's income will be adequate to meet the financial burden that exists because of its financial structure. The financial burden includes both the payment of the interest charges and the retirement of the principal. The interest payments to the suppliers of debt capital represent fixed charges to the firm.

Assuming the same earning power, a company with greater relative indebtedness is more vulnerable to failure than a company with less borrowed capital because of the legal claims granted to the suppliers of debt capital.
Legally, the suppliers of debt capital are viewed as different from the suppliers of equity capital. One result of this is that payments to the suppliers of debt capital constitute a fixed commitment regardless of whether the income is earned. In situations where the earnings of the firm are sufficient to service the debt burden, management and ownership are not unduly affected by the legal claims of debt. However, if the earnings of the firm are not sufficient to meet required debt payments, the ownership of the firm must meet them by reducing the equity account.

Financial risk, defined as the uncertainty that the company's income will be adequate to meet the financial burden that exists because of the firm's financial structure, is a function of income and the capital structure. Income is a function of business risk. Thus, financial risk is a function of business risk and the capital structure of the firm. In other words, the firm's financial risk is governed by (a) its business risk and (b) the manner in which its capital, i.e., the degree of financial leverage in its financial structure. Financial risk does not exist in an all-equity capital structure. It increases with leverage and approaches a limit as the capital structure approaches one hundred per cent debt.

If return is the remuneration for the assumption of risk, then with an all-equity capital structure the return demanded by equity should be solely a function of business risk. As debt is introduced, so also is financial risk. Once debt is introduced, financial risk, in addition to business risk, should become a factor in the determination of the appropriate return to equity. Debt holders, because of their protection by the so-called equity cushion, have a financial risk
advantage relative to the other suppliers of capital and should demand a lower rate of return than the suppliers of equity capital. Theoretically, as the capital structure approaches an all-debt position, the demands of the suppliers of debt capital should approach those of equity in all-equity capital structure.

The Concept of Trading on the Equity

The first appearance of the term "trading on the equity" is said to have occurred around the middle of the seventeenth century. The term was used at that time to describe the activities of banking institutions which had begun lending funds deposited with them. The institutions received interest from these loans and the practice of realizing an income through the use of borrowed capital was instituted.

Thomas L. Greene seems to have been the first to write about it in the corporation finance literature. Mr. Greene certainly wasted no time in discussing this concept. In the first sentences of the first chapter of his text, Corporation Finance published in 1897, he states:

The business men or firm must borrow money. With the few exceptions, where firms have command of practically unlimited sums of their own business success is possible only through the aid of the money-lender.

He then presented an example, very similar to those in present-day finance texts, of the potential gains and losses that the equity interests could expect with the introduction of debt capital.

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33 Greene, op. cit.
The term "trading on the equity" was introduced into American financial literature by W. Hastings Lyon in his "Capitalization: A Book on Corporation Finance." He adapted the term from the British usage and used it to denote the policy of utilizing borrowed as well as owned capital in a firm's operation. He stated that the origin of the term "trading on the equity" was in the expression "Equity of redemption, which describes a mortgager's right in the property he has mortgaged; that is, the right to get back the title he has pledged to the mortgagee as security for the capital advanced. In Lyon's words,

"The business man mortgages his property to get more money in his business in order that he may engage in it on a larger scale, and all to the end that he may make a greater return on his own capital invested. To do this he undergoes the disadvantage that he must assume the greater risk."

Except among academicians, the term "trading on the equity has been superseded in the American vernacular by the term "leverage" and in the English vernacular by the term "gearing." These vivid terms conjure a clear mental image of the effect which obtaining borrowed funds at a fixed interest and maturity value has upon the earnings on, and the value of, the owned capital -- multiplying or magnifying the impact (upon owned capital) of fluctuations in the earnings on, and the value of, the total capital.

The trader on the equity in the case of a corporation is the common shareholder. Lyon suggested that the holders of the other

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corporate securities are taking shelter under the protection of the equity of the invested capital of the common shareholders. In his thinking, the common shareholders take advantage of the protection they offer by obtaining more funds for the business on terms that they expect will make their capital more profitable than it would be otherwise. Lyon devoted an entire chapter in his text to this concept. Corporation finance authors following Lyon devoted less attention to this concept. Interest in it has risen during the last decade.

One of the "classics" in the field of corporation finance, Financial Policy of Corporations36 written by Arthur Stone Dewing and first published in 1919 does not explicitly use the terms "leverage" or "trading on the equity." Other texts, however, did discuss the concept. For example, Corporation Finance37 written by Henry Hoagland and first published in 1933 deals with both terms. He states that

in a sense trading on the equity and leverage may be used interchangeably. Both suggest means by which the owner of the share capital may increase his rate of earnings through the process of spreading his equity to cover bond issues or other borrowings. Leverage is perhaps more harsh in its implications, since it places emphasis upon the spreading of the equity in thin layers. Trading on the equity tends to call attention to the fact that, after all, there is an equity to protect the lender and that its existence justifies the collection by the owner of the share capital of a return for its presence. In some respects, the word leverage is a more honest term, because, in both cases, the owner of the share capital is trying to use it as a lever.

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to lift a heavy load of borrowed capital, thereby earning for himself a larger return than if he relied only upon the use of the capital that he owns.38

Almost all of the texts in the field of corporation finance written since Hoagland's work have used a similar explanation of the term "trading on the equity." The explanation was invariably followed by an example showing the benefits to shareholders in prosperous times and the potential risks accompanying lean years.

Thus, trading on the equity can be viewed as a financing process. The prerequisite is debt capital available for use in the enterprise. The collateral for the debt is the equity capital existing. A part of the income arising from placing the debt capital in production is used to remunerate debt suppliers; any excess accrues to the benefit of the equity interests. It is true that the possibility of earning a smaller rate on total capital than the firm is paying on bonds confronts the business. In such a situation the negative effects of leverage are realized. Thus, leverage exposes equity interests to the possibility of greater losses as well as greater gains than would occur in an all-equity capital structure. Trading on the equity can generate additional income for the shareholders, but creditors will insist on commitments from management to insure the safety of their funds. Often coupled with the potential of added income is the requirement that management surrender a part of its freedom in managing the firm.

38 Ibid., p. 347.
Cost of Capital Concepts in the Tradition-Finance Literature

The purpose of this section is to examine the concepts presented in the traditional finance literature concerning the cost of equity and the cost of debt. Professor Pearson Hunt was probably the first to use the term "traditional approach." His definition is accepted in discussing the traditional finance literature. In reviewing Arthur I S. Dewing's fourth edition of The Financial Policy of Corporations in an article in 1943, Hunt used the term to describe the main emphasis of the literature of corporation finance until that time. He stated that

...the traditional approach to the subject matter took up the topics of the firms of corporate securities, of promotion and the financial plan, of evaluation of expansion with special reference to the holding company, of the determination and administration of income and of failure and reorganization, in the way in which it has become familiar to all readers in the field.39

The idea of utilizing borrowed funds for purposes other than consumption, e.g., to earn a rate of return higher than their cost is not new. John Locke faced by the question of why borrowers are willing to pay interest for the use of money answered by pointing out that the borrower can use the funds to produce more than the cost of borrowing.40

The corporate form of business organization was viewed by early writers as a means of dividing what were called the "incidents of

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ownership." These "incidents of ownership" were described as management, income, and risk.\textsuperscript{41} The cost of the capital sources to the firm and income to suppliers of capital were viewed as the two sides of the same coin.

The concept that the different sources of long-term capital had different costs with resultant benefits to equity interests was introduced early in the finance literature. In fact, in the oldest text entitled \textit{Corporation Finance} that the author could find, authored by Thomas Greene in 1897, the writer began by imploring equity interests to gain the advantages provided by debt in the capital structure.

It would seem that the traditional school took what could be called an incremental approach in the determination of the costs of the various sources under consideration were related to the incremental revenues which would be generated by the source.

For example, Greene stated: Let us suppose for illustration that a firm employs a capital of $1,000,000 in its business, one half of which it borrows from the banks on its commercial paper at six per cent interest. We will suppose also that the firm 'turns its capital over' six times a years, which is only another way of saying that its volume of sales is six times the capital. Assuming that our firm is enabled to earn two per cent net upon its sales, the resulting profits, $120,000, amount to twelve per cent upon the capital employed. As under our assumption the firm is paying six per cent on the amount borrowed, or $30,000 yearly, it follows that the actual earnings from the firm's own capital are $90,000, or eighteen per cent, a handsome return made possible only through the borrowing of money which can be used to extend the volume of trade and to earn something for the firm over and above the percentum of interest paid.\textsuperscript{42}


\textsuperscript{42}\textit{Greene, op. cit.}, pp. 1-2.
Thus, the emphasis, by what has come to be known as the traditional school of finance, is on the explicit costs which were directly attributable to the sources of capital. Early writers seemed to concentrate attention on the difference between the income demands of the suppliers of capital and the incremental revenues which an incremental amount of capital would generate. Attention seemed to be directed particularly to the difference in the cost of debt capital and the revenues produced by utilizing it in the firm.

While it was recognized by some traditional writers that the introduction of debt into the capital structure would increase the risk to equity interests, this question of increased risk was not explicitly dealt with.

As an example, Lyon stated:

The business man mortgages his property to get more money in his business, in order that he may engage in business on a larger scale, and all to the end that he may make a greater return on his own capital invested. To do this he undergoes the disadvantage that he must assume the greater risk. 43

Therefore, while it was indicated that the risks to equity interests rose with the firm's acquisition of debt, it was implied through numerous examples that the increase in risk to equity was not commensurate with the increase in revenues. This implicit assumption seemed to be the impetus for numerous recipes for increasing the returns to equity. This seemingly universal emphasis on the maximization of returns to equity led many writers to suggest an optimal financial structure. The optimum capital structure was defined as that combina-

43 Lyon, op. cit., p. 50
tion of stock and bonds which resulted in the highest market value for
the firm's total securities.

One example of this is provided in Forbes magazine published
privately for businessmen. The article was concerned with identi-
fying a 'sound' financial structure. The author felt that the
extremes and mean type of financial structure could be represented
by a pyramid; a pyramid standing on its head - an inverted pyramid -
and an ordinary office building. If one knew the strength and weak-
ness of the extremes, he would have enough knowledge of corporation
architecture to recognize well-built or badly designed structures when
he saw them. The pyramid had a broad base of common stock with a
small debt component. The inverted pyramid, quite logically, had a
small equity base with a large amount of debt. The readers of this
article were to note that the pyramid-shaped company was built to with-
stand severe financial storms and endure. However, the inverted pyra-
mid had its base in the air. And "if the Egyptian pyramids had been
built in this inverted fashion, they would not have withstood many
hard winds. We should find them today blown over upon one of their
sides and this is what happens to the inverted pyramid-type corporation
in a financial storm; reorganization sets it upon its base."^45

The author further indicated that: "However strong a pyramid may
be, it has obvious defects as an office building. The sloping sides
cut off valuable space, and a business corporation does not look to

^44 F. F. Johnson, "Organized Business Knowledge. How to Tell at a
Glance Whether Financial Structures are Sound or Unsound," Forbes
April 28, 1923, p. 93.

strength alone, but to utility. No architect would have suggested building the Woolworth Building in the shape of a pyramid. 46 When borrowed and owned funds were equal, the financial structure looked like an office building. Therefore the optimum capital structure seemed to be one composed of half debt and half equity.

Another writer, cited previously, Thomas Greene, stated that "formerly it was with hesitancy that a bank would lend a firm one quarter of its required capital; now, there is temptation for a writer to say that a quarter of the firm's own money with three quarters of borrowings, would be nearer the usual proportion. To borrow one half of one's necessary capital, in money or goods, is common." 47

These suggestions for optimum capital structure seem to suggest rather strongly that the traditional writers are convinced that the introduction of a reasonable amount of debt into the capital structure would prove beneficial to equity interests. Debt can usually be acquired at a lower cost than the current cost of equity capital. It is assumed that the firm can earn approximately the same return on the new capital structure, expanded by the addition of the debt capital, as it had previously on the smaller capital structure. Debt is assumed to demand a lower return because of the protection offered by the equity interests. Changes in the rate of return that equity should demand when confronted with higher levels of risk were not explicitly dealt with. Attention was instead directed to the possible ways to divide the higher returns to the firm which were made possible by the

46 Ibid., p. 93
47 Greene, op. cit., p. 4
acquisition of low-cost debt capital. Most commonly these increased returns are treated as accruing to equity interests. The possibility that some of it could be partially siphoned off in the form of higher salaries to managers, lower prices to consumers or higher wages to labor are ignored.

What then is the thinking concerning the cost of capital in the traditional finance literature? One could probably summarize the several possible positions by indicating that, first, there is belief that debt capital is available at a lower cost than equity capital. A second point is that investment opportunities are available yielding the same rate of return as previously secured from an all-equity structure. Third, the capital structure composed of both debt and equity is advantageous to equity because equity interests, defined as residual claimants can siphon off returns not demanded by debt and realize a higher percentage return on their investment. Therefore, from the point of view of the equity interest, firms are wise to incorporate some debt in the capital structure. As a result early writers felt compelled to discuss an optimum capital structure.

Cost of Capital Concepts in the Present Finance Literature

In this section, the concepts concerning the cost of equity and the cost of debt which are currently being discussed in the finance literature are examined. Although some of the current writings in the field contain the same concepts that were presented in the previous section, in some literature there has been a significant change in finance theory concerning the costs of debt and equity with varying degrees of leverage.
As was stated in the previous section, the traditional view is that the stockholders' position is enhanced by the judicious use of debt. In time, people began to wonder just what constituted the "judicious" use of debt. Business, as contrasted with the academic world, was unable to avoid the question. It would seem that management has always had to set minimum standards of required performance, decide the size and composition of capital expenditures and determine the appropriate balance of debt and equity in the capital structure. Although the approach to the solution of these problems probably was not expressed in terms of "the cost of capital," which seems to be still largely an academic term, management did develop some basis for making these decisions.

Today, surprisingly little is known about the managerial decision bases used by business and how they are derived. One of the strongest reasons for this seems to be that, traditionally, financial decisions have been formulated near the top of the business management organization and top management has usually been rather reticent about stating its decision-making logic explicitly. However, since new investments are being made constantly, it seems clear that business has developed a variety of approaches to guide the basic decisions which theory now suggests should be guided by a measure of the cost of capital.

One approach to determining the volume of investment has been to increase assets each year so that a company's relative position is maintained in a growing market. 48 Another approach is the so-called

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New England Theory of business expansion.49 This "theory" indicates an investment cutoff point by limiting the amount of capital expansion in any period to the volume of profits being earned in that period.

In contrast to the New England Theory is the Banker Theory for business expansion. Burchett explains this theory as follows: "This theory amounts to the proposition that expansion by borrowing should occur when, as and if the rate of earnings on the added capital is in excess of the rate paid by the corporation for that capital."50

In what would seem to be an effort to be definitive in the area, Burchett included both the New England and the Banker theories in an apparently contradictory recipe for determining capital structure.

Insofar as it is possible to deduce general rules with respect to the utilization of these two theories, the following appear sound: (1) Industries with a large proportion of fixed capital should employ the New England Theory. (2) Industries with a large percentage of liquid assets lean toward the Banker Theory.51

More recently, the emphasis seems to be shifting from the use of one of these general "theories" to the application of some type of standard to each investment proposal. Quite frequently, it seems, the standard applied is in the form of a payback period within which the proposed investment must return the funds invested in them. The use of a payback period as an investment criterion implies some minimum rate of return, but since the rate of return on a project de-

50 Ibid., p. 730.
51 Ibid., p. 730.
pends in part on the expected useful life of the asset which may differ from the payback period, the rate of return implied by any given payback period is difficult to determine.

In an attempt to aid financial management in setting the minimum standards of required performance for investments, deciding the size and composition of capital expenditures and determining the appropriate balance of debt and equity in the capital structure many writers in the present finance literature are working to define the concept of the cost of capital and determine methods for measuring it.

Solomon states that "cost of capital" is only one way of defining the concept involved in financial management's problem of selecting investments which will maximize net present worth. He mentions that the concept has also been referred to as (1) the minimum required rate of return on proposals using capital funds, (2) the cutoff rate for capital expenditures, (3) the "hurdle" rate or "target" rate of return which must be surpassed if capital-use is to be justified, and (4) the financial standard. In his opinion, these phrases describe the function performed in the process of making correct capital allocation decisions more adequately than does the term, cost of capital.

The concept of the cost of capital is being used by most writers, however, because it concentrates attention on the way capitalization rates for capital inflows and outflows are determined given the conditions under which the enterprise is able to obtain funds in the capital market for the proposed investment.

Much of the difficulty in determining the cost of capital arises from two factors. The first has been dealt with in a previous section.

It is the problem of business risk; business assets are utilized in projects which do not offer a sure return. The second factor is that businesses are faced with a bewildering array of available instruments which possess almost innumerable combinations of control, risk, cost and flexibility.

Thus, one is faced with the problem of determining how the cost of capital should vary both with the business risk and with the financial risk created by raising funds with varying attributes of risk, control, cost and flexibility.

Almost all of the present inquiries into determining the cost of capital begin with the certainty model. The certainty model postulates a world of complete certainty in which the return on capital is known. Under these assumptions, there could be no risk or uncertainty; therefore the cost of capital could be certain and known. It would be equal to the rate of interest determined by the time-value of money.

Within this certain world, it would be relatively easy for management to select acceptable investment alternatives. Managers would simply accept those proposals whose present worth (capitalized at the rate of interest) was larger than the required outlay.

The certainty model is not immediately useful since it deviates so markedly from the uncertain real world. Present authors have justified its use, however, as a logical point of departure -- a springboard for the solution of the problem at hand. It immediately focuses attention on the role of the cost of capital as a financial criterion.
for accepting capital-using proposals. It displays the cost of capital as a vital part of the selection process utilized to choose between two or more competitive ways of doing something and as a cutoff point for determining total capital expenditures.

Solomon indicates that the certainty-model provides additional insights. He states that

One of these is that true profitability, or economic efficiency, is not an absolute attribute, but depends intimately on prevailing market rates of interest. Thus a proposal that is economically efficient and hence desirable in one economy or at one point of time may not be so in another economy or at another time, if the cost of capital is different. 53

The certainty model in which both business and financial risk are taken as certain, it is agreed, loses much usefulness in the transition from the certainty world to the real world. Immediately, returns are uncertain and capital is supplied by equity interests as well as debt and by means of many instruments which combine the attributes of these polar forms.

In view of this, present writers are attempting to make the transition from the certainty model to the "real world." The basis for much of the current discussion is a new position first expounded by Franco Modigliani and Merton Miller. 54 While these writers utilized the certainty model as the springboard for their discussion, their contribution consisted of a model of the cost of capital which partially

53 Ibid., p. 31.

bridged the gap between the certainty world and the uncertain real world. With the exception of the current writing devoted to a re-examination of the traditional position, much of the work by economists in this area today is based on the premises first expostulated by Modigliani and Miller.

An understanding of the present thinking concerning the cost of capital begins with an examination of the Modigliani-Miller position. This position implies that in the absence of taxes on corporate income, the value of the firm to the stockholder is not altered by varying the amount of debt in the capital structure. These authors contend that the value of the firm is independent of the proportion of debt to total capitalization.

In order to understand this point of view, one must assume that a firm is composed of a fixed set of assets which are expected to produce a constant expected yearly income, $Y$, with no debt in its capital structure. One could then consider the effects of financing these assets with different proportions of debt to equity. The letters $L$ and $E$ are used to represent the market values of debt and equity, respectively. The letter $X$ is the measure of leverage and is defined as $L/E$. The total market value of the company, $V$, is defined as $L+E$.

The hypothesis advanced by Modigliani and Miller is that the total value of the company is fixed by the amount of $Y$ and the uncertainty connected with this income, and is not in any way dependent on $X$. Thus, one is introduced to their Proposition I, which states that with respect to leverage,

$$ V = \frac{Y}{p} = \text{a constant}, $$

where $p$ is the company's over-all cost of capital.
If one assumes that $V$ is in fact constant, then, the substitution of debt for equity produces results which differ from the traditional explanation. For example, assume that a company has $n$ shares of stock outstanding, and that the market price, $p$, of a share is one dollar. It is assumed that there are no corporation income taxes. The firm now issues debt in the amount of one dollar and uses the proceeds to repurchase one share of stock. It would seem apparent that, if the total value of the company is unchanged by this substitution, then the price per share of the company's stock cannot change. Because

$$V = L_0 + np = (L_0 + 1.00) + (n-1)p$$

implies that $p$ is constant and equal to one dollar. Thus, the hypothesis of Modigliani and Miller implies that the value of a share of stock is independent of the composition of the capital structure, given $Y$.

As was stated in the previous section, the traditional position holds that, as a company replaces equity with debt the average cost of capital to the firm falls, so long as the amount of debt incurred is within "reasonable" limits.

Modigliani and Miller, as was indicated earlier, were the first individuals to discuss the concept of a constant cost of capital to the firm with varying degrees of debt and equity in the capital structure. Since many current advocates of this point of view seem to accept their basic assumptions, it would seem worthwhile to state these assumption.

The first assumption is that firms can be grouped into homogeneous risk classes. The firms in a given risk class are not necessarily the same size, but the subjective probability distributions assigned to
the firms' expected values of Y must be such that all investors value all the firms in the class at the same rate of return p. In other words, one must assume that investors "demand" the same rate of return for all firms whose expected income is regarded by investors as identically risky.

The expected average yearly income $\bar{Y}$ is defined in the following manner. First, $X [Y(t)]$ is defined as a joint probability distribution for the incomes in all future years, $Y_1, Y_2, Y_3 \ldots$ The variable $Y$ is defined as the average of the values in this series. Modigliani and Miller assumed that even though $Y_1, Y_2, Y_3, \ldots$ could be an infinite series, $Y$ would approach some finite value because the mean of the probability distribution of each $Y_t$ was assumed to be constant and the variance of each was finite. Thus, Modigliani and Miller define their constant expected yearly income as $\bar{Y} = E(Y)$. In a strict sense one could maintain that $Y$ is not a random variable, since there is a definite, "true" value for it. It is treated as a random variable because one does not know what this true value is. In a way, it is assumed that stockholders use past and present income as data in a sampling process to make an inference about the value of $Y$, and as the profits of the firm are observed over the years, stockholders may well change their best estimate of what $Y$ is. In this situation the risk to investors arises not only from the random fluctuations of $Y_t$, but also from the possibility that the actual value of $Y$ may turn out to be different from their "best estimate," $\bar{Y} = E(Y)$.

In addition, Modigliani and Miller assume that all present and prospective investors have determined identical estimates of the average expected income $\bar{Y}$.
Stocks and bonds are assumed to be traded in perfect markets. The authors also assumed that there were no taxes on corporate income.

For the purposes of this discussion, the most important implication drawn from an analysis based on these assumptions is that the cost of capital to the firm remains constant while the proportions of debt and equity in the capital structure are varied. This cost is not affected no matter how "judicious" or "excessive" the use of debt.

This entire point of view is expanded in the next chapter.

The Author's Concept of the Cost of Capital

Both traditional and nontraditional concepts of the cost of capital have been presented. The author's definition varies somewhat from both of these. In the writer's opinion, the cost of capital is that rate of return that must be earned in order that the firm's suppliers of capital will be willing to continue to supply their type of capital to the firm. It is deceiving, in a way, to use the word 'cost' in this concept. Cost seems to be an ex post or 'realized' concept while the author's cost-of-capital concept is entirely ex ante or anticipatory. It is the return that suppliers of capital are anticipating should be earned. The confusion resulting from the ex post or realized approach can be demonstrated by applying it to a firm that realized zero profits or even negative profits. Surely it is folly to suggest that this firm has no cost of capital or perhaps even a negative cost of capital. If the cost of capital were computed in this way and it was utilized in determining a cut-off point for investment alternatives, management would be faced with strange investment recommendations.
The author feels that the word 'should' in the phrase 'should be earned' used in defining the cost of capital was correct. It is a normative concept.

The rate of return to be demanded from a given quantity of assets depends on the market evaluation of the risks associated with these assets. This most appropriate rate of return that should be demanded from a given volume of assets is not fixed -- it varies continuously. Anything that changes any of the myriad risks associated with a body of assets changes this most appropriate rate of return. Factors of change could be the investment in projects with a risk level different from the present risk of the firm, changes in technology, changes in competition, etc.

In addition, ignoring corporate taxes for the time being, the writer conceives the cost of capital to a firm as being constant as the proportion of debt and equity in the capital structure are varied. It would seem incredible to suggest that a change in capital structure could affect the real productivity of a firm. In most cases, it would seem that the laborers would not know whether their plant and equipment was financed with debt or equity. Also, as explained in great detail later, as low-cost debt is introduced into the capital structure, the risk, and therefore the return commensurate with that risk, must rise for the equity interests. Once debt is introduced, financial risk is added to business risk for equity holders. As explained later, if both debt and equity suppliers demand a rate of return commensurate with the risk confronting them, the cost of capital to the firm will remain constant.
This, then, is the author's concept of the cost of capital. This concept is expanded and embellished throughout the remainder of this work.
CHAPTER III
THE COST OF CAPITAL MODEL

Introduction

In this chapter, cost of capital models which represent the traditional finance literature, the present finance literature and the writer's point of view are contrasted.

A model can be defined as a representation that attempts to explain the behavior of some aspect of reality. A model, being an explicit representation of reality, is necessarily less complex than the reality itself, but it must be sufficiently complete to approximate those aspects of reality which are being investigated. Models are utilized because every empirical problem is enormously complex. There are literally an uncountable number of inherent factors in any important empirical situation, and every potential course of action starts a chain of cause, effect and interaction that logically is without end. Consider, for example, the relatively simple problem confronting a professor desiring to lecture to a class meeting in a room with only one entryway, a door with a standard knob. An endless amount of time could be devoted to gathering factual material about this situation: a map describing the precise location of the building; a contractor's report specifying the exact physical characteristics of all external parts of the building; a diagram of the interior of the building; a detailed record of the climatic conditions of the neigh-
borhood; a calculation of the amount of effort to be expended in opening the door based on the size of the knob, weight of the door, efficiency of the hinges and the size of the door-opener's hand. If any decision maker adopted a strategy of collecting all the facts before he acted, it follows that he would never act. The human mind cannot consider every aspect of an empirical problem; some attributes of a problem must be ignored if a decision is to be made. One must abstract from the empirical situation those factors which are considered to be most relevant to the problem faced. Abstraction is the first step in the solution of any human problem.

After selecting the critical factors, or variables, from an empirical situation, one must combine them in some logical manner so that they form a counterpart or model of the empirical problem. A model, then, is a simplified representation of an empirical situation; ideally, it bares a natural phenomenon of its bewildering complexity and duplicates its essential behavior with a few variables, simply related. The simpler the model, the better, provided it serves as a reasonably reliable counterpart of the empirical problem. Thus, a model is economical of time and thought and can be understood and manipulated more easily than its empirical counterpart.

One must remember that the objective of the model builder is not to construct a model that is as close as possible to reality in every respect; such a model would require an infinite length of time to construct and then it might be beyond human comprehension. Rather, the model builder wants the simplest model that predicts outcomes reasonably well and is consistent with effective action on the user's part.
Once a model has been constructed, certain conclusions may be derived about its behavior by means of logic or by other tests. The decision maker bases his action on these conclusions. If the logic in deriving the conclusions from the abstracted variables is correct, and if the relevant variables have been abstracted, then the solution to the model problem will also serve as an effective solution for the empirical problem.

In this presentation, as in every analysis utilizing abstraction, the writer has drastically oversimplified the complex reality of the problem in an effort to explain certain of its salient aspects.

Cost of Capital Models Utilized in the Traditional Finance Literature

In an earlier section, the concepts of the cost of capital contained in what has been called the traditional finance literature were presented. It was indicated that the traditional writers took what could be called an incremental approach to the solution of the cost-of-capital question. It seems that they focused their attention on the explicit incremental costs and benefits incurred by the investment of a new amount of capital. In particular, if the new source were debt, the interest payments were compared with the incremental returns of investment.

It seems that the traditional writers conceive of the most of capital as being an ex post or realized concept. The cost of debt capital is contractual and the firm attempts to secure the lowest rates of interest, or lowest cost, available. The discussion concerning returns to equity is almost all from an ex post or realized point of view. For example, attention is focused on the benefits to equity resulting from
the introduction of debt into the capital structure. The early discussion of the effects on equity resulting from the introduction of debt was almost completely confined to a discussion of the increased earnings. Attention was not focused on the idea that the risk to equity interests increases with the introduction of debt. No attempt was made to determine what rate of return equity interests should demand from the new combination of business risk plus financial risk created by the acquisition of debt capital with fixed legal claims. Equity interests were defined as residual claimants and they were treated as if their demands or anticipations should be residual.

In line with what has been called its ex post approach to the costs of the various sources of capital, it seems that one could characterize the early traditional approach to finance theory as positive when contrasted with normative. The traditional writers seem to deal with the costs as they exist. They do not, for example, attempt to determine what the various suppliers of capital should demand under different combinations of business and financial risk. Instead, they focus their attention on returns which result from the different combinations of debt and equity.

This is not to say that all early writers ignored the increase in risk to equity interests resulting from the introduction of debt into the capital structure. However, while it was indicated that the risks to equity interests rose with the firm's acquisition of debt, it was implied through numerous examples that the increase in the risk to equity interests was less than commensurate with the increase in revenues. The conclusion is implied in the early writers' concept of the optimum capital structure as being one which contains some debt capital.

While early writers did not present a graphic representation of the cost of capital concept, it would seem that one could be easily constructed to represent their views. Their concept of the model will be presented as a graph which has the vertical axis representing the rate of return and the horizontal axis representing the combination of debt and equity in the capital structure, progressing from an all-equity capital structure at the origin to an all-debt capital structure. The line on the graph representing the cost of

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capital would begin at that rate of return adjudged by the market to be commensurate with the risks inherent in the assets of the firm. The amount of risk inherent in a given "bundle" of assets will vary with the amount of business uncertainty involved in a firm's operations and with the attitude of the capital markets toward this uncertainty. This uncertainty in turn is composed of a composite of expectations with regard to a company's product markets and prices, the fixity of its costs, the liquidity and marketability of its assets and the opinion of the market with respect to the firm's management.

It is assumed that the capital markets are reasonably perfect and that there are no corporate income taxes.

For the purposes of this presentation, it is assumed that a ten per cent rate of return is adjudged by the capital market to be commensurate with the risks involved in the model firm with an all-equity capital structure.

There are two ways in which the debt-to-equity ratio can be altered in a model. It can be assumed that the model firm substitutes debt for equity in its capital structure, i.e., it issues debt and uses the proceeds to redeem outstanding stock. This approach has the virtue that it keeps the asset structure constant as leverage changes. An alternative method for analyzing changes in leverage is to permit the model company to expand, i.e., to issue more and more debt using the proceeds to acquire additional assets. In order not to contaminate the leverage effect, however, it is necessary to assume that each new asset acquired generates operating earnings of a same size and quality as those produced by existing assets. Although both appro-
ches yield the same conclusions, in this paper the method which changes leverage by substitution is used.

With these assumptions in mind, it would seem that the traditional position could be portrayed as follows:

![Graph]

Figure I

TRADITIONAL REPRESENTATION OF THE COST OF CAPITAL

In the notation used with the proceeding graph, \( V \) represents the combined total of the company's stock and bonds or the total market value of the firm. The symbol \( k_e \) represents the rate at which the
market capitalizes the net earnings of the firm; $k_1$ represents the average yield on the company's debt and the symbol $k_o$ represents the over-all capitalization rate which equates earnings on capital to the company's total market value.

The traditional view of the hypothetical reaction of a firm's over-all cost of capital was that initially as low cost debt capital was introduced into the capital structure, $k_o$ would fall. The assumption, often implicit, concerning investment was that new investments would be made at the same risk level as was contained in the existing assets of the firm.

The over-all cost of capital would fall because while $k_e$, the rate at which the market capitalized net earnings, rose with the introduction of low-cost debt; it would not rise fast enough to offset the increase in the net earnings rate achieved through the increased use of the lower cost debt capital.

However, the increase in debt could not continue unabated.

Taking a position typical of the early traditional writers, Burchett cautions that

Over a period of years the experience of investors in corporations will gradually erect standards by means of which they will be inclined to favor or disfavor borrowing operations by a corporation. If the amount which the corporation seeks to borrow is greater than the limit which the experience of the investors has shown to be safe for similar corporations in comparable circumstances, investors will be unwilling to part with their funds. Indeed, as a corporation borrows more and more, the increasing resistance encountered in securing money in the capital markets of the country, although perhaps a mental state, is a real and seemingly insurmountable barrier which finally limits the borrowing operations of the corporation. Whether or not
these barriers are based upon indefinable tenants, they exist and must be admitted in any determination of the borrowing policy.\textsuperscript{5}

Therefore, beyond a certain critical point, further increases in the acquisition of debt capital were unwise. When leverage was carried beyond this critical point, increases in the cost of debt were such that the over-all capitalization rate was forced upward. In the traditional view, there was an optimum capital structure. The optimum capital structure was defined as that which caused $V$ to reach its highest value. Increasing debt levels beyond that amount contained in the optimum capital structure caused sharply increased interest rates which made further borrowing unwise.

Cost of Capital Models Utilized in the Present Finance Literature

Introduction

The cost of capital models utilized in the present finance literature are here examined with respect to their usefulness for financial management. The scope of financial management has been redefined in the recent literature to cover decisions about both the use and the acquisition of funds. Within this broadened context it would seem, as Solomon has suggested, that the principal content of the subject should be concerned with determining the answers to three basic questions:

1. What specific assets should an enterprise acquire?
2. What total volume of funds should an enterprise commit?

3. What should be the composition of its liabilities?  

As will be demonstrated throughout this paper, these questions are very closely related. The three questions are really three facets of the same basic problem and in reality they must be solved simultaneously. In the writer's thinking, the solution to the basic problem can most easily be achieved by immediately attacking the last of the three questions posed, namely: what should be the composition of the firm's liabilities?

Questions concerning the composition of a firm's liabilities and its effect on the cost of capital have been vigorously debated in the recent finance literature. In discussing the effects that varying capital structures have on the cost of capital, writers are led to varying answers to the first two questions which were posed as the principal content of the subject of financial management. It is this writer's intent, then, to examine in this section the models presented by current authors dealing with the implications for the cost of capital resulting from varying financial structures. In the next section, the author will present his views on the subject.

Schools of thought in the present literature. It would seem that present writings in the literature concerning this subject could be divided into two rather clearly defined schools. One school of thought contends that a variation in capital structure will have no effect on a firm's cost of capital. The second group asserts that the traditional position reviewed in the previous section is correct and seeks

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to demonstrate that the cost of capital is affected by the composition of a firm's liabilities.

The Modigliani-Miller approach. The first view seems to have gained its impetus from an article by Franco Modigliani and Merton Miller published in 1958. The basic proposition underlying this argument is that in a world of perfect markets and rational investors, two identical companies, i.e., two sets of assets offering net operating earnings of the same size and quality, must have the same total market value, regardless of differences in leverage. Once this assumption is granted, the market value of a company and hence its cost of capital are both independent of its financial structure. A perfect market was defined as one in which two identical commodities could not sell at two different prices, and the foregoing proposition logically followed.

Other writers had expressed doubt concerning the logic of the traditional position and its associated proposition that a change in leverage, in itself, could increase a firm's total market value or reduce its over-all cost of capital. Durand, in one of the earliest papers of this nature, argued against the traditional position because it implied that the totality of risk or uncertainty incurred by all security holders of a given firm could be altered by changing the way in which this totality was distributed among the classes of capital.


suppliers. Durand held that a change in leverage could only change the way in which operating earnings and the uncertainty of these earnings were distributed between owners and bondholders. He maintained that a change in capital structure could not change the total amount of uncertainty. Therefore, since the market value of a firm depended on these totals, a change in leverage could not change the total market value.

In addition to the hypothesis advanced from the certainty model they had constructed, Modigliani and Miller attempted to show that the existing capital markets were sufficiently perfect to ensure that their propositions would hold in the real world of uncertainty. Assuming that corporate taxes could be ignored, they attempted to demonstrate that the mixture of debt and equity did not affect a firm's over-all cost of capital. Modigliani and Miller proposed that the investor's ability to engage in personal leverage was enough to ensure that a firm's leverage could not alter total market value. A key assumption at this point was that all borrowers with a given debt-to-equity ratio would be required to pay approximately the same rate of interest. Since the rate of interest charged on brokers loans to individuals has not been noticeably higher than over-all corporate borrowing rates, this assumption does not seem to be seriously out of line with general capital market conditions.

This proposition was clarified by means of a simple numerical example. In this example it is assumed that the rate of interest is equal for all borrowers and that it does not vary with the degree of leverage used. Assume that two companies C and C* exist. The companies are identical in all respects except in their use of leverage.
C is an unlevered firm financed entirely by equity. C produces net operating earnings of 10 dollars per annum. These earnings are capitalized by the market at the rate of ten per cent. The value of the company is therefore one hundred dollars and since no debt exists the value of its stock is also one hundred dollars.

The second company, C*, has some debt in its capital structure. Assume that it possesses four per cent bonds in the amount of thirty dollars in its capital structure. It is assumed that the effective market rate of interest for obligations of this risk level is four per cent so that the bonds have a market value of thirty dollars. The Modigliani-Miller proposition discussed above would hold that the value of company C* must be the same as the value of company C. In other words, the market value of the levered firm, V*, must be equal to the market value of the unlevered firm, V or V* = V.

The traditional position discussed in the previous section of this chapter would not necessarily have evaluated V* as being equal to V. If the leverage possessed by company C* exceeded what was thought to be the "acceptable" amount, the traditional theory would have evaluated V>V*, or V*<one hundred dollars. On the other hand, if the degree of leverage had been within "acceptable" limits, traditional theory would have evaluated V*<one hundred dollars. For illustrative purposes assume that traditional theory would have assigned a value of one hundred and ten dollars to V*. The value of the bonds of V* was set at thirty dollars therefore, the stock would be evaluated as being worth eighty dollars.

The Modigliani-Miller proposition maintains that this assumed discrepancy between V and V* cannot exist very long. Rational investors
would immediately seize upon this opportunity to increase their yields. They would eliminate the discrepancy through what Modigliani and Miller described as arbitrage. In their view the owner of the "over-valued" stock, the levered stock of C*, could sell his stock, borrow on his own account, buy stock of the unlevered firm C and realize a net gain.

For example, assume that the investor owns one-tenth of the stock of the levered firm C*. This holding yields net operating earnings of one dollar. On this share the company pays interest pro rata in the amount of twelve cents. The stockholder possesses net earnings of eighty-eight cents.

Now if the value of the stock of the levered firm or S* was worth eighty dollars as suggested by the traditional position, the stockholder could sell his shares of C* for eight dollars. He could then borrow two dollars from a broker at four per cent per annum and use the ten dollars to acquire a one-tenth interest in the outstanding stock of the unlevered company C. The new holding would yield net operating earnings of one dollar. This yield is subject to risks identical with those affecting the yield from C*. After paying the broker eight cents interest, the stockholder possesses net earnings of ninety-two cents. This return is greater than the eighty-eight cents acquired from his previous holding of C*. Modigliani and Miller also indicate that since the two streams of net operating earnings are of like quality, the fact that the new holding is subject to smaller prior charges makes it better in quality as well as quantity.

Therefore, the Modigliani-Miller position is that investors will sell C* and buy C on margin and that this process of arbitrage or switch-
ing will continue until any opportunities for further gain cease to exist. This point will be reached only when $V^* = V$.

Modigliani and Miller use a similar line of reasoning to show that the total market value of a highly levered company cannot be lower than that of a less levered firm.

Through this method of reasoning, Modigliani and Miller conclude that for any given company the total market value $V$ and the over-all capitalization rate $k_o$ by which its earnings are valued by the market will be constant over all possible ranges of leverage, or that $V = V^*$ and $k_o = k_o^*$. This means that the cost of capital function with respect to leverage is horizontal and not U shaped as envisioned by traditional theory.

Modigliani and Miller demonstrated by the use of a graph the meaning of their basic proposition. For the purpose of this study, it would seem useful to separate their composite graph into two parts to more clearly show the meaning of their statement. In presenting their views, the authors state that in the simplest case with $r$ (the rate of interest) constant at all levels of leverage, the relation between the yield on common stock and financial structure, measured by $D/S$ would approximate the straight line $(M - M')$ with the slope of this line defined as $p_k$ (the appropriate capitalization rate for the class) minus $r$. The line $M - L$ represents the assumed relationship between yield and leverage. The intercept of the $M - M'$ line would occur at $p_k$ as shown in the graph on the following page.
Expected Yield on Common Stock

\[
\begin{align*}
\text{Expected Yield on Common Stock} & \quad \% \\
M'_{f} & \quad L \\
M_{f,k} & \quad \% \\
0 & \quad 0.25, 0.50, 0.75 \\
& \quad \text{Leverage}
\end{align*}
\]

**Figure II**

THE MODIGLIANI - MILLER COST OF CAPITAL-LEVERAGE RELATIONSHIP WITH CONSTANT RATE OF INTEREST

Modigliani and Miller indicated that this relationship between rate of return to equity and leverage would hold true for all firms of a given risk class. The intercept of \( p_k \) would vary with different risk classes.\(^9\)

In an attempt to apply their model to the world of uncertainty, the authors then explain what would result in a situation in which interest rates did not remain constant at all levels of leverage but in fact

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\(^9\)Modigliani and Miller, *op. cit.*, p. 274.
rose with increased leverage. They mention that their basic proposition is actually unaffected in form and interpretation by the fact that the rate of interest may rise with leverage; while the average cost of borrowed funds will tend to increase as debt rises, the average cost of funds from all sources will still be independent of leverage (apart from the tax effect). This conclusion follows directly from the ability of those who engage in arbitrage to undo the leverage in any financial structure by acquiring an appropriately mixed portfolio of bonds and stocks. Because of this ability, the ratio of earnings (before interest charges) to market value - i.e., the average cost of capital from all sources must be the same for all firms in a given class. In other words, the increased cost of borrowed funds as leverage increases will tend to be offset by a corresponding reduction in the yield of common stock.\footnote{Ibid., p. 273-274.}

In their thinking if the rate of interest increased with leverage, the yield on common stock would still tend to rise with increased leverage but at a decreasing rather than a constant rate. They stated that beyond some high level of leverage, depending on the exact form of the interest function, the yield might even start to fall.\footnote{Ibid., p. 275.}

This situation is portrayed in the graph on the following page.

The interest rates available to the firm are shown by the curve \( r-G \). In contrast to the previous graph, the interest rates here begin to rise rapidly once a certain level of leverage is attained. The authors mentioned that with interest rates rising the relationship between the yield on common stock and leverage could conceivably take the form indicated by the curve \( MD \). This down-curving yield for equity was contrasted with the situation in which interest rates remained constant with increasing amounts of leverage. In the case of constant interest rates
the relationship of yield and leverage would be linear throughout as
shown by line MM' of Figure II.

The Modigliani-Miller position to the effect that "beyond some
high level of leverage depending on the exact form of the interest func-
tion, the yield may even start to fall" is in the author's thinking
logically inconsistent, indefensible and incorrect.

Modigliani and Miller state that the downward sloping part of the
curve MD might require some comment since it might be hard to imagine
why investors, other than those who like lotteries, would purchase stocks
in this range. They stated that
should the demand by the risk-lovers prove insufficient to keep the market to the peculiar yield-curve MD, this demand would be reinforced by the action of arbitrage operators. The latter would find it profitable to own a pro-rata share of the firm as a whole by holding its stock and bonds, the lower yield of the shares being offset by the higher return on bonds.

It would seem that this statement implies that bonds holders are receiving a return that is more than commensurate with the market evaluation of the risk. This would seem to be the only situation in which an investor would prefer to hold them in preference to other bonds in other firms of the same risk class. In addition, it seems improbable that rational investors, which are assumed by Modigliani and Miller would continue to hold the stock at the downward sloping portion of line MD. This paradox is nonexistent in the author's explanation of the yield-leverage relationship at the end of this chapter.

The Neo-Traditional School

A school of thought found in the current literature supports the traditional point of view. One of the strongest positions taken seems to be that of Ezra Solomon. After reviewing the Modigliani-Miller position, he restates and defends the traditional position which holds that, even if the tax effect of leverage is ignored, moderate leverage can lower $k_0^*$ (the over-all cost of capital in a levered capital structure) relative to $k_0$ (the over-all cost of capital in a unlevered capital structure). He indicates that the traditionalists' counter-
argument to Modigliani and Miller arbitrage model is that personal leverage is not a perfect substitute for corporate leverage and that the equilibrating mechanism posited in the arbitrage model might not fully erase the tendency for $k_0^*$ to fall below $k_0$.

Solomon divides the basic Modigliani-Miller thesis into two component statements. These are "(1) an increase in borrowing (and hence in leverage), no matter how moderate or 'judicious,' can never lower a company's cost of capital; (2) an increase in borrowing (and hence in leverage), no matter how immoderate or 'excessive,' can never raise a company's cost of capital."

In Solomon's thinking, the really crucial part of the Modigliani-Miller thesis is the second part, namely, that $k_0$ will not rise, no matter how far the use of leverage is carried. He concedes that this conclusion might hold if it is assumed that the rate of interest paid for debt does not rise as leverage is increased. In practice however, Solomon maintains that the average rate of interest paid on debt, $k_1$, must rise as leverage is increased. This observation that the average rate of interest paid on debt rises with increased leverage leads Solomon to reject the Modigliani-Miller model as a reasonable representation of the behavior of a firm's capital costs in the real world of uncertainty. Solomon states that for $k_1$, the average cost of debt, to rise, the marginal cost of borrowing must be above $k_1$. Therefore, at some point a firm in increasing its leverage would find that $m$, the

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13Ibid., p. 275.
marginal cost of more debt, is higher than its average cost of capital, \( k_o \). In view of the attitudes of the suppliers of debt capital, Solomon feels that this point could be reached quite rapidly if leverage is increased beyond levels acceptable to the debt markets.

All this leads Solomon to conclude that

For all practical purposes, the point at which a company finds that \( m > k_o \) represents the maximum use of leverage, for it can be argued that no rational company will finance with more pure debt if it can do so more cheaply by using a mixture of debt and equity similar to that outstanding in its existing structure. If this fact is accepted, then the argument between Modigliani and Miller and the traditional position vanishes. Both would agree that leverage is clearly excessive if carried beyond the point at which the rising marginal cost-of-debt curve intersects the over-all cost of capital at that point.\(^{14}\)

At this point Solomon argues that if the straightforward logic of his position is accepted, one is left with something very similar to the U-shaped \( k_o \) curve envisaged by traditional theory. This position is outlined in Figure IV.

One wonders if after discussing the Modigliani-Miller position ignoring taxes, Solomon includes the tax effect in the representation of the traditional position in order to ensure a U-shaped \( k_o \) curve. In this representation \( k \) is defined as the rate of return on investment. The symbol \( k_o \) represents the over-all cost of capital, \( k_e \) represents the cost of equity capital, \( k_d \) represents the average cost-of-debt capital and \( m \) represents the marginal cost of debt. The graph indicates that in the early phases of leverage, \( k_o \) declines. Solomon maintains that this happens possibly because of leverage but at the very least because of the tax-effect factor.

\(^{14}\)Ibid., p. 276.
The traditional position is that the cost of debt is constant until the amount of debt in the capital structure reaches the limit acceptable to the debt market. Once these limits are exceeded, \( m \) rises rapidly and the tax advantage of even more leverage is offset by the rising cost of further increments of debt. Once the marginal cost of debt, \( m \), exceeds \( k_o \), further increases in leverage will cause a rise in \( k_o \). On the basis of this evidence Solomon maintains that one can determine a clearly determinate point or range of optimal leverage for a firm. Professor Solomon feels that it is unfortunate that Modigliani and Miller and their followers have not been willing to accept his conclusion.

\[ \text{TRADITIONAL VERSION}^{15} \text{ LEVERAGE AND CAPITALIZATION RATES (TAX EFFECT INCLUDED)} \]

\[ ^{15}\text{Ibid, p. 277.} \]
Instead, they argue that $k_0$ remains constant even when leverage is increased beyond the point at which $m > k_0$. According to them, what brings about this startling and wholly illogical result is that $k_e$, the cost of equity capital, falls as leverage is increased through the use of increments of debt which cost more than $k_0$. This device of having $k_e$ fall as leverage is increased leads squarely into a second dilemma. We now have to assume that rational investors in the equity markets capitalize a more uncertain stream of residual earnings at a lower $k_e$ than they capitalize a less certain stream.16

It is indeed difficult to reconcile this reasoning by Modigliani and Miller with the assumptions stated early in their paper concerning rational investor behavior and reasonably perfect markets. The sole explanation they offer in support of a downward sloping $k_e$ curve seems rather weak and is as follows:

Should demand by risk lovers prove insufficient to keep the market to this peculiar yield-curve, this demand would be reinforced by the action of arbitrage operators.17

Solomon in what seems to be a statement expressing the consensus of many critics objects to the introduction by Modigliani and Miller of subjective risk preference as a major determinant of equity prices for just this phase of the leverage argument. The critics have suggested that any explanation should be applicable to all phases of leverage.

In what Solomon characterizes as a last line of defense in support of a constant $k_0$, Modigliani and Miller simply assert that arbitrage will keep $k_e^*$, the equity-capitalization rate for an overly levered stream of net earnings, below $k_e$, the rate for a less levered stream so

16*Thid.*, p. 278.

17*Modigliani and Miller, loc. cit.*, p. 276.
that \( k_o^* \) will equal \( k_o \). Once again it would seem that on the basis of the early assumptions concerning rational investors and reasonably perfect markets, this position is not justified. Indeed, it would seem that the opposite is true. It would seem that rational investor preferring increased return with increased risk would force \( k_o^* \), the cost of highly levered equity, above \( k_e \), the cost of less highly levered equity and in turn force \( k_o^* \), as described in this presentation above \( k_o \), the average cost of capital for a less highly levered firm.

On the basis of his investigation, Solomon concludes that

> There is, therefore, no legitimate basis for assuming that \( k_e \) will fall as leverage is increased and hence no basis for assuming that \( k_o \) can remain constant as leverage is increased through the use of debt issues which involve a marginal cost higher than \( k_o \). Given this conclusion, it must follow that the cost of capital \( k_o \) rises with the increased leverage whenever \( m > k_o \).

Development of the Writer's Model

Both the traditional and nontraditional concepts of the cost of capital model have been presented. The author's concept of this model varies somewhat from both of these. Since the Modigliani-Miller explanation assuming constant interest rates with increasing degrees of leverage was shown to be logically inconsistent and their explanation assuming varying interest rates seems unreasonable in view of their assumptions concerning rational investors and reasonable perfect markets it would seem that their approach should be rejected. Also, in view of the work of Durand cited previously, it would seem that the traditional model is not adequate to meet the needs of decision makers.

\[^{18}\text{Ibid.}, \text{p.} 279.\]
It is the writer's belief that the model developed in this section more adequately meets the requirements of the definition of a model, that is, presenting a reasonable, but simplified representation of reality. As will be demonstrated later in this paper, the author's model can be used to predict the outcome of "real world" situations reasonably well and is consistent with effective action on the user's part. It will be demonstrated that solutions derived from the use of the model will serve as effective solutions for the empirical problems it represents.

Assumptions. At this point it would seem appropriate to identify the assumptions to be used in the writer's analysis. Initially, it is assumed that one is dealing with firms which possess or acquire assets of only one quality. Later in the paper this assumption is relaxed. These assets are such that for each dollar invested, a flow of operating earnings is generated which provides a rate of return of \( k \) per annum of a given quality with respect to the certainty or uncertainty with which it can be expected to occur. The specific quality inherent in the assets of this model firm is immaterial so long as all assets possess the same quality. Quality then, in this sense, is related only to certainty earnings. Since the assets of each firm are assumed to be of a given quality, changes in risk will occur solely as a result of changes in leverage. It should be clear that assuming a given level of risk is not the same as assuming no risk. The model merely identifies a risk level and holds it constant for purposes of analysis. In the "real world" it is quite true that the risk level of a firm will not be known or constant.
The second assumption requires that the model company may acquire a capitalization structure composed of only two kinds of financing, pure externally derived equity in one case and debt in the other. This second assumption is maintained throughout the analysis. However, it can be illustrated that the use of more than two types of financing would not change the conclusions.

The third assumption is that the structure of market capitalization rates is given and that this structure does not change over time. This assumption is relaxed later in the paper. The market is assumed to consist of rational investors. Rational investors are assumed to prefer more return to less and possess an aversion to risk. Initially it is assumed that there are no corporate taxes; however, in Chapter V this assumption is relaxed.

The final assumption, which is relaxed in Chapter IV is that the capital market is reasonably perfect. This assumption has commonly been used in the analysis of the cost-of-capital problem and is defined as one in which buyers have equal knowledge concerning products. Following from this, it is assumed that in a reasonably perfect market a given commodity cannot consistently sell at more than one price.

The term reasonably perfect market as used in the finance literature has not possessed the meaning given to it in the literature of economics where it implied perfect knowledge of the future; hence no risk and no return for assuming risk.

**Development of the model**

There are two ways in which leverage can be altered in a model. It can be assumed that the model company substitutes debt for equity.
in its capital structure, i.e., it issues debt and uses the proceeds to redeem outstanding stock. This approach has the virtue that is keeps the asset structure constant as leverage changes. An alternative method for analyzing changes in leverage is to permit the model company to expand, i.e., to issue more and more debt, using the proceeds to acquire additional assets. In order not to contaminate the leverage effect, however, it is necessary that each new asset acquired generates operating earnings of a same size and quality as those produced by existing assets. Although both approaches yield the same conclusions, in this paper the method which changes leverage by substitution is used.

**Return to debt holders**

As mentioned previously, it would seem that the leverage question can most easily be resolved by thinking in terms of a model. This model will be presented as a graph with the vertical axis representing the rate of return and the horizontal axis representing the degree of leverage. The model firm is assumed to be a ten per cent firm. In other words, the market is in agreement that a ten per cent return to the owners of the firm's assets is completely commensurate with the risk of success or failure inherent in the assets of the firm. Therefore, at an all equity position, equity interests will demand a ten per cent return. As the firm approaches a one hundred per cent debt position, it would seem that the demands of debt holders would approach ten per cent. This would seem logical since as the debt position approached one hundred per cent the position of the debt holders would approach that of the equity interests at a one hundred per cent equity
position. It would seem that rational investors in a reasonably perfect market would demand the same ten per cent return from the same bundle of assets with their same inherent risks. Since in a reasonably perfect market a given commodity cannot consistently sell at different prices, it would be expected that rational suppliers of debt capital would demand the same return from this given bundle of assets as did equity interests at an all-equity position as debt's position vis-à-vis the assets approaches that of the equity interests when the capital structure was entirely equity.

Solomon seems to support this position when he states: "for extreme leverage positions, i.e., as the company approaches an all-debt situation, it is clear that \( k_d \) will be at least equal to \( k_e \)."\(^{19}\)

The risk to debt holders in this capital structure which contains less than one hundred per cent debt is a risk level less than that commensurate with a ten per cent return and approaches that point only as debt becomes one hundred per cent of the capital structure. Below a one hundred per cent debt capital structure, the risk to debt holders is less than that contained in the business risk of the assets because of the protection afforded by equity. The claims of equity interests are defined as subordinate to those of debt interests by law. As the capital structure approaches one hundred per cent debt, this legal advantage of debt disappears. The advantage continues to exist but becomes meaningless for practical purposes.

\(^{19}\)Ibid., p. 276.
The debt holders are assumed to be rational investors, preferring more return to less and demanding a return commensurate with risk assumed. As such, the rate of return demanded as the capital structure approached one hundred per cent would approach ten per cent. It is assumed that the business risk inherent in the assets is ten per cent. As the capital structure approaches one hundred per cent debt, the total risk assumed by debt holders would be commensurate with the risk inherent in the assets of the firm or ten per cent. In line with this approach, Solomon states: "...at one hundred per cent leverage, the bondholders are simply owners with no senior securities ahead of them, i.e., the total value of the company cannot be below its hypothetical zero-leverage value..."20

The term \( k_i \) is used to represent the average cost of debt capital and appears on the graph as:

![Graph showing the cost of debt capital in a changing capital structure.](image)

**Figure V**

THE COST OF DEBT CAPITAL IN A CHANGING CAPITAL STRUCTURE

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As the debt position approaches one hundred per cent, it is assumed that rational debt holders will demand a rate of return on assets approaching ten per cent. What are the demands of debt holders as the debt position approaches zero?

It was established in an earlier section that for the purposes of this paper there is assumed to be a relationship between risk and return. It was assumed that rational investors would demand more return for assuming more risk. Debt suppliers because of their legal contractual claims have less risk than equity suppliers. As was indicated previously, as the firm approaches an all-debt position, the demand of debt suppliers for this firm should approach ten per cent. Return is assumed to vary continuously with risk. Therefore as the debt position of the firm approached zero, the risk to the suppliers of debt would approach zero and their demands should approach zero.

It is recognized that debt capital is not available at these rates of return and this empirical situation is dealt with in the next chapter. In addition, it is important to note that while return is assumed to vary continuously with risk, this does not imply a linear relationship. For the purposes of this analysis and in the interest of initially utilizing a simple model, it is assumed that the \( k^*_1 \) line is a straight line beginning at zero degree of leverage and approaching ten per cent as debt approaches one hundred per cent. While the return to debt could be assumed to follow some curvilinear pattern, the justification for this does not seem to be greater than that yielding a straight line. The assumption that the return follows a curve does not affect the results of this analysis. While in the graph the \( k^*_1 \)
line appears to be continuous, it is true that in reality it is a discontinuous function because of the fact that debt issues are offered with yields which vary in discrete amounts. Therefore, the graph of the $k_1$ function could be more accurately portrayed as:

![Figure VI](image)

**THE INCREMENTAL COST OF DEBT CAPITAL**

This discontinuity has led scholars to believe that in reality the $k_1$ line appears as follows:

![Figure VII](image)

**THE PERCEIVED COSTS OF INCREMENTS OF DEBT**
This graph represents a situation in which a firm is able to secure a relatively large amount of debt financing at a fixed rate. The rate remains constant for different levels of leverage. It must be pointed out that this situation occurs in imperfect markets. In this situation debt holders are unable to accurately evaluate the increase in risk between two conditions of leverage. When this occurs, the $k_1$ function does not appear to be continuous and the firm is able to secure debt financing at advantageous rates. The debt holders are at a disadvantage at point (A) because their risk increase has been continuous while their rate of return increase is not. While it is clear that these situations exist, it would be difficult to construct a model based on innumerable possible market imperfections.

Return to equity holders

The term $k_e$ represents the cost of equity capital and appears on the graph as:

![Rate of Return vs. Leverage Graph](image)

**Figure VIII**

**THE COST OF EQUITY CAPITAL IN A CHANGING CAPITAL STRUCTURE**
It would be expected that the rate of return demanded by equity interests would increase with the introduction of debt into the capital structure. The risk to equity has been increased by the addition of financial risk to the business risk they already possess.

It is assumed that the suppliers of capital under consideration are not risk lovers but rational investors who demand increased return when subjected to increased risk. If one is not considering the case of risk lovers, then it can be assumed that at any level of leverage B which is more levered than any degree of leverage A, no matter how small the difference between A and B, the rate of return demanded by each class of security holder (debt and equity) will be higher for level B than for level A. If the preceding propositions are assumed and the upper limit for debt is established, then whether the function describing the return demanded by debt is continuous or discontinuous it will be an increasing function. Since it is assumed that both debt and equity holders perceive the increased risk identically, except for their different positions resulting from different combinations of business and financial risk, equity will also demand an increased rate of return as leverage increases in the same manner that debt does.

If these propositions are extended to their logical conclusion, an increase in leverage from A to B should increase the rates of return demanded by debt and equity by the same amount. By a series of steps proceeding from a low level of leverage A to a high level of leverage B, it can be shown that as the return to debt approaches the rate of return demanded by equity when there is no leverage, equity will be demanding that rate times two. The only conditions under
which this conclusion would not be reached are: a) if one postulates
that the rates of return demanded by debt and equity holders do not
increase in the same way and by the same amounts, b) if one postulates
the rate of return to debt as something other than zero at zero degree
of leverage and at the same time holds the writer's assumption that
both types of capital suppliers evaluate increased risk as calling for
equal increases in return, or c) if one postulates that the rate of
return demanded by debt at one hundred per cent leverage will be dif­
ferent from that rate demanded by equity at zero degree of leverage.

To suggest that the demands of equity would exceed the rates
shown on the $k_e$ line is to suggest that the inherent risk of the assets
has been changed by the financing of such assets.

The rate of return demanded by equity interests approaches but
does not reach twenty per cent because leverage only approaches and
does not reach one hundred per cent. This is true because legally a
corporation cannot exist with a one hundred per cent debt capital
structure.

Earlier the equity interests were described as residual claimants.
It is true that because of the legal position of debt, equity has a
secondary claim to the earnings of the firm. If the cost of capital
were defined in an ex post sense as many current authors deal with it,
it could easily be demonstrated that the returns available to equity
interests in this situation would approach twenty per cent. An
example of this approach is presented in Appendix one.
The average cost of capital

The term $k_0$ is used to represent the over-all cost of capital to the firm. Once the $k_1$ line and the $k_e$ line are derived, the resultant is a constant $k_0$ for and all levels of leverage. The completed graph containing $k_e$, $k_1$ and $k_0$ appears as follows:

![Diagram showing the relationship between rate of return, leverage, and average cost of capital.](image)

Figure IX

THE AVERAGE COST OF CAPITAL IN A CHANGING CAPITAL STRUCTURE

Therefore, one must conclude that, given the assumptions of the model, an increase in leverage can neither raise nor lower a company’s cost of capital no matter how "judicious" or "excessive" this increase may be. For example, representative levels of leverage yield the following values for $k_1$, $k_o$ and $k_e$:

<table>
<thead>
<tr>
<th>Leverage</th>
<th>25% debt</th>
<th>50% debt</th>
<th>75% debt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$k_1 = 2.5%$</td>
<td>$k_1 = 5%$</td>
<td>$k_1 = 7.5%$</td>
</tr>
<tr>
<td></td>
<td>$k_o = 10.0%$</td>
<td>$k_o = 10.0%$</td>
<td>$k_o = 10.0%$</td>
</tr>
<tr>
<td></td>
<td>$k_e = 12.5%$</td>
<td>$k_e = 15.0%$</td>
<td>$k_e = 17.5%$</td>
</tr>
</tbody>
</table>
Immediately one might inquire as to the incentive for equity interests to increase leverage since at any degree of leverage $k_0$ remains constant. At this point, one must understand that it is $k_e$ which does not remain constant with leverage which is of most relevance to the equity interests. From the stockholder's point of view, it would seem that the sole reason for an increase in the leverage of a firm is that owners have arbitrarily decided that they would prefer to take on additional risk with its commensurate increase in dollar income. It is recognized that many times the decision is made not by stockholders but by the management of the firm which could have objectives other than increased return to equity such as growth. While it can be assumed that people are generally interested in increasing their dollar income, the various reasons involved in a stockholder's decision to assume additional risk are as yet unknown.

After arbitrarily deciding to assume more risk, is an investor indifferent as to the type of investment so long as the risk is right? No. It seems that a preference could exist between two situations from which an investor has decided he would demand the same return in the next time period. For example, there is the problem in deciding what has gone into the determination of the return to be demanded. If all variables were accounted for in deriving this return, then the two investments must be equal and an investor would be indifferent as to the one chosen. However, in all probability an investor would feel that he had not taken all variables into consideration - possibly because of the large number and complexity of the variables - and he probably could not be certain that he had appropriately weighed all the
variables considered. Therefore, even though an investor feels that he may receive the same interest-rate-like return from two stocks in the next time period, he may prefer one to the other. This preference may be based on the expectation that one firm is in a growing industry and the other in a declining one. It could be based on the expectation of stability in one company over the long run as compared to volatility in the other, or, feeling that he cannot accurately weigh all variables, an investor could prefer a position in a levered firm with its lower risk inherent in the physical assets to one promising the same return in an unlevered situation. In other words, an investor may prefer a levered position in a nationwide firm in a stable industry returning 12 per cent to an unlevered position in a local pizza shop yielding the same return.

It would seem that this line of thought could explain an increase in leverage. Some investors might be willing to take a higher risk for a higher yield. It is possible that investors could possess a preference for one investment alternative among several expected to yield the same returns in the next time period. In other words, certain investors might prefer to increase their financial risk in a line of business with a relatively low business risk rather than switching their capital to a firm with a higher level of business risk offering the same rate of return.
Introduction

Although the concept of leverage and its relationship to the cost of capital were discussed in the last chapter, certain vital aspects of this problem are explored in further detail in this chapter. The discussion of the cost of capital model was begun in Chapter III in an attempt to solve one of the three questions at the heart of financial management, that is: What should be the composition of a firm’s liabilities? It is the author's belief that the best way to solve this problem is to resolve the controversy surrounding the leverage-cost-of-capital relationship. In this chapter, this problem area is attacked.

First, the contribution of the traditional school concerning the effect of leverage on a firm's cost of capital is reviewed. Secondly, nontraditional concepts concerning this relationship are presented. Thirdly, the author presents his concept of the leverage-cost-of-capital relationship and, finally, the author's concept of the minimum acceptable degree of leverage is introduced. This concept seems to suggest a new approach to solving the questions concerning the optimal composition of a firm's liabilities or constructing an optimal capital structure.
Traditional Thought

The traditional financial literature seems to be consistent in its appraisal of the effects of leverage on the cost of capital to the firm. In short, leverage was considered to be almost basic to the success of the firm.

Thomas Greene

One of the earliest writers in the field, Thomas Greene, in 1897, began his treatise on corporation finance by advising: The business man or firm must borrow money. As cited in Chapter III, he then gave an example of the beneficial effects on the cost of capital which accrue from the use of leverage.

With the few exceptions, where firms have command of practically unlimited sums of their own, business success is possible only through the aid of the money-lender. Let us suppose for illustration that a firm employs a capital of $1,000,000 in its business, one half of which it borrows from the banks on its commercial paper at six per cent interest. We will suppose also that the firm 'turns its capital over' six times a year, which is only another way of saying that its volume of annual sales is six times the capital. Assuming that our firm is enabled to earn two per cent net upon its sales, the resulting profits, $120,000, amount to twelve per cent upon the capital employed. As under our assumption the firm is paying six per cent on the amount borrowed, or $30,000 yearly, it follows that the actual earnings upon the firm's own capital are $90,000 or eighteen per cent, a handsome return made possible only through the borrowing of money which can be used to extend the volume of trade and to earn something for the firm over and above the percentum of interest paid.1

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Greene's concept of the effects of leverage on the cost of capital led him to suggest that an optimum capital structure would contain some debt. He tells us that

Formerly it was with hesitancy that a bank would lend a firm one quarter of its required capital; how, there is a temptation for a writer to say that a quarter of the firm's own money with three quarters of borrowings would be nearer the usual proportion. To borrow one half of one's necessary capital, in money or goods, is common.\(^3\)

**Hastings Lyon**

Mr. Lyon was another early writer to discuss the benefits of leverage. He also included a discussion and example of the risks inherent in acquiring fixed cost capital and seems to have been one of the first writers to include a graphic explanation of the effects of leverage. His graph is presented below:

![LYON'S REPRESENTATION OF THE EFFECT OF LEVERAGE](image)

**LYON'S REPRESENTATION OF THE EFFECT OF LEVERAGE**


\(^3\)Ibid., p. 4.
He stated that the curve of operating costs would fall with the gross revenue but not at the same rate. The part of the diagram between the curve of operating and the curve of gross represents the amount of net. Interest, it was emphasized, was a constant cost. Thus the returns and risks of leverage were graphically presented to beginning finance students in 1916.

Floyd Burchett

Another early writer, Burchett, also seemed to feel quite strongly that leverage was beneficial and, in addition, that there was some "proper" relationship that should be maintained between debt and equity. To him, the experiences following the crash of the stock markets of 1929 had taught, at a terrible cost, that fixed charge securities had been issued in too large quantities. He had suggestions for a somewhat saner basis for the use of these securities. This "saner" approach included specific numerical prescriptions on tailoring leverage to different business risks.5

Henry Hoagland

Hoagland, in discussing the concept of leverage, seemed to be concerned with the implications of the term for suppliers of capital. He felt that the term leverage was perhaps too harsh in its implications, "since it places the emphasis upon the spreading of the equity in thin layers. Trading on the equity tends to call attention to the fact that,

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after all, there is an equity to protect the lender and that its existence justifies the collection by the owner of the share capital of a return for its presence. 

He felt however that

in some respects, the word leverage is a more honest term because, in both cases, the owner of the share capital is trying to use it as a lever to lift a heavy load of borrowed capital, thereby earning for himself a larger return than if he relied only upon the use of the capital that he owns.

Some of Hoagland's statements present an excellent example of the confusion that existed in the minds of some traditional writers concerning the return to retained earnings.

He writes that

sometimes a distinction is made between internal and external leverage. Trading on the equity is an example of the latter. Internal leverage occurs when a corporation accumulates earned surplus and proprietorship reserves that continue to earn for the corporation, but without obligation to pay anyone specifically for their use. For example, suppose a corporation had earning assets of $1,000,000, represented by stock of $750,000 and surplus and proprietorship reserves of $250,000. If the corporation earned 6 per cent on its total investment, this would be equivalent to 8 per cent on its outstanding stock. This advantage is called "internal leverage."

Hoagland also felt that there were limits to a firm's borrowing and discussed them. His discussion seemed more than a little fuzzy and the decision rule seemed of questionable value to a manager. He unhesitatingly stated that

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7 Ibid., p. 171.
8 Ibid., p. 171.
Since borrowing creates obligations to be liquidated in the future, only a reader of the future can tell whether or not such obligations can be met. Those who claim such power are not usually entrusted with the management of business corporations. It is probably true that more business tragedies result from overborrowing than otherwise. There are no hard and fast rules to prevent such errors. In general, a corporation should not borrow when it has no assurance of meeting interest payments currently and of providing for principal installments when due.9

Edward Mead

In Mead's text first published in 1910, a recommendation concerning the amount of debt that should be incorporated in a firm's capital structure was also made. While the returns to equity interests from the use of debt were desirable,

the amount (of debt) should not be so great as to impose upon the corporation a burden of interest charges which is above, or even equal to, a conservative estimate of the earning power of the company under the worst conditions which it is likely to meet. If a corporation does not pay its interest, and is put into bankruptcy, its affairs are thrown into confusion.... In issuing bonds, therefore, conservative financiers keep in mind the danger of business depression or other unforeseen contingencies, and regulate the amount of debt to guard against the consequences of any untoward event.10

Mead, it seems, was typical of those traditional writers who in discussing the concept of leverage seemed to emphasize the risk aspects. At least later writers began devoting more attention to the risk aspects than did Greene.

The relationship between the new levels of risk and return to the suppliers of debt and equity capital resulting from increased leverage

9Ibid., p. 171.
and the old levels, established under lower degrees of leverage, did not seem to be clearly understood by traditional writers. The traditional position concerning leverage is that there is an optimum point or range. For the purposes of this paper, optimal leverage is defined as that mix of debt and equity which will maximize the market value of the company, i.e., the aggregate value of the claims and ownership interests composing the credit portion of the firm's balance sheet.

Harry G. Guthmann and Herbert E. Dougall

An indication of the traditional writers' thinking concerning the change in the value of the firm resulting from a shift of risk among the classes of capital suppliers as a consequence of increased leverage is this statement by Guthmann and Dougall:

The use of low-yielding prior securities has made it possible to offer a higher return on the common stockholders' investment and so increase its attraction. Theoretically, it might be argued that the increased hazard from using bonds and preferred stocks would counterbalance this additional income and so prevent the common stock from being more attractive than when it had a lower return but fewer prior obligations. In practice, the extra earnings from trading on equity are often regarded by investors as more than sufficient to serve as a 'premium for risk' when the proportions of the several securities are judiciously mixed.  

In this statement, Guthmann and Dougall introduce the idea that the risk to equity interests increases with the introduction of debt into the capital structure. They emphasize, however, that the increased returns are more than commensurate with the increase in risk.

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Benjamin Graham, David Dodd and Sidney Cottle

These authors also take the traditional point of view. They defend what Durand has classified as the 'optimal' approach to constructing the capital structure. In regard to this 'optimal' approach Durand stated:

Those who adhere strictly to this method contend: first, that conservative increases in bonded debt do not increase the risk borne by the common stockholder; second, that a package of securities containing a conservative proportion of bonds will justifiably command a higher market price than a package of common stock alone.¹²

Graham, Dodd and Cottle seem to assume that the tax-saving aspect of leverage is accepted by finance theorists and that the main problem in this area consists of calculating the amount by which a given acceptable bond component will raise the total market value of a firm. They suggest that

In our opinion the advantages to stockholders from the appropriate proportion of corporate debt will go beyond the indubitable tax savings.... The appropriate amount of debt is that which the company can safely borrow, which in turn is no more and very little less than investors may safely lend to it. The upper limits of such borrowing have been spelled out in our specific standards...¹³

In their opinion,

Where debt is conservative, the security analyst need not adjust his earnings and dividend multiplier downward for the debt factor... (a) second consequences relates to corporate financial policy. It suggests that


frequently the stockholder will be better off if the company has a moderate amount of debt than if it has none.\textsuperscript{14}

In conclusion, the authors of this text on security analysis state,

...we find nothing in our studies of actual experience which is seriously opposed to our thesis that companies with moderate debt are likely to have a larger enterprise value than the same type of company without debt.\textsuperscript{15}

Summary of Traditional Thought

This collection of statements is relatively consistent and would seem to be representative of the traditional position concerning the leverage—cost-of-capital relationship. Solomon has stated that the heart of the leverage question is given by the following question:

Given that a firm has a certain structure of assets, which offers net operating earnings of a given size and quality, and given a certain structure of rates in the capital markets, is there some specific degree of financial leverage at which the market value of the firm's securities will be higher than at other degrees of leverage?\textsuperscript{16}

The traditional positions presented above would suggest that these writers were convinced that such an optimum point or range existed. However, the decision rules for financial management resulting from this approach are not easy to define. In addition to being couched in general terms, the traditional discussions of leverage are intertwined

\textsuperscript{14} Ibid., p. 543.
\textsuperscript{15} Ibid., p. 547.
with the discussion of other factors which were held to be important in the construction of a capital structure such as the industry, the age of the firm, and conditions in the capital markets.

This, then, is the state of the traditional literature concerning leverage. The writers of the traditional literature consistently connote a strong feeling that an optimum level of leverage exists but they are not precise in defining this point.

The Cost of Capital-Leverage Relationship in the Post-Traditional Finance Literature

Pearson Hunt's definition of the traditional school was presented in Chapter II. There the traditional approach to the subject matter was defined as that which

...took up the topics of the forms of corporate securities, of promotion and the financial plan, of evaluating, of expansion with special reference to the holding company, of the determination and administration of income and of failure and reorganization...17

It was an emphasis on the periodic episodes in the life-cycle of a hypothetical corporation and the outsiders' viewpoints that Hunt termed the "traditional approach". This view prevailed in the decade of the 1950's.

The traditional school viewed leverage as being beneficial to equity interests. Equity was defined as the residual claimant to the earnings of the firm and the benefits accruing to equity through the employment of fixed-charge prior-claim sources of capital which earned more than their cost were explored by many early texts. Questions con-

cerning the increased risk to equity interests incurred with the acquisition of debt capital were not clearly defined. The use of any fixed cost source of capital which earned more than its explicit cost was felt to be beneficial to common stockholders.

Later authors began suggesting that the introduction of fixed cost capital might increase the risk to common stockholders so that as rational investors they would be required to demand a rate of return that was equal to or greater than the net income of the firm, including that portion of the income generated but not demanded by the fixed charge sources. It was suggested that, given a degree of business risk, equity interests in a capital structure containing fixed cost capital and generated more earnings than its explicit costs could be in a less satisfactory position than it possessed in an all-equity capital structure.

Traditional accounting does not show explicit demands by equity. Net income is computed for the firm and treated as accruing to equity interests. Traditionally, there has been no discussion of the "reasonableness" of this return. In the "new approach" to finance this return or net income is related to the common stockholders' expected returns. There came an awareness of the responsibility of financial management to earn a reasonable return for equity. This approach led authors in the field of finance to suggest that the benefits of debt capital should be weighed in relation to their effects on the demands of equity interests. In other words, there came an awareness that there might be implicit as well as explicit costs associated with the acquisition of fixed charge prior claim sources.

In the earliest traditional literature, any concept concerning implicit costs created by leverage seems to have been missing. There-
fore, many writers of the traditional school assumed that even in the absence of corporate income taxes, the introduction of favorable leverage would increase the returns to equity interests and thus increase the total market value of the firm and as a result lower the average cost of capital to the firm. The logical extension of this concept of leverage led early traditional writers to suggest that the ideal capital structure would contain some debt. Many recipes for the "correct" amount of debt were given. And as discussed earlier, these recipes were usually disturbingly vague.

Beginning in the 1950's, writers in the field of corporate finance began suggesting that the effects of leverage for equity interests were not so one-sided as had been previously suggested. It was even suggested that, in the absence of corporate income taxes, leverage had no effect on a firm's cost of capital. The writers of this new approach "emphasized the internal viewpoint as distinct from the outsiders' viewpoint which dominated the "traditional approach."

Specific Examples from the Literature

Beginning in the fifties, a few finance texts began to emphasize the managerial "insider" viewpoint. However, some texts remained "traditional" in their approach and the modification of some concepts was slow. In this period, one finds authors giving more explicit treatment to the implicit costs created by an increase in leverage.

Bion B. Howard and Miller Upton

This text, Introduction to Business Finance (1953) \(^{18}\) is considered

by Danellis\textsuperscript{19} to be the first of many books to break away from the "traditional" approach to the subject of business finance. These authors described leverage in a rather standard way as follows:

"Capital structure leverage is the pressure exerted on the earnings of the residual equity interest as a result of trading on this equity. That is to say, when total asset requirements are financed partly with funds bearing a limited return (debt, preferred stock etc.) there is a likelihood that the rate earned on the residual equity investment will differ from that earned on the total investment.\textsuperscript{20}"

While the authors indicated that leverage was a two-way street, the changes in risk confronting the suppliers of both debt and equity capital were not dealt with. Equity is considered a residual claimant to earnings and a "reasonable" return to this source of capital is not discussed.

**Franco Modigliani and Merton Miller**

In an article published in 1958\textsuperscript{21}, these authors took a position that had a tremendous effect on the approach to determining a reasonable return to equity with increases in leverage. They contended that in a world of perfect markets and rational investors, two identical companies, i.e., two sets of assets offering net operating earnings of the same size and quality, must have the same total market


\textsuperscript{20}Howard and Upton, op. cit., p. 151.

value, regardless of differences in leverage. As explained in presenting their model in Chapter III, once their initial assumptions are granted, the market value of a company and hence its cost of capital are both independent of its capital structure. A perfect market was defined as one in which two identical commodities would not sell at two different prices, and their propositions logically followed.

Given these assumptions, the traditional position was attacked as logically inconsistent. The authors did state that in a world in which the costs of debt capital are tax deductible, the use of debt capital could affect the total market value of the firm and, as a result, the over-all cost of capital.

The importance of the article lies in the fact that previously many traditional authors had considered that even in the absence of corporate income taxes the use of debt could lower the cost of capital. This article focused attention on the increase in implicit costs created by the introduction of prior claim capital.

Ernest W. Walker and William H. Baughn

In discussing leverage and the cost of capital in their text entitled Financial Planning and Policy, Walker and Baughn stated that one of the most difficult components of financial planning is the choice between debt and equity capital. In addition it was suggested that

Since both forms of capital have obvious advantages to the firm, the decision is often the result of conflicting opinions and evidence.22

The concept of risk was introduced in discussing the choice between debt and equity capital. The authors noted that: "In some instances the question is easy to resolve, but in many marginal cases the choice will be affected by management's willingness to assume risks."²³

In discussing the amount of debt that a company should introduce into its capital structure they suggest that

Actually a combination of equity and debt is the proper answer for the majority of firms, not a choice between the two. One is not a substitute for the other. The problem is, then, not which to use in the capital structure but rather what proportion of debt and equity is the optimum under given circumstances. The three influencing factors in that decision are (1) relative costs, (2) relative risks, and (3) availability of funds as affected by the investor criteria normally used in the debt-equity ratio.²⁴

In one of the better discussions concerning the risk-leverage problem to be found in business finance texts, Walker and Baughn then write that

Since debt capital is generally considered to be cheaper than equity capital, the choice between the two broad sources of funds would be an easy one if it were not for the risk factor. The risk rests upon the possibility that earnings may not be sufficient to cover debt service which is a contractual obligation, thus resulting in default. The extent of risk assumed, therefore, can be related to (1) the level of earnings in relation to debt service and (2) the degree of fluctuation in earnings.²⁵

The concept of the "safe debt limit explained so often in the traditional finance literature is criticized by these writers. They

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²³Ibid.
²⁴Ibid., p. 108.
²⁵Ibid., p. 109.
suggest that this limit is usually computed from the average of other firm's experiences in the past and implies that the future will be very similar to the past.

Raymond P. Kent

In this work entitled *Corporate Financial Management*, one has another of the recent texts purportedly taking the "new approach" to the field of finance. The concept of trading on the equity is mentioned, and with an example much like those found in the earliest texts the author describes the magnification of both profits and losses achieved through leverage. Risk was discussed only in terms of default and failure of the firm. There was no discussion of the increased risk affecting equity interests as leverage was increased. The term cost of capital was not used in the text. This text is representative of those which allegedly take the "new approach" but rather completely ignore the leverage-cost of capital relationship.

Robert W. Johnson

This text entitled *Financial Management* also takes the "new approach" to the problems of finance. The discussion of trading on the equity, however, is similar to that found in the "traditional" tests. The following sentences concerning the risk incurred by equity interests in acquiring leverage summarized this author's position fairly well:

> Although the financial leverage may be profitable to the owners, the profits can hardly offset the loss

of the business to creditors should the financial manager fail at any time to arrange his cash flows to meet the fixed payments on the debt.27

This treatment of leverage shows a change from the very earliest texts in that the concept of risk is introduced. The discussion of risks is confined, however, to the possibility of the failure of the firm rather than that affecting the rate of return to be demanded by the suppliers of debt and equity capital at different percentages of leverages.

William Beranek

In his text Analysis for Financial Decisions, Beranek states that rational external financing enhances future earnings and dividends to shareholders, and in this way exerts an upward pressure on price per share. At the same time, he cautions that

...senior financing increases leverage and, all other things being equal, this may put a downward pressure on price. Leverage enhances the probability of default, of insolvency, and also of severe decline in the future market value of stock.28

For these reasons, Beranek is led to believe that "...investors bid less for a stock given the magnitude of all other variables, the higher the ratio of senior claims to residual interests."29

In keeping with the concept of the optimum capital structure common in the traditional literature, the author suggests that


29Ibid., p. 197.
If leverage is modest, however, there is the possibility that it will even exert an upward price effect.30

Beranek suggests that the effect of increasing leverage on the market value of the firm may be two-fold.

First, there is the depressing effect due to the insolvency-price-decline risk. This influence normally prevails for all degrees of leverage and is expected to increase with rising leverage. Thus, all other things given, this effect induces a declining value of common stock as leverage increases.31

Secondly, and counterbalancing the insolvency-price-decline risk, there is the inflation effect.

...should inflation continue, all other things being equal, firms with debt will benefit more from inflation than will firms without debt.... In sum, leverage may exert two separate effects on price, a depressing insolvency-price-decline effect, a swelling inflation effect. For modest amounts of leverage, the net effect of these separate influences might induce a positive influence on price. As leverage increases beyond a certain level, however, the insolvency-price-decline effect swamps the inflation effect, and with further increases in leverage average price declines.32

Beranek then graphs his suggested relationship between leverage, L, and total market value of common stock, holding constant all other relevant variables (including earnings). When leverage exceeds \( L_0 \), the insolvency effect dominates. Until that point is reached, however, the inflation effect prevails and market value increases with leverage.

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30 Ibid.
31 Ibid.
32 Ibid.
The graph is reproduced below:

![Graph of Total Market Value vs. Leverage]

**Figure XI**

BERANEK'S REPRESENTATION OF THE EFFECTS OF LEVERAGE

It will be noted that Beranek's position is very close to that of Ezra Solomon presented in Chapter III. Both describe the optimum capital structure and its effect on total market value in this same way.

Pearson Hunt, Charles M. Williams and Gordon Donaldson

The text *Basic Business Finance* by these authors contains some excellent comments concerning leverage and its effects on the cost of capital. After explaining the benefits to common stockholders which occur when borrowed capital is used to generate earnings which exceed

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The text *Basic Business Finance* by these authors contains some excellent comments concerning leverage and its effects on the cost of capital. After explaining the benefits to common stockholders which occur when borrowed capital is used to generate earnings which exceed
its cost, the authors ask the question: "Why do corporations not adopt the policy of borrowing all that anyone can lend?"35

First is the fact that as the proportion of debt in a capitalization rises, the investor's appraisal of the quality of the debt falls. Higher cost of borrowed money is the result. Furthermore as just shown, both the volatility and the riskiness of the common stock are increased, so that the investor's appraisal of the stock is also changed. From these changes comes the second reason, namely, that the appraisal of the quality of a company's securities will take the risk into account. A more highly "leveraged" capitalization will be made up of more costly elements. Any change in the debt ratio will, in theory, be reflected in the cost of each of the elements of capitalization.36

These authors then state that the quality ratings of securities are not sensitive to small changes in capitalization ratios, particularly when burdens seem to be covered amply. They suggest that people with experience in the field agree that in many corporations there is considerable room for maneuver before major changes in quality ratings will occur. The authors then devote an excellent chapter to a discussion of the factors affecting how, conceptually at least, the risk to equity is increased with each increment of debt brought into the capital structure.

Richards C. Osborn

In his text, Business Finance, The Management Approach, Osborn describes leverage as follows

A definite prior claim fixed charge is accepted because funds are available on sufficiently reasonable

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36Ibid.
terms that earnings on those funds are expected to earn more than they cost the borrower. It is, therefore, anticipated that a gain will be obtained from the process.37

Following this, in an excellent section he discusses the risk incurred by equity interests as leverages increased.

One of the most significant factors restricting excessive trading on the equity is its impact on the price of common stock. Even though earnings per share continue to go up, the price per share may come down. As risk increases, the rate of return expected by common stock investors also rises. This means that the price they are willing to pay for the stock, in comparison with its earnings, is reduced. Earnings of $5.00 a share may be valued at a price-earnings ratio of 10, giving a market value of $50.00, whereas earnings that are pushed up to $8.00 a share by excessive leverage may be valued at only 6 times that $8.00 or $48.00.38

In both tabular and graphical form, Osborn illustrates the effects of risk on the amount of return demanded by debt holders and equity holders, and on total market value of the firm. As the financial risk is raised with increased leverage, the rate of interest increases and the rate of return demanded by stockholders rises sharply.

Summary

The preceding excerpts are felt to be representative of the treatment of the leverage-cost of capital problem in the post-traditional finance literature. Some of the texts surveyed, while varying from the traditional texts in organization and content, are very


38 Ibid.
similar to the traditional texts in their discussion of leverage. Slowly, however, some very useful statements of the leverage-cost of capital relationship are evolving.

It will be recalled that one of the questions of primary importance to be considered in this chapter is: What should be the composition of the firm's liabilities? One can observe that the traditional writers are not hesitant to suggest that the ideal capital structure should include a generous amount of fixed cost, prior claim capital. Just how generous an amount is not made quite clear.

The writers of the so-called "new approach" began a consideration of the effects of these prior claim, fixed cost sources on the amount of return anticipated by the residual claimants. Some of the writers of this post-traditional school began to suggest that implicit costs as well as the explicit cost of sources should be considered. This led to a more cautious, slightly less enthusiastic appraisal of the benefits of prior claim capital for equity interests than that advanced by the traditional school.

Without question, much of this progress was fostered by the Modigliani-Miller article which focused attention on this area of financial management.

Some of the recent texts which discuss the changes in risk which affect residual claimants as prior-claim sources are acquired by the firm are very close to the Modigliani-Miller position. While the Modigliani-Miller position states that there is no optimum capital structure, this was true only in a world containing relatively perfect markets and no corporate income taxes. In a world which contained
market imperfections and income taxes, Modigliani and Miller agreed that the introduction of debt into a capital structure would affect the total market value and cost of capital to a firm.

The texts surveyed in this section were written for use in a world containing such taxes. Therefore, the positions of Modigliani and Miller and some of the recent text writers seem to be converging. These, then, are some of the most recent approaches to the problem of creating an optimum capital structure in a world which contains imperfect capital markets and corporate income taxes.

It is the author's thinking that by the use of the model developed in Chapter III, a more definitive approach to the solution of this problem can be utilized. In the following section of this chapter, one of the assumptions contained in the author's model, that of perfect capital markets is relaxed and a different approach to determining an optimum capital structure is discussed. In the following chapter, the assumption regarding corporate income taxes is relaxed and an optimum capital structure in a closer approximation to the 'real world' is considered.

The Author's Concept of the Leverage-Cost of Capital Relationship

The author's concept of the effect of leverage on the firm's cost of capital is derived from the cost of capital model introduced in Chapter III and reproduced on the following page.

In this graphic representation, \( k_1 \) represents the rate of return demanded by debt suppliers at different degrees of financial leverage. It was assumed in the development of the model that the return demanded
by suppliers of capital varies directly and continuously with risk. It was assumed that with an all-debt capital structure, the suppliers of debt would demand the same rate of return as that demanded by the equity interests in an all-equity capital structure, since their position vis-a-vis the assets would be the same as that of the equity interests in an all-equity capital structure. It is assumed that rational investors demand increased return when subjected to increased risk. Therefore, as the debt position of the firm approached zero percentage, the risk to the suppliers of debt capital approaches zero and their demands should approach zero.

The $k_e$ line represents the demands of the equity interests. As rational investors, they should demand a higher rate of return with the
introduction of prior-claim sources of capital into the capital structure. As was indicated in discussing the model in Chapter III, these demands should approach twenty per cent as leverage approaches one hundred per cent. The symbol \( k_0 \) was used to represent the resultant over-all cost of capital to the firm. Given the assumptions of no corporate income taxes, rational investors and relatively perfect capital markets utilized in the model, it was suggested that a firm's cost of capital is independent of its capital structure. If the demands for increased return by the suppliers of both debt and equity capital are commensurate with any increase in risk, then the cost of capital is constant for all levels of leverage.

In the hypothetical world posited by this model, the answer to the question posed at the beginning of this chapter, concerning the composition of a firm's liabilities would be that any and all combinations are equally satisfactory. The model suggests that there is no optimum capital structure. An increase in leverage can neither raise nor lower a company's cost of capital no matter how "judicious" or "excessive" this increase may be. Differences in capital structure for firms in the same risk class would necessarily be explained in terms of factors other than cost.

The Concept of the Minimum Acceptable Degree of Leverage

It is readily noted by even the casual observer that great differences in capital structures do exist. These variations are not explained by the model as it now exists. It would seem that if this model is to be useful to operating financial managers, it should be modified in an
attempt to make it more applicable to the real world. One way to accomplish this would be to relax some of the assumptions that are least like the real world.

At this point, the assumption concerning perfect capital markets stated in developing the model in Chapter III is relaxed. It is observed that no one offers to lend funds at the lowest rates shown on the $k_1$ line. John Maynard Keynes explained this phenomenon in terms of the concept of "liquidity preference." Since it is impossible to secure funds in this interest rate range, the problem can be dealt with by assuming an instantaneous rise in the real $k_1$ line.

Once this market imperfection is introduced, it would seem that the implications for equity interests are clear. If any leverage is contemplated, equity interests must push leverage to some point where the real $k_1$ line coincides with the theoretical $k_1$ line. While it is recognized that ex ante and ex post results are in equilibrium in an all-equity capital structure, ex ante and ex post results with leverage will be in equilibrium for equity interests only at those points where the real $k_1$ line coincides with the theoretical $k_1$ line. So long as equity interests find the ex ante and ex post situation in disequilibrium, they should adjust leverage. In the case under consideration

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40The expression "theoretical $k_1$ line" is used to identify the $k_1$ line representing the earlier assumptions of perfect markets and rational investors. The term "real $k_1$ line" identifies the market level of interest confronting the firm.

41ex ante; planned or anticipated

42ex post; realized
here, equity interests should increase leverage at least to the point where \( k_1 \) and \( k_0 \) intersect or decrease leverage to the zero level where they are also in equilibrium.

As shown below, when a degree of leverage is contemplated not sufficient to make the real \( k_1 \) intersect the theoretical \( k_1 \), it would seem in an ex ante sense that the \( k_0 \) line is rising and then declining while in an ex post sense it is the \( k_e \) line which dips. In other words, equity's anticipated returns coupled with the required payments to debt would make it seem when viewed in an ex ante sense, that the returns to the suppliers of capital would exceed the ten per cent return on total assets assumed for the model firm. However, in an ex post or realized sense, it can be seen that when the required payments are made to debt the remaining returns available to equity are less than the amount anticipated.

![Figure XIII](image)

**Figure XIII**

**THE MINIMUM ACCEPTABLE DEGREE OF LEVERAGE**
In the situation portrayed by Figure XIII, it is assumed that the minimum cost of debt capital is 4 per cent. If it is assumed that investors continue to behave rationally and that the market remains relatively perfect except for liquidity preference, then it can be seen that the ex ante and ex post positions of equity interests will be in disequilibrium (except at zero leverage) until leverage reaches 40 per cent; equilibrium then exists from 40 per cent leverage to 100 per cent leverage.

The figures below show $k_e$ in both an ex ante and an ex post sense at different degrees of leverage with the market imperfection included. For example, with a capital structure consisting of 1 per cent debt, equity interests anticipate a 10.1 per cent return; however, only 10.03 per cent is realized. In other words, from a realization point of view, the $k_1$ and the $k_o$ are given and $k_e$ is the dependent variable.
Equity interests have an incentive to increase leverage until equilibrium is reached. In this example, equity interests will not receive payment commensurate with the risk they are taking until 40 per cent of the capital structure is represented by debt. In the area beyond the market imperfection (40% debt in this case), the ex ante and ex post equilibrium from equity's point of view would seem to connote management indifference as to the type of security to issue to secure funds. At this point, cost is not a factor and management is concerned with the less quantitative factors of control, flexibility and availability.

This approach to the leverage question would appear to contain powerful implications concerning the appropriate degree of leverage for various types of industries.

For example, assume a very stable industry with a 6 per cent risk inherent in the physical assets and a capital market demanding a minimum of 4 per cent on debt instruments. In this situation, equity interests must extend leverage 60 67 per cent in order to have ex ante and ex post conditions in equilibrium.

![Figure XIV](image)

**THE MINIMUM ACCEPTABLE DEGREE OF LEVERAGE IN A LOW RISK FIRM**
On the other hand, in a higher risk firm such as one with a sixteen per cent risk inherent in the assets, it seems that leverage would be pushed only to twenty-five per cent in order to reach the point of indifference with the same market imperfection. Equilibrium between ex ante and ex post conditions is attained with a lower percentage of debt in the capital structure.

Traditionally, finance texts have indicated that the optimal range of leverage was higher for low risk companies than for high risk ones. The author's approach to the leverage question indicated why the preceding statement is valid.

At this point, one might suggest that interest rates have been rather volatile at times in the past and pose a question concerning the effects of a change in the general level of interest rates, such as that initiated by the 1966 change in the rediscount rate, on the
minimum acceptable degree of leverage. A change of this nature would merely alter the minimum acceptable degree of leverage. In other words, with a rise in the general level of interest rates, the minimum acceptable degree of leverage would occur at a lower percentage of debt in the capital structure. In other words, changes in the general level of interest rates could be viewed as changes in the point at which $k_i$ intersects the vertical axis on the graph.

Market imperfections also exist in the equity markets. Though these market imperfections indeed exist, it should be noted that this existence does not alter the usefulness of the model. There are situations in which equity capital is not available at the lowest rates shown on the $k_e$ line. For example, certain types of rental housing projects are rarely financed solely with equity.

The explanation for this could be that the value of the asset in a given market is such that there is very little risk associated with the project. If equity is not normally supplied at less than a stipulated rate of return, such as ten per cent, equity interests may be interested in utilizing leverage to acquire a level of risk and return that they desire. This would be an explanation for a move along the $k_e$ line by equity interests discussed at the end of chapter three and would remove the zero leverage point of equilibrium from consideration in this case in the real world.

Another more probable explanation of high leverage for rental projects is that large amounts of debt capital are available for investment in this type project as a result of the legal restrictions placed on the investment of funds by certain of our large financial institutions such as life insurance companies. Therefore nonfinancial companies are
able to borrow from them at interest rates which are lower than would be required to compensate creditors in a free market. If rental properties are considered preferred investments by these types of institutions, large amounts of debt capital might be available at rates less than commensurate with the risk inherent in certain assets. Rational equity interests could be expected to take advantage of this situation. An example is presented in graphical form below.

In the graph, the horizontal line below $k_o$ is used to represent the amounts of debt capital made available at a fixed rate by institutions. The decision on the part of equity interests to utilize all the debt that they can acquire at the fixed rate is shown as an instantaneous increase in the rate of return demanded by equity interests. The returns to equity are shown by the solid line labeled $k_e$. If it is assumed that at some point the debt suppliers will refuse to supply any more capital, then any alternative debt suppliers could be assumed
to demand a return commensurate with the risk that they assume, causing the real $k_1$ line to adjust instantaneously to the theoretical $k_1$ line. This would result in the real $k_e$ line dropping instantly to the theoretical $k_e$ line. The most advantageous capital structure for the equity to construct in this situation is that which contains the maximum amount of debt obtainable at rates of interest which are below the theoretical $k_1$ line. Returns to equity interests are maximized at this point. This analysis is thus an ex post point of view in which $k_e$ is the dependent variable.
CHAPTER V

TAXATION AND THE COST OF CAPITAL

Questions concerning the effect of the corporate income tax on a firm's cost of capital have occurred with regularity in the finance literature. It is recognized that if the corporation income tax does affect a firm's cost of capital, it would have a direct bearing on some of the questions toward which this paper is directed, such as those concerning the composition of a firm's capital structure. In this chapter, therefore, the assumption that corporate income taxes do not exist, utilized in developing the models in Chapters III and IV is relaxed in an effort to render the model more applicable to the real world and thus of more use to operating financial managers.

The Corporation Income Tax

While finance literature contained explanations of the effects of leverage in the earliest works, the discussions concerning the effects of the corporate income tax did not occur until much later. It wasn't that the early writers were not aware of the effects of taxation; the corporation income tax simply didn't exist when the earliest texts were written and even after the tax was introduced, its rates were not significant for several decades.

The present corporation income tax has its beginnings in the revenue legislation of the Civil War years. Prior to that period, customs duties were the principal source of revenue. Experience in
internal revenue taxes was not entirely lacking, however, for during
two periods, 1791 - 1802 and 1813 - 1917, revenue had been collected
internally. Civil war taxes included certain levies on gross receipts
or corporations and a corporation income tax was included in the un-
successful income tax law of 1894.

Finally in 1909, the Payne-Aldrich Act was passed. It provided
for a tax on corporate income. Constitutional objections to it were
overruled by the Supreme Court in 1911 on the ground that the tax was
an "excise tax" on the privilege of doing business rather than on
corporate income as such. The tax rate was one per cent and was appli-
cable to net income in excess of five thousand dollars. The flat five
thousand dollar exemption was eliminated by Part K, section 2 of the
Tariff Act of October 3, 1913. The Sixteenth Amendment to the Consti-
tution adopted in 1913, specifically empowered the federal government
to "lay and collect taxes on incomes, from whatever source derived,
without apportionment among the states, and without regard to any
census or enumeration." During World War I, the corporate tax rate
rose from the original one per cent level to twelve per cent, and the
nation's first "excess profits" tax was enacted to recoup abnormal
profit gains arising out of wartime conditions. During the 1920's and
early 1930's, corporation tax rates were fairly stable, varying only
between eleven and thirteen per cent, and were applicable on a flat-
rate basis. In 1935 a "graduated" tax was adopted providing a range
of twelve and one-half to fifteen per cent. A special tax on undis-
tributed net income was introduced by the Revenue Act of 1936. At the
same time, the range of tax rates was broadened so that they varied
from eight to fifteen per cent. By 1939, graduated rates (twelve and one-half per cent to sixteen per cent) applied only to corporations with income under twenty-five thousand dollars, while higher income corporations paid nineteen per cent.

Revenue legislation in the early forties increased corporation income tax rates by more than fifty per cent and introduced a temporary excess profits tax providing rates up to eighty-nine and one-half per cent. At war's end, the excess profits tax was repealed and the corporate tax rate was fixed at a flat thirty-eight per cent.

The present two-bracket tax rate structure in the United States dates from Korean War legislation of 1950-1951. The 1951 Revenue Act established rates of thirty per cent on corporate income up to twenty-five thousand dollars and fifty-two per cent on income over that amount. Legislation of 1964 established the rates of twenty-two per cent on income up to twenty-five thousand dollars and forty-eight per cent on income exceeding that level.

Prior to 1918, the income tax law restricted the amount of interest which could be deducted. In the first income tax law of 1913, interest could not be deducted on an amount of indebtedness greater than one-half the total indebtedness plus the capital stock. The Revenue Act of 1916 relaxed this limitation with the provision that interest could be deducted whenever the indebtedness on which the interest was paid did not exceed "the sum of (a) the entire amount of the paid-up capital stock and (b) one-half of its interest-bearing indebtedness then outstanding." Beginning with the 1918 law, all interest has been fully deductible except on debt that was incurred for the purpose of carrying tax-exempt securities.
Consideration of the corporate income tax is extremely relevant to any discussion concerning capital structure occurring in the present finance literature both because of the current high rate of the tax and because certain sources have been defined by tax authorities as tax deductible. The remuneration to the suppliers of debt capital, or interest payments, are treated as an expense which is deducted before the computation of net income. The remuneration to the suppliers of equity capital is viewed as a division of profits and is not tax deductible.

Arthur Stone Dewing. The present high tax rates have not always existed. As corporation income tax rates increased rapidly, the views of authors regarding the use of debt changed significantly. The following statements taken from consecutive editions of Dewing's work, The Financial Policy of Corporations, clearly depict this shift in position. In the fourth edition of his text, Dewing, in discussing the possibility of converting preferred stock to debt, comments,

It should be noted that the refunding of preferred stock into bonds also brings about a saving in federal income tax, in that bond interest is an allowable deduction in computing taxable net income. Problematical as the policy may appear to be, it was followed by certain large corporations in the period directly preceding the culmination of business activity in 1929. And, strange as it may seem, the additional bonds in the financial plan did not bring about disaster to these corporations in the following period of depression. The most favorable case for such a refunding operation would be that of a successful public utility with a long record of earnings; but in spite of the adoption
and success of the expedient in the hands of prominent and wisely administered corporations, the funding of preferred stock into bonds is fundamentally inexpedient. From every point of view it is unsound financial policy.  

In the fifth edition he amended his position. After rewriting the first three sentences of this section exactly as in the fourth edition, he stated:

The most favorable case for such a refunding operation would be that of a successful public utility with a long record of earnings. Nevertheless, in spite of the adoption and success of the expedient in the hands of prominent and wisely administered corporations, the funding of preferred stock into bonds is fraught with uncertainty. That it has proved expedient has been due in large measure to circumstances beyond the control of the corporation itself. There has been throughout the nineteen forties a steady rise in general prices, and corporate gross profits have risen in response to the general economic prosperity. Again, there has been a steady rise in corporation income taxes which has, more and more, thrown an advantage in favor of debt securities as against preferred stock. Interest is paid before the income tax is computed; preferred dividends are paid after it is computed.

Those factors, described by Dewing as beyond the control of the corporation, continued throughout the fifties and sixties to make it expedient for the firm to utilize debt as a source of funds. The position of current writers with respect to the tax advantage of debt seems to be summarized in this statement by Graham, Dodd and Cottle. In discussing the two opposing schools of thought concerning the optimum capital structure, the authors declare that

...a good part of any suggested gain in enterprise value through creating or increasing the debt com-

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ponent will be accounted for (under existing legislation) by the factor of tax savings — a benefit apparently conceded by those who deny the other claimed benefits.... Since the tax saving is not in dispute, the great controversy — from a practical standpoint — seems to reduce to a calculation of the amount by which a given acceptable bond component will raise the total value.

There appears to be a general agreement among the authors of finance texts that the introduction of debt into a firm's capital structure creates a tax saving which accrues to the benefit of the equity interests.

Restatement of the Writer's Position
Ignoring Corporation Income Taxes

The author's concept of the effect of corporation income taxes on the firm's cost of capital is derived from the cost of capital model introduced in Chapter III and reproduced below.

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It will be recalled that in this graphic presentation, $k_1$ represents the rate of return demanded by debt suppliers at different degrees of financial leverage. It was assumed in the development of the writer's model that the return demanded by the suppliers of capital varies directly and continuously with risk. It was assumed that in a firm whose capital structure was composed solely of debt the suppliers of debt capital would demand the same rate of return as would be demanded by equity interests if the firm's capital structure was composed solely of equity. In these two capital structures, debt and equity were defined as incurring the same amount of risk, namely the business risk contained in the given bundle of assets. It is assumed that rational investor's demand increased return when subjected to increased risks. It follows from this assumption that as the leverage of the firm approached zero percentage, the risk to the suppliers of debt capital approaches zero and their demands should approach zero.

In the graph the $k_g$ line represents the demands of the equity interests. As rational investors, they should demand a higher rate of return with the introduction of prior-claim sources of capital into the capital structure. As was indicated in discussing the model in Chapter III, these demands should approach twenty per cent as leverage approaches one hundred per cent. The symbol $k_g$ was used to represent the resultant over-all cost of capital to the firm. Given the assumptions of no corporate income taxes, rational investors and relatively perfect capital markets utilized in the model, it was suggested that a firm's cost of capital is independent of its capital structure. If the demands for increased return by the suppliers of both
debt and equity capital are commensurate with any increase in risk, then the cost of capital is constant for all levels of leverage.

Since debt and equity are treated differently in computing a firm's tax liabilities, the introduction of corporation income taxes might significantly alter the recommendations previously derived from the model concerning a firm's optimum capital structure. The ramifications of this alteration of the model are explored for the remainder of this chapter.

The Introduction of Corporation Income Taxes

At this point the assumption concerning the absence of corporation income taxes utilized in developing the model in Chapter III is relaxed.

Once the presence of corporation income taxes is acknowledged, any discussion of the effects of such taxes on an optimum capital structure will be affected by the assumption made concerning the factor that bears the burden of the taxation. Traditional accounting shows the tax as being borne by the suppliers of equity capital. The amount of tax borne by the suppliers of equity capital would seem to be extremely relevant to the present discussion. If income taxes are borne by equity, then the amount of return demanded from the firm's assets by the suppliers of capital would vary as the amount of equity in the capital structure varied. In other words, if taxes are borne by the suppliers of equity capital the composition of a firm's capital structure would affect its over-all cost of capital. One way to mitigate the confusion involving questions concerning the effect of the corporation
income tax on a firm's cost of capital would be to examine the firm
while making different assumptions as to the incidence of taxation.

**Taxes Borne by Customers**

One way to view the burden of taxation is to assume that all taxes
are passed on to consumers. For example, it could be argued that as
taxes were introduced at low rates and then increased, prices for the
firm's products were slowly raised to cover this expense. In support
of this approach, one could indicate that much of American industry
is characterized by oligopoly. Following the action of a price leader,
all tax increases could be readily recovered in higher prices. If,
indeed taxes were completely borne by customers, the over-all cost of
capital to the firm would not be affected. The relationship between
the rate of return demanded remains the same as developed in the origi­
nal presentation of the model and shown below.

![Graph](image-url)

**Figure XVIII**

*COST OF CAPITAL ASSUMING ALL TAXES
ARE BORNE BY CUSTOMERS*
It must be remembered that two variables are being considered at this point, first, the rate of taxation and secondly the degree of leverage. This position holds that given a degree of leverage, all increases in tax could be passed on to customers. Or, given a tax rate, the benefits of the tax treatment of debt could be passed along as reduced prices as leverage was increased. In other words, this position assumes that the physical output from a given bundle of assets remains constant while pricing is varied to yield the rate of return required by equity.

Taxes Borne by Stockholders

Another approach to determining the effect of the corporation income tax on a firm's cost of capital is to assume that the tax is completely borne by the suppliers of equity capital. This is the way that traditional accounting has dealt with the tax. If one assumed this to be true and, in addition, assumed that the capital market was composed of rational investors, then, a representation of this situation would appear as follows:

[Diagram: Figure XIX - COST OF CAPITAL ASSUMING ALL TAXES ARE BORNE BY STOCKHOLDERS]
In the preceding figure, the dashed line represents the value of the output of the assets of the firm under consideration. It is assumed that additional assets acquired by the firm will generate the same revenue as the body of assets presently in existence. It is recognized that this condition will not be completely fulfilled in the real world but that this line would shift during time as new assets with slightly different rates of return are acquired. This does not affect the analysis. The tax rate is assumed to be fifty per cent.

With an all-equity capital structure it can be seen that equity interests bear the total tax burden and thus receive only one-half the output of the assets. This situation containing equity interests who demand less than the entire output of the assets could arise as tax rates were introduced at low rates and raised slowly over time. During this period of time, equity's perception of the risk inherent in the assets could change so that they would be willing to hold the assets for a rate of return less than commensurate with the entire output of the assets.

As debt is introduced into the capital structure the rate of return demanded by equity is increased. As explained previously, equity now is faced with a combination of business risk and financial risk. This rate of return demanded by equity is shown by the $k_e$ line. The rate of return demanded by debt is shown as the $k_d$ line. The resultant cost of capital to the firm is shown by the $k_o$ line shows the combined effects of the tax deductibility of interest payments and the willingness of the suppliers of capital to hold the firm at a rate of
return lower than the value of real output. The downward sloping $k_o$ line will result only if ex ante and ex post rates of return to the suppliers of capital are in equilibrium.

**Excess Returns**

It becomes immediately apparent that if one retains the assumption that income taxes are borne by the suppliers of capital and further assumes that the suppliers of capital evaluate the risk as described in the development of the model in Chapter III, then excess returns exist. These are amounts of income which are not demanded by the suppliers of capital. For example, assume that the firm consists of one hundred dollars worth of assets. The assets generate twenty dollars worth of returns. Equity is willing to supply the entire amount of capital for a ten dollar return. Likewise, debt is willing to supply the total amount of capital required for a ten dollar return. In this situation the following amounts of excess returns will be generated at various degrees of leverage.

<table>
<thead>
<tr>
<th>Leverage</th>
<th>0%</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>90%</th>
<th>99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Returns</td>
<td>$20.00</td>
<td>$20.00</td>
<td>$20.00</td>
<td>$20.00</td>
<td>$20.00</td>
<td>$20.00</td>
</tr>
<tr>
<td>Debt Demands</td>
<td>0</td>
<td>0.625</td>
<td>2.50</td>
<td>5.625</td>
<td>8.10</td>
<td>9.80</td>
</tr>
<tr>
<td>NIET</td>
<td>20.00</td>
<td>19.375</td>
<td>17.50</td>
<td>14.375</td>
<td>11.90</td>
<td>10.20</td>
</tr>
<tr>
<td>Tax 50%</td>
<td>10.00</td>
<td>9.687</td>
<td>8.75</td>
<td>7.187</td>
<td>5.95</td>
<td>5.10</td>
</tr>
<tr>
<td>Net Income</td>
<td>10.00</td>
<td>9.687</td>
<td>8.75</td>
<td>7.187</td>
<td>5.95</td>
<td>5.100</td>
</tr>
<tr>
<td>Equity Demands</td>
<td>10.00</td>
<td>9.375</td>
<td>7.50</td>
<td>4.975</td>
<td>1.90</td>
<td>1.199</td>
</tr>
<tr>
<td>Excess</td>
<td>$0</td>
<td>$0.32</td>
<td>$1.25</td>
<td>$2.812</td>
<td>$4.05</td>
<td>$4.901</td>
</tr>
</tbody>
</table>

If instead of a one hundred dollar firm, one was dealing with a multimillion dollar firm these excess returns could become significant absolute amounts.

---

4 Net income before taxes.
As previously mentioned, normal accounting treatment is to credit these so-called excess returns to the account of the equity interests. Equity interests are defined as residual claimants and are credited with this "residue."

If these amounts are assigned to equity, an imbalance is created between their ex ante demands for return and their ex post or realized returns. For example, a graph of the ex post returns to equity would appear as follows:

![Graph showing anticipated and realized returns to equity with different degrees of leverage.](image)

**Figure XX**

ANTICIPATED AND REALIZED RETURNS TO EQUITY WITH DIFFERENT DEGREES OF LEVERAGE

The dashed line in Figure XX shows equity's ex ante demands and the solid \( k_e \) line shows their realized rate of return as leverage is increased. The ex ante demands for return approach twenty per cent as leverage approaches one hundred per cent. The ex post returns to equity exceed five hundred per cent as leverage approaches one hundred per cent.
Increased Market Value

The most probable result in the preceding example would seem to be an increase in the value of the firm. If equity interests are satisfied to hold the firm for the rate shown on the $k_e$ line the value of the firm will increase as follows:

<table>
<thead>
<tr>
<th>Leverage</th>
<th>0%</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>90%</th>
<th>99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollar Return to Equity</td>
<td>$10.00</td>
<td>$9.687</td>
<td>$8.75</td>
<td>$7.187</td>
<td>$5.95</td>
<td>$5.10</td>
</tr>
<tr>
<td>$k_e$ Factor</td>
<td>.10</td>
<td>.125</td>
<td>.150</td>
<td>.175</td>
<td>.19</td>
<td>.199</td>
</tr>
<tr>
<td>Value of Firm</td>
<td>$100.00</td>
<td>$102.50</td>
<td>$108.33</td>
<td>$116.06</td>
<td>$121.31</td>
<td>$124.62</td>
</tr>
</tbody>
</table>

If the firm in this example had been a one-half billion dollar firm rather than a one hundred dollar firm, the increase in market value would have been in excess of forty-one million dollars.

Of course the possibility always exists that management could siphon off the excess return. Since no one is demanding these returns in an ex ante sense, management could manipulate the records of the firm and pay themselves a higher salary while at the same time allowing the suppliers of capital to realize their ex ante demands. In addition, these excess returns could be expensed for research and development without annoying stockholders, thus possibly giving the firm competitive advantages. The option of passing a part of these excess returns along to customers or labor exists. In this latter approach, the pure profit created by government taxation could be shared by all the interests in the corporation. An alternative course of
action that management could take would be to secure stock options and then increase leverage and credit the "excess returns" to the equity account, thus increasing the value of their holdings.

**Combined Effects of Income Tax and Market Imperfection**

At this point it would seem that a reason can be advanced for the existence of many firms containing what would seem to be low levels of leverage. In Chapter IV, the minimum acceptable degree of leverage was discussed. If there are firms which do not seem to have achieved this minimum point, the deductibility of interest may provide an explanation. As shown in the graph below, the effects of the corporation income tax treatment of interest would make it appear that the minimum acceptable amount of debt had been attained at a lower level.

![Graph](image-url)

**Figure XXI**

THE COMBINED EFFECTS OF INCOME TAX AND MARKET IMPERFECTIONS
In other words, equity interests reach the $k_e$ line and achieve an ex ante - ex post equilibrium before the real $k_1$ line intersects the theoretical $k_1$ line.

The existence of firms with debt levels below what was shown to be the minimum acceptable degree of leverage in the no-tax model would seem to be further support for the concept that a $k_e$ line exists as developed in the model. In this case, equity holders have achieved their anticipated rate of return at a lower degree of leverage than the no-tax model indicated they would.

In this same line of thought, it would seem that this type of analysis could be applied to certain of the situations that are defined as "economic failures." An "economic failure" is defined as an investment that is not yielding a return commensurate with the risk inherent in the assets. An example of this might be holdings of land used for agricultural purposes. In certain situations the market has bid the price of the land to very high levels. When these investments are financed with equity, the return on investment could be below the rate that equity could earn in comparable risk situations elsewhere. In these situations, moderate amounts of debt could push the ex post returns to equity through the $k_e$ line very quickly. Through the use of debt, the equity holders could realize the rate of return available in comparable risk investments. Such a situation is portrayed on the following page.
The effects of taxation in the real world probably lie somewhere between the two positions discussed in this chapter. Taxes are probably neither passed on to the consumer entirely nor totally borne by the suppliers of capital. Extreme positions were taken to emphasize the author's view that if any part of the taxes is borne by the suppliers of capital, equity should press toward the maximum degree of leverage attainable. Being the residual claimant equity benefits from the tax treatment of debt.

In examining the incidence of taxation in this chapter, it was assumed that stockholders bear some of the burden of corporation income taxes. It was suggested that if this were not so and assuming all things other than capital structure equal, one would perceive varying prices based on the amount of leverage contained in the capital structures of firms in an industry. It would seem that uniform prices for a
product must assume a certain level of leverage. If a firm is not at the level assumed by industry prices, equity interests are benefited or penalized. Since equity bears some of the incidence of taxation of the firm has less leverage than assumed by industry prices, equity interests should work for increased leverage.

This analysis suggests that financial management is not opening efficiently if the level of leverage for the firm is below that level assumed in industry pricing. From the point of view of equity interests and considering only the effects of corporation income taxes, returns are maximized as leverage is maximized.
Chapter VI

SUMMARY

It has been suggested that the principal content of financial management should present a defensible basis for answering three questions:

1. How large should an enterprise be, and how fast should it grow?
2. In what form should it hold its assets?
3. What should be the composition of its liabilities?

The recent finance literature has contained a recurring controversy concerning the resolution of these questions. This study has been directed toward answering the last of these questions. In the most part, this study has been an attempt to re-examine the relationship of the concept of the cost of capital to financial management's problems in determining financial structure. Seemingly, two of the most difficult questions facing financial management in modifying capital structure are the effects of both leverage and the corporate income tax on the firm's over-all cost of capital.

A major part of this paper was directed toward the resolution of these two major problems.

Chapter I of this dissertation discusses the justification, scope, and methodology of this study. In Chapter II, the concept of risk is
Return on capital is viewed as the remuneration for the acceptance of risk. The concept of trading on the equity is traced through the finance literature. The concept of the cost of capital is presented as described by traditional finance authors, present finance authors and the writer of this paper.

Chapter III is devoted to an examination of the cost of capital model utilized in the traditional finance literature and the present finance literature. In addition, the author's views concerning the cost of capital are presented.

In Chapter IV the effects of leverage on a firm's cost of capital are examined. The concept of the minimum acceptable degree of leverage is introduced.

Chapter V deals with the effects of the corporate income tax on a firm's cost of capital as leverage is altered. The problem of the distribution of the "pure profit" resulting from the government's different tax treatment of different sources of capital are explored.

Chapter II - Concepts of the Cost of Capital

The second chapter discusses the concept of risk. It seems that the original idea expressed by the term risk was "hazard" or "exposure" to mischance." In common usage the term seems to denote the possibility of occurrence of an adverse event or effect.

This paper concentrates on the risk facing the suppliers of capital. Within the context of this study, risk was considered to be the probability that the ex ante and ex post positions of the suppliers of capital to a firm would be in disequilibrium. In other words, risk was defined as the probability that realized returns would be less than
returns anticipated from an investment alternative in time period \( t - 1 \). If realized returns are less than the anticipated returns, an investor could perceive that he had suffered an opportunity loss. By committing funds to an enterprise which failed to yield a rate of return calculated as commensurate with the risk contained, the investor has foregone the opportunity to place the same funds in a firm containing the same level of risk which yielded a rate of return equal to that anticipated by the investor.

Because of the risk of loss both in an absolute sense and in an opportunity sense, a supplier of capital demands a return. The rate of return demanded is dependent on the degree of risk as perceived by the suppliers of capital. The earliest writers in the field of corporation finance discussed this relationship. Greene stated:

>Purchasers of its (a firm's) bond or shares weigh the chances of success, and usually demand concessions in some way commensurate with the supposed risks before buying.\(^1\)

The return to suppliers of capital is defined as remuneration for the acceptance of risk. The risk confronting a firm's suppliers of capital was conceived as consisting of a combination of business risk and financial risk. The basis for business risk seems to be the uncertainty concerning business operations. This uncertainty arises from all the factors which can affect these operations. Financial risk arises from the uncertainty that the company's income will be adequate to meet the financial burden that exists because of its financial structure. If return is the remuneration for the assumption of risk,

then with an all-equity capital structure the return demanded by equity should be solely a function of business risk. As debt is introduced, so also is financial risk. Once debt is introduced, financial risk, in addition to business risk, should be come a factor in the determination of the appropriate return to equity.

The practice of introducing debt into a firm's capital structure is referred to as "trading on the equity." The intention of management in acquiring such debt is to utilize it in such a way that the return from its use will exceed its cost. Any returns in excess of the cost of debt are treated as accruing to equity interests.

Early writers in the field of finance took an incremental approach in the determination of the costs of the various sources of capital. The explicit costs of a source under consideration were related to the incremental revenues which would be generated by the source. No consideration was given to the implicit costs created by the introduction into the capital structure of a prior-claim, fixed-cost source of funds.

Beginning with Durand's work of 1952\(^2\), some of the present writers in the field of finance began to question the use of the incremental approach to determine the cost of the various capital sources. It was suggested that management should be aware of the implicit costs as well as the explicit costs created by the firm's acquisition of prior-claim capital. It was suggested that the return demanded by the suppliers of capital was dependent on both financial and business risk. In other words, the financial risks confronting equity which were created by

the addition of debt to a capital structure could cause equity to demand a rate of return higher than that demanded when faced with only business risk in an all-equity capital structure.

If equity holders did in fact demand higher rates of return as increasing amounts of debt were acquired, the benefits of leverage envisioned by earlier writers might prove to be nonexistent.

In an article published in 1958, Franco Modigliani and Merton Miller asserted that these supposed benefits of leverage were indeed nonexistent. Their position implied that in the absence of taxes on corporate income, the cost of capital to the firm remained constant with varying amounts of leverage. They contended that the value of the firm is independent of the proportion of debt to total capitalization.

The writer defines the cost of capital as that rate of return that must be earned in order that the firm's suppliers of capital will be willing to continue to supply their capital to the firm. The rate of return to be demanded from a given quantity of assets depends on the market evaluation of the risk associated with these assets. The most appropriate rate of return that should be demanded from a given volume of assets is not fixed -- it varies continuously. Anything that changes any of the myriad risks associated with the body of assets changes this most appropriate rate of return.

Chapter III—The Cost of Capital Model

The costs of the various sources of capital available to a firm are of great concern to financial managers and are discussed throughout the finance literature. In this chapter, cost of capital models representing the traditional finance literature, the present finance literature and the writer's point of view are contrasted.
The traditional writers took an incremental approach to determining the cost of capital. They seemed to focus their attention on the explicit incremental costs and benefits incurred by the investment of a new amount of capital. In particular, if the new source were debt, the interest payments were compared with the incremental returns on investment. To traditional writers, the cost of capital was an ex post or realized concept. The most interesting facet of leverage to the traditional writers as adjudged by the volume of writing, was the distribution of "excess" earnings made possible by the use of low-cost debt.

While early writers did not present a graphic representation of the cost of capital concept, one can be constructed to represent their views. In the graph representing their views, the vertical axis represents the rate of return and the horizontal axis represents the combination of debt and equity in the capital structure; progressing from an all-equity structure at the origin to an all-debt capital structure. The line on the graph representing the cost of capital begins at the rate of return adjudged by the market to be commensurate with the risks inherent in the assets of the firm.

In the graph, the symbol \( V \) represents the total market value of the firm. This is composed of the total market value of the stock and debt of the firm. The symbol \( k_e \) represents the rate at which the market capitalizes the net earnings; \( k_i \) is the effective yield on the company's debt and \( k_o \) is the over-all capitalization rate which equates net operating earnings to the company's total market value.
The traditional view of the hypothetical reaction of a firm's over-all cost of capital was that initially as low-cost debt was introduced into the capital structure, $k_o$ would fall and simultaneously $V$ would rise. The over-all cost of capital would fall because while $k_o$, the rate at which the market capitalized net earnings, rose with the introduction of low-cost debt; it would not rise fast enough to offset the increase in the net earnings rate achieved through the increased use of the lower cost debt capital.

Increases in debt could not continue unabated. According to this school of thought, once a certain critical point of leverage was reached, further acquisitions of debt capital would lead to rapid increases in $k_d$, the cost-of-debt capital, and decrease in $U$, total market value for the firm.

In contrast to the traditional point of view, one school of thought present in the current finance literature contends that a variation in
capital structure will have no effect on a firm's cost of capital.
This school seems to have gained its impetus from an article by Franco Modigliani and Merton Miller published in 1958. The basic proposition underlying this argument is that in a world of perfect markets and rational investors, two identical companies, i.e., two sets of assets offering net operating earnings of the same size and quality, must have the same total market value, regardless of differences in leverage. Once this assumption is granted, the market value of a company and hence its cost of capital are both independent of its financial structure. A perfect market was defined as one in which two identical commodities could not sell at two different prices, and the foregoing proposition logically followed.

Modigliani and Miller present their concept by means of graphs. Their initial position is as follows:

![Graph](image)

**Figure XXIV**

**THE MODIGLIANI - MILLER COST OF CAPITAL - LEVERAGE RELATIONSHIP WITH CONSTANT RATES OF INTEREST**
In presenting their views, the authors state that in the simplest case with \( r \) (the rate of interest) constant at all levels of leverage, the relation between the yield on common stocks and financial structure, measured by \( D/S \) would approximate a straight line \( (M - M^1) \). The slope of this straight line was defined as \( p_k \), the appropriate capitalization rate for the class, minus \( r \). The intercept with the vertical axis was at \( p_k \). This representation would hold true for all firms in a given risk class. In an attempt to apply their model to the world of uncertainty, the authors then explained what would result in a situation in which interest rates did not remain constant at all levels of leverage but in fact rose with increased leverage. This situation is portrayed as follows:

![Graph](image)

Figure XXV

THE MODIGLIANI - MILLER COST OF CAPITAL - LEVERAGE RELATIONSHIP WITH VARYING RATES OF INTEREST

In this graph, as leverage is increased the cost of debt \( (G) \) rises. In the author's thinking, if the rate of interest increased with leverage,
the yield on common stock would still tend to rise with increased leverage but at a decreasing rather than at a constant rate. It was stated that beyond some high level of leverage, depending on the exact form of the interest function, the yield might even start to fall. It was mentioned that the relationship between the yield on common stock and leverage could conceivably take the form indicated by the curve MD.

The author's concept of the cost of capital model varies somewhat from both the traditional and nontraditional models presented thus far. A graphical presentation of the author's concept of the cost of capital contains a vertical axis representing the rate of return and the horizontal axis representing the degree of leverage. The firm represented by the model is assumed to be a ten per cent firm. In other words, the capital market is in agreement that a ten per cent return to the owners of the firm's assets is completely commensurate with the risk of success or failure inherent in the assets of the firm. Therefore, in a capital structure composed solely of equity, stockholders will demand a ten per cent return. As the firm's capital structure approaches one hundred per cent debt, it would seem that the demands of debt holders would approach ten per cent. This would seem logical since, as the debt position approached one hundred per cent, the position of the debt holders would approach that of the equity interests at a one hundred per cent equity position. It would seem that rational investors in a reasonably perfect market would demand the same ten per cent return from the same bundle of assets with given inherent risks. Since in a reasonably perfect market a given commodity cannot consistently sell at different prices, it would be expected that rational suppliers of debt capital would demand the same return from this given bundle of assets
as did equity interests at an all-equity position, since debt’s position vis-a-vis the assets approaches that of the equity interests when the capital structure was entirely equity.

In this presentation, the symbol $k_i$ is used to represent the average cost-of-debt capital and appears on the graph as:

As the debt position approaches one hundred per cent, it is assumed that rational debt holders will demand a rate return on assets approaching ten per cent. Return is assumed to vary continuously with risk. As the debt position of the firm approaches zero, the risk to the suppliers of debt approaches zero and their demands should approach zero.

It is recognized that debt capital is not available at these low rates of return and this empirical problem is explored. In addition, it is important to note that while return is assumed to vary continuously with risk this does not imply a linear relationship. For the purposes of this analysis and in the interest of initially utilizing a simple
model, it is assumed that the \( k_1 \) line is a straight line beginning at zero return at zero leverage and approaching ten per cent as debt approaches one hundred per cent. While the return to debt could be assumed to follow some curvilinear pattern, the justification for this does not seem to be greater than that yielding a straight line. The assumption that the rates of return follow a curve does not affect the results of this analysis.

The term \( k_e \) represents the cost of equity capital and appears on the graph as:

![Graph showing the cost of equity capital in a changing capital structure](image)

**Figure XXVII**

**THE COST OF EQUITY CAPITAL IN A CHANGING CAPITAL STRUCTURE**

It would be expected that the rate of return demanded by equity interests would increase with the introduction of debt into the capital structure. If debt interests evaluate the increasing risk with increasing leverage as described in the preceding paragraphs, equity interests defined as equally rational investors must do the same. Therefore, the returns to equity interests must be such that as rational investors...
demanding a return which varies continuously with risk, their demands will follow the $k_e$ line shown on the graph. As the firm approaches one hundred per cent debt, and given the demands of the debt interests, it would seem that the returns demanded by equity should approach twenty per cent. If the cost of capital is defined in an ex post sense and debt is treated as prior claim capital, it can be demonstrated that the returns available to equity interests will approach twenty per cent.

The term $k_0$ is used to represent the over-all cost of capital to the firm. Once the $k_1$ line and the $k_e$ line are derived, the resultant is a constant $k_0$ for any and all levels of leverage. The completed graph containing $k_e$, $k_1$ and $k_0$ appears as follows:

Rate of Return

\[ K_e \]

\[ K_0 \]

\[ K_1 \]

Leverage

Figure XXVIII

THE AVERAGE COST OF CAPITAL IN A CHANGING CAPITAL STRUCTURE

Therefore, one must conclude that, given the assumptions of the model, an increase in leverage can neither raise nor lower a company's cost of capital no matter how "judicious" or "excessive" this increase may be.
Chapter IV—Leverage and the Cost of Capital

The effects of leverage on a firm's cost of capital are considered in Chapter IV. Traditional writers who primarily considered the explicit costs incurred with the acquisition of debt argued that leverage lowered the firm's over-all cost of capital. Later writers in considering the implicit costs as well as the explicit costs created by the acquisition of prior-claim capital began to question the benefits attributed to leverage by earlier writers.

On the basis of the model developed in Chapter III, the author suggests that given the assumptions of the model, leverage does not affect a firm's over-all cost of capital.

In this chapter, the concept of the minimum acceptable degree of leverage is introduced. By the use of the model, the author demonstrates that given a market rate of interest on debt capital available to the firm, the firm must acquire a determinable minimum degree of leverage. This minimum acceptable point of leverage varies with the level of business risk inherent in a firm's assets and market rate of interest. If a degree of leverage below this minimum acceptable point is acquired, the ex ante demands of equity holders will not be realized.

Chapter V—Taxation and the Cost of Capital

The cost of capital model utilized in this study is made more realistic in Chapter V by the introduction of the corporation income tax. Once the presence of corporation income taxes is acknowledged, any discussion of the effects of such taxes on an optimum capital structure will be affected by the assumption made concerning the incidence of the taxation. Traditional accounting shows the tax as being borne by the
suppliers of equity capital. The amount of tax borne by the suppliers of equity capital is extremely relevant to the present discussion. If income taxes are borne by equity, then the amount of return demanded from the firm's assets by the suppliers of capital would vary as the amount of equity in the capital structure varied. In other words, if taxes are borne by the suppliers of equity capital, the composition of a firm's capital structure would affect its over-all cost of capital. One way to mitigate the confusion involving questions concerning the effect of the corporation income tax on a firm's cost of capital would be to examine the firm while making different assumptions as to the incidence of taxation.

The first assumption concerning the burden of taxation is that all taxes are passed on to customers. This position assumes that the physical output from a given bundle of assets remains constant while pricing is varied to yield the rate of return required by equity.

The second assumption made concerning the burden of taxation is that all taxes are borne by the suppliers of equity capital. This is in line with the assumption of traditional accounting practice. Since the payments to the suppliers of debt capital are tax deductible, the over-all cost of capital to the firm, under these assumptions, is downward sloping rather than constant as suggested by the earlier model which ignored taxes. The problem of distributing the excess returns or "pure profit" created by the government's different treatment of the suppliers of debt and equity capital is discussed in the remainder of this chapter.
Conclusions

The state of the recent finance literature suggests that some confusion exists concerning the concept of the cost of capital. This paper has been an attempt to resolve some of the questions surrounding several aspects of this problem area.

A model explaining the cost of capital was developed. The model is normative. It deals with the rates of return that should be demanded by the suppliers of capital when confronted with different levels of risk. This model was utilized in examining the leverage-cost of capital relationship and the taxation-cost of capital relationship. Given the assumptions of the model, leverage does not affect a firm's cost of capital. This finding conflicts with traditional financial thought. The results of this study also indicate that in a world containing corporation income taxes, the use of debt capital could prove beneficial to equity interests, customers, labor and financial managers. This finding conflicts with traditional financial thought.

At this point the reader might wonder why, in the face of these suggested benefits of debt, more companies are not utilizing larger amounts of it. One reason is that an extremely cautious approach to the use of debt is a part of the legacy passed to the present students of finance by earlier writers. Typifying this school of thought is Dewing who states,

> it has been said repeatedly that financing by means of common stock and preferred stock leaves the financial structure free from fixed charges and therefore intact for the subsequent issue of bonds in case an emergency arises.³

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In addition to the warnings of early scholars, potential users of debt are faced with the cautious attitudes of lenders. As has been noted by Hardy,

In general, commercial money lenders do not make a charge for interest varying with the assumed degree of risk but establish a single rate and classify applications for credit into those which do and those which do not appear safe enough to be graded at this rate.4

These factors seem to be very important in explaining why firms do not possess the levels of debt suggested by the model.

Another extremely relevant factor seems to be the attitude of management toward debt. As Donaldson pointed out in his work, Corporate Debt Capacity,

...there was very little evidence of a serious attempt on the part of the borrowing corporation to make an advance appraisal of the validity of a debt capacity criterion in terms of its own unique circumstances.5

In the final analysis, then, the results of this study indicate that the cost of capital is dependent on the investment decisions of the firm, not the financing decisions as has been previously suggested in the finance literature. In addition, it would seem that other clear implications for financial management exist. First, from the point of view of equity interests, a minimum acceptable degree of leverage does exist. This amount of leverage is that amount necessary to force the real \( k_1 \) line to coincide with the theoretical \( k_1 \) line. If the real \( k_1 \) lies above the theoretical \( k_1 \) line, as in line segment A-B, shown in


graph XXIX, the equity interests are at a disadvantage relative to the zero leverage position. If the real $k_i$ line intersects and lies below the theoretical $k_i$ line, as in line segment B-C in the graph below, the equity interests are at an advantage relative to their position at the point of zero leverage or in any point where the real $k_i$ coincides with the theoretical $k_i$ line. From the point of view of equity interests, point C is the most advantageous position at which to secure debt. The returns to equity are maximized at this point. It is recognized that in perfect markets debt capital at rate shown by line segment B-C would not exist in the long run. When the real $k_i$ line is below the theoretical $k_i$ line, equity holders are receiving more return than anticipated or required.

Secondly, because of the existence of the corporation income tax, financial management should work toward higher levels of leverage.
In examining the incidence of taxation in Chapter V, it was assumed that stockholders bear some of the burden of corporation income taxes. At that time, it was suggested that if this were not so and assuming all things other than capital structure equal, one would perceive varying prices based on the amount of leverage contained in the capital structures of firms in an industry. It was suggested that uniform prices for a product must assume a certain level of leverage. If a firm is not at the level assumed, equity interests are benefited or penalized. Since equity bears some of the incidence of taxation if the firm has less leverage than assumed by industry prices, equity interests would be penalized and should work for increased leverage.

This analysis suggests that financial management is not operating efficiently if the level of leverage for the firm is below that level assumed in industry pricing. If the firm contains the level of leverage assumed in industry pricing equity is not being penalized. Nevertheless, increased leverage would still prove beneficial to these stockholders, therefore, from the point of view of equity interests and considering only the effects of corporation income taxes, returns are maximized as leverage is maximized.

Given the corporation income tax, increased leverage can either reduce the average cost of capital to the firm or increase the return to equity beyond that which they theoretically require. It seems apparent that very few firms possess maximum levels of leverage in their capital structure. Since the author's analysis indicates that at worst, leverage forces equity interests to a point of indifference as to the rates of return on their investment and at best proves very beneficial to them,
one must look to factors other than the cost of capital to find the reasons for firms not possessing maximum levels of leverage. The author finds no theoretical or practical reason for attaining less than the maximum amount of leverage that capital markets will allow when the analysis is confined to the cost of capital. Since the empirical evidence indicates that these levels of leverage are not attained, further research seems indicated.

One factor in this seeming paradox is that management, not equity, makes the decisions concerning the amount of leverage the firm will possess. In many cases, it seems, management is more sensitive to risk at high levels of leverage than are the equity interests. One reason might be that for management, salary as well as return on investment is at stake. The entire decision process might include factors of control which are important to management and at the same time do not seem to be important to the economics of the corporation. In other words, many decisions relating to leverage are not entirely economic. Perhaps a few of the decisions in this area are made on the basis of tradition alone. Therefore, it seems that any firm which doesn't carry leverage to the maximum levels discussed in this paper must justify this section on some basis other than the cost of capital or return to equity interests.
# Appendix I

## THE COST OF CAPITAL VIEWED AS AN EX POST CONCEPT

<table>
<thead>
<tr>
<th>Capital Structure</th>
<th>Payment to Capital (Bonds First)</th>
<th>( k_i ) and ( k_e ) Ex ante</th>
<th>( k_o ) Ex ante</th>
<th>( K_i ) and ( K_e ) Ex post</th>
<th>( k_o ) Ex post</th>
</tr>
</thead>
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<tr>
<td>Bonds 500</td>
<td>$ 2.50</td>
<td>10%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Stock 9500</td>
<td>997.50</td>
<td>10.5%</td>
<td>10.5%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Bonds 1000</td>
<td>100.00</td>
<td>1.0%</td>
<td>10%</td>
<td>1.0%</td>
<td>10%</td>
</tr>
<tr>
<td>Stock 9000</td>
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<td>10%</td>
<td>11.0%</td>
<td>10%</td>
</tr>
<tr>
<td>Bonds 2000</td>
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<td>2.0%</td>
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<tr>
<td>Stock 8000</td>
<td>960.00</td>
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<td>10%</td>
<td>12.0%</td>
<td>10%</td>
</tr>
<tr>
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<td>10%</td>
<td>3.0%</td>
<td>10%</td>
</tr>
<tr>
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<td>910.00</td>
<td>13.0%</td>
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<td>13.0%</td>
<td>10%</td>
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<td>10%</td>
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<tr>
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<tr>
<td>Stock 5000</td>
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<td>10%</td>
<td>15.0%</td>
<td>10%</td>
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<tr>
<td>Bonds 6000</td>
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<td>10%</td>
<td>6.0%</td>
<td>10%</td>
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<tr>
<td>Bonds 8000</td>
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<td>8.0%</td>
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</tr>
<tr>
<td>Stock 2000</td>
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<td>10%</td>
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<tr>
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<td>19.0%</td>
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<tr>
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<td>10%</td>
</tr>
<tr>
<td>Stock 500</td>
<td>97.50</td>
<td>19.5%</td>
<td>10%</td>
<td>19.5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

1 Assuming that the demands of bondholders follow the \( k_i \) line developed in Chapter III.
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