The Elasticity of Investment Demand: An Empirical Survey

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OLD DOMINION UNIVERSITY
DEPARTMENT OF ECONOMICS

THE ELASTICITY OF INVESTMENT DEMAND:
AN EMPIRICAL SURVEY

PRESENTED IN FULFILLMENT OF
THESIS REQUIREMENTS

BY

Donald E. Schatz
July 10, 1970
THE ELASTICITY OF INVESTMENT DEMAND:
AN EMPIRICAL SURVEY

A Thesis
Approved for the Department of Economics

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CHAPTER ONE: THE RATE OF INTEREST AND THE M.E.C.

Since the time of Adam Smith and the original conception of economics as an independent area of academic and practical study, great strides have been made in almost all areas of economic concern. Reasonably good explanations and accounts have been formulated for explaining variations, fluctuations, and interactions in such diverse areas of concern as income levels, consumer demand, price determination and productivity. Yet, the theory of investment and the determination of the level of investment spending — an area assigned a position of pivotal importance in almost all macroeconomic analyses — has defied the development of a single all-inclusive theoretical framework. Despite the fact that economists and other writers constantly allude to investment theory and have been able to identify the influence of investment expenditures on the level of demand and even employment, very little is understood or formulated to accurately explain the determination of the level of investment expenditures itself.¹

During the past thirty years, gross private investment expenditures has accounted for an average of about 11.4 per cent of the gross national product of the United States. Over this same period, the percentage has ranged from a minimum of 2.0 per cent to a maximum of 17.1 per cent.² In short, the fluctuations in the level of invest-


ment expenditures have been of an extremely divergent nature. As for the causes of these fluctuations, little concrete empirical evidence has been brought forth to identify their source. Indeed, according to the generally accepted notion of autonomous investment determination\(^3\), the causes of these fluctuations are probably beyond the scope of present empirical methods. Consequently, given the inability to empirically justify or validate investment theory, the subject of the determination of investment expenditures remains as an area of constant conjecture and unsubstantiated analysis.

The purpose of this paper is to discuss one area of investment theory — the Marginal Efficiency of Capital (M.E.C.) schedule or the demand for investment — and to examine some of the limited empirical evidence which relates to this concept. Specifically, given the assumptions of the M.E.C. schedule, the purpose will be to determine whether the demand for investment is elastic or inelastic to changes in the market rate of interest. Towards this purpose, the concept of the marginal efficiency of capital and investment demand will be briefly examined in the remainder of this chapter. After this foundation has been laid, the analysis will turn to the problems involved in any empirical exposition of this concept and finally to the presentation and analysis of several significant studies in this area. After examining these studies it is hoped that an evaluation of the actual elasticity characteristics of investment demand can be made.

\(^3\)Although induced investment can also be identified, major shifts or fluctuations in investment levels tend to be caused by forces outside of the normal frame of economic determination.
The Marginal Efficiency of Capital: Concept and Formulation

According to classical economic theory investment spending sufficient to equate with any level of savings would always be forthcoming in a market economy. Indeed, savings and investment came to be treated as synonymous terms in the writings of many of the classical economists. Thus, the familiar identity: Savings = Investment. Little attention was paid to the actual processes of savings and investment as they actually took place. With Say's Law of Markets and the Quantity Theory of Money as their guide, the classical economists seemed relatively unconcerned as to the origin of investment demand or the desire to save. In their theoretical framework investment and savings would always reach a position of equality through automatic adjustments in the rate of interest. Thus, with the rate of interest and the Quantity Theory as their "equalizer", Say's Law became the pillar of classical investment theory.4

It was not until after the beginnings of the industrial revolution that economists became truly concerned about the level of capital accumulation and investment expenditures. Except for a few early notions about growth and possible stagnation5, little attention was paid to the problem of capital accumulation and the determination of investment expenditures until the appearance of Marx's writings on capitalism and Marshall's exploration of productivity and marginal analyses. In fact, very little real concern seems to have come forth until after the depression and the advent of the Keynesian revolution.


5A notable exception is Ricardo's theory of the declining rate of profits. See his Principles.
However, since that time the question of the determination of investment expenditures has become the target of considerable investigation and discussion. As a result a multitude of investment theories each with its own approach to the problem has appeared in the literature of the last half century. Some of these approaches concentrate on induced investment (i.e. Samuelson and the acceleration principle), others on autonomous influences (for example Schumpeter and his theory of strategic innovations), and still others on the combination or interaction of induced and autonomous forces. In short, the literature is filled with innumerable accounts of the investment process. Yet, no single comprehensive theory of the determination of the level of investment expenditure has emerged.

Despite this wide divergence in the scope and direction of investment analyses, almost all economists today begin their discussions of the investment problem on the same basic and fundamental foundation — the concept of the Marginal Efficiency of Capital. Briefly stated, the Marginal Efficiency of Capital can be described as the relation between the expected return of a capital good and its supply price. More specifically, the Marginal Efficiency of Capital can be described as the rate of discount which would make the present value of the returns expected from a capital investment over its lifetime equal to the supply price of that investment.6

Given the supply price of an investment project and the expected flow of income from that project over its lifetime, the marginal efficiency can be determined by discounting the returns to the point

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where the discounted returns are equal to the present cost of that project. Thus, the rate of discount required to equate the income and the supply price is the marginal efficiency of that investment. In mathematical terms, this figure can be found by manipulating the following formula.7
\[ C = \frac{R_1}{(1+r)} + \frac{R_2}{(1+r)^2} + \frac{R_3}{(1+r)^3} + \ldots + \frac{R_n}{(1+r)^n} \]
where \( C \) = the cost of the investment project today, \( R_1, R_2, R_3, \ldots R_n \) = returns each year, and \( r \) = the Marginal Efficiency of Capital.

Solving this formula for any investment project will yield the rate of return, expected profitability, or M.E.C. for that investment.

Given the marginal efficiency of capital for any given investment project, that project will be profitable only if the rate of return is greater than the market rate of interest. If a firm can invest its money in perfectly safe securities and obtain a guaranteed return of 3 per cent it would not profit that firm to invest in a project with a marginal efficiency of 3 per cent or less. On the other hand, if it costs a firm 5 per cent to finance an investment project, it would not be profitable to invest in a new capital project unless the rate of return or marginal efficiency is 5 per cent or greater.8 Thus, the concept of the Marginal Efficiency of Capital states that the expected rate of return in combination with the rate of interest will determine the profitability of a given investment project and only those projects which can be expected to yield a net rate of profitability will be undertaken.

7Taken from Sam Rosen, National Income (New York: 1963), p. 334.

8It is possible that a firm would invest in a project with a rate of return lower than these figures if the market rate of interest were expected to fall at some future date.
At any given point in time, the individual businessman will normally have more than one investment possibility which he can consider. In analyzing these investment possibilities, the businessman will face a series of possibilities each of which has its own expected rate of profitability. Some investments will have high rates of return and others will have lower and lower rates. Given the market rate of interest some of these investment projects will yield a net profit and others probably will not. Consequently, only those projects which yield a net profit will be considered worth undertaking. Moreover, given the assumption of the profit-maximizing businessman, the firm will consider the project with the highest M.E.C. as the most desirable investment and will implement its investment program accordingly. In short, the firm will invest in the project with the highest net rate of return and continue to do so until all investment projects which will yield a positive return have been implemented.

In terms of Marshall's marginal utility of investment concept\(^9\), this process is similar to any marginal analysis — be it marginal utility, marginal revenue, or marginal cost. According to Marshall a firm will continue to invest in profitable capital goods until it just pays to employ the last project. In other words, the firm will invest up to the point that the marginal utility of the last investment project just equals the market rate of interest. At this point, the firm will have just reached the point where the marginal utility of capital equals the marginal returns to capital for that firm. Thus, it can be implied that the lower the rate of interest.

falls, the lower need the marginal utility of capital be, and the more possibilities for profitable investment to take place. Conversely, the higher the rate of interest, the fewer the number of profitable investment projects will be.

At any given point in time, the business concern will be faced with this variety of investment possibilities. Given the cost of capital and the M.E.C. or rate of return for each of the possible investment alternatives, a schedule of these alternatives can be set up as shown in the table in figure 1. This schedule can be called the Marginal Efficiency Schedule for the firm and provides a method of determining the comparative profitability of each of the investment opportunities open to the firm at any point in time.

Assuming that each of the projects included in the M.E.C. schedule is equally desirable from every standpoint except profitability and assuming that each project can be readily financed and implemented, the businessman's behavior is such that the most profitable investments will be undertaken first. In other words, if the market rate of interest is 12 per cent, only the investment which yields more than 12 per cent return will be undertaken. Then, if the market rate of interest falls to say 6 per cent, the projects yielding more than 11%, 8%, 7%, and 6% would be initiated in that order. Briefly then,

<table>
<thead>
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<th>M.E.C.</th>
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<tr>
<td>12%</td>
<td>50</td>
</tr>
<tr>
<td>11%</td>
<td>65</td>
</tr>
<tr>
<td>8%</td>
<td>75</td>
</tr>
<tr>
<td>7%</td>
<td>75</td>
</tr>
<tr>
<td>6%</td>
<td>80</td>
</tr>
<tr>
<td>5%</td>
<td>125</td>
</tr>
<tr>
<td>3%</td>
<td>150</td>
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</tbody>
</table>

Figure 1 - TABLE OF MARGINAL EFFICIENCY OF CAPITAL.

12 per cent return will be undertaken. Then, if the market rate of interest falls to say 6 per cent, the projects yielding more than 11%, 8%, 7%, and 6% would be initiated in that order. Briefly then,
the normal behavior is to expand through investment up to the point where all projects would produce a positive net yield over the rate of interest. To bring forth new investment, then, "the rate of return over cost must exceed the rate of interest".10

This relation between the M.E.C. and the rate of interest can also be shown through the use of a graphic representation of the M.E.C. schedule. This graphic representation of the M.E.C. is shown in Figure 2 and represents the same statistics given in Figure 1. The Marginal Efficiency of Capital for the individual projects and the market rate of interest are plotted on the Y axis while the total capital stock invested in the firm is measured against the X axis. In this example the firm is assumed to have already invested in all projects with an M.E.C. of over 12 per cent and has accumulated to this point a capital stock of 900 thousand dollars.

![Figure 2 - THE MARGINAL EFFICIENCY OF CAPITAL SCHEDULE (for the firm)](image)

Using this schedule and assuming a market rate of interest of 12 per cent as before, the graph indicates that the capital stock will expand to 950 thousand dollars. Then when the rate of interest falls to 6 per cent, the capital stock stock will expand to the level of one million two hundred and forty-five dollars. At both levels, the total investment would be at the point of profit-maximization and the Marginal Efficiency of Capital for the firm would equal the market rate of interest. The last unit of investment would be returning just enough to make that investment worthwhile.

This graph of the individual firm's M.E.C. schedule can be interpreted as the firm's investment demand schedule or demand curve.\textsuperscript{11} Given this demand schedule, the volume of investment expenditures will be determined as a function of the rate of interest. Thus, it can be said that the level of investment for the firm is a function of the rate of interest:

\[ I = f(r) \textsuperscript{12} \]

The same principles developed in this discussion of the individual firm can be applied to the aggregate investment question. Throughout the economy it can be assumed that each individual firm faces a unique M.E.C. schedule such as the one illustrated above. When each of these M.E.C. schedules is determined and added together, the result is an aggregate M.E.C. schedule which represents the overall or aggregate demand for investment. Since this aggregate schedule reflects a summation of individual M.E.C. schedules, the graph of the aggregate M.E.C. will reveal the same information as

\textsuperscript{11} The step-like appearance of the individual demand curve is due to the "lumpiness" of individual investment projects.

\textsuperscript{12} Rosen, op. cit., p. 337.
the graph of the individual M.E.C. curve. Thus, in figure 3 the reaction of the economy to a fall in the rate of interest will be very similar to the reaction of the individual firm discussed above. Given the M.E.C. schedule in figure 3 and a market rate of interest of 8 per cent, the total capital stock would be $17 Billion. If the rate of interest were to then fall to 6 per cent the total capital stock would gradually expand to the level of $18 Billion after all of the new investment opportunities opened up by that fall had been implemented. Thus, just as the individual firm

<table>
<thead>
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<tr>
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<tr>
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<td>14</td>
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M.E.C. FOR THE FIRM. THE AGGREGATE M.E.C.

Figure 3

reacts to changes in the rate of interest, the aggregate response will be to expand investment along the M.E.C. curve as the rate of interest falls.

However, in the aggregate model, all of the investment projects will probably not take place immediately. Because of the limited capacity of the capital goods industry, the move from the higher
rate of interest to the new profit-maximizing stock of capital will take place gradually over time with the most profitable undertakings being implemented first. In fact, this period of adjustment may last for several years or longer depending on the replacement requirements of the economy, the exact capacity of the capital goods industry, and the size of the increased investment opportunities.¹³

Despite this slight complication to the principle of the Marginal Efficiency of Capital and its role in the determination of investment expenditures, the basic concept remains the same. Investment expenditures are determined by the demand for investment or the M.E.C. and the supply price (or rate of interest) for investment at any given point in time. Consequently, given the market rate of interest and the M.E.C. schedule it should be a simple matter to determine whether or not and in what magnitude investment expenditures will be forthcoming.

The M.E.C.: Fact or Fancy?

Assuming for the present that the M.E.C. concept is an accurate description of the demand for investment and that the rate of interest will regulate that demand, an explanation for the seeming inaccuracy of the concept in reality must be developed. This explanation can be found in the nature of the M.E.C. concept itself. Reflecting as it does the expectation of future returns, the M.E.C. schedule is subject to wide fluctuations over time. Consequently, as the environment in which an investment can be made varies or is expected to vary, the M.E.C. for that investment will be a constantly changing

¹³Edward Shapiro, Macroeconomic Analysis (New York: 1966), pp. 252 - 256.
figure. In short, as an expectational variable the M.E.C. schedule can be expected to vary and fluctuate frequently and unpredictably.

In addition to expectations, the concept of the M.E.C. and indeed the M.E.C. itself is influenced and affected by a multitude of different factors. In fact, the number of factors which can influence the determination of the M.E.C. schedule is almost inconceivable. Included among the most often discussed and most important of these influences are such factors as the level of income, the effects of government policies, population growth, technology and innovation, changes in the level of income, and even the stock of capital itself. Other factors are the general political condition surrounding the economy, the rates and direction of changes in the level of overall economic activity, the position of the nation in international affairs, and others. Even such factors as the immigration laws of the country, the traditions and customs of the people, natural disasters, and weather conditions may influence the position of the M.E.C. schedule and cause shifts in the demand for investment.\textsuperscript{14}

Given the number of possible influences on the position of the marginal efficiency of capital, it is not surprising that so many different theories concerning the determination of the level of investment expenditures have come forth. Although each theory uses the marginal efficiency of capital concept as a foundation, each one concentrates on a different influence to explain the shifts in the M.E.C. schedule and the subsequent fluctuations in the level of investment.

\textsuperscript{14}Rosen, op.cit., pp. 340 - 344.
expenditures over time. Given the seeming inaccuracy of the unaltered M.E.C. concept, this approach to explaining the fluctuations in investment expenditures is the only way to perpetuate the M.E.C. as the pillar of the investment process.

Thus it is that Schumpeter can emphasize innovations\textsuperscript{15}, Pigou expectations\textsuperscript{16}, Samuelson the interaction of the multiplier and the accelerator\textsuperscript{17}, and so forth without destroying the concept of the M.E.C. schedule. By explaining the wide fluctuations in investment expenditures in terms of shifts in the M.E.C. as all of these theories do, the M.E.C. concept remains aloof from the investment argument and immune to critical analysis and reconstruction. However, critical economic investigation has failed to substantiate to any large degree the validity or accuracy of the marginal efficiency of capital as a true representation of investment behavior.

The possibility exists that the M.E.C. concept as known and understood today is not an accurate description of investment behavior. Perhaps the reason for the void in investment theory stems from the inability of economists to discard the M.E.C. concept and begin to search for a new foundation for investigation of the investment question. If the M.E.C. concept does not hold true or if it is


\textsuperscript{17}Paul A. Samuelson, "Interaction Between the Multiplier Analysis and the Principle of Acceleration", Review of Economic Statistics, (May 1939) XXI.
being misinterpreted, the lack of a clear understanding of the determination of the level of investment expenditures is easily understood. No comprehensive theory of investment can be expected if the basis of that analysis is itself in error.

The point of this discussion is a simple one. If the marginal efficiency of capital concept is an inaccurate statement of investment behavior, it follows that any theory built upon that concept will also be inaccurate. Consequently, the M.E.C. concept or at least the interpretation of that concept must be reviewed before the investment discussion continues. If the concept is an accurate one, then economists are probably on the right track in the discussion of investment theory as it is known today. If however, the concept is an inaccurate one, the search for an answer to the investment quandry must start again from scratch. On the other hand, it is also possible that the M.E.C. is an accurate concept, but that it has been misinterpreted or miscalculated. In either case, the validity of the M.E.C. is a matter of crucial importance to the understanding of the determination of investment expenditures.

In the investment discussions which permeate the economic journals there has been very little in the way of empirical justification for the investment theories presented or for the M.E.C. on which they are founded. Based as they are on autonomous changes and a priori assumptions, these discussions simply do not lend themselves to empirical evaluation or substantiation. Consequently, very little empirical evidence has been brought forth to support or
substantiate these theories. As a result, discussions on the determination of investment expenditures have been allowed to roam far and wide without fear of rejection through empirical investigation.

Even so, almost all of these theories take their beginnings on the basic foundation of the marginal efficiency of capital. Consequently, it seems clear that a rejection -- or even an alteration -- of the M.E.C. concept would force a re-evaluation of almost every investment hypothesis which has been brought forth to date. In short, if the M.E.C. concept can be proven inaccurate, the state of investment theory as we know it today would require a complete re-evaluation.

Therefore, the question which must be answered is an important one. Indeed, the question is not one but several questions. First, does the M.E.C. accurately describe the investment behavior of the individual firm? Next, is the aggregate M.E.C. an accurate or usable concept in predicting and understanding the determination of investment expenditures? Furthermore, if the M.E.C. is only a partially accurate concept, to what extent can such a concept be of value in the ultimate understanding of the investment process? Finally, if the M.E.C. is not an accurate principle -- if it does not reflect actual investment behavior patterns -- what are the consequences in terms of the future of investment analysis?

In attempting to answer some of the questions outlined above, it would be foolish to base any of the comments which follow on a logical or speculative theory which is unsubstantiated by empirical evidence. The questions being examined were themselves generated by the lack of empirical evidence in the area of investment analysis.
In response to this void it would be inappropriate to follow the same pattern in this discussion. Therefore, the examination of the M.E.C. found in the following pages will be confined as much as possible to empirical evidence. In an attempt to re-evaluate the value of the M.E.C., the discussion will focus on this evidence and the questions posed in the preceding paragraph. Although much of the M.E.C. concept itself is not subject to substantial empirical analysis and must be covered in more general terms, the emphasis will be heavily in favor of those areas where empirical evidence can be brought forth.

The Scope of the Analysis

In reviewing the marginal efficiency of capital concept, there are very few areas which would seem open to question. Since there is very little empirical evidence to either renounce or substantiate the majority of the M.E.C. concept or even its assumptions, these areas will be relegated to the "no contest" category. In other words, those areas of the concept which cannot be discussed in empirical terms will be assumed to hold true. Although this assumption may seem trite or even foolhardy in an attempt to validate or repudiate an economic theory, it is felt that a substantial deviation from empirical evidence would only result in the further confusion of the investment quandry. However, this is not to say that conclusions concerning the entire M.E.C. concept will not be drawn from the evidence presented on specific aspects of that concept.
With these restrictions, it has proven to be a very difficult task to find any portion of the M.E.C. concept itself which is subject to empirical analysis. However, since the late 1930's many economists have begun to question the validity of the rate of interest as a controlling factor in the determination of the level of investment expenditures. The source of their concern is found in the appearance in recent years of several empirical studies which indicate that the interest-elasticity of investment is extremely small.\(^{18}\) Since the term elasticity of investment demand and the term elasticity of the M.E.C. schedule can be used almost interchangeably, the evidence presented in this area will be used as the basis for evaluating the M.E.C. concept in this paper.

Of the empirical evidence concerning the elasticity of investment demand, several studies will be examined. Most significant are two studies done at Oxford University in the late Thirties and reported in the *Oxford Economic Papers* and a study done in 1938 at the Harvard Business School. There are also several more recent studies which will be discussed in the analysis. As these studies are analyzed, criticized, and examined in the remainder of this paper, the attempt will be to connect each to the evaluation of the M.E.C. concept as a pillar of investment theory. Then, in the concluding chapter the studies will be drawn together and related more specifically to the concept of the marginal efficiency and the process of determining the level of investment expenditures.


\(^{19}\) If the period analysis of the investment process is bypassed, the terms would be identical. However, they are close enough in meaning for the remainder of this analysis to apply to both.
In the end, it is hoped that the questions posed above can be at least partially answered. In short, the intent will be to re-evaluate the M.E.C. and its position in the theory of investment. If a clarification of this role can be made through this evaluation then this discussion will have served the purpose for which it is intended.
CHAPTER TWO

INTEREST ELASTICITY OF INVESTMENT DEMAND:

The Oxford Studies.

According to the marginal efficiency of capital principles outlines in chapter one, a falling rate of interest should stimulate investment expenditures substantially. However, economists in recent years have come to place less and less confidence in the ability of a falling rate of interest to influence the level of investment expenditures. Even Keynes\textsuperscript{20} - one who was generally in favor of low interest rates - occasionally lost confidence in the usefulness of monetary theory and the rate of interest in stimulating investment expenditures. In short, there is considerable doubt as to whether short run investment is significantly related to the interest rate. As mentioned earlier, a great deal of this skepticism lies in the findings of several empirical studies. However, before moving to the evaluation of these studies, it will be useful to examine the a priori reasoning upon which these doubts have grown.

To understand this seeming insensitivity to the rate of interest the individual investment decision must be examined in detail. The rate of interest enters this decision through the influence it has on the discount rate applied to expected future earnings. However, the non-interest variables employed in the determination of the M.E.C. may often far outweigh the rate of interest, thus making fluctuations in the rate of interest relatively insignificant.\textsuperscript{21} In short,

\textsuperscript{20}Keynes, \textit{op.cit}, pp. 374 - 377.

autonomous variables influence the investment decision to the point that changes in the rate of interest have little effect in comparison to the influence of these factors.

Because of the wide degree of variation which may take place in these autonomous forces, the estimate of the future income from a particular project is never a certainty. Hence the rate of discount used in the businessman's estimate of the present value of an investment is typically inflated to reflect the risks and uncertainties involved in that project. Consequently, the rate of discount used by the businessman is usually higher than the actual market rate of interest. Indeed, it is possible that the businessman would allow for fluctuations in the rate of interest in his determination of the rate of discount. In any case, the effect is to over-ride the expected importance of the interest rate.

Perhaps the most important reasons for the belief that investment demand is interest in elastic lies in the complexity of the market place which the businessman faces in the present day economy. Not only must he consider the rate of interest and the factor of risk, but he must also consider a multitude of varying forces all of which have a direct or indirect effect on his investment decision. In his analysis of investment alternatives and in the construction of the M.E.C., the businessman must take all of these forces into account. Given the fact that predicting the future is always a matter subject to a wide degree of error and given this complex relationship of investment variables, it is not surprising that the influence of only one

\[22\text{Ibid., p. 64.}\]
of these variables - the rate of interest - could be considered insignificant in relation to the total problem of determining investment expenditures. Moreover, the fact that these complexities exist fortifies the belief that businessmen would allow room for error (the risk and uncertainty adjustment) in their determination of the M.E.C. or expected rate of return.

In recent years this atmosphere of uncertainty has led to the creation of an extremely cautious attitude towards investment decisions. Consequently, such factors as the payoff period have become extremely important in the decision even though the life of the asset may be much longer than that period.\textsuperscript{23} In general this "payoff" period is from one to five years. If the investment decision is guided by discounting the returns only over the payoff period, interest calculations become unimportant. The rate of interest would have to be much higher than present rates to be a significant variable over such a short period of time. The absolute cost of investment and other factors will over-ride any such interest costs at today's relatively low interest rates.\textsuperscript{24}

Because of the increasing availability of internal funds and the imperfect nature of the financial market place, the rate of interest may become a factor which is overlooked or ignored in the investment decision. Consequently, when there are internal funds available to finance an investment project, the effect is to diminish the importance of the rate of interest even more. Although the rational entrepreneur would be expected to charge himself the interest


\textsuperscript{24}Klein, \textit{op.cit}, p. 65.
in the form of opportunity costs, the businessmen of today do not seem to behave in this manner at all.25

Other reasons to suspect an inelastic M.E.C. or demand for investment are related to the complexities of the modern industrial economy. In a highly industrial economy such as the United States, technical relationships between such factors of production as capital, land, labor, and others tend to be quite rigid. Consequently, there is little opportunity to substitute capital for labor and the M.E.C. schedule tends to be relatively inelastic.26 The fact that an economy such as ours is close to the lower limits of the M.E.C. schedule also indicates that the interest elasticity would be small.27 At an interest rate of 4 or 5 per cent the reaction to a change in the interest rate would be less than a change of equal magnitude where the rate of interest is 7 or 8 per cent.

Additional arguments could be brought forward on an a priori basis to further expose the doubt which exists concerning the businessman's reaction to fluctuations in the rate of interest, but to do so would only over burden the scope of this analysis. Thus, given the a priori logic outlined in the preceding paragraphs, the discussion will now turn to the empirical evidence in an attempt to determine whether or not the rate of interest is a significant factor in the decision to invest. Although several different studies will be examined, each has been selected because of its relevance to the question of the interest elasticity of demand.

25 Ibid.
26 Keynes, op.cit., p. 375.
27 Rosen, op.cit., p. 338.
Each study will be criticized and analyzed in terms of its value, the methods used, and the conclusions reached. However, the relationship of each study — but most importantly the aggregate conclusion that can be drawn from these studies — to the questions posed in chapter one will be withheld until all of the evidence has been examined.

The Oxford Case Studies

Of all the studies concerning the interest rate and the elasticity of investment demand, the most important and most often quoted evidence in this area can be found in the pages of the Oxford Economic Papers. In 1938 two articles appeared which discussed a recent survey of British businessmen. Undertaken by the Oxford Economists Research Group, the survey was the first significant attempt to uncover the relative importance of the rate of interest in investment decisions.

During the survey thirty-seven British businessmen were questioned regarding the significance of the rate of interest in their investment decisions. Of those with whom this question was discussed, only about twenty-five per cent admitted that the cost of capital or the rate of interest had an effect upon their decisions to invest. Even these considered it less important than other factors. The rate of interest was felt to be too small in comparison with depreciation, obsolescence, and other factors to significantly affect the total investment decision. This was especially true of

those businessmen who relied on internal-financing in their investment behavior.\(^{29}\) In short, the general conclusion of the survey was that the rate of interest was an insignificant variable in the investment decision. In terms of the elasticity of investment demand, this type of rationale would indicate that the demand for investment was inelastic in nature.

Although this survey was read and discussed widely, it did not contain sufficient evidence to justify the extraction of any significant conclusions from its findings. A population of thirty-seven taken from a universe with as many industries and firms as the British economy could not be expected to provide an accurate representation of the investment decisions made throughout that economy. In fact, the size, prosperity, and importance of the thirty-seven businessmen involved in the survey was skewed towards the larger and more powerful firms. In addition, there is question about the wisdom and accuracy of the personal interview technique used. No one really knows, but it is possible that the techniques used by the interviewer—whether knowingly or not—could have been biased towards the results obtained. Simply stated, the survey was not by itself an acceptable investigation.

Realizing the fact that results of this limited survey were highly debatable, the Oxford researchers undertook a broad survey of the entire economy.\(^{30}\) This survey involved the use of a simple questionnaire which was distributed through the mail and asked only three simple questions. More specifically, it inquired as to whether

\(^{29}\)White, op.cit., p. 566.

investment expenditures in such areas as plant expansion, plant main-
tenance, or securities were ever affected by the bank rate, the
discount rate, government security yields, or other considerations
stemming from the condition of the capital or financial market place.

Approximately thirteen-hundred questionaires were mailed out
to firms throughout the economy. Of these, 1,000 were chosen com-
pletely at random. Subsequently, an additional 308 were sent to
companies not selected in the random sample of 1,000. All of the
firms in a few industries containing a very small number of com-
panies were also included at that time. The questionnaire was a
simple one which required only that three blank spaces be completed.
However, of the 1308 questionaires mailed out, 77 per cent were never
returned. Only 23 per cent of the quesjtionaires were returned for
analysis.

Of those questionaires returned, approximately 25 per cent
said that capital costs (ie. the rate of interest) were involved
in their investment plans and decisions. Consequently, the researchers
felt that an accurate survey where all of the sample population
responded would show that the rate of interest was a factor in the
investment decisions of only 6 per cent to 25 per cent of the firms
questioned. In addition, the researchers went on to speculate that
even these figures were an over-statement of the actual significance
of capital costs since most of the respondents indicated that it was
only one of several determinants. According to comments attached to
several of the returned questionnaires, the other determinants were far more important than the rate of interest. Depreciation, obsolescence, and other factors far outweighed the cost of capital in their investment decisions.31

Given these results, the effect of the survey's findings was to reinforce the findings and conclusions of the original Oxford analysis. Indeed, the findings would indicate that the rate of interest is even less important than the first survey showed. In terms of the elasticity of investment demand the conclusion — if the findings can be considered accurate — is that the demand for investment is very interest inelastic. In other words, the determination of investment expenditures would seem to be almost insensitive to changes and fluctuations in the rate of interest. However, before accepting these conclusions at face value some further facts about the survey must be examined.

When the Oxford investigators began this second evaluation of the investment decision they attempted to obtain more reliable and more statistically acceptable data than had been brought forth in their previous study. Realizing the limited value of the meager evidence originally examined, they increased the sample size, choose its members at random, and made particular efforts to eliminate the obvious bias of the first study. Although the evidence presented in this second study is much improved as a result, the study is still open to considerable criticism and re-evaluation.

31Sayers, op.cit., p. 27.
The main criticism stems from the failure of the research group to recognize the bias of the sample. Even though the sample was selected on a completely random basis, the data is biased in the direction of the small firm. The numeric population of an economy such as Britain's is dominated by small concerns. Consequently, an accurate random sample will also be characterized by an abundance of small firms. It is a well recognized fact in industrial economies that the larger firms will carry out substantially heavier volumes of investment and that they will therefore be more vulnerable to the influence of capital costs. Since the purpose of the investigation was to determine the influence of these capital costs on the level of investment expenditures, it would have been much more accurate had the evaluation of the responses taken this fact into consideration. More specifically, there should have been some adjustment or weighting of the responses according to the potential volume of investment which each represented.

In this manner, the survey would have come closer to reliably predicting the effect of changes or fluctuations in capital costs on the total volume of aggregate investment expenditures.

32 White, op. cit., p. 573.

33 Ibid., p. 576.

34 Although determining an accurate method for weighting the responses would have been a difficult and tedious task, eliminating the bias towards small businesses should have been an essential consideration.

35 White, op. cit., p. 73.
This would be a small point if the responses of different size firms did not vary as their size varies. However, this is not the case. Small firms are typically self-financers and therefore are relatively insensitive to variations in such factors as the rate of interest. Therefore, to the extent that small firms are over weighted in the investigation, the characteristic of insensitivity remains as a built-in bias. In other words, given the seeming immunity of these small investors to variations in the cost of capital, the survey could have been expected to yield exactly the results that it did.

In addition to this "built-in bias", the results of the survey are also questionable on the grounds that the 77 per cent who did not reply were included as part of the data from which the researchers gained their conclusions. Even some of the investigators admitted that other reasons for failure to respond are quite possible. Indeed, unless the questionnaire had been specifically designed so that negative respondents could be expected to withhold their answers, there is no reason to believe that the failure to respond was any more a result of insensitivity than pure laziness or lack of concern for economic investigations. In short, the argument that the twenty-five per cent figure be reduced because 77 per cent did not respond is not justifiable without further evidence than that given in the survey.

Another factor which must be considered in examining the findings of the Oxford investigators is found in the fact that the study can

only be applied to the conditions which existed in the British economy prior to the second World War. At the time that the study was made the British economy was characterized by two conditions which were inherently built into the responses of the businessmen questioned. First, with the remembrance—in fact, the remnants—of the depression still at hand businessmen were in an extremely cautious mode towards any kind of investment. It is probable that most of the investments that they would have even considered in such a conservative climate would have promised rates of return high enough that the interest factor would not come into the picture at all. To put it another way, the investment picture was not one in which capital was maintained at its point of marginal efficiency.

A second, and equally important characteristic of that economy can be found in the attitude of the British firms towards capital investment in general. Before the war, very little attention was given to the principles of scientific management in British industrial circles. This was especially true in the area of investment analysis. Most English businessmen at that time were not re-equipment minded. As a general rule a machine was only replaced when it no longer could do the job for which it was originally obtained. As the Economist put it: "Only rarely was the question asked whether a new machine could do the job better......or whether a new plant...would do the job more economically still."  

37White, op.cit., p. 578.
38Ibid., p. 579.
39The Economist, October 6, 1945, p. 494.
Under such conditions it is not surprising that the survey would indicate an insensitivity to fluctuations in capital costs. Since the war, however, businessmen in England have become increasingly aware of scientific management techniques and have learned "that frequent re-equipment and modernization of plant really does pay".40 In light of this new attitude it seems likely that capital costs are more important now than before the war. Since this new attitude is closer to the general attitude which exists in the United States, any attempt to apply the conclusions of the study to post-war England or to the U.S. must be adjusted accordingly. In fact, a 1950 study by the British Chambers of Commerce, the chief officers of eight large British firms, and the Federation of British Industries reveals that the role of the rate of interest in England is now more significant than the Oxford studies indicate.41

In addition to these qualifications the study failed to examine the cost of capital as affected by the ability to obtain public financing. In short, the lack of questions regarding financing through bond offerings or through the sale of common or preferred stock eliminates the cost of important capital funds from the scope of the survey.42 Consequently, the survey does not inquire into the total cost of capital figure. Although this factor does not enter into the question of responding to the rate of interest, it does significantly affect those who would apply the cost of capital (rather than the rate of interest) to the M.E.C. schedule and the determination of the level of investment expenditures.

40ibid., p. 494.
41White, op.cit., p. 579.
42ibid., p. 579.
Summary

Given the question of the interest elasticity of investment demand, there are significant a priori arguments which suggest that the elasticity of the marginal efficiency of capital schedule is extremely low. However, the only way to empirically examine the aggregate responsiveness to interest fluctuations is by examining the investment behavior of a number of representative firms. In the two studies done by the Oxford Economists Research Group, this is exactly what was done: individual businessmen were questioned as to their investment behavior. The conclusions of both studies indicate that the responsiveness to changes in the rate of interest - or the cost of capital - is extremely small. In other words, they indicate that investment demand is inelastic. However, both studies require significant qualifications and thus cannot be accepted at face value.

In the first study, the population was far too small to present an accurate representation of the aggregate investment behavior of the economy. Although this problem was recognized and steps taken to correct it, the appendage of several qualifications sheds considerable doubt on its findings. Despite the large number of firms included in the second study, the population does not appear to be representative of the average businessman. The bias towards the small firm which is incorporated into the study biases the results towards those obtained. A further analysis of the study indicates that the failure to include all capital costs, the inclusion of all
questionnaires (both returned and unreturned), and the conditions of British industry at the time the study was made limits the usefulness of the results.

Consequently, the results of both studies should not be used without further support. Although the results and conclusions may be valid, the methods and approaches incorporated in both investigations are subject to a wide degree of question. Further evidence must be presented in this area before any firm conclusions as to the interest elasticity of investment demand can be developed.
CHAPTER THREE: FURTHER EMPIRICAL INVESTIGATIONS

Perhaps because they were the first significant empirical investigations into the role of the rate of interest and cost of capital in the determination of the level of investment expenditures, the Oxford Economists Research Group's studies have received considerable attention in economic circles. In fact, many economists have come to accept these studies as "proof-positive" that investment demand is interest inelastic. J. R. Hicks, for example, states that:

It seems clear to me to have been made clear by the empirical studies referred to (the Oxford Group's studies) that the traditional theory exaggerated the direct effect of the rate of interest on investment plans. 43

However, the qualifications which must accompany the Oxford studies prevent a complete acceptance of their results. Basing any conclusions on a study requiring such extensive qualification would render those conclusions as no more reliable than the results of the study itself.

Consequently, more evidence is needed before the analysis of the M.E.C. can proceed. In this chapter, the analysis will turn to the examination of three additional investigations into the role of the interest rate. One is a survey developed by an investigator at the Harvard Business School. The other two are obscure studies done by French investigators during the early 1950's.

43 J. R. Hicks, "Comment" on "The New Monetary Policy and the Problem of Credit Control" and "Monetary Policy and the Crisis", Bulletin of the University of Oxford Institute of Statistics (April - May, 1952), XIV, p. 158.
The Harvard Case Studies

In 1938 a second investigation into the role of the rate of interest was published by J. Franklin Ebersole in the Harvard Business Review. The investigation sought to answer the same questions that had been examined in the Oxford studies discussed above. Is the rate of interest or cost of capital an important influence in the determination of whether a business will expand its plants and fixed investments or contract its operations? However, unlike the Oxford studies, the information used in the analysis was obtained indirectly.

In attempting to define the role of the rate of interest, the survey data was obtained from case studies which had been developed by investigators who were not specifically concerned with the rate of interest when they collected the evidence. Drawing on a total of 13,119 case studies on file at the Harvard Business School, Ebersole felt that the neutrality of these cases would make the results more acceptable than if he had collected the information especially for use in his survey. Specifically, he felt that the implied neutrality of the Harvard case studies would more accurately predict how frequently or infrequently businessmen were actually concerned with the rate of interest. In addition, this would also reveal a better perspective on how often the interest rate is the most important variable and how often it is only one of several determinants.


45 Ibid., p. 35.

46 Ibid., p. 36.
Since examining each of the over thirteen thousand case studies in the file would have been an insurmountable task and since only a limited number of those cases could be expected to deal with the interest rate anyway, only selected cases were examined. The selection of the cases used in the analysis was accomplished through the use of the index under which the file was maintained. As each case study in the file was typically indexed under three topic titles, the index was searched for those topics which might lead to cases where the rate of interest was discussed. In this manner, the index was searched and the cases which could possibly apply were withdrawn and examined.

In searching through these cases and examining each one closely, 93 cases were found where the rate of interest might have been considered a factor. Of these cases, there were 63 instances where the rate of interest or cost of capital was not even mentioned. In only 30 of these cases was the rate of interest or the cost of capital mentioned. Of these 30, there were twenty cases in which the rate of interest or cost of capital was not considered a factor contributing to the decisions to expand or contract. Thus, there were only 10 cases in which the rate of interest or cost of capital funds was considered a significant factor in an investment decision. Moreover, of these ten cases not one involved an instance where the interest rate was the over-riding or decisive factor in the decision.

47 The Harvard case studies included a multitude of business problems ranging from personnel management to pricing policy and hiring practices. Consequently, a limited number of applicable cases would be available for any similar study, i.e. a study of goals and objectives.

48 Ibid., p. 37.
The conclusions to be drawn from such evidence are clear. The rate of interest seems to be an insignificant and negligible factor in investment decisions. However, the investigator himself realized the limitations of his survey and pointed out at least three areas in which the investigation was subject to criticism. First, he felt that all of the cases in the file should have been examined. Second, he realized that the data used in the file had been collected over a long period of time (as far back as 1920) and as such covered at least two distinct periods — the prosperity of the twenties and the depression of the thirties. In addition, he recognized and questioned the ability of the investigators who developed the original data to adequately cover the interest rate question when searching for other phenomenon and the ability of business executives to adequately describe their own behavior.49

Given these qualifications on his study, Ebersole attempted to support its conclusions through an additional survey taken from the professors who taught at Harvard during the 1936 - 1937 school year. During that year, 56 semester hours of classroom work were identified where the case study method was employed. Reasoning that the experience and knowledge of the instructors at the Harvard Business School would be representative of actual business behavior, it was felt that an analysis of the case studies used in their courses would provide a further insight into the actual importance of the rate of interest. Of all the case studies used in the courses examined,

49 ibid., p. 37.
only 4.06% might have been expected to include the interest rate or even mention it. Furthermore, the rate of interest was known to be a factor in only 1.64% of the cases and the controlling factor in only .10% of the case studies examined.50

In light of these figures and the results obtained by the analysis of the cumulative file of case studies, the investigator stated that there was an extremely strong presumption that:

The interest rate is not viewed as an important problem by business management; the interest rate is seldom considered as a factor in the entrepreneurial decisions of business to expand or contract, and is a controlling factor in a negligible number of instances.51

Thus, the results of the Harvard study echoed the findings and conclusions of the Oxford studies discussed above.

However, in addition to the qualifications indicated by the investigator himself, the Harvard study is subject to many of the same shortcomings which plague the Oxford studies. Most apparent is the same failure to weight the case studies as to the size of the companies involved. Many of the case studies probably involved large corporations; however, since many of the student body were undoubtedly training for small business positions, the file must also have included many case studies representing the attitudes and behavior of small firms.52 Consequently, there is no way of determining the representativeness of the cases examined to the structure and make-up of the actual economy.

50 Ibid., pp. 38 - 39.
51 Ibid., p. 39.
52 White, op.cit., p. 578.
In addition, it should be noted that the case studies, as with most case studies, represent individual decisions or individual problems rather than comprehensive inquiries. In other words, although a particular firm may have disregarded the rate of interest in a case study included in the file, that does not necessarily mean that the same firm always disregarded the rate of interest in its investment decisions. Thus, it is not surprising that the survey may have understated the actual sensitivity of investment demand to changes in the rate of interest.53

Regarding the first part of this survey -- the examination of the case study file -- the investigator's own qualifications are enough to discount the value of the results obtained. However, in his attempt to justify the results of that survey with the survey of professors, it seems doubtful that any substantial new evidence was brought forward. The mere fact that a man teaches business management or any other subject for that matter does not necessarily mean that his beliefs or ideas concerning the actual practice of management are indicative of the average businessman. In fact, it would be more logical to assume that his ideas and principles were not widely practiced since the theoritician is normally several years ahead of those in the field. Consequently, the second survey really adds nothing to the original analysis.

In short, the Harvard case study analysis, although it agrees with the Oxford studies, is no more reliable than the results of the

53 Ibid., p. 578.
Oxford investigations. The biases and qualifications pointed out render the analysis as too unreliable to be fully accepted. Further evidence in regard to the role of the rate of interest in the determination of investment expenditures is still necessary.

**Two French Investigations**

Included in the empirical evidence which exists on the role of the rate of interest and the elasticity of investment demand are two rather obscure French studies done in the early fifties. The first of these investigations was developed at the Rennes Laboratory of Economic and Statistical Research and was designed to measure the attitudes of French businessmen towards long-term capital costs in 1950 - 1951.\(^{54}\)

The survey covered approximately 50 firms in the Brittany area of France and was particularly concerned with the reaction of these firms to the rate of interest paid on long-term government securities. Of the firms questioned in the survey only 13% said that they were subject to the influence of the yield on government securities in their investment decisions. However, over 30 per cent reported that their plans for new investments would be affected by their ability to obtain capital from the public through the sale of stock or issue of bonds.\(^{55}\)

In light of these figures, the Rennes survey also supports the hypothesis that the interest elasticity of investment demand

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is extremely low. However, as with the Oxford and Harvard studies, the conclusions and results of the investigation are subject to considerable qualification and criticism. Once again the survey must be qualified on the basis that there is no consideration for the size or type of firms that were included in the investigation. Since the study involved only firms in the Brittany area this qualification becomes even more critical. The firms in this area are small family-type enterprises which have no real access to the long-term capital market. It is also doubtful that these firms employed advanced management techniques of any consequence. 56

In addition to these shortcomings, the survey was taken during a period when French businessmen had experienced severe inflationary pressures. Consequently, the rate of interest in real terms had been negligible or even negative for some period of time. In light of this consideration, it could even be said that the 13% figure represents a high elasticity of investment demand. 57 At any rate, the results of the survey cannot be taken at its face value as proof of interest inelasticity. The conclusions and results must be tempered just as the surveys discussed in the previous pages.

In late 1954 -- a time when the French economy had entered a more stable period of prices -- the National Institute of Statistics and Economic Studies developed another investigation into the role of the rate of interest in investment decisions. 58 In this study the

56 Ibid., p. 582.
57 Ibid., p. 582.
58 The results of this survey were originally published in "Les investissements dans les entreprises de l'industrie et du commerce, realisation in 1954 et perspectives en 1955 d'apres une enquete des chefs d'entreprises," Conjoncture et Mouvement des Affaires (December, 1954), Third year, no. 12, fasc. 30, entire issue.
managing directors of French firms were questioned on a variety of general business problems and conditions. Included in the survey was an inquiry into the reasons which might have prevented some of the firms from making a fixed capital investment decision during the past year.

Of the firms represented in the survey, there were 162 industrial firms and 182 commercial firms who reported they had not made a capital investment in the previous year. Of these 344 responses, the reasons given for the failure to invest can be broken down as follows: 59

- Investment Program Previously Completed • • • • • • 17%
- Product Market Did Not Justify Investment • • • • • • • 42%
- Necessary External Financing Unobtainable • • • • • • • • • 22%
- Cost of External Financing Too High • • • • • • • • • • 25%
- Total • • • • • • 106%

From this breakdown the survey showed that approximately 25% of the respondents were in fact influenced by the cost of capital funds. In addition, another 22% of the firms reported that the needed capital funds were unobtainable. In effect then, over 40 per cent of the firms who did not invest had been affected by the condition of the capital market. Therefore, the survey indicates a higher elasticity than any of the previous studies. Moreover, most of the respondents who claimed that capital costs had been too high, seemed to indicate that this was the sole or predominant reason for their failure to invest.

59White, op.cit., p. 583.
Using only the 25 per cent who were prevented from investing by capital costs which were too high, the survey parallels the Oxford study in the fact that 75 per cent were unaffected by capital costs. However, in the Oxford studies the respondents had been unaffected over a period of years. In this survey, the respondents were unaffected only during the year involved in the survey data. Consequently, the 75% who were unaffected in 1954 were not necessarily unaffected during the previous years. Thus, the indication of a high sensitivity to interest rates and capital costs given in the survey would probably have been stronger if the period of time in question had been longer.60

However, this study is also subject to considerable comment and criticism. As in the previous studies there is question as to the makeup of the firms included in the sample and the failure to weight the responses accordingly. If the firms who did not report a sensitivity to capital costs represented significantly more potential investment than those which did report sensitivity, the survey could have actually represented inelasticity in the demand for investment.

In addition, the composition of the sample is of a questionable nature. Only firms who did not invest in the previous year were represented in the responses. There is no indication as to the sensitivity of those firms which invested during the period which was examined. Consequently, there is no way to apply the results of the survey to the entire economy. The sensitivity of the non-investors of 1954 could be entirely different than the sensitivity of all firms.

60Ibid., p. 584.
There is also a strong likelihood that many of the responses came from submarginal firms. If this were true, these firms would not be expected to invest heavily and might very well tend to rationalize their behavior in terms of a factor entirely beyond their control (i.e. the cost of capital). In short, there is no reason to rely on the results of this survey any more than the results of the previously discussed investigations.

Summary

The Harvard study, although supporting the findings of the Oxford studies, suffers from many of the same qualifications which must be attached to the Oxford studies. Consequently, although the results and conclusions of the Harvard study tend to support the hypothesis of interest inelasticity set forth in the Oxford studies, the investigation cannot be accepted without further confirming support.

In the Rennes investigation, the evidence also points to inelastic interest elasticity of demand. However, this survey is even more questionable and open to criticism than the surveys developed at Harvard and Oxford. The composition of the firms included in the study is obviously biased towards the small, non-investing firm and was undertaken during a period when the French economy had been suffering from extreme inflation. As a result, the survey really adds no new information.

61 Ibid., p. 585.
In the Second French survey, however, indication that the demand for investment may be elastic rather than inelastic has arisen for the first time. Even though this study must also be qualified to some extent, the evidence proves at least one point. The question of the interest elasticity of investment demand has definitely not been answered.
CHAPTER FOUR: ADDITIONAL EVIDENCE

In light of the findings of the second French study, the question of the elasticity of investment demand remains an open question. Despite the fact that both of the Oxford studies, the Harvard case study survey, and the Rennes study all point to an investment demand which is inelastic with respect to the rate of interest or cost of capital, the contrary conclusion of the second French survey indicates that further investigation into the nature of investment demand is needed before any real or substantial conclusions can be formulated.

Even without the difference in conclusions which has now appeared, the questionable nature of each of the studies would require further substantiation before acceptance of those conclusions could be justified. Although it is realized that any empirical investigation in economic questions will be subject to considerable qualification on the basis of its assumptions and methods of determination, the qualifications which must be attached to the studies so far presented are beyond the realm of acceptability as far as this author is concerned. Therefore, in this chapter several additional investigations into the nature of investment demand as it relates to the rate of interest will be examined and discussed before any attempt is made to evaluate or analyze that relationship. Only after this additional information has been presented will conclusions be formulated and presented in the final chapter which follows.
An N.B.E.R. Survey

During the depression years of the 1930's a study for the National Bureau of Economic Research was conducted by Ruth P. Mack. In an interview survey of more than fifty medium to large U.S. firms she explored the investment decision and its inter-action with the rate of interest. 62

Interestingly, she found that little or no attention was commonly given to minimum rates of return on investment expenditures. In those cases when the rate of return was considered, however, she found that the minimum acceptable rates were extremely high. For an investment in modernization projects the acceptable rates were generally fixed somewhere between 20 per cent and 50 per cent. For expansion investment expenditures the minimum rate of acceptable return was substantially higher. 63 In short, she found very little to indicate that the rate of interest was an influential factor in the investment decision. Therefore, she concluded that the rate of interest played an insignificant role in the determination of investment expenditures.

As in the Oxford studies and the Harvard case studies, the N.B.E.R. study supports the case for an interest inelastic demand for investment expenditures. However, the N.B.E.R. survey is also subject to questionable validity. Conducted during the depression years, it is doubtful that the investment policies and practices examined in the survey and reported by Mrs. Mack can be considered

63Ibid., p. 106.
typical business nature. Whether the depression psychosis or the fear of the New Deal policies or any other specific factor is considered the cause of the atypical practices of business during that period is not important. The important point is that the depression years are not considered normal times and therefore the results of the survey cannot be accepted without qualification. In fact, the interviewer herself admitted that the importance of the rate of interest might in more normal times be a significant influence on the investment decision.\(^64\) Thus, the fact that her survey indicates a small role for the rate of interest is not as significant a finding as it might have been during another time period.

**Minnesota Business School Study**

While working in the field of capital formation, Walter W. Heller\(^65\) and his colleagues at the University of Minnesota conducted a study in 1950 of the investment decisions of manufacturing firms headquartered in the Twin Cities area. They relied heavily on interviews with key decision makers in these firms and attempted to explore "the anatomy of decisions to invest in plant and equipment".\(^66\)

Realizing the large range of factors which can influence the investment expenditures decision, the investigators were searching for the combination and inter-relationship between factors and for the most important factor. They hoped to thus determine a natural direction for business and government policy in order to stimulate

\(^{64}\)Ibid., p. 106.

\(^{65}\)Walter W. Heller was Chairman of the President's Council of Economic Advisors.

and control the divergent effects of investment expenditures. In addition they tried to determine whether or not the decision making process leads to the selection of those investment projects which promise maximum efficiency according to the principle of the marginal efficiency of capital.

In pursuing these objectives, the interviewers made several interesting findings. They found the main factor in the investment decision to be the availability of internal financing. This reliance on internal financing stemmed from four specific conditions which they identified as follows: (1) the delays, costs, and inconvenience of obtaining outside financing, (2) the necessity of revealing the innermost secrets of the business, (3) the dilution of per share earnings and control in the case of security issues, and (4) the possible risks of long term fixed commitments and the possibility of banker interference in future policy decisions.67

In summary, they found that the cost of external financing was more frequently expressed in terms of factors other than the rate of interest. Thus they were able to explain the dependence on internal financing through intangible costs not specifically related to the rate of interest.

In addition, the investigators found that computations of the expected rate of return from investment expenditures were either not made or were made but not related to the outside rate of interest. In short, they found that the apparent disregard for the market rate of interest and the reluctance to employ external financing tended to

67 Ibid., p. 103.
relegate finance to a position where it is "more of a barrier to capital formation than a 'thrust' toward new projects."68

At first glance these findings would indicate that the study supports the hypothesis of an interest inelastic demand for investment expenditures. However, the fact that the study found the availability of internal funds to be the most important factor in investment decisions of the firms interviewed indicates that the cost of capital (in terms of the marginal efficiency of capital) is indeed a pivotal factor in investment decisions. Any firm truly concerned with the cost of capital in its investment expenditures would only logically turn to the lowest cost capital (i.e. internal funds) first. In short, the intensive use of internal funds does not necessarily indicate an inelastic demand for investment. Indeed, even the extensive qualifications given to external financing and listed in the study do not negate the possibility of an elastic demand for investment. These added inconveniences can be considered part of the cost of capital and as such may vary over time in much the same manner as the rate of interest itself.

As in the case of the other studies and surveys examined earlier, the Minnesota survey is subject to many criticisms and qualifications. In the first place, the study included only thirteen firms all of which were located in the Twin Cities area. Consequently the firms did not represent an accurate cross section of American industrial firms. In addition, many of their directors were on the

68 Ibid., p. 101.
boards of several of the companies examined. Thus, the actions of one firm could be expected to parallel the actions of the other firms. In short, the firms included in the study seem to have been small and atypical in their composition and practices. 69

In addition, the timing of the study may have produced results which are not typical of even those firms examined. According to the investigators, the firms in the study were just completing their well planned and deliberate post-war modernization and expansion programs. Therefore, they were not as concerned with future investments as they might have been at another time. The Korean crises was also developing at the time of the survey and the business climate was unsettled and uncertain. 70

Another finding of the Minnesota survey — the fact that a lack of management and engineering talent tended to limit investment expenditures — also sheds doubt on the validity of the survey. As one writer put it, "only after the temporary shortage and rationing phase had ended could there be a valid survey of the importance of a market mechanism factor such as the price of capital." 71

The McGraw-Hill Survey

At the end of 1949, the McGraw-Hill Department of Economic Surveys developed a survey of a large cross-section of American industry designed to examine industry's capital spending plans for

69 White, "Interest Inelasticity of Investment Demand ... Re-examined," p. 108.

70 Heller, op.cit., p. 98.

71 White, "Interest Elasticity ... Re-examined", p. 109.
In one of the survey's inquiries, businessmen were asked where the money to finance their capital spending plans would come from. As indicated in the Minnesota Business School survey, most companies planned to finance their capital spending plans through internal sources — retained earnings and depreciation reserves — as far as possible. The survey found that 92 per cent of all planned capital expenditures in the manufacturing sector were scheduled to be financed through such internal sources. On the other hand, only six per cent of the expenditures planned were to be financed through borrowing, and less than one-half of one per cent through the sale of stock.

The appearance of this decided preference for internal financing is no more surprising than in the Minnesota study. Profit-maximizing businessmen can only be expected to use the lowest cost funds available before turning to more expensive forms of financing. Thus, although the survey again points out the importance of internal funds for financing capital expenditures, it tells us very little about the nature of investment demand in relation to the elasticity of the cost of capital.

The survey asked a second question regarding the financing of capital expenditures and investment demand which also relates to the questions posed in this paper. Simply stated, the inquiry asked if the firms would increase their 1950 capital expenditures if they could sell common stock at a price 50 per cent higher than its present market price. Surprisingly, ninety-three per cent of the firms replied in the negative. Only seven per cent would adjust their 1950 investment plans upward under such conditions.\textsuperscript{74}

Under an interest elastic demand for investment such a rise in stock prices would seem to lower the cost of capital and thereby increase the amount of investment expenditures. On the surface then, the failure of the firms in the survey to respond with increased investment expenditures indicates that investment demand may well be inelastic to changes in the cost of capital. However, the negative responses encountered by the McGraw-Hill economists can be accepted without negating the possibility of an elastic demand.

One reason for the high ratio of negative responses may be found in the fact that most firms could not take advantage of the situation in question during the limited time (the year 1950) with which the survey was concerned. It takes considerable time and effort to prepare and effect a stock issue and it is doubtful that the companies could have completed such a task in time to affect 1950 expenditure plans. Thus a rise in stock prices during 1950 could be expected to have a minimal effect on capital expenditures planning for 1950 itself. On the other hand, the results of such a rise in

\textsuperscript{74} Ibid., p. 78.
stock prices might very well appear as an increase in the investment expenditure plans of the survey during a subsequent time period such as 1951.75

Another explanation for the large percentage of negative responses can be found through a closer examination of the question the firms were asked. Given the condition of the stock market at the time of the questionnaire, the per share earnings to share price ratio would have produced a cost of capital figure in the neighborhood of 15 per cent even after the 50 per cent increase in common stock prices. Thus, it is not surprising that businessmen would not respond in a positive manner. Many of the firms in the survey were already borrowing capital funds at interest and risk prices well below 15 per cent. They could hardly be expected to then employ capital from another source at a more expensive cost even though the cost of that particular type of capital (i.e. stock issues) had fallen substantially.76

In summary, although the information from the McGraw-Hill survey can be interpreted as supporting the belief in the inelasticity of investment demand, its results can also be interpreted as consistent with the hypothesis of an elastic demand situation. In this respect it resembles and parallels the findings of the Minnesota Business School Survey and the N.B.E.R. survey discussed above. Again, more evidence is needed.

75Ibid., p. 79.

76White, "Interest Inelasticity ... Re-examined", p. 109.
The Smith Survey

In another survey conducted during the same time period as the Minnesota study and the McGraw-Hill survey, Dan T. Smith of Harvard obtained results very similar to the studies above. Through personal interviews with over 175 key executives in finance, accounting, investment, commercial banking, and industry he found that long-term debt was generally avoided except in cases where the capital venture is extremely urgent or exceptionally profitable. From this finding he concluded that investment demand was inelastic in nature. According to Smith, "Variations of a few percentage points in the rate of interest is not a controlling element in most decisions on business investment... (except when) interest represents a substantial fraction of total cost." According to Smith, "Variations of a few percentage points in the rate of interest is not a controlling element in most decisions on business investment... (except when) interest represents a substantial fraction of total cost." 78

However, the surveyor also reported evidence that a fall in the rate of interest to a certain level or below would bring forth considerably more interest than the statement above might indicate. For example, many of those interviewed felt that long term money obtainable for 3 per cent or less was just "too good a thing to pass up." He also predicted that businesses would turn to more and more long term debt financing in the years to come. 80

Although the study did confirm the Minnesota and McGraw-Hill findings, it could have been expected to yield such results in that it was conducted during the same time frame. Its real significance seems to lie in the fact that the investigator predicted a more

77 Ibid., p. 110.
79 Ibid., p. 40.
80 White, "Interest Inelasticity... Re-examined", p. 110.
important role for long term external financing during the coming years.

The Brockie and Grey Survey

In 1955 M. D. Brockie and A. L. Grey conducted a mail survey designed to examine the marginal efficiency of capital concept as it compared to actual business practices. From the 644 firms listed on the New York Stock Exchange, 175 firms were selected at random and were mailed questionnaires concerning their investment policies and practices. Of the 175 firms to whom questionnaires were sent, 33 per cent (57 firms) responded. The questionnaire was specifically concerned with the following points: (1) the determinants of future income, (2) the degree to which future returns on investment are estimated, (3) sources of funds for new investments, (4) the relevance of the market rate of interest in profit estimates, (5) the evaluation of alternative investments — both internally and externally financed, and (6) the effects of time as a factor influencing the profitability of investment expenditures and capital projects. In short, it was concerned with all aspects of the M.E.C. concept.

Of the firms responding, 85 per cent reported that internal sources were of primary importance in financing plant and equipment expenditures. Of the remaining firms, approximately half were primarily dependent upon external financing with the other half equally dependent upon internal and external sources. From this


82 Ibid., p. 663.
evidence the investigators concluded that the relative importance of capital markets had decreased in the years preceding the survey. Consequently, they felt that fluctuations in the market rate of interest were insignificant in their influence on the level of investment expenditures.\(^8^3\)

In addition to this evidence, the investigators were able to collect several other interesting figures concerning investment behavior. They found that 59 per cent of the firms did not use the market rate of interest in their profit estimates of investment projects which were to be financed through internal funds. In interpreting this evidence, the surveyors felt that it reinforced their belief in the insignificance of the interest rate in investment expenditures. This information coupled with the fact that 85 per cent of the respondents reported using the "payout" method of investment analysis and 45 per cent reported using a period of five years or less for that pay off period led the researchers to question the validity of the M.E.C. itself.\(^8^4\)

According to Brockie and Brey, the widespread use of the payoff period as a tool in investment decisions and the lack of interest in opportunity costs found in the survey revealed a disregard for the traditional cash-flow method of discounting returns to capital. Consequently, they concluded that the M.E.C. concept did not accurately describe practical methods of investment analysis. Therefore, the rate of interest could not be an important influence on the determination of the level of investment expenditures.

\(^8^3\)Ibid., p. 666.

\(^8^4\)Ibid., pp. 667, 668, 670.
The evidence obtained in this survey has been called the most important empirical evidence available on the question of the rate of interest and investment demand. However, there is considerable controversy over the conclusions drawn from the survey's findings. Most notable are the implications drawn by William H. White. According to White, the fact that 85 per cent of the respondents to the survey reported internal funds to be of primary importance as a source of funds for their investment projects does not discount the relative importance of the capital market place nor the existence of a usably high elasticity of investment demand.

Given a worst case assumption that the firms who reported this primary dependence still had to resort to the use of external funds for 20 per cent of their investment funds, White felt that there would still be ample room for changes in the rate of interest to exert a substantial influence on the level of investment expenditures. In addition, he said that at least half -- and probably much more -- of all gross fixed investment expenditures would be carried out by firms financing at least 20 per cent of their investments through capital markets. Consequently, he concluded that the evidence presented in the study did not support Brockie and Grey's conclusion that investment expenditures are largely isolated from the influence of conditions in the capital market.


86Ibid., pp. 52 - 54.
In analyzing the other findings of the survey, White was particularly interested in the fact that 59 per cent of the firms disregarded the rate of interest in calculating returns on internally financed investments. Turning this figure around, he interpreted it as showing that 41 per cent paid at least some attention to the interest rate in their calculations. He also noted that the investigators failed to ask a similar question with regard to externally financed projects. Therefore, he could not accept the original authors' contention that this apparent disregard for the opportunity cost of capital further emphasized the isolation of capital expenditures from the influence of the rate of interest. He argued that this 41 per cent figure for internal investment expenditures is undoubtedly less than a similar figure for externally financed projects would have been. Consequently, he concludes that this evidence supports, rather than refutes, the hypothesis of a workably elastic demand for investment expenditures.87

In addition to these findings, White also criticized Brockie and Grey on their conclusions regarding the use of the payoff analysis in their investment planning. According to White the survey proved that businesses were using much more sophisticated methods of investment analysis -- and requiring lower rates of return -- than economists had previously supposed.88 However, the fact that the

87 Ibid., p. 54.
88 White, "Interest Elasticity...Re-examined", p. 110.
payoff method was being used as a measure of risk and uncertainty did not indicate a disregard for long-term returns as revealed by the traditional discounting of returns. In fact he was able to bring forth evidence to equate the payoff analysis described by Brockie and Grey with the use of discounted returns and the M.E.C. concept.\footnote{White, "The Rate of Interest...", pp. 58 - 59.}

In summary, White believed that the empirical evidence presented in Brockie and Grey's study indicated and, indeed, supported the existence of an elastic demand for investment expenditures. He found no reason to support Brockie and Grey's conclusion that the demand for investment was inelastic to changes in capital costs. Although his interpretation was based on "second-hand" figures and incomplete knowledge of the survey in question, he seems justified in having questioned the survey as it was presented. Brockie and Grey responded to White's allegations with a lengthy reply in The Economic Journal.\footnote{M. D. Brockie and A. L. Grey, "The Rate of Interest, Marginal Efficiency of Capital, and Investment Programming" — Rejoinder", The Economic Journal (June, 1959), Vol LXIX, No. 274, pp. 333 - 343.}

The reply was factual and conceded many of White's contentions regarding the data presented in the original study. However, the authors did not alter their conclusions. Nor did they present sufficient new evidence to substantiate their original position or to refute White's interpretation. Although White subsequently restated his position in a rebuttal article,\footnote{William H. White, "The Rate of Interest, Marginal Efficiency of Capital, and Investment Programming -- Reply", The Economic Journal (March, 1960), Vol LXX, No. 277, pp. 154 - 157.} he did little to
reinforce his arguments either. Thus, although the empirical facts given in the Brockie and Grey survey remain as important information in the field of investment theory, the conclusion to be drawn from those facts remains an open question.

The N.A.P.A. Surveys

As one of the sources for the N.B.E.R.'s "leading" indicators, a monthly questionnaire is sent to 200 members of the National Association of Purchasing Agents inquiring into the current status of employment, production, sales, and other business conditions. Although the questionnaire normally asks only standard inquiries, four special questions concerning the rate of interest and investment expenditures were included in the survey during the second half of the 1950's. Since these questions were asked periodically over a period when interest rates were rising, the results would seem to be especially significant in the study of interest elasticity and investment demand.92

The first of these questions appeared in the questionnaire of October 1956 and inquired into the effects of the rising cost of borrowing on plans for capital expenditures. In response to this question, 33 of 96 respondents reported that the rising cost of capital funds was indeed influencing their investment plans. The second special inquiry was included in the questionnaire of October 1958 and again inquired into the effect of the high cost of borrowing

92White, "Interest Elasticity...Re-examined", p. 111.
on investment plans. Twenty-two per cent of the respondents to this question reported that their investment plans were being affected to some degree by the high cost capital. Since this question was posed at the end of the 1958 recession when industry was also suffering from a high degree of excess capacity, the responses indicate that the workably high elasticity revealed by the first special question was a true representation of the elasticity of investment demand.93

Since the interest rate continued to rise over the next few months, a third special inquiry into the effects of the rate of interest was included in the survey of July 1959. In response to this question, however, only 20 per cent were apparently affected in their investment plans by the higher cost of borrowing. Despite this somewhat low influence, investment demand could still be considered relatively elastic since the survey's question was posed at a time when capital spending was at a low level.94

The fourth special question was included in the February survey of 1960 when interest rates had attained even higher levels. In response to this inquiry, 8 per cent of the 135 respondents reported abandoning the capital market for needed investment projects. Although this response could be interpreted as supporting the hypothesis of an inelastic demand, the question asked only about "needed" projects and was not concerned with the marginal projects which would be the first projects to be abandoned after an interest rate rise. In addition, further evidence indicates that the original 8 per cent of the respondents represented 22 per cent of the firms which were actually

93 Ibid., p. 111 - 112.
94 Ibid., p. 112.
using the capital markets at the time. Therefore, the response actually indicates support for a relatively elastic demand for investment expenditures.95

As these questions were asked over a period when interest rates were continually rising, the results indicate support for the hypothesis of an interest elastic demand. However, the responses to these special questions cannot be considered conclusive evidence since they were not actually designed to examine the nature of the elasticity of investment nor were they necessarily indicative of the entire period over which they were asked.

Summary

The information presented in the McGraw-Hill survey, the Minnesota survey, and the N.B.E.R. survey all appears to point to an inelastic interest demand for investment expenditures; however, none of these surveys is really inconsistent with the opposite hypothesis of an elastic demand. The Smith study, the Brockie and Grey survey, and the N.A.P.A. survey indicate the opposite condition. Thus, the question of the elasticity of investment demand remains open to interpretation and further examination.

95 Ibid., p. 112.
CHAPTER FIVE: CONCLUSION

As discussed in chapter one, the marginal efficiency of capital concept relates the level of investment expenditures to the rate of interest or cost of capital. Thus, if the marginal efficiency of capital concept is an accurate concept, a rise in the rate of interest should cause a decrease in the level of investment expenditures. On the other hand, a fall in the rate of interest should result in an increased level of investment expenditures.

Given this simple relationship, measuring or determining the elasticity or inelasticity of investment demand would not appear to be a major problem for economic analysis. It should be a simple exercise of comparing the percentage change in the rate of interest over a period of years to the corresponding percentage changes in the level of investment expenditures. Even if such an analysis required the inclusion of time lags or period analyses, the problem would not be a difficult one. However, this simple approach has proven to be an ineffective means of analyzing the relationship between the interest rate and the level of investment demand.

The source of this difficulty can be found in the nature of the M.E.C. schedule at any given point in time. Although the M.E.C. schedule may represent an accurate description of the relationship between the rate of interest and investment demand at any given
point in time, the M.E.C. is influenced by too many autonomous factors to remain constant over time. Such forces as expectations, technological change, changes in the level of income and output and others are constantly working to cause shifts in the M.E.C. schedule itself. Thus, the relationship between the interest rate and investment demand can be easily obscured by a constantly shifting M.E.C. schedule. This effect can be seen in the graphic illustrations shown below.

In figure 1 a change in the rate of interest from 8% to 6% can be expected to bring forth investment expenditures of $15 million along the fixed M.E.C. schedule. However, in figure 2 the same fall in the interest rate would bring forth no new investment expenditures if the M.E.C. schedule shifts from M.E.C.\(_1\) to M.E.C.\(_2\) during the same period of time.
Because of the difficulty involved in isolating this type of shift in the marginal efficiency of capital, it is almost impossible to isolate the influence of the rate of interest in the determination of the level of capital expenditures. Therefore, a simple numerical comparison of changes in the rate of interest to changes in the level of investment would be of little value in analyzing the elasticity or inelasticity of investment demand. Consequently, the majority of the empirical evidence on the elasticity of investment demand does not involve extensive statistical studies of aggregate investment nor examination of the changes in the rate of interest over a period of years. Rather, the evidence is confined to surveys and questionnaires of individual businessmen in regards to their investment plans and the techniques used to determine those investment plans.

The empirical evidence presented in the previous chapters can be generally divided into two groups. The first group supports the hypothesis that investment demand is inelastic to changes in the rate of interest. Conversely, the second group supports the hypothesis that investment demand is elastic in regards to changes in the rate of interest. In the remaining pages of this analysis, the intent will be to briefly re-examine these two hypotheses and to attempt to reach a valid conclusion regarding the marginal efficiency of capital and the elasticity of the M.E.C. schedule. An effort will also be made to relate that conclusion to modern economic policy considerations.
An Inelastic Demand

As mentioned earlier, many economists hold strong reservations regarding the hypothesis that investment levels are substantially influenced by changes in the rate of interest. Stemming from the apparent ineffectiveness of monetary policy during the depression years, the hypothesis that the interest elasticity of investment demand is extremely low has gained much support over the last three years. Indeed, the emergence of such investment theories as the multiplier-accelerator analysis, Schumpeter's theory of innovations and others indicates a disregard for the rate of interest as a major determinant of the level of investment expenditures. Much of the evidence presented in this paper also supports the inelastic hypothesis.

The most often quoted evidence which supports the inelastic hypothesis can be found in the two studies done by the Oxford Economists Research Group. Of the thirty-seven firms questioned in the first of these studies, only 25 per cent reported that the rate of interest was a factor in their investment decisions. Even these considered the interest rate of little importance when compared to such factors as the rate of depreciation, obsolescence and other factors. In the second Oxford survey a greater number of businessmen were included in the sample. Again the researchers were able to report a relatively low dependence upon the rate of interest as a factor in the investment decision. The researchers determined that only 6 to 25 per cent of the firms included in the study were
influenced by the rate of interest. As in the first survey, even those who were affected by the rate of interest considered it a minor influence. Thus, both of the Oxford studies reveal an extremely small role for the rate of interest in the determination of the level of investment expenditures.

Another often referenced survey which supports the hypothesis that investment demand is inelastic is the Harvard Case Study survey. In this rather simple review of case studies on file in the Harvard library, Franklin Ebersole reached the conclusion that the rate of interest was an insignificant and negligible factor in investment decisions. In searching through the case studies being used in the classroom during a given semester, he found that the rate of interest was the controlling factor in less than 10 per cent of all cases examined. As in the Oxford surveys, the conclusion is a simple one -- investment demand is extremely inelastic with respect to the rate of interest.

An obscure survey undertaken by the Rennes Laboratory of Economic and Statistical Research also supported the contention that investment demand is inelastic. Covering about 50 firms in the Brittany area of France, this survey revealed that only 13 per cent of the firms would be affected by the rate of interest paid on long-term government securities. Since the rate of interest on long-term securities such as these parallels the market rate, the inelastic conclusion is natural.
In a survey done for the National Bureau of Economic Research during the depression years, Ruth P. Mack found that very little attention was given to minimum rates of return on investment expenditures. Even in those cases where a minimum rate of return was considered, the rate was so high that changes in the rate of interest would have very little influence on the investment decision. Consequently, she felt that the rate of interest played a very insignificant role in the determination of the level of investment expenditures.

The investigation conducted by Walter W. Heller and his colleagues at the University of Minnesota also tended to support the hypothesis that investment demand is inelastic to changes in the market rate of interest. The investigators involved in this survey discovered a predominant dependence on internal funds for financing investment expenditures. In addition, they found that external financing was usually considered in terms other than the rate of interest. Consequently, they concluded that the rate of interest was normally not a major consideration in the decision to invest.

The McGraw-Hill survey of early 1950 seemed to echo the results of the Minnesota Business survey. Once again the researchers found a predominant tendency to rely on internal sources for investment funds. In fact, less than 6 per cent of all planned investments covered in the study were to be financed through external borrowing. In addition, the firms included in the study reported that they would not increase their investment plans even if the cost of funds from the
sale of stock decreased by as much as one third. This type of evidence not only an interest inelasticity of demand, but also an inelastic demand with respect to the broader term of "the cost of capital."

Similar conclusions must also be drawn from the survey conducted by Dan T. Smith of Harvard. Although he predicted that the rate of interest and the cost of capital would more than likely increase in importance, Smith's survey of over 175 key decision makers indicated that long term debt was generally avoided except in those cases where the rate of interest fell to extremely low rates. In the majority of cases he found that even a substantial fall in the interest rate -- for example one or two percentage points -- could not be considered a controlling element in the decision to invest.

In perhaps the most important and most empirically oriented of all the surveys regarding the rate of interest and the decision to invest, Brockie and Grey concluded that fluctuations in the market rate of interest were insignificant in their influence on the rate of investment expenditures. Of the firms included in this study, 85 per cent reported that internal funds were the primary source of financing investment expenditures. In addition, 59 per cent of the firms did not even use the rate of interest in estimating the future profitability of their investment projects. In further support of the inelastic hypothesis, the researchers reported that 85 per cent of the firms were using the pay-off method of analyzing their potential investment possibilities. Of
these 45 per cent were reported to be using a pay-off period of less than five years.

This apparent disregard for the rate of interest in the determination of future profitability and the widespread use of the pay-off analysis led the investigators to question the validity of the M.E.C. concept itself. They felt that the concept of the marginal efficiency of capital was not being employed in actual practice. Therefore, they could not accept the concept of the rate of interest as a principle determinant of the level of investment expenditures.

In summary, there is a large degree of empirical evidence which supports the contention that the demand for investment is inelastic to changes in the rate of interest. Indeed, the preponderance of the evidence presented in this paper reaches the conclusion that the influence of the rate of interest is extremely small. There is evidence that indicates almost a complete disregard for the role of the interest rate. There is also evidence which indicates that the rate of interest is the least important of the many factors which influence the investment decision. Indeed, there is even evidence which questions the validity of the marginal efficiency of capital concept on which the traditional role for the interest rate has been based. In the light of such evidence, it is not surprising that many economists have accepted the contention that the demand for investment expenditures is inelastic to fluctuations in the rate of interest.
Conflicting Evidence

Despite the seeming preponderence of evidence in support of the inelastic hypothesis, there is also substantial support for the contention that the demand for investment expenditures is elastic. Surprisingly, much of this support can be found by examining the evidence from which the investigators mentioned in the previous section reached their conclusions regarding the inelastic hypothesis.

For example, although Dan T. Smith’s survey indicated that investment demand was interest inelastic, it included two bits of information which support the opposite contention. The first of these is that a fall in the interest rate to an extremely low rate — say 3 per cent — was considered too much of a bargain to forego. This would indicate that the rate of interest does indeed influence the rate of investment expenditures even though a substantial fall in that rate may be the key to the amount of influence it exercises. The second point of interest was the fact that Smith himself predicted that the rate of interest would become more important in the years to come. As similar statement was made by Ruth P. Mack when she admitted that the depression conditions surrounding her survey had probably understated the real influence of the rate of interest on the level of investment expenditures.

In both the McGraw-Hill survey and the Minnesota Business School survey, the major source of investment funds was found to be internal funds such as depreciation allowances and
retained earnings. Although both surveys interpreted this finding as inelastic, the fact that a firm would turn first to internal funds to finance its investment expenditures is not inconsistent with an elastic demand for investment. In a profit oriented business it is only natural that the least expensive source -- internal funds -- of investment funds would be used before turning to more expensive external funds. Thus, although both of these studies indicated that the demand for investment is inelastic, the evidence they present is not inconsistent with the hypothesis that the demand for investment expenditures is elastic.

In the case of the Brockie and Grey survey, the evidence supporting an elastic demand for investment is even more dramatic. Although the surveyors themselves concluded that the demand for investment was inelastic, a subsequent review of the same empirical evidence used by Brockie and Grey reached the opposite conclusion. In a thorough examination of the statistics presented by Brockie and Grey, William H. White found that the evidence supported the elastic hypothesis. White felt that the survey presented at least three points of significant interest. First, the survey indicated that more sophisticated methods of investment analysis were being used than economists had generally believed. Second, at least 41 per cent of the respondents used the rate of interest in their investment calculations. Finally, White felt that the survey proved that at least half -- and probably more -- of all investment was carried out by firms which financed at least half of their investment expenditures through external capital
markets. All of these facts support the contention that the demand for investment expenditures is elastic to changes in the rate of interest.

In addition to this type of evidence, there are several studies which supported the case for the elastic hypothesis. The second of the two French studies presented above clearly indicates that investment demand is interest elastic. This survey found that over 40 per cent of the firms included in the study had not been able to complete investment plans due to problems with the cost of capital.

In the continuing questions asked members of the National Association of Purchasing agents, the hypothesis of an elastic demand finds its greatest support. In a series of four special questions regarding the influence of the rate of interest, this survey reveals that the rate of interest is indeed an important influence on the rate of investment expenditures. Since this evidence is the only evidence which covers a period of time rather than a single point in time, its results are not as questionable on the grounds of special conditions which may exist during the time a study is undertaken. In addition, the fact that the special questions were asked over a period of time when the rate of interest was generally rising indicates that the elastic responses probably understated the actual influence of the rate of interest.

Thus, although the majority of the researchers involved with the question of the elasticity of investment demand concluded that investment demand is inelastic, there is evidence
which also supports the contention that investment demand is elastic. Indeed, much of that evidence can be found in studies which seem to support the inelastic hypothesis. In addition, there are studies which unquestionably support the hypothesis that investment demand is elastic to changes in the rate of interest and the cost of capital.

Elastic or Inelastic?

Although much of the evidence presented in this analysis unquestionably supports the contention that the demand for investment is inelastic, there is also a considerable amount of evidence to support the elastic hypothesis. The question which now remains is whether one type of evidence is sufficient to outweigh the other. If so, one of the hypotheses must be clearly supported and the other clearly refuted. On the other hand, if neither hypothesis can be accepted in this fashion, the conclusion is more difficult.

Although many economists have accepted the contention that investment demand is inelastic with regard to the rate of interest, the empirical evidence presented above is not sufficient to justify their positions. All of the studies which support the inelastic hypothesis are subject to structural or interpretive criticism of one sort or another. In addition, many of these "inelastic studies" have been shown to include evidence which clearly supports the contention that investment demand is interest elastic. These facts coupled with additional evidence
which supports the elastic contention is sufficient to deny an unconditional acceptance of the inelastic hypothesis.

Although the hypothesis that the demand for investment is elastic does not enjoy the widespread support given the other hypothesis, there is evidence which clearly supports this contention. However, this evidence is not sufficient enough to refute the inelastic argument. Thus, the hypothesis that the demand for investment is elastic cannot be accepted with any greater enthusiasm than the inelastic contention.

In searching for a conclusion to be withdrawn from the evidence presented, one point is definitely clear. Neither the inelastic contention nor the elastic contention can be accepted as the answer to the elasticity dilemma. However, this does not preclude a generalized conclusion based on the evidence supporting both hypotheses. Indeed, the review of the evidence surrounding the elasticity question presented in this paper would be of little value if the conclusion that further evidence is needed were the only conclusion brought forth. Surely further evidence is needed in this area, but the evidence which already exists may hold the key to the direction that further studies should explore. In terms of the "thesis, antithesis, synthesis" theory, a new approach to the problem of the elasticity of investment demand may hold the answer for future investigators.

In searching for this new approach to the elasticity question it should be helpful to briefly review the reasons why this question is important. It should also be helpful to
once again review the question of the rate of interest in terms of the aggregate marginal efficiency of capital concept. In this way, it will be easier to identify and explain the type of "synthesis" which is needed.

The root of the concern over the elasticity of investment demand can be found in the controversy over the use of monetary policy. If investment demand is elastic with regard to the rate of interest, then monetary policy can be considered an effective tool in controlling such conditions as the rate of investment expenditures, the level of income and output, and inflation. If, on the other hand, investment demand is interest inelastic, monetary policy will probably have very little effect when used to influence the economic factors already mentioned. Thus, the question which is really important is not whether investment demand is interest elastic or interest inelastic. Rather, the important question is whether or not changes in the rate of interest can cause sufficient desired changes in such factors as the rate of investment spending or the level of income and output. In this light, perhaps the real problem surrounding the elasticity of investment demand can be rephrased. It would probably be more realistic to ask whether investment demand is "usably" or "usefully" elastic. In other words, can the demand for investment be considered elastic enough for monetary policy to be effective.

In order to answer this question, a review of the nature and makeup of the marginal efficiency of capital concept is necessary. As the basic principle on which most investment
discussions are based, the M.E.C. concept is generally accepted in almost all economic circles. Given the M.E.C. concept and the M.E.C. schedule, net investment expenditures can only take place through a movement along the M.E.C. schedule or through a shift in that schedule. Consequently, a change in the rate of interest which would normally cause a movement along the M.E.C. schedule can very easily be overshadowed by a shift in the M.E.C. schedule itself. Since the M.E.C. schedule is commonly believed to be an ever-changing schedule whose fluctuations are caused by such "autonomous" forces as changes in technology, innovations, expectations, and even the level of income and output, the effect of a change in the rate of interest or the cost of capital at any one point in time will remain a difficult and elusive quantity. As in the case of the autonomous factors mentioned above, the rate of interest must be considered only one of many factors which influence and affect the level of investment expenditures. Therefore, if a "usefully" elastic investment demand does exist, it must be remembered that monetary policy in and by itself cannot be expected to effectively control levels of investment expenditures. Rather, monetary policy can become an effective tool only when used in conjunction with sound fiscal policy designed to control the level of investment expenditures.

Given these considerations, a final question regarding the evidence presented in this paper must be answered. Simply stated, that question is whether or not the evidence presented in the previous pages supports the hypothesis of a "usefully"
elastic demand for investment. In other words, given the evidence previously examined, can monetary policy be considered an effective tool when used in conjunction with a sound fiscal policy.

In reviewing the studies and surveys covered earlier, one fact stands out. That fact is that in every study at least some of the businessmen and firms responding reported that they were influenced and effected by the rate of interest or the cost of capital. In some of the studies - the Brockie and Grey study for example — the percentage was very low. Thus, although some influence was reported in all of the surveys, no clear pattern of influence has been identified. However, if further research coupled with the surveys discussed above can identify a distinct pattern, the hypothesis that investment demand is "usefully" elastic may indeed prove true.

Subsequent researchers should also concern themselves with a further consideration. In all of the studies presented in this analysis one point of criticism invariably appeared. None of the studies related the influence of the rate of interest in terms of the relative percentage of total business investment expenditures. As a result, a study which shows a small influence for changes in the interest rate on the basis of interviews with decision makers may easily have understated the actual degree of influence on aggregate investment levels. This is especially true if those few businessmen influenced
by the rate of interest control a relatively large percentage of investment expenditures. In short, an attempt must be made to quantify the influence of the rate of interest in terms of the actual percentage of aggregate investment expenditures rather than in terms of numbers of firms.

In summary, neither the inelastic hypothesis nor the elastic hypothesis can be accepted on the basis of the surveys which have been examined. However, the reason for not accepting one or the other of these hypotheses may lie in the fact that they are somewhat misdirected. Perhaps a new approach to the question of the elasticity of investment demand is necessary before the true significance and actual influence of the rate of interest can be identified. The question of the elasticity of investment by itself has little meaning. Therefore, it is felt that further research into the question of elasticity of investment demand is needed. In addition, this new research should be guided towards a new hypothesis. Since the real concern with this problem is found in the controversy over the influence of monetary policy, this new hypothesis should seek to answer the question whether investment demand is "usefully" or "usably" elastic in terms of the influence of monetary and fiscal policy.


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