AN EMPIRICAL INVESTIGATION OF THE INTERACTION OF FIRMS' FINANCIAL DECISIONS

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PREFACE

This study explored the interdependence among financial decisions that a firm makes and the impact of various independent market and firm related variables on these decisions. The objective of this study was to identify and analyze these interdependent relationships. Data were gathered primarily from the COMPUSTAT Industrial Tapes and analyzed through multiple regression, two-stage least squares simultaneous equation estimation and canonical correlation analysis.

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CHAPTER I

INTRODUCTION

Nature of the Problem

In the field of financial management there are four basic areas for decision making. The first of these areas is that of working capital management. Working capital management deals with the more specific decisions of cash management, accounts receivable management, and inventory management. The basic decision concerning these working capital items is what level of each to hold given the state of the firm variables and market variables that impact on working capital management.

The second basic area for financial decision making is that of capital investment. This decision deals with the capital expenditures a firm must make to produce the desired level of output. Here, as in the case of working capital, the basic decision deals with what level of capital expenditures the firm should make given the market and firm factors that affect it.

The third area of financial decision making is that of debt financing. The decision in this area deals with the level of debt in the capital structure given the firm and

market variables that impact on it. The debt decision is used in this paper in place of the debt equity type decision process since given the level of debt and the balance sheet constraint equity is defined.

The final major area for financial decision making is that of dividend levels. The decision process here involves the level of dividend payments relative to the market and firm variables related to this decision.

The problem that exists with these four decision areas is that too often they are thought of, studied, and taught as separate subjects. For example, when studying the working capital decision researchers tend to negate the importance of the other decisions or ignore them all together. The majority of previous empirical studies and normative models developed for indicating the manner in which financial decisions are made use one of the four decisions mentioned above as the dependent variable and attempt to explain how various independent market and firm related variables affect the decision. For example, in the area of capital budgeting the net present value model is frequently used. It takes the cost of capital as given or fixed relative to the decision. The cash inflows and outflows are estimated based on various forecasting techniques, discounted at this fixed cost of capital and compared. If the net present value is positive the project will be ranked with others using the same technique to determine acceptance. Myers [105] points out the importance of taking the

interaction of the financing and investment decision into account and adjusting the net present value model to account for this rather than taking the traditional myopic approach of looking at only one dependent variable at a time.

Myers' study and a number of others that will be discussed in the literature review section indicate the problem of looking at financial decisions as separate entities. It clearly seems illogical for a financial manager to consider one type of financial decision without taking other financial decisions into account. For example, it would seem that if a financial manager was considering a new capital investment he would also be concerned as to how he was going to finance it. Similarly, that if a financial manager was considering using more debt he may also be concerned about the amount of working capital he has to support the debt service.

The danger in the single decision approach is that the very interrelatedness of financial decisions may be as important as the given set of traditional independent market and firm related variables in making financial decisions. The problem then, clearly stated, is that the financial decisions of firms have too long been studies as separate entities in isolation from one another.

Purpose of This Study

The purpose of this dissertation to empirically investigate the interdependence among financial decisions of firms

and the independent variables on these decisions. Three specific hypotheses will be tested. These hypotheses are presented in detail in Chapter III. It should be noted at this point that the nature of this study is positive and not normative. This dissertation is an attempt to take the information as it existed and describe how firms apparently made financial decisions in an integrated manner based on this information.

This investigation allows the evaluation of previous hypotheses that have been proposed in the individual financial decision models of working capital, capital expenditures, financing, and dividend levels. It further allows the testing of the simultaneous relationship among the financial decision of firms that this author believes to exist. It is then a major purpose of this study to determine if simultaneous relationships exist among financial decisions. Finally, this study allows the testing of the nature of the relationships among the financial decisions of firms relative to one another and to the independent market and firm related variables.

By achieving the previously stated purposes of this study, another objective may be achieved. This is to stimulate more interest in the area of integrated financial theory of the firm. In other words, a secondary objective is to create further interest in research into the structural relationships that exist among financial decisions themselves and with the related independent market and firm

related variables. This interest may be generated on two planes. The first being the empirical model building where new structural relationships are described based on the integration of the existing body of theory. The second being the further empirical investigation of the theoretical relationships thought to exist.

The first three purposes are accomplished by this study and it is hoped the fourth will come with the eventual publication of its results.

General Overview of the Study

The study essentially consists of taking the data available on 218 firms from the COMPUSTAT Industrial Tapes and external market variables from various sources for the years 1955-74 and performing statistical tests on them to attempt to describe what relationships exist. The variables used in this study can be grouped into three categories. The first of these is the firm's financial decision variables of working capital level, capital expenditure level, debt level, and dividend level. The second of these is the market related variables which include the Gross National Product level, the one-year Treasury Bill rate, and the amount of loans granted by lending institutions during the period. The third set is the firms financial variables internal to the firm that are described in each of the four models which are too numerous to mention here.

The statistical models used in the study included

multiple regression analysis, two-stage least squares simultaneous equation analyses and canonical correlation analyses. The first technique was used to test the basic traditional models of the financial decision making processes of the firm. The second method, two-stage least squares simultaneous equation estimation is used to investigate the simultaneous nature of the financial decisions of firms. The final type of analysis used is that of canonical correlation. This technique was used to further investigate the relationships among financial decisions and to test the relationships set forth by the traditional models.

Limitations of the Study

The limitations of this study are primarily related to those associated with the data. The primary source of data for this study is from the COMPUSTAT Industrial Tapes for the years 1955-74. One of the limitations of these tapes is that they do not contain all firms in the United States so that a random sample could be taken. This is a limitation that is not too difficult to accept, since the firms on the tape do comprise a significant number of the larger firms in the United States. The second limitation of the tapes is associated with the number of firms with full data for items needed for this study. Of the approximately 850 firms on the tape, only 218 had all of the data items needed.

The other limitations of this study are associated with the one-year period taken to do it. The firms with missing

data points could not be surveyed so as to find out why data is missing; differences in accounting treatments of the firms were not investigated and the COMPUSTAT was not screened for errors. These, however, seem to be only minor limitations. In other words, the inference space of this study is limited by the above problems, but it seems as though the limitations are not at all severe.

Synopsis of the Following Chapters

Chapter II presents a review of the current literature concerning financial decision making. This literature review will concentrate on a few articles written on the integration of financial decision making and a brief review of the traditional literature on the independent financial decision making. Chapter III presents the research methodology and the models used to test the proposed hypotheses. Chapter IV is the analysis chapter and contains a detailed discussion of all the models presented. In this section the multiple regression, simultaneous equation, and the canonical correlation results are thoroughly reviewed and analyzed. Chapter V contains the summary and conclusions as well as the implications for future research in the area of integrated financial decision making.

CHAPTER II

LITERATURE REVIEW

The purpose of this chapter is to present the research that has been conducted in a brief form so as to place this dissertation in its proper perspective. Two basic types of studies will be covered. The first studies will be those of the nonintegrated type. They will deal with the individual models of working capital, capital expenditures, financing and dividend levels. These studies will be presented in capsule form so as to avoid the voluminous and redundant review of this portion of the literature. The second type of studies that will be reviewed is that of an integrative nature. More depth will be required when reviewing these studies so as to give foundation to this study. The extent of integrated studies is limited and consequently there are not a great number to review. The studies of a nonintegrated nature will be presented first and second the integrated studies.

Nonintegrated Studies

This review of nonintegrated studies will be presented by type of model with the working capital models first, followed by capital expenditure models, financing models,

and finally, by the dividend level models. The review of these models will take the form of a brief review of the major overall findings of those models with reference as to where more detailed results can be found. The purpose of this review as mentioned above is to avoid a review of literature of the sort that becomes unnecessarily long and repetitive.

The Working Capital Decision Models

Working capital models take many forms but mainly they deal with the cash and marketable securities balance decision, the accounts receivable policy decision, or the inventory decision. Only a few models attempt to integrate the working capital decision let alone the working capital decision with the other financial decisions of the firm. The models that deal with the management of cash and marketable securities will be dealt with first. The classic article in this area is that of William J. Baumal [14] that applies the economical order quantity model to the cash management problem. Baumal used an inventory management approach to take into account the cost of obtaining cash, maintaining cash balances, and the costs of being out of cash. The basic point of this model is to evaluate the trade offs of these costs to find the optimum cash balance to hold. Marketable securities can be added to this model quite easily by simply incorporating administration and brokerage fees when making transfers between the cash

account and the short-term securities portfolio.

Baumal makes some pretty restricting assumptions in his model but basically captures the essence of the cash management problem. The basic improvement that has been made over the Baumal model as an independent cash management model is the use of a stochastic generating process for periodic changes in cash balances set forth by Merton Miller and Daniel Orr [103]. In contrast to the completely deterministic assumptions of the Baumal model, Miller and Orr assume that net cash flows behave as if they were generated by a stationary random walk.

Miller and Orr tested their model by using it on nearly a year's data for a large industrial firm. When their model was compared to the decisions made by the treasurer of the company, the model was found to produce an average daily cash balance that was approximately 40 percent lower than that the treasurer had.

The third model to be considered is that of William Beranek [18]. Beranek's model differs from Baumal's in that he includes a probability distribution for expected cash flows and a cost function for the loss of cash discounts and the deterioration of credit rating when the firm is caught short of cash.

All of these models indicate the nature of the cash-marketable securities management problem. There are a host of other attempts to develop cash management models [3, 7, 38, 58, 61, 77, 95, 109, 112, 128, 134, 144, 145, 146] that

use variations of the basic models presented here.

The second type of working capital model is that of accounts receivable management. There is an abundance of these models just as there are cash management models. The model developed by Carl C. Greer [47] typifies these models in the variables that it considers and will be briefly reviewed here. Basically, Greer's model states that the accounts receivable level depends upon the credit worthiness of credit applicants, the standards of the industry, the amount of sales that can be generated, the administrative costs of credit, the influence of current credit granting on future sales, discount given, the time period allowed for discount and final payment, the prior bad debt experience and the bearing of credit sales on total sales. This model captures the essence of the accounts receivable decision process and is typical of the many other models that exist [17, 66, 76, 91, 93, 96, 119, 124, 149].

The third and final type of individual working capital model that will be considered here is that of inventory management. Inventory management models have provided the basis for much of the work done in all areas of working capital management which was evidenced in the models earlier cited in this chapter dealing with cash management. The model developed by Arthur Snyder in 1964 [123] provides a good illustration of the typical inventory model. Snyder's model considers basically three types of costs. The first of these is ordering costs which is simply the cost of

making an order so as to obtain inventory goods. The second cost is that of carrying costs. This is simply the costs of storing and holding the goods in the form of inventory. The third cost is that of being short of inventory items. With these three costs and the current sales levels and output levels the basis for the inventory management problem is at hand. Other models incorporate the external market problem such as Gross National Product levels, unemployment levels, and expected inflation that improve the model but most models are some variation of the one set forth above as can be seen from any of the following works [15, 18, 53, 81, 82, 107, 132, 138, 140].

In the area of working capital the most recent and complete integrated model of working capital management is that of Dileep Mehta [94]. This model is an attempt to integrate the working capital components into a complete model of working capital management. Rather than consider each component of working capital and a single solution to each, Mehta attempts to consider how one working capital decision may affect another. He accomplished this through a programming approach in his final chapter. This model is an extremely worthwhile contribution to the beginning of the total integration of financial decision making.

The Capital Expenditure Decision Model

The capital expenditure decision is probably the most researched and written about of all the financial decisions

with the exception of the debt level decision which is probably on about the same plane. The models for nonintegrated capital expenditure decisions range from the simple payback approach, through the net present value, net terminal value, internal rate of return models, to more complex models such as the Lawler and Bell method of partial enumeration [73] and Bogue and Rolls 1974 model [20]. To say the least, the literature on the subject is voluminous. The basic decision models for capital expenditures incorporate variables to estimate cash inflows and outflows associated with a project, the cost of obtaining funds to finance the project, and some measure of risk associated with taking on the project. For example, in the typical net present value model adjusted for risk by the certainty-equivalent approach takes all of the above into account. The financial manager must obtain information concerning cash savings on repairs, maintenance personnel and other related items when considering a new capital expenditure. He must also obtain estimates of incremental cash outflows associated with the project. The manager must take the risk free rate and use it as the discount rate to put the cash flows on a present value basis. These cash flows are put on a certainty basis by determining a certainty equivalent to take the risk premium into account. The present value of the discounted certain cash inflows are then compared to the present value of the certain cash outflows. If the net present value of the project is positive it can be considered for adoption.

The following articles incorporate these concepts and can be read for further depth in the area [2, 16, 19, 20, 24, 25, 32, 36, 44, 48, 52, 54, 55, 56, 63, 67, 83, 84, 85, 86, 97, 104, 108, 110, 111, 112, 114, 122, 126, 129, 133, 135, 137, 143, 149]. The integrated models associated with capital budgeting will be discussed in a later section. These models noted above are very representative of the types of models that exist and are only a small portion of what exists on the literature on capital budgeting.

The Financing Decision Model

Much of the literature pertaining to the financing decision may be found under the title of the "cost of capital" determination. The financing decision centers around how investments should be financed depending on the variability of earnings, unexpected changes in cash flows, expected level of earnings, the availability of funds and expected uses of funds. These factors include both market and firm related specific variables. A typical article of this type is that of Lev and Pekelman [75]. This article incorporates the above mentioned variables plus the rate of technological change and the amount of dividends paid and their cost. This model is somewhat of an integrative model, but is considered a good basic model to point out the type of variables in the model that are common. For further study in this area, there are a number of good articles [5, 6, 22, 23, 33, 34, 68, 70, 78, 88, 98, 99, 120, 131, 147]

that one may review.

The Dividend Decision Model

There is a great volume of literature that has been written discussing the nature of dividend policy. One of the most important is of course the article written by Miller and Modigliani [101] on the relevance of dividend policy. From this article has grown an important body of literature that discusses the merits of particular dividend policies and speculation about what affects dividend policy and what dividend policy affects, if anything. Most of the literature on dividend policy deals with the dividend decision as a residual type of decision, but basically, in isolation from other decisions in the integrative sense. The Lintner model [79], while not considering dividends as a residual, is a good example of an isolated model stating that dividends are primarily determined as a function of a firm's target or desired dividend level, its past dividend level, and the level of earnings. This model does not integrate the other financial decisions of the firm into the analysis. Whether the Lintner results can be improved upon in this paper will be explored in the analysis section. For a more thorough view of the literature concerning this topic, the following articles may be reviewed [12, 22, 29, 30, 37, 39, 41, 45, 46, 100, 102, 141, 142].

With this brief discussion of these nonintegrated models completed, the next section will be devoted to the few

integrated models that have been developed. The above section was presented to give a brief overview of the types of models that exist and their nonintegrated nature. It is not the purpose of this section or any other to negate the importance of these models. These models must be generated, tested, and validated before more complex, integrated models can be constructed. This point is important for the reader to keep in mind throughout the remainder of this paper.

Integrated Studies

Any discussion of integrated financial decision models must start with a comment on the much quoted Lintner article [79]. In this article, Lintner provided evidence that dividend decisions represented primary and active decision variables in most situations. The views of Lintner can be summarized in the following quote.

> As will be developed later, savings, in a given period are largely a by-product of dividend action taken in terms of pretty well established practices and policies; dividends are rather seldom a by-product of current decisions regarding the desired magnitude of savings as such. Similarly, the primary effects of taxes on the volume of net corporate results from their impact on the magnitude of net earnings which is a primary determinant of the volume of dividends and this again can most easily be developed by focusing on dividend decisions and policies [p. 97].

Lintner set forth past dividends and earnings level in his study as the primary determinants of dividend level and other firm and market variables as having smaller impacts. The important thing here is not specifically what variable

Lintner specified and tested to show a relationship to dividends, but instead, that dividend policy is relevant. Shortly after this article came the famous Miller-Modigliani (MM) article [99] that indicated that dividend policy is not relevant in perfect markets. This article with Lintner's set the stage for a great debate in the literature as to whether dividend policy is relevant or not or under what conditions it is or is not relevant. Much of the debate has centered around the assumption used by Irving Fisher [43] that the schedule of investment opportunities available to a firm is often assumed to be relatively fixed. In other words, in this context the investment decision may be taken as primary and the dividend as residual or secondary. The controversy has led to the conclusion [40, 51, 99] that there is not an interdependence of financial decisions, or at least, dividend and investment decisions in perfect markets.

Researchers now bear the burden of indicating when perfect markets do not exist or portions of the necessary criteria for them do not exist and what the results are. This challenge has been taken up by several authors that will be briefly considered in this paper. These are the works of Myers and Pogue [106], Fama [40], Hite [57], Higgins [51], Dhrymes and Kurz [31], and McDonald [92].

Dhrymes and Kurz' study was the first of those mentioned above and has been the basis for many other articles. Dhrymes and Kurz assumed that in imperfect markets dividend, investment, and financing decisions are interdependent and

mutually determined in the firm. They studied a large cross section of American firms for the period 1951-60 in both single equation and simultaneous equation models. They found that there appeared to be substantial interdependence between investment and dividend decisions. Based on this finding they concluded that financial decisions, at least dividend and investment decisions, cannot be best determined using single equation systems. The single equation system does not take into account the interactions of these two decisions and hence they do not give accurate descriptions of how the decisions are made.

More recently Higgins [51] completed a study on American firms using the data from the 1961-65 time period. His findings were that dividends are a function of earnings and investment but that investment did not depend on dividends. In other words, Higgins' findings support the MM hypothesis that dividend decisions are residual. His finding contrary to that of Dhrymes and Kurz found no support for the contention that corporate dividend and investment decisions are interdependent. The model as it emerges from this study treats dividends as a residual in the corporate decision but one that does require management attention since it does affect the value of the firm. Its influence, he claims, is in that the firm is successful or not in establishing a dividend policy which minimizes the costs of excess liquidity and external financing.

Eugene Fama's [39] was the next study that was conducted in this vein. This study was done on 298 major industrial

firms for the period of 1946-68. All the firm related variables are measured on a per share basis adjusted for changes in the number of shares outstanding. Fama conducted tests of single equation models and simultaneous equation models. Fama found support for the findings of Higgins in that investment decisions do not depend on dividend decisions. It is important to note at this point that none of the studies reviewed are fully integrated models of the four major financial decisions of the firm. Fama is very careful to note in his study that his results are not proof that his findings describe the way the world exists, but instead, he states that he cannot reject the MM hypothesis based on the outcome of his study.

Myers [105] and Myers and Pogue [106] are the next studies that will be reviewed. The purpose of the first study was to present a general approach for analysis of the interactions of corporate financing and investment decisions and to derive the approximate implications for capital investment decisions. This paper of Myers deals with a mathematical programming formulation of the problem of investment and debt management by the firm. Myers develops what he calls an "adjusted net present value model." In essence this model incorporates financing charges in the investment problem to adjust the basic net present value model to include financing costs of different types of financing. Myers concludes that the corporate investment and financing decisions should be made simultaneously

since the decisions interact in important ways. Hence, this paper of his is concerned with integrating the financing and investment decisions rather than the investment dividend decision as the previous studies.

In the article by Myers and Pogue [106], they extend the previous model and come up with a mixed integer linear programming financial planning model they call the LONGER model. This model incorporates the investment, financing, and dividend decision facing the firm. In the development of this model, Myers and Pogue state that this decision process requires simultaneous consideration of the investment, financing, and dividend decisions. They point out a number of constraints that make simultaneous consideration necessary. These major constraints are first a debt limit (specified as a function of the value and risk characteristic of the firms assets and new investment) and second, a requirement that planned sources and uses of funds are equal. In addition, there are constraints on liquidity, dividend policy, and investment choices due to mutually exclusive options.

Details of the Myers and Pogue study are not important to this current paper. LONGER's main contribution to the field of finance is its theoretical contribution in that it considers the simultaneous treatment of investment, financing, and dividend decisions in a framework consistent with the main results of modern finance theory.

An even different approach from the previous studies

cited is taken in the next work to be considered. The study by Hite [57] deals with the integration of the theory of production, investment, and financing by the firm. Hite's work is purely theoretical since it is his belief that even though recent developments have focused on relations production and investment decisions and the interactions of investment decision and financing decisions, no integrated theory exists for the theory of the firm. Hite successfully develops a comprehensive integrated theory of the firm that takes not only financing and investment decisions into account, but also considers production decisions. Other similar works are those of Arzac [9], Turnovsky [136], and Rocette and Long [112]. These theoretical works provide added impetus to the need for more integrated theoretical work and empirical testing of these models.

The final study to be considered here is the one of McDonald, et al. [92]. This study is an integrated study of dividend, investment and external financing decisions. Although it is an integrated study, its concentration is primarily on the problem of dividend policy. Furthermore, the study is on French firms. The data for these firms was taken from a cross section of the seven years of 1962-68. The number of firms in the study was 75. Their premise is that their study, being of French firms, will increase the perspective in business finance through a better understanding of the financial behavior outside the United States. They estimated single equations using the ordinary least

square method for dividends, investment, and external financing. They also estimated simultaneous equation relationships using the two-stage least squares technique. Their results of the two equation systems were that they were consistent with one another and they conflicted with the results of the Dhrymes-Kurz study. The reason they conflict, however, is based more on their interpretation of their findings rather than on the findings themselves. They do not want to disagree with the MM theory so they interpret their results such that dividend decisions do not affect investment decisions. For the purposes of this paper, the important point about this study is that it was a further attempt to understand the integrated nature of financial decisions. The specific results are tenable and the questions of the relevance of interaction among financial decisions is not clearly answered.

It is clear that the research in the area of financial decision making is heading toward more integrated approaches. It is the intent of this chapter to briefly review both the important theoretical and empirical studies that have been done in the recent past to indicate the extent and direction of research in this area. The empirical work seems to be bent primarily on resolving the dividend relevancy question rather than the total integration of financial decisions. Consequently, the work is incomplete in regard to integrated financial decision making. The theoretical models of Myers and Pogue and Hite provide the basis for more empirical work

to test their approaches. The Hite model incorporates the production decision into the analysis and looks at the interaction effects of this on the capital structure. It does, however, attempt to narrow the interaction effects to specific relationships not all potentially financially interdependent variables. The Myers and Pogue model provides a basis for the interaction of dividend, financing, and investment decisions and moves farther on that score than any other model up to that point in time.

The models tested in this dissertation are expected to shed some light on the relationship that exists among the working capital, financing, capital expenditures, and dividends decision of firms. In other words, the above studies have for the most part made important contributions to the understanding of integrated financial decision making and provide the basis for the current study.

CHAPTER III

RESEARCH METHODOLOGY

The research design set forth in this chapter provides the basis for the examination of the relationships of firm and market related variables to the financial decisions of the firm and those financial decisions to one another. This design allows for the testing of the hypothesized relationships of the firms financial variables to its financial decisions. It also allowed for the evaluation of the hypothesized relationships of the market related variables to the financial decisions firms make. Most importantly, it provides the basis for describing the relationship among the financial decisions that are formed by market and firm related variables.

This study is based on American firms listed on the New York Stock Exchange from 1955-74, and its results must be interpreted in that light and not generalized to all American firms nor to the firms of foreign countries.

Hypotheses

In this study there are three major hypotheses. The specific hypothesized signs of each variable, specific in each model, while important, are not major hypotheses in and

of themselves. The following hypotheses are the major concern of this paper.

Hypothesis No. 1

The financial decisions of firms are partially determined by firm related factors.

Hypothesis No. 2

The financial decisions of firms are partially determined by market related factors.

Hypothesis No. 3

The financial decisions of firms while dependent upon market and firm related factors are simultaneously determined and there is interaction among them.

The first hypothesis has been tested in numerous ways in the literature. The point of the test in this study is to establish a base upon which to work. The specific models used in this endeavor will be specified in the model section of this chapter. The tests of this hypothesis are done while including the market related variables. The sign and significance of the coefficient of the firm related variables are observed to determine their impact upon the various financial decisions of the firm.

A second hypothesis is also tested from these models that includes both firm and market related variables. These models are referred to as the traditional models of finance

in the remainder of this paper. In other words, the traditional models of the firm have one dependent variable and market and firm related independent variables.

Although the first two hypotheses are important, the third hypothesis is the crucial one for this paper. The dependent financial decisions of the firm are influenced by market and firm related variables; however, they are also not believed to be made entirely independently of one another. Furthermore, there is believed to be specific describable relationships among these dependent variables.

This study is positive, not predictive, in nature. The models set forth in the following section are an attempt to describe the behavior of firms during a time period. They are not to predict the behavior of firms during another time period or to be normative in nature.

The Models

The Traditional Models

Traditional approaches to financial decision models use a single dependent financial decision variable and a great number of market and firm related independent variables. The general form of such a model may be written as follows:

$$D_i = f(X_f, X_m) \tag{1}$$

When D_i is the ith financial decision to be made and X_f is the vector of firm related factors, the X_m is the vector of market related factors. The point of such a model is to

consider the vectors X_f and X_m and their impact on only one decision variable at a time. These models are referred to in this paper as the "traditional models." The traditional models used in this paper are as follows:

The working capital model:

$$WCLC = f(X_{11}, X_{12}) \tag{2}$$

Where X_{11} represents the vector of firm related independent variables and the expected sign of the variable appears above each variable. This vector looks as follows:

$$X_{11} = X_{11}(\overset{+}{WCLL}, \overset{+}{SPHC}, \overset{-}{TA}, \overset{+}{SZFC}, \overset{+}{ERLC}, \overset{+}{VERN}) \tag{3}$$

The vector X_{12} represents the market related factors for the working capital model. This vector looks as follows:

$$X_{12} = X_{12}(\overset{+}{LEAN}, \overset{-}{EIR}) \tag{4}$$

The construction of the variables for the working capital model are shown in Appendix A. The definition of the variables and their proxies are briefly described in Table I, however, for an aid to the reader in understanding the model.

The capital expenditure model:

$$CAPEC = f(X_{21}, {}_{22}) \tag{5}$$

$$\text{when } X_{21} = X_{21}(\overset{+}{CAPL}, \overset{+}{EGR2C}, \overset{+}{SZFC}, \overset{+}{TA}, \overset{+}{EXRN}, \overset{+}{ERLC}) \tag{6}$$

$$\text{and } X_{22} = X_{22}(\overset{-}{CRTDR}, \overset{+}{EIR}, \overset{+}{LEAN}). \tag{7}$$

TABLE I

WORKING CAPITAL VARIABLES

Variable	Description	Proxy
WCLC	Normalized working capital level[1]	None
WCLL	Normalized one period lagged working capital level[2]	None
SPHC	Normalized sales predictability	The absolute value of the one period difference of sales levels-normalized
TA	Firm size	Total assets[3]
SZFC	Normalized sales level of the firm	None
ERLC	Normalized earnings level of the firm	None
VERN	Variability of earnings before interest and taxes	Coefficient of variation
LEAN	Level of economic activity	GNP level
EIR	Expected inflation rate	One-year treasury bill interest rate[4]

[1]The process of normalization in this case is the division of all firm related variables by total assets. This is a common practice and was used in a similar study by Higgins [51].

[2]The practice of using the one period lagged variable is used here to indicate the degree of inertia and adjustment costs. The work of Eisner and Strotz [35] can be referenced for this technique. This same reasoning is used for working capital and debt level variables. Dividends use the Lintner [79] partial adjustment reasoning and the capital expenditure model uses the Chenery and Koyck [26, 69] flexible accelerator model for a reference.

[3]Total assets are used for the size of the firm as is a common practice as shown by Higgins [51].

[4]The one-year treasury bill rate is used here as the proxy for the expected inflation rate as found by found by Fama [40].

The variables with the same title as in the previous model are shown in this model. Additional variables are shown in Table II.

TABLE II

CAPITAL EXPENDITURE VARIABLES

Variable	Description	Proxy
CAPEC	Normalized capital expenditure level	None
CAPL	Lagged one period capital expenditure level	None
EGR2C	Normalized 5 year average earnings growth	None
EXRN	Excess returns	None
CRTDR	Credit tightness	Last period's loans minus this period's loans divided by last period's loans[1]

[1]This credit tightness variable is based on techniques used by Jaffee [62].

The financing model:

$$DBLC = f(X_{31}, X_{32}) \tag{8}$$

$$\text{where } X_{31} = X_{31}(\overset{-}{SZFC}, \overset{+}{TA}, \overset{-}{VERN}, \overset{-}{PERR}, \overset{+}{DBBL}) \tag{9}$$

$$\text{and } X_{32} = X_{32}(\overset{-}{LEAN}, \overset{+}{EIR}, \overset{-}{CRTDR}). \tag{10}$$

The only variables in this model not shown in previous models are PERR, DBLC, and DBBL. PERR is the current price earnings ratio compared to the average of the last five years price earnings ratio. It is referred to from here on as the price earnings relative. The DBLC variable is the debt level of the firm. This variable is used here for a measure of the firms external financing since given the balance sheet constraint it is not necessary to estimate other external financing. The DBBL variable is the one-period lagged debt level. These variables are shown in Table III.

TABLE III

FINANCING MODEL VARIABLES*

Variable	Description	Proxy
DBLC	Normalized debt level	None
PERR	Current price earnings ratio compared to the last five years price earnings ratio	None
DBBL	One period lagged debt level of the firm	None

*These are the variables in the financing model that have not already been defined in previous models.

The dividend model:

$$DIVC = f(X_{41}, X_{42}) \tag{11}$$

$$\text{where } X_{41} = X_{41}^{(+,+)}(DIVL, ERLC) \tag{12}$$

$$\text{and } X_{42} = X_{42}^{(-,-,+)}(LEAN, CRTDR, EIR) \tag{13}$$

This model has only two new variables that have not been previously defined. The DIVC variable is the dividend level for the period. Here the second new variable is DIVL which is the one-period lagged dividend level. These variables are shown in Table IV.

TABLE IV

DIVIDEND DECISION VARIABLES*

Variable	Description	Proxy
DIVC	Dividend level of the firm for this time period	None
DIVL	Dividend level of the firm one period lagged	None

*These are the variables in the dividend decision that have not already been defined in previous models.

A definition of all of the terms of these and other models used in this paper can be found in Appendix A.

Coefficients for the models above were estimated by using the Statistical Analysis System [12] to compute ordinary least squares regression using the maximum R^2 option. Each of the four models is fitted with an ordinary least squares regression line. These models lay the foundation for the rest of the study by creating a traditional base from which to work.

The Simultaneous Models

The essence of this paper is that the traditional models of financial decision behavior by firms are not wrong but incomplete. More complete models of the financial behavior include simultaneous relationships that exist in the joint determination of financial decisions. There seems to be no firm concensus in the literature as to whether financial decisions are or are not simultaneously determined. There are those such as Stiglitz [130], Higgins [51], and McDonald, et al. [92], that believe that markets are perfect and that there is no need for simultaneous financial decisions. On the other hand, there are those such as Lintner (79], and Dhrymes and Kurz [31], who believe that market imperfections do exist and make a difference in financial decisions and do make the simultaneous determination of them important.

Perfect capital markets are usually defined (39,40] as having the following characteristics:

1. Markets for consumption goods and investment

assets are assumed to be infinitely divisible,

2. Any information is costless and available to everybody,
3. There are no transaction costs,
4. No taxes,
5. All individuals pay the same price for any given commodity or asset,
6. No individual is wealthy enough to affect the market price of an asset, and
7. No firm is large enough to affect the opportunity set facing consumers,

and the following corollary assumptions:

1. Rational behavior,
2. Perfect certainty, and
3. No bankruptcy risk.

If these "perfections" hold in the United States capital markets it implies that dividends are irrelevant the method of financing is irrelevant and financial decisions are therefore, not interdependent. This present study does not hold that markets are strictly perfect or imperfect, but investigates the relatedness of financial decisions that may be the result of various imperfections or perceived imperfections by financial managers. To explore the impact of market imperfections, six cases may be reviewed. Case one is the interaction of working capital and capital expenditures. Working capital levels may have to be adjusted downward if capital expenditures are to increase since there are

transaction costs to the firm to go into the capital market and seek additional funds. On the other hand, working capital may be decreasing with increasing sales as inventories are used down to lower levels and pressure is put on capacity and capital expenditures increase. This pressure on capacity may not be anticipated in advance because of uncertainty. Uncertainty itself may lead the cause effect relationship if firms are forced to keep larger working capital balances because of uncertainty they may be forced to reduce capital expenditures.

Case two is that of the interaction of the working capital and debt decision. Given bankruptcy risk, firms may wish to hold greater working capital balances as the proportionate amount of debt in the capital structure is increased. In other words, as financial risk is increased due to uncertainty and bankruptcy risk when more debt is included as a proportionate share of the capital structure, working capital balances will increase because the need for precautionary balances increase. On the other hand, if the firm has large working capital balances, the firm may rely on them for financing and reduce their level of debt financing since there is a transaction cost associated with keeping and issuing debt.

The third case involves the relationship of working capital and dividends. Owners may prefer the firm to retain funds rather than finance with debt in a market with differential taxes and transaction costs. This may cause firms

to retain funds in the form of working capital balances, in anticipation of capital expenditures rather than pay it out as dividends, and then be forced to seek outside financing. This type of a relationship may cause dividends and working capital to move in opposite directions. If, on the other hand, the firm pays out funds as dividends given transaction costs of issuing new securities they will probably be forced to reduce their investment in working capital.

The fourth case is the relationship of capital expenditures and debt. Given that these are taxes in the market when capital expenditures are increased, one would expect the debt level of the firm to also increase as the new assets are partially financed through debt. This effect of more debt increase leverage with increased capital expenditure financing and presumable increasing sales. With sales increasing the effects of more leverage should be favorable and hence capital expenditures and debt would tend to increase and decrease roughly at the same time. Because of the leverage effect of increasing debt a firm would unlikely increase debt levels in an uncertain world when it cannot be readily used for capital expenditures that would lead to greater output and sales.

The fifth relationship is that of capital expenditures and dividends. Given that there is the risk of bankruptcy for firms when capital expenditures increase, one would expect the retention of earnings to increase so that the proper balance of debt and equity is maintained in the

capital structure. Furthermore, given that there is uncertainty the firm would be cautious about their debt level relative to the equity level when anticipating sales increases and making capital expenditures. From the opposite standpoint, if dividends are increasing, one would expect capital expenditures to decrease. This may occur if the investments of the firm appear too risky because of uncertainty and hence they cannot afford to fund them. The earnings may be paid out in dividends in this case.

The sixth case is that of the interaction of debt and dividend decisions. Given the previous cases where uncertainty and bankruptcy risk exists, it seems clear that if the level of dividends increases the level of debt would decline so as to maintain a constant relationship of debt to equity. This argument has been clearly stated above and will not be reiterated here. If the debt level was the leader in the cause effect relationship one would expect dividends and debt financing to move in the same direction. In other words, if debt increases the proceeds may go to increasing capital expenditures which may in turn result in higher earnings and larger dividends. Higher debt levels may, on the other hand, be for the purpose of increasing dividends and consequently they may be positively related. In either case this may be caused by the market imperfection of taxes which makes debt a cheaper form of financing than equity.

These simultaneous models are estimated using the two

stage least squares technique. In the first stage the following relationships are estimated in the reduced form:

$$P_1 = WCLC = f(X_{11}, X_{12}, X_{21}, X_{22}, X_{31}, X_{32}, X_{41}, X_{42}) \quad (14)$$

$$P_2 = CAPEC = f(X_{11}, X_{12}, X_{21}, X_{22}, X_{31}, X_{32}, X_{41}, X_{42}) \quad (15)$$

$$P_3 = DBLC = F(X_{11}, X_{12}, X_{21}, X_{22}, X_{31}, X_{32}, X_{41}, X_{42}) \quad (16)$$

$$P_4 = DIVC = f(X_{11}, X_{12}, X_{21}, X_{22}, X_{31}, X_{32}, X_{41}, X_{42}) \quad (17)$$

In the second stage these simultaneous relationships take the following structural form with the expected signs of the financial variables that were predicted in stage one indicated above the variables.

$$WCLC = f(X_{11}, X_{12}, \overset{-}{P_2}, \overset{+}{P_3}, \overset{-}{P_4}) \quad (18)$$

$$CAPEC = f(X_{21}, X_{22}, \overset{-}{P_1}, \overset{+}{P_3}, \overset{-}{P_4}) \quad (19)$$

$$DBLC = f(X_{31}, X_{32}, \overset{+}{P_1}, \overset{+}{P_2}, \overset{-}{P_4}) \quad (20)$$

$$DIVC = f(X_{41}, X_{42}, P_1, P_2, P_3) \quad (21)$$

Simultaneous equation estimation is used for two purposes. First, it is used to assess the interdependence of the four financial decisions. This will be assessed by evaluating the direction and significance of the coefficients. The second purpose of this approach is to verify the original traditional models with respect to the basic market and firm related variables. If these models verify the traditional models and indicate a simultaneous

relationship among the determination of the financial decisions, the final totally integrated model will be employed.

The Multiple Dependent Variable Model

The first model used in this paper has multiple dependent financial decision variables with the entire spectrum of firm and market related independent variables from the traditional models.

This model written in functional form is as follows:

$$f_d = (WCLC,CAPEC,DBLC,DIVC) = F \left| f_m(X_{11},X_{21},X_{31},X_{41}), \; f_f(X_{12},X_{22},X_{32},X_{42}) \right| \quad (22)$$

where f_d, f_m, and f_f are the functions for the financial decision variable, market related variables and firm related variables respectively. The statistical tools used to estimate this model are the Statistical Analysis System and Econometric Analysis System canonical correlation programs.

The purpose of this model is three-fold. The first is to investigate the relationships that appear to exist from the traditional models and confirm their consistency in the model. The second is to analyze the relationships that exist among the firm and market related variable and the package of financial decisions of the firm. The third is to investigate the relationship that exists among the four financial decisions of the firm. These relationships, if

shown to exist, may be extremely important in the understanding of the integrated financial decision making process of the firm. The "trade-offs" that exist among these financial decision terms will be scrutinized closely for their meanings and implications. These relationships, while important, depend upon the congruence of the relationship of the dependent variables with their respective independent variables from the previous two models. If these relationships remain consistent then the canonical correlations can have meaningful interpretation.

The Data

Data for this study came from three sources. All of the firm related data which is the bulk of all the data collected, comes from the COMPUSTAT Industrial Tapes for the years 1955-74. The firms were selected from the industries from 0100 SIC code to 5999 SIC code. The 6000 level firms were not used because of their nature (they are financial institutions) and hence were excluded from the screening procedure used. The remaining industries were screened for complete data sets for the years 1955-74. These complete data sets consist of all the variables in the list of variables in Appendix A. There were approximately 850 firms screened and 218 had complete data sets. These firms have a minimum size of 16 million dollars in net tangible assets. A complete list of these firms may be found in Appendix B.

The second source of data for this study is the Federal

Reserve Bulletin. The proxy for level of economic activity is the GNP level and the proxy for the expected inflation rate is the one-year Treasury Bill rate. These variables were taken from the Federal Reserve Bulletin from 1957 to 1975. The raw data taken from this source may be found in Appendices C and D.

The Annual U. S. Economic Data prepared by the Federal Reserve Bank of St. Louis released May 12, 1975 [7] is the third data source for this study. The total loans figures were taken from this source and used in the calculation of the proxy for credit tightness. The actual loan figures may be found in Appendix E.

In summary, this study first sets forth hypothesized traditional models of financial decision making and tests then for significance using the ordinary least squares regression technique. These models are then taken as the foundation for the study of the simultaneous determination of financial decisions. The simultaneous relationships are estimated using the two stage least squares technique and tested for consistency with the original models for significance. In the final stage of this research design canonical correlation is used to test again for the consistency of the traditional models and then for the nature of the interaction of financial decisions. This design provides for the testing of the hypotheses set forth for testing and hence provides an appropriate framework for conducting this study.

CHAPTER IV

RESULTS OF THE EMPIRICAL TESTS

Data and analysis in this chapter are organized around the statistical testing of the hypotheses posed in Chapter III. First the results of the multiple regression models are presented and examined closely. Then the results of the simultaneous equation models are presented and scrutinized. Finally, the results of the canonical correlation analysis are presented, linked to the previous models, and explored for new meaning.

The Multiple Regression Models

Relationships of each independent variable in these models will be discussed relative to the dependent variable and the expected sign of that variable. The expected signs for each variable in each model may be found in Chapter III. All firm related variables in the models have been normalized by the division by total assets to reduce heteroscedasticity.

The Working Capital Decision Model

Overall results of the working capital model indicate that the model seems to be an accurate description of how a

working capital decision is made. With an R^2=.957 and an overall significance level of the model of .0001 the model appears to give exceptionally good results supporting the traditional views that working capital decisions are made based on the variables in the model. A summary of the results are found in Table V.

TABLE V

WORKING CAPITAL MODEL MULTIPLE REGRESSION ESTIMATES

R^2=.95728923 Prob >F .0001

Variable	Partial Sum of Squares	Beta Coefficients	Prob>|T|
MEAN		.00691771	
WCLL	77.74158565	.96281327	.0001
SPHC	.05646776	.03518381	.0001
LEAN	.11955738	.00000004	.0001
EIR	.08907386	-.00689480	.0001
TA	.00179632	-.00000023	.2549
SZFC	.00150127	.00116998	.2997
ERLC	.00016364	.00513835	.7318
VERN	.00015860	.00009248	.7356

The first independent variable in the regression equation to be discussed is the one-period lagged working capital level. This variable has the greatest effect in the model shown by the partial sum of squares of 77.741 and with a beta

value of .9628 that is statistically significant to the .0001 level. The sign of this variable is positive as predicted. This seems to indicate that there is a great deal of inertia in the working capital decision of the firm in that adjustment costs must exist and previous working capital levels are used as a strong basis for decisions concerning new working capital levels. In the Eisner and Strotz [35] sense the cost of being out of equilibrium must be small relative to adjustment costs. This presents a very interesting result in that inertia of previous working capital levels tends to be the most significant factor in determining a new level.

Another interesting consideration related to the one-period lagged working capital level is the speed of the adjustment of the new level. It can be seen from Table V that the speed of adjustment is .04 which is extremely slow. In other words, the adjustment rate is approximately four percent per year. This result clearly indicates that working capital levels remain fairly stable over time.

In general, then, one must conclude that the previous level of working capital must play a large part in the new level of working capital a firm adjusts to. The coefficients of the remaining variables in the model are small and their partial sums of squares are small compared to the previous level of working capital, but they are important nonetheless. The important part they play is to help determine what factors do make up or effect the small amount of explanation

left to describe working capital level decision. This is a crucial factor and must be clearly understood at this point. It is clear that a great deal of inertia exists in the working capital decision, as is captured in this model; however, it is important to consider the remaining effects of other variables in the determination of working capital levels to get a more complete picture of what factors effect this decision. Thus, this complete model attempts to capture as many as possible of the variables bearing on this decision.

Sales predictability is the second independent variable in the working capital model. The expected sign of this variable is positive. The larger this variable, the less predictable sales and hence, the greater the working capital balances. This is the finding and it is consistent with the work of many research studies (Meltzer [96], Sprenkle [127], Baumal [14], and Lewis [77]). This seems to be a reasonable expectation based on the precautionary demand for working capital. The beta coefficient for sales predictability is .035 and it is statistically significant to the .0001 level. This variable enters the model second in the maximum R^2 (Table V) procedure and is the second most important in explaining the variability of working capital. The actual sign being positive as expected helps confirm the research that has been done and is consistent with the model.

The level of economic activity as measured by Gross National Product levels is the third independent variable to

be considered. The relationship that was expected to exist between working capital level and the level of economic activity was positive. The actual sign found from the regression results is positive and significant at the .0001 level (Table V). This would indicate that as the economic level measured by GNP went to a higher level working capital would concommitantly increase. This must mean if inventories decrease as a result of higher levels of GNP, that cash and accounts receivables increase more than inventories decrease. This seems logical since the inventories are not sold at cost. In other words, if GNP increases the firm reduces its inventories through sales and increases its cash.

Conversely, at lower levels of economic activity the decreases in accounts receivable and cash must more than offset the increases in inventories. The sign of the variable's coefficient is supported by the relevant research in the area as shown by the following works [15, 18, 59, 60, 90, 94, 95, 117, 118, 123, 137].

The fourth independent variable in the working capital decision model is the expected inflation rate. The proxy for this variable is the one-year Treasury Bill rate. The expected sign of this variable is negative. It was expected to be negative in accordance with the literature on inflation and working capital levels as shown in the works cited above.

Expectations were correct and the actual sign came out

negative and tends to confirm the point that most authors make that if a firm has expectations of inflation that they should reduce their investments in working capital so as to lower exposure to inflation. Firms would want to increase inventories of goods that the price will rise on, but on the other hand, they would want to reduce their investments in accounts receivable and cash. It appears from the results found here that firms must reduce cash and accounts receivable levels more than they build up inventories when inflation is expected. It may be even more appropriate in at least the last ten years to talk about the expectation of greater inflation and not just of inflation per se. This, nevertheless, fits with the argument already presented and is consistent with it. The beta coefficient of the expected inflation rate was significant to the .0001 level (Table V) although it was small relative to the previous beta coefficient for independent variables. The significant factor is that the sign was in the predicted direction and is statistically significant. Another important item to note is the correlation between sales predictability and the expected inflation rate. This can be seen from the correlation matrix (see Appendix F). The correlation coefficient between these two variables is .189 and has an observed significance level of .0001. This indicates that the higher the expected inflation rate the more difficult sales are to predict, which fits the results of this model that have been found thusfar.

Total assets is the fifth independent variable to be

investigated. The relationship of total asset levels to the level of working capital corrected was expected to be negative. This relationship is expected to exist based on the premise that total assets are a measure of firm size as pointed out in Chapter III and one would expect the proportionate share of working capital to decrease as all assets increase. In other words, one would not expect working capital to increase in the same proportion to total assets as fixed assets since economies of scale for working capital should exist as total assets increase. This particular variable, however, was not statistically significant at the .10 level. The probability of getting a t value larger than was gotten in this sample is .25 which is beyond most expectations of a reasonable level of statistical significance. Hence, even though this variable had the correct sign, its significance to the explanation of the ordinary least square results for the working capital decision model is questionable.

Sales levels of the firm is the sixth independent variable in the working capital model. The expected sign of this variable is positive and the actual sign turned out to be in agreement with this. This result coincides with the results of the level of economic activity variable described above. It appears that as sales levels are increasing, working capital items such as cash and accounts receivable must increase at a faster rate than inventories are depleted. As sales increase the transactions demand for cash must

increase to accommodate the new level of transactions. Further, cash may build up as sales increase in a residual manner. Possibly marketable securities build up as excess cash is generated and used for short-term investments. A further possibility is that with increasing sales levels accounts receivables increase at an increasing pace to new levels which are multiples of sales due to the trade credit period. This type of reasoning is that used in the numerous sources noted in the literature review which will not be repeated here because of its voluminous nature.

Sales levels, as the variable previous to it, is not statistically significant at the .10 level. The probability of getting a calculated t value greater than the one observed is .30. This much uncertainty as to the accuracy of the coefficient leaves conclusive results undeterminable from this study. It can only be noted that the sign did not come out as expected and the observed significance level is .30 (Table V).

Earnings levels of the firm is the seventh independent variable to be analyzed. The expected sign of this is positive. The actual sign turned out to be positive but not statistically significant. The observed significance level of this variable is .73 which is far outside the range of acceptable limits. It is important, however, to note the implications that a positive sign may have. The positive sign of the earnings level coincides with that of the level of economic activity and sales. This may be an indication

that when the level of economic activity is high, sales and earnings are high, the firm does not utilize working capital management to its fullest extent or it may be indicative of the simple relationship of a corresponding necessary increase in working capital as sales and economic activity increase. The fact that earnings level has a positive sign may, however, be interpreted in a negative manner such as was mentioned. It is difficult to state the precise cause of the relationship; it may be one or the other or both of the reasons given here. Since it can be seen from the correlation matrix (Appendix F) that sales are made more highly correlated with working capital levels than the level of economic activity or earnings level, one would be inclined to assess the relationship of earnings level to working capital or perhaps a somewhat spurious result and rely more heavily on the relationship of sales to working capital to explain the behavior of the firm.

Variability of earnings measured by the coefficient of variation is the eighth variable considered in the working capital decision. The expected sign of this variable was positive and the actual sign was positive. The statistical significance of this variable, like the last, is very low with an observed significance level of .74. The sign is correct, however, and does imply that the greater the variability of earnings the greater the level of working capital (Table V). This result is logically related to the result of working capital levels being positively related

to the predictability of sales. The more unstable conditions are for the firm in terms of sales predictability and earnings variability the more of a precaution demand for working capital. Specifically, if the earnings of the firm were quite variable, the firm would want to have higher levels of cash to meet the contingencies that may occur or for ordinary expenditures when earnings are very low or negative. This variable, however, may be a redundant variable and in fact, the explanation may be with sales level since they are so highly correlated.

Final consideration in the working capital model is given to the intercept term. The intercept term is .0069 and is significant to the .0001 level (Table V). This indicates that the amount of variation explained by the independent variables in the regression was very great since the intercept term is so small. The intercept relative to some of the coefficients, however, is not relatively smaller nor is it insignificant. This leaves one with the conclusion that there is some small but important variation unexplained by the model which is to be expected or since the results were obtained from aggregation a possible explanation is that there were individual firm effects.

In summary, the working capital model described by the author was accurate in terms of the direction of the signs in all cases. This model was based on the current literature available on the topic as pointed out in the literature review and was expected to be accurate. The signs of all

variables were correct and four out of the eight variables were significant at the .0001 level of significance. Two variables, total assets and sales levels, were not statistically significant at the .10 significance level and the remaining two, earnings level and variability of earnings, were completely nonsignificant statistically. Overall it must be concluded that the model accurately describes the working capital level decision accounting for approximately 95.7 percent of the variability in working capital levels. It is also clear that the one most important factor in determining working capital levels is the previous working capital level indicating a great deal of inertia in the working capital level decision.

The Capital Expenditure Decision Model

Discussion of this model will parallel the previous discussion of the working capital model by considering each independent variable, its expected sign, and how it relates to the dependent variable. The dependent variable is the normalized level of capital expenditures. The overall results of the model are that the model is a modest description of the method in which capital expenditure decisions are made. The model must be classified as a modest description based on the results of the previous model. This model has an R^2 of approximately .47 which is considerably lower than the working capital decision model but acceptable for a description of the complex process of capital expenditure

decision making. The other model does have, however, an observed significance level of .0001 which is extremely good. A summary of the results of this model are found in Table VI.

TABLE VI

CAPITAL EXPENDITURE MODEL MULTIPLE REGRESSION ESTIMATES

R^2=.47188829 Prob>F = .0001

Variable	Partial Sum of Squares	Beta Coefficients	Prob>|T|
MEAN		.01890654	.0001
CAPL	3.08786369	.63688528	.0001
GRZC	.03948783	.50276175	.0001
CRTDR	.05377097	-.11498505	.0001
SZFC	.02426756	-.00397724	.0001
TA	.00667866	.00000045	.0230
EIR	.04183523	.00481407	.0001
LEAN	.04126260	-.00000003	.0001
EXRN	.00105492	.00005693	.6254
ERLC	.00001634	-.00197153	.9076

One period lagged capital expenditures is the first independent variable to be considered in the capital expenditure decision model. This variable entered the maximum R^2 improvement model first with a partial sum of squares 3.6 (Table VI) which was by far the most contributed by any variable in the model. This indicates as did the lagged term in the previous model for working capital that there is

a great deal of inertia in capital expenditure level decisions. The beta coefficient for this term is .64 and is significant to the .0001 level. It is clear that the lagged capital expenditure level is important in making the decision as to the new level of capital expenditures as has been shown in the Chenery [26] and Koyck [69] flexible accelerator model. This may occur since firms that are large and complex like the firms studied here tend to make long-range plans for capital expenditures and hence they are fairly constant over time with changes being reflected by the current level of firm and market variables. This means that for the remaining variability to be explained in this model the subtle influences on capital expenditures must be caused by remaining market and firm related variables that currently exist. It is also important to note at this point that the speed of adjustment for this model is approximately .36. This means the adjustment takes place at the rate of 36 percent per year which is much faster than that of working capital. This indicates that the remaining firm and market related variables must be important to the adjustment process, since it takes place so quickly.

Average growth in earnings over the past five years is the second independent variable to enter the model. This variable has a positive expected sign and in fact the actual sign is positive and significant at the .0001 level. Hence, the average growth in earnings is positively related to the level of capital expenditures which is ceteris paribus what

one would expect. The average change in earnings over the past five years must be taken as a partial indicator of how the firm expects to do next period. It is interesting to note at this point that the correlation coefficient between the average earnings growth and excess returns that will be discussed later is .19. This indicates that the average earnings growth is related to excess return in a positive manner and both are positively related to capital expenditure levels. These results coincide with what one would expect based on the results of the studies noted in the literature review, Chapter III. If a firm has had a positive five year average change in earnings this would be a positive input into the model for increasing capital expenditures. In other words, the past average is a proxy for future profitability. If the five year average was negative the firm would be inclined to reduce capital expenditures. Other factors obviously bear on this decision and are included in the model but this variable appears to be very important in this decision making process.

Credit tightness is the third independent variable to enter the capital expenditure model. The credit tightness variable measures the degree to which firms borrowing gets greater or less during a period. The expected sign of this variable is negative. This is the case, since the tighter credit is, the larger the credit tightness variable, and the smaller capital expenditures since there are fewer funds available for investment. The actual sign came out negative

as predicted and is statistically significant at the .0001 level indicating that credit tightness does play a part in the capital expenditure decision.

From this result it appears that when credit is not tight firms tend to increase their level of capital expenditures. It may also possibly be considered a matter of informational content such as when credit is not tight there may be an anticipation that it can only get tighter and consequently cause higher interest rates more difficulty in borrowing and hence lead to less profitable capital expenditures.

Interesting relationships can be drawn from the correlation matrix (Appendix F) to embellish upon this analysis. The correlation coefficient between credit tightness and the expected inflation rate that will be discussed later is -.41. This indicates that credit tightness and expectations of inflation are highly negatively correlated not as one would expect. In other words, when there are expectations of inflation creditors are not as inclined to make loans but apparently lenders of funds are seeking them at higher interest rates.

Another interesting relationship from the correlation matrix is that between credit tightness and the level of economic activity. The correlation coefficient between these two is -.50. Furthermore, the correlation coefficient between the expected inflation rate and the level of economic activity is .86 and the correlation coefficient

between the expected inflation rate and credit tightness is -.41. These correlations suggest that when the level of economic activity is low credit is tighter than in high levels of economic activity and the expected inflation rate is moving in the opposite direction of credit tightness and the level of economic activity. All of these indicate that when the level of economic activity is high, credit is loose and expectations of inflation are high (and so are short-term interest rates since the one-year Treasury Bill rates are the proxy for expected inflation rates) and the level of capital expenditures are high.

The inference here is somewhat contrary to the traditional wisdom. The reason for this may be the way the proxy is defined (see Appendix A). Firms may increase their borrowing even though interest rates are higher because of anticipation of higher rates in the future or because of profitable opportunities that exist now or a combination of both.

Sales level is the fourth variable to enter the capital expenditure model. The expected sign of this variable is positive. This means that as sales increase expectations about near future output and/or current output levels are such that the firm would need to expand capacity to meet these needs. In other words, sales levels here serve as a proxy for pressure on output capacity.

The actual sign for this variable came out negative. This is the opposite of what was expected and furthermore,

it is statistically significant to the .0001 level. Since the sign came out different than expected, the author will try to make possible suggestions as to why this may be the case. The first reason as to why firms react in this manner may be due to the fact that they are able to forecast sales levels or pressure on output well enough to adjust the level of capital expenditures before the actual sales levels occur. If this is the case, one would expect the level of capital expenditures to fall when the sales levels are reached unless there is a constant or increasing pressure on output.

This result is somewhat consistent with the findings of McDonald, et al. [92] and Jorgenson [65]. They found that the one-year change in sales variable that they used for capacity utilization in their model had a negative and significant relationship in one year studied and was not significant in the other years. The study of Higgins [51], on the other hand, finds a positive relationship of the four year average sales level change to four year average change in investment level. Higgins model, however, only has two independent variables which may alter the relationship of the regression results. Also, both the McDonald and Higgins studies deal with changes, not levels.

Another possible explanation that can be given is that capital is an inferior input and that this increase causes a decrease in output which is not a very plausible explanation. It seems that the most likely explanation is that capital expenditures preceeds sales increases or output increases

and hence, are reduced when actual sales levels are realized and vice versa when output decreases. The specific study of the relationship of sales levels to capital expenditures levels in terms of leads and lags is beyond the scope of this study and hence no specific solution to this result can be given.

Total assets is the fifth independent variable to be analyzed. The relationship of total assets to capital expenditure levels is expected to be positive. It is expected that the ratio of capital expenditure levels relative to total assets increases as total assets increase and the proportion that working capital is of total assets decreases as total assets increase as was pointed out in the discussion on the working capital model.

As expected, the actual sign of this variable turned out to be positive. The total asset variable turned out to be significant to the .02 level. While this level of significance is not as great as the previous four variables considered, it is certainly good enough by most standards to be considered highly significant. From this result it appears that when firms make decisions to increase assets it is the fixed asset proportion that increases the most through capital expenditure.

Some light can be shed on this variable from the correlation matrix. Total assets and excess return have a correlation coefficient of .20 which indicates firms with higher excess returns have higher levels of total assets.

As already shown, the greatest proportion of this increase in assets goes to capital expenditures. The results of this analysis seem clear and require no further elaboration at this point.

Expected inflation rate is the sixth variable in this model to be considered and was already discussed briefly in relation to the credit tightness variable. The expected sign for this variable is positive. This would indicate that one would expect that the greater the expectations of inflation the greater the capital expenditures level.

The actual sign of this variable was positive as expected, and significant to the .0001 level. Firms do apparently based on expectations of higher prices, make larger capital expenditures in the current period. If one relates this result to the previous discussion on the credit tightness variable, it aids in understanding this effect. At high levels of economic activity, the expectations of inflation are high, credit is loose, interest rates are high, and capital expenditure levels are high. This result seems consistent in all respects except that as interest rates rise it appears that capital expenditures rise. In that rising interest rates are an indication of expectations of inflation it then seems to fit a logical pattern. Firms are not making larger capital expenditures related to the rise in interest rates per se, but because of expectations of inflation possibly as a hedge against inflation.

Economic activity is the seventh variable to enter the

model. As in the case of sales, the expected sign is positive and the actual sign is negative and significant to the .0001 level. The expected sign was based on the concept of pressure on output during high levels of economic activity and sales hence an increase in capital expenditure levels. In fact, the case may be as was stated in the analysis of the sales variable, that the firm makes capital expenditures during lower levels of economic activity and sales in anticipation of future rises in the level of economic activity and sales.

Discrepancies with regard to the sign of sales and the level of economic activity variables related to the level of capital expenditures may be caused by the incorrect conclusion drawn from the research reviewed in Chapter III. The pressure on capacity is not necessarily the result of current sales or economic activity but of the anticipation of future levels of these two variables. This is the most plausible relationship the author can find to explain the signs of these two being different from those expected.

Entering the model as the eighth variable is excess returns. This variable has a positive expected sign and a positive actual sign that is not statistically significant by any standards with an observed significance level of .63. The variable was expected to have a positive sign since it is consistent with current literature results that the higher excess returns earned by a firm the more capital would put into use in that firm. This result holds here,

but turns out not to be statistically significant to such a high level that one can only very cautiously infer any meaningful or reliable conclusion from the results. One pragmatic possibility for this result may be that the excess returns of the firm do not vary a great deal and hence are not highly related to the amount of capital expenditures.

Again, if one goes to the correlation matrix in Appendix F, some valuable information may be gained. It is interesting to note that excess returns and the average earnings growth for the past five years have a .19 correlation coefficient that is significant to the .0001 level. This indicates that if the firm has a higher excess return they have a higher earnings growth which is precisely what one would expect. Furthermore, earnings level and excess returns are positively related with a correlation coefficient of .24 that is significant to the .0001 level and total assets and excess returns are positively correlated with a correlation coefficient of .20 that is significant to the .0001 level. This indicates that as the firms earnings level increases, average earnings growth increases and excess returns increases the level of capital expenditures increase. It is difficult to tell which of these variables is affecting the level of capital expenditures without reference back to the maximum R^2 improvement model. It is clear that the average earnings growth has the most impact since it entered the model immediately following the one-period lagged capital expenditures. It follows then, that

since there is some correlation between the average growth of earnings and excess returns and the former enters the regression equation, that it explains some of the variation one would expect to be explained by excess returns. Another possibility is that past excess returns is not a good indication of future excess returns. The final analysis of this interaction of these variables and their impact on capital expenditure levels can best be seen by turning to the final variable.

Finally, the ninth, and last, variable to enter the model is earnings level. The expected sign of earnings level is positive. The actual sign turned out to be negative, but was not significant by any standard at an observed significance level of .91. Apparently earnings level, by entering the regression equation lost its significance in terms of its contribution to the explanation of additional variation. From the correlation matrix, one can see that on a one-to-one basis capital expenditure levels and earnings level have a correlation coefficient of .03 that has a .05 observed significance level. It also appears from the correlation matrix that the cause of the problem in the regression results may come from the correlation between the average earnings growth and earnings level which have a .56 correlation coefficient that is significant to the .0001 level. Hence, a major portion of the variation that could be explained by earnings level has already been explained by the average earnings growth variable entering the

maximum R^2 improvement model first. Consequently, the negative sign of the earnings level variable is not significant to the analysis at this point.

Final consideration in this model is given to the intercept term which is .019 and is significant to the .0001 level. This term is clearly not large in absolute terms, but its existence as statistically significant indicates that there is some statistically significant explanation that is left in the intercept term. However, since the term is so small and the author has no specific explanation it will be left to the standard interpretation that there is a fixed level of capital expenditure that is independent of the variables specified in the model.

In summary of the capital expenditure level decision model, it can be said that the model did a reasonably good job of describing how capital expenditure decisions are made. The R^2 of .47 is considerably lower than that observed in the working capital model of .957 but one cannot expect to explain this much of the variation in all models. However, since the observed significance level is so high, one can conclude that the variation that is explained is very reliable.

It does appear that by including other financial decisions interacting in a capital expenditure model it may enhance its predictability which will be done in a later section of this paper. The temporary conclusion that may be drawn at this point is that the model as described above

is a moderately good description of how capital expenditures are made.

The Financing Decision Model

Discussion of this model will follow the same format as the previous model by analyzing each independent variable in detail and its relationship with other variables where it is important. The dependent variable used here is the debt level normalized by the division by total assets. This dependent variable is used since we have the balance sheet constraint. Overall the model looks good in terms of its ability to describe how the debt level decision is made. The R^2 of the overall model is .796 and the model is significant to the .0001 level. Again, while this model does not do as good a job of describing as the working capital model, it does do rather well by most standards. The summarized results are shown in Table VII.

One-period lagged debt level is the first independent variable to enter the maximum R^2 improvement model. The coefficient for lagged debt level is .79 and it is significant to the .0001 level. From the correlation matrix it is seen that the one-period lagged debt level and the current debt level have a correlation coefficient of .89 and an observed significance level of .0001. This clearly indicates that there is a very strong relationship between last periods debt level and this periods debt level. This can be explained in two ways. First it is reasonable to suspect

TABLE VII

FINANCING MODEL MULTIPLE REGRESSION ESTIMATES

R^2=.79558253 Prob>F = .0001

Variable	Partial Sum of Squares	Beta Coefficients	Prob>|T|
MEAN		.02915524	
DBBL	33.68816024	.78783731	.0001
SZFC	.13450016	-.00927016	.0001
LEAN	.05700921	-.00000003	.0001
TA	.02963128	.00000092	.0019
EIR	.02517559	.00366140	.0037
VERN	.00693760	-.00061227	.1197
PERR	.00024453	.00001941	.7698
CRTDR	.00021697	-.00723203	.7819

that sheer inertia plays a part in the relationship. In other words, capital structures are not changed every period at the discretion of management. The decision to make sizable increases in debt is not a routine one for most firms. Debt levels will be established to provide funds for long periods of time and hence, large debt decisions are made infrequently.

A second reason for the strong relationship between this period's debt and that of last period is the cost of issuing new debt. If the firm wishes to issue new debt, in most cases one would suspect that the costs of being out of equilibrium with desired debt levels is less than the cost of issuing new debt for short periods of time, such as one year. In the Eisner and Strotz [35] sense, then, the adjustment costs of change prohibit frequent adjustments of debt levels. It is also interesting to note that the speed of adjustment is .21 which indicates that debt adjusts at the rate of 21 percent per year toward the desired level, hence, nearly a five year period is needed for full adjustment to a desired level. It is now necessary to look at the other independent variables to determine what the other more subtle influences are on debt level determination.

Entering the model as the second independent variable is the sales level of the firm. The expected sign of this variable is negative. This relationship is expected to be negative based on the belief that capital expenditures for the current level of sales have already been made in

previous periods and was then funded by the possible use of debt. In the periods where sales are high the firm probably generates an internal source of financing through the retention of earnings, hence the less is the need for debt level increases. Thus, when sales levels reach higher levels debt levels decrease as debt may be replaced by internally generated funds.

If one reviews the correlation matrix the observation is made that sales levels and total assets have a negative correlation coefficient. The reason for this occurrence is that the variables are defined. As has been pointed out several times previously, all firm variables are put on a comparable basis by dividing through by total assets. Thus, in this case it gives an explanation to the otherwise odd looking relationship. If total assets increase and sales do not increase proportionately, as we would not expect them to do based on the previous analysis, then the corrected sales variable would decrease, hence the negative relationship.

It is also interesting to note the -.16 correlation coefficient (significant to the .0001 level) between sales levels of the firm and the one-period lagged debt level. This indicates that the build-up of debt to finance sales increases for future periods happens more than one period prior to the sales increase. The investigation of this specific lag function is beyond the scope of this study and will not be pursued further here.

Variable number three to enter the financing model is the level of economic activity. The expected sign of this variable is negative. The actual sign is negative and significant at the .0001 level. Firms appear to need the increases or decreases in debt levels as the level of economic activity moves the opposite direction. This may indicate that firms use debt financing in anticipation of higher levels of economic activity and decrease debt financing in anticipation of decreasing economic activity. Since sales of the firm are somewhat correlated with levels of economic activity the effects of financial leverage seem to be taken into account relative to expectations of changes in levels of economic activity and sales. However, from the correlation matrix comes a somewhat confusing result at first sight. In a one-to-one relationship the level of economic activity and debt levels are positively correlated with a .16 correlation coefficient with an observed significance level of .0001. Furthermore, the one-period lagged debt level has a .22 correlation coefficient in relation to the level of economic activity. These two correlations seem to contradict the results found in the ordinary least squares model. Strictly speaking of a one-to-one relationship, the level of economic activity and debt levels are positively not negatively related. However, in the maximum R^2 improvement model, the one-period lagged debt level has already entered the model and it is correlated with the level of economic activity. Hence, by the time the level of economic activity

enters the model the variation explained by it may already be explained or even overexplained by the other variables. This puts the level of economic activity variable in a role of compensating for overexplanation of its influence, consequently, the coefficient turns out to be negative and statistically significant. In other words, when the other variables that are entered first it is actually considered first in the analysis since it offers more of an explanation of the variability of debt levels and this puts the consideration of the level of economic activity in a negating role. Which in reality may mean that the other preceeding variables will have less of an impact and the level of economic activity considered in conjunction with them in a positive manner.

To be considered as the fourth variable in this model is total assets of the firm. The expected sign of total assets is positive. The actual sign of this variable is also positive and significant to the .0019 level. One would expect the relationship to be positive since a portion of new asset levels are in most cases partially financed by debt. Furthermore, there may be economies of scale here. As asset size gets larger, the firm may be able to issue greater proportions of debt financing. The positive relationship between total assets and the level of economic activity noted in the correlation matrix (.10 correlation coefficient significant to the .0001 level) indicates that at high levels of economic activity the firms increase

assets probably by the retention of earnings or increasing the debt level. A more detailed discussion of this matter will be made in the next section of this chapter when the simultaneous equation relationships are looked into.

Expected inflation rate for which the one-year Treasury Bill rate is used as a proxy is the fifth variable to enter this model. The expected sign for this variable is positive. The actual sign is also positive with an observed level of significance of .0037. This result is what one would expect in that as the expectations of inflation increase firms seek to become net debtors. If one looks at the correlation matrix there are a number of interesting relationships to be seen. The first of these is the positive relationships between the expected inflation rate and the level of economic activity. The correlation coefficient between these two variables is .86 and it is significant to the .0001 level. This relationship suggests that firms operating in periods of high economic activity tend to have inflationary expectations and hence increase their debt levels. If one looks back to the discussion on this variable relative to capital expenditures decision model the results are confirming.

The second interesting result shown in the correlation matrix relative to the expected inflation rate variable is the correlation between this variable and the credit tightness variable. The correlation coefficient between these two variables is -.41 and it has an observed significance

level of .0001. This result indicates that when inflation expectations are high and interest rates are high, firms borrow more money. This indicates that even though interest rates are high in light of inflationare expectations, firms can still borrow if they are willing to pay the price.

General results from this analysis are that the expected inflation rate does play the role that one would expect, based on past studies of the reactions of debtors when there are inflationary expectations. In other words, firms do increase their debt levels when there are inflationary expectations even though the advantages of doing so may be offset by rising interest rates.

Variability of earnings is the sixth variable that will be considered here. The expected sign of this variable is negative. The actual sign in the ordinary least squares model is also negative and significant at the .1195 level. However, in the correlation matrix where variability of earnings is correlated with only debt level the correlattion coefficient is .04 with an observed significance level of .0184. The correlation of variability of earnings with the one-period lagged debt level is also positive and significant at the .0004 level. This set of results, then, seems to point to the fact that in the ordinary least squares model the variability of earnings must be playing a compensating role such as the earnings level variable in the capital expenditure model that was mentioned previously. This result is very difficult to accept since one expects a

negative relationship to always obtain between variability of earnings and the level of debt because of business risk. One possible reason for the positive relationship in the correlation matrix may be that considering only variability of earnings relative to debt levels may give erroneous results since growth of earnings may account for some of the variability over the five year average period. However, if one turns to the correlation matrix for working capital and observes the correlation between variability of earnings and the average earnings growth it is negative with an observed significance level of .259. These results do not bear out this contention and one must look for another possible reason.

Another possibility is that firms with more earnings variability use more leverage to improve their returns from the tax savings on interest of the debt since the variability of earnings is negatively related to earnings level. This is a very tenuous result or speculation, however. In an unpublished masters' thesis entitled, "The Effect of Leasing on Corporate Debt Capacity - A Test of Loan Market Efficiency," by Victor Hatridge[50], the same result was obtained. Still another possibility is that a riskier firm may tend to maintain existing debt when working capital increases but do not increase debt due to a cash shortage when working capital levels decrease. The precise explanation for this result is not obtainable from this study or from the current study.

The ratio of the current price earnings ratio to its five year average, henceforth called the PE relative, is the seventh variable to enter the model. The expected sign for the variable was positive. The reason for this expected sign is that if the firm's PE relative is high the market value of the stock must be higher relative to its earnings than its five year average and, hence, the total market value of the equity base is larger than it has been. Based on this favorable move in the market price of the equity of the firm, the firm now has a larger equity base from which to issue more bonds. One may label this a type of double clientele effect since the bond holders are affected by the equity base which may be governed partially by clientele effect.

The actual sign of this variable is positive with an observed significance level of .77. Even though the sign is positive as expected, it is difficult to put much faith in the variable as a descriptive device with such a high observed significance level. In fact, one might reason the sign should be negative in which case one would issue more stock at a higher price and fewer bonds. It may be insignificant since the firm does not have the ability to precisely time external financing.

Finally, the eighth and last variable to enter the model is credit tightness. This variable has an expected sign of negative. In other words, the looser credit is, the more debt is issued. The actual sign of this variable is

negative as expected with an observed significance level of .782. This observed significance level makes the interpretation of this variable's impact on the debt decision weak. However, if one goes to the correlation matrix some strength for the analysis is gained. The one-to-one correlation between debt level and credit tightness is .024 with an observed significance of .176. This indicates that credit tightness is negatively related to debt level, but turns out with an unacceptable observed level of significance in the ordinary least squares results since it entered late in the model and suffered from matrical problems with the expected inflation rate and the level of economic activity.

The intercept term in the model does not have a great deal of significance in terms of interpreting the model. The intercept is a positive .029 and is significant to the .0001 level, but in this author's opinion is not representative of an explainable effect. It also seems reasonable to assume most firms have a minimum level of debt to maintain operations. Accounts payable alone in most firms of any size will have a minimum level. Hence again, the amount of interpretation for the intercept term for a better understanding of the model is not of much benefit.

In summary of this model, it can be said that the model as specified did a reasonably good job of describing how the debt decision is made. The R^2 of .7956 and the observed significance level of the model at .0001 are quite respectable for a descriptive model. It is hoped that this

model can be improved upon in the later sections of this paper when the impact of other financial decisions are taken into account.

The Dividend Decision Model

Overall, the model seems to do a good job in describing how dividend decisions are made by firms. The R^2 for the model is .954 and the model's overall significance level is .0001. The intercept term in the model is small and significant at the .0001 level. The interpretation of the intercept term appears to have no special meaning. It seems to be due to the lumping together of some of the unexplained variations not captured by the rest of the model. The independent variables that will be reviewed next give a clearer indication of the specific relationship that may cause dividend decisions to be made. A summary of the results of the dividend model are shown in Table VIII.

One-period lagged dividend level is the first variable to enter the model. The expected sign of this variable is positive. The actual sign is positive and significant to the .0001 level of correlation coefficient from the correlation matrix of .97 and the variable is significant to the .0001 level. This seems to indicate that there is a great deal of inertia in the dividend decision. The target payout ratio is .65 which seems quite reasonable.

At this point it is appropriate to look at the results of the second variable to enter the model and to discuss it

TABLE VIII

DIVIDEND MODEL MULTIPLE REGRESSION ESTIMATES

R^2=.95414809 Prob>F=.0001

Variable	Partial Sum of Squares	Beta Coefficients	Prob>|T|
MEAN		-.00010578	
DIVL	.84978386	.85686978	.0001
ERLC	.02376388	.09384004	.0001
LEAN	.00046553	-.00000000	.0009
CRTDR	.00029422	-.00858192	.0062
EIR	.00002822	-.00012282	.5999

in conjunction with the first. This second variable is the earnings level of the firm. The expected sign of the variable is positive and the actual sign is positive and the variable is significant at the .0001 level. From the correlation matrix it is clear that earnings levels and dividend level are highly correlated with a correlation coefficient of .80 and is significant to the .0001 level. These results indicate that there is an adjustment of dividends in most cases to new levels of earnings. In other words, some sort of partial adjustment is taking place. This result fits neatly with that of the lagged dividends relationship. It appears that the adjustment is partial relative to the new level of earnings and is tied to the previous level of dividends which must represent a proportionate payout with limitations. The adjustment to the new level of earnings is made while still maintaining a relationship with past dividends so as to avoid overadjustment from temporary increases in earnings. This is pointed out in the correlation matrix also. The correlation coefficient between last period's dividends and this period's earnings level is .75 and is significant to the .0001 level. The speed of adjustment as can be seen from the results is .14 which is quite slow.

These first two independent variables, then, taken together explain a great deal about the formation of dividends levels without trying to estimate precise lead and lag type relationships.

The level of economic activity is the third variable to enter the model. The expected sign of this variable is negative. The actual sign is in fact negative and the observed level of significance is .0009. The sign was expected to be negative in the belief that at high levels of economic activity the firm would retain earnings in anticipation of future expansion. It would appear from this result that the higher the level of economic activity the higher the expectation for the need to retain funds or the less available other forms of financing may become. In other words, the level of economic activity in this case may serve as a proxy for future expectations of the need for funds with the firm.

Credit tightness is the fourth variable to enter the maximum R^2 improvement model. This variable is expected to have a negative sign. The actual sign is negative and has an observed significance level of .0001. This implies that the looser credit is the more firms pay out in dividends. This seems logical, since as credit gets easier to obtain, the firm would tend to rely less on the retention of earnings and more on the use of debt.

The last variable to enter the model is the expected inflation rate. The expected sign of this variable is positive. The actual sign turned out to be negative but not significant with an observed significance level of .60. The sign was expected to be positive based on the firm perceiving that the investors would strongly prefer to have

dividends paid this period rather than in future periods if there are expectations of inflation. With the significance level as it is, however, (.60) it is extremely difficult to describe what the behavior of firms was over this period.

Summary of the Multiple Regression Models

Traditional models of how firms make financial decisions seems to do a fairly good job. The working capital model seems to do the best with an R^2 of .957. Furthermore, the signs were correct as hypothesized in all cases, which is rare. Out of the eight independent variables in the model four had significance levels of .0001, two less than .30, and the last two not significant by any standards.

With an R^2 of .954, the second best descriptive model is the dividends decision model. Out of five variables, four had the correct sign and the same four were highly significant. In other words, 80 percent of this model's independent variables had the correct sign and the same 80 percent were significant and hence, usable in the analysis.

The third most successful model is that of the debt decision. This model has an R^2 of .796 and has coefficients with the signs as predicted in seven out of eight cases for 88 percent accuracy. Five out of eight of the signs had a significance level of .004 or better and one had a .12 level of significance. Overall, then, 63 percent of the variables were both significant and had correct signs, not including the variable with the .12 significance level.

Finally, the capital expenditures model had an R^2 of .472 to come in last. In this model seven out of nine or 78 percent of the variables have the correct sign. Six out of nine of the variables, for 67 percent, have both the correct sign and are significant at a minimum at the .03 level. This model, even though it had a low R^2 compared to the other models, did an adequate job of describing the capital expenditure decision.

In all the models all had the majority of the signs both significant and with the proper sign. It is now appropriate to turn to the next stage set forth in the research design.

The Simultaneous Equation Models

The Working Capital Decision Model

Discussion of this model as well as the three that follow it will concentrate on the new variables added over and above the multiple regression models. The variables used in the multiple regression models will be discussed only when they give conflicting results or it is important to confirm results that were found to be unusual in the first stage. A summary of these results may be seen in Table IX.

The first variable to be considered in this model is the level of capital expenditures as estimated in the first stage regression results (Table IX). The expected sign of this variable is negative. The actual sign is negative

TABLE IX

WORKING CAPITAL MODEL - SIMULTANEOUS EQUATION ESTIMATES

R^2=.95865639 Prob >F = .0001 Durbin Watson Statistic = 2.07

Variable	Partial Sum of Squares	Beta Coefficients	Prob>|T|
INTERCEPT		.04005757	.0001
P_2	.13265540	-.28122275	.0001
P_3	.00299715	.01257032	.1363
P_4	.04684893	-.025197575	.0001
LEAN	.05015300	.00000003	.0001
SPHC	.07418947	.04153466	.0001
TA	.00057178	-.00000013	.5152
EIR	.03696384	-.00460509	.0001
ERLC	.05068543	.17999969	.0001
VERN	.00022502	-.00011059	.6831
SZFC	.00194448	.00134330	.2301
WCLL	39.94385160	.92892669	.0001

and significant to the .0001 level. This sign should be negative based on a balance sheet constraint and case one of market imperfections in Chapter III. It must be kept in mind that these firm variables are normalized by the division by total assets. With this being the case, it means that if the proportion of one increases the other one must decrease. It is clear that with the sign as expected and with this variable significant it aids in the determination of the working capital decision. It then does appear that there is a significant simultaneous relationship between working capital decision and the capital expenditure decision.

Debt level as determined by the first stage is the second variable in the model. The expected sign of this variable is positive. This relationship is expected to exist since some of the working capital expansion would usually be financed by debt. The second reason for this relationship to exist is that with more leverage there is more financial risk and it would be supported with larger working capital balances in imperfect markets where bankruptcy exists as explained in case two of Chapter III.

The actual sign is positive and significant to the .136 level. Hence, this term being added to the working capital expenditure model does improve the model and indicates that a simultaneous relationship between working capital and debt decisions does exist.

It is interesting to note the relationship in the

correlation matrix, however. The correlation matrix shows the estimated levels of debt negatively related to the observed level of working capital and positively related to the capital expenditures. The reason for this again, is the construction of the variables. In other words, the division of all firm variables by total assets causes this proportion relationship to exist. If most of the debt issued is used to finance capital expenditures as it apparently is, then total assets increase while working capital remains fairly unchanged and thus working capital variable declines while debt increases although working capital uncorrected may slightly increase the relationship shown up negative here because of the balance sheet constraint.

The dividend level from the first stage is the third variable in the model. The expected sign of the variable is negative. The actual sign is negative and has an observed significance level of .0001. The sign of this variable is expected to be negative based on the fact that if dividends are paid out it should reduce working capital and the imperfections arguments of case three in Chapter III.

If one looks at the correlation matrix, it shows that on a one-to-one basis dividends are positively related to working capital with a correlation coefficient of .17 and an observed significance level of .0001. The results of the regression equation reversed the sign and appears to be

the result of the simultaneous relationships that exist. The correlation between the capital expenditure level and the debt level is .32 with an observed significance level of .0001. Furthermore, the correlation between the debt level and the dividend level is -.58 with an observed significance level of .0001.

Results of the dividend variable in the working capital model may be distorted by multicollinearity but does not appear to be here.

Three other variables in the model warrant comment. The first of these is the earnings level of the firm. The sign is the same as in the multiple regression models, but the level of significance is higher. In the multiple regression model the observed significance level is .735 and in the simultaneous equation for working capital it is .0001. The second variable that deserves comment is that of variability of earnings. In the multiple linear regression model the sign of variability of earnings is positive, but not significant. In the simultaneous equation relationship it turns out to be negative and also not significant. The consequences of this conflict are not important based on the observed significance level since one would expect this type of error in this case.

Sales level is the third variable to be mentioned here. The sign in the simultaneous equation results is not the same as in the multiple regression model but in neither case is it significant.

All other variables in the model, of those that also appeared in the multiple regression models, have the same signs and approximately the same levels of observed significance.

In summary, the simultaneous equation results tend to support the multiple regression results plus the hypothesis that there is a simultaneous relationship in the determination of the working capital decision depending upon other financial decisions. This is illustrated by the R^2 going up to approximately .958.

The Capital Expenditure Decision Model

Working capital as estimated in stage one of the two stage process is the first variable in this model. The results of this model may be found in Table X.

For the reasons just stated in the discussion on the working capital decision model and case one of Chapter III, the expected sign is negative. The sign is negative and significant at the .0001 level. There is no need to go through the reasoning of this relationship since it already has been done once, so we shall move on to the next variable.

The second variable in the model is the estimated debt level from stage one. The expected sign is positive based on the imperfection arguments in case four of Chapter III. The actual sign is negative and significant at the .35 level. One must turn to the correlation matrix to have a more

TABLE X

CAPITAL EXPENDITURE MODEL-SIMULTANEOUS EQUATION ESTIMATES

R^2 = .49745109 Prob > F = .0001 Durbin Watson Statistic = 2.11

Variable	Partial Sum of Squares	Beta Coefficients	Prob>|T|
INTERCEPT		.05188994	.0001
P_1	.15752269	-.05311776	.0001
P_3	.00109569	-.00765167	.3503
P_4	.05479633	-.26468818	.0001
EGR2C	.03910179	.50785842	.0001
EIR	.04323852	.00489497	.0001
LEAN	.04637750	-.00000003	.0001
CRTDR	.03168068	-.08968866	.0001
EXRN	.00112341	.00005897	.3443
ERLC	.03234653	.14916348	.0001
TA	.00119095	.00000019	.3302
SZFC	.00000011	.00000939	.9925
CAPL	1.42317683	.53550981	.0001

complete picture of the situation. In the correlation matrix capital expenditures and debt level have a positive correlation coefficient of .225 significant at the .0001 level. Debt level and working capital have a correlation coefficient of -.366 with an observed significance level of .0001. These two results taken together suggest that much of the effect of debt is taken into the model when working capital is entered and hence puts debt in a compensating role in the regression model. This is partially the result of how the variables are constructed and partly a result of the multicollinearity problem.

The estimated dividend level from stage one is the third variable to enter the model. The expected sign of this variable is negative since the more paid out in dividends the less available for capital expenditure based on the imperfections arguments of case five in Chapter III. The converse may also be true that because of fewer investment opportunities a firm may tend to pay out more in dividends. The actual sign is negative and significant at the .0001 level. If one checks the correlation matrix the same basic result is found. This lends support to the hypothesis that capital expenditures are not made independently of other financial decisions.

Results of the other variables in this model are all basically the same as in the multiple regression models and consequently will not be repeated here. The important result of this model at this point is that it does indicate

that financial decisions are not made independently of one another. In other words, there is some sort of simultaneous relationship as this model indicates, as a result of market imperfections, institutional restrictions, and uncertainties, by improving the R^2 to .497 up somewhat over the multiple regression model.

The Financing Decision Model

The debt financing model shows an improvement in fit with the addition of the estimates of the other financial decisions. The complete summary of the results of this model are shown in Table XI.

Working capital level is the first variable to be discussed here. The expected sign is positive and the actual sign is negative and significant at the .0001 level. This result clearly violates the symmetry constraint. It appears from the results of this model and the results of the working capital model combined that higher level of debt may require a higher level of working capital, but on the other hand, larger working capital levels in the debt model are negatively related to debt levels. This result when viewed in this context and in reference to the imperfections arguments in case two of Chapter III, seems feasible. In other words, the debt level is a positive important variable in the working capital decision. On the other hand, the higher the levels of working capital when making a debt decision, the lower level of debt apparently desired.

TABLE XI

FINANCING MODEL-SIMULTANEOUS EQUATION ESTIMATES

R^2=.81778016 Prob>F=.0001 Durbin Watson Statistic = 1.24

Variable	Partial Sum of Squares	Beta Coefficients	Prob>|T|
INTERCEPT		.0975604	.0001
P_1	.36841208	-.09033418	.0001
P_2	.04705434	.15035564	.0001
P_4	.00489021	-.05309231	.1712
EIR	.00619185	.00187742	.1236
LEAN	.03485841	-.00000003	.5297
VERN	.00236603	-.00035801	.3411
CRTDR	.00070507	-.01310577	.6033
TA	.00000039	.00000000	.9902
PERR	.00010223	.00001256	.8431
DBBL	21.42172516	.76127168	.0001

Capital expenditures as estimated from stage one is the second variable to enter the model. The expected sign is positive from case four in Chapter III. The actual sign is positive and significant at the .0001 level. This indicates as was pointed out in the capital expenditures model that debt is used primarily to finance capital expenditures. This analysis will not be repeated here since it would only provide redundancy, not clarification.

Predicted dividend levels from stage one is the third variable to enter the model. The expected sign is negative based on case six of the imperfections arguments in Chapter III and the actual sign is negative and significant at the .17 level. The reason for this expected relationship is that if capital expenditure levels are high, debt levels tend to be high also and some blend of debt and equity primarily through retained earnings are necessary to finance new investment. This increase in capital expenditures leads to an increase in the debt level and a reduction of the dividends in an attempt to retain earnings to finance the capital expenditure.

With the exception of sales levels which is not significant in either case, the other variables in the model have the same signs and the same basic significance levels as before in the ordinary least squares results. The important summary from the model is drawn from the stability of the coefficients of the variables that were in the ordinary least squares results, as well as the simultaneous relationship that were pointed out. Two of the financial decision variables that entered this model had the expected sign and were significant to the .0001 level and the third .17. These results were extremely good and lend continuing support to the hypothesis that there is a meaningful simultaneous relationship among all firm financial decisions.

The Dividend Decision Model

Results of this model were improved also with the addition of the three other financial decisions as independent variables. The results of this model are summarized in Table XII.

TABLE XII

DIVIDEND MODEL-SIMULTANEOUS EQUATION ESTIMATES

R^2=.95499508 Prob>F=.0001 Durbin Watson Statistic = 1.70

Variable	Partial Sum of Squares	Beta Coefficients	Prob>|T|
INTERCEPT		.00242614	.0041
P_1	.00047735	-.00311392	.0004
P_2	.00208891	-.03500533	.0001
P_3	.00066091	.00585035	.0001
ERLC	.02407950	.11079333	.0001
CRTDR	.00031023	-.00882228	.0045
LEAN	.00099743	-.00000000	.0001
EIR	.00003064	.00013216	.3717
DIVL	.72536033	.84564562	.0001

The first of these variables to be analyzed is the working capital decision. The expected sign of this variable is negative since when dividends are paid out it

temporarily reduces working capital as was pointed out in the working capital model and the arguments of case three in Chapter III. The actual sign of this variable is negative and significant at the .0004 level.

Capital expenditure level is the second variable into the model. Its expected sign as pointed out before and based on the arguments of case five in Chapter III in relation to dividends is negative. The actual sign is negative and significant at the .0001 level. These results are discussed in the section on the capital expenditure model and need not be repeated here.

Debt level estimated in stage one is the third variable entered into the model. The expected sign is positive since if the firm is increasing its dividend levels it may need to finance this through new debt levels as indicated in case six in Chapter III. The actual sign is positive and significant to the .0001 level. It should be noted here that the sign of dividends in the debt model was negative. These results do not seem contradictory since on the one hand if a firm is going to pay out more in dividends it may finance that with debt. On the other hand, however, if the firm increases its debt levels it may also decrease its dividends in the debt model so as to finance increasing capital expenditure.

Other variables that enter the model, those that also appeared in the multiple regression model, have the same signs and roughly the same significance levels as they did

in the multiple regression model.

Summary of the Simultaneous Equation Models

Overall the results of the simultaneous equation models indicate that there is a significant amount of interrelatedness in the financial decisions of firms. One measure of this is that the R^2 measure in each model was increased but more importantly, the coefficients of the financial decision in each model were significant in 8 of 12 cases or 67 percent of the time. These results support the study of Dhrymes and Kurz [31] in that in imperfect capital markets dividend, investment, financing, and working capital decisions are mutually determined and strongly interdependent in the firm.

Dhrymes and Kurz found the signs of the investment coefficients in their dividend model to be a negative when using two stage least squares simultaneous equation estimates. They also found the coefficient of the dividend decision to be negative in the investment model when using simultaneous equations. This coincides exactly with the results of this study. The results of the McDonald, et al. [92] for French firms did not coincide with the current study, nor did they conclude there is significant interrelatedness of financial decisions. They only used 75 French firms and hence, their results may be a result of their particular sample.

Higgins [51] study found that there was no simultaneous relationship among the dividend and investment decision. This study used a detailed set of arbitrary weighted averages for its variables. This system of weights may account for their finding and the lack of important simultaneous results.

In summary, the model used in this paper not only found a significant simultaneous relationship between the dividend and investment decision but among the capital expenditure decision and the working capital decision, the working capital decision and the dividend decision, the debt decision and the working capital decision, the debt decision and the capital expenditure decision, and the dividend decision and the debt decision. It is now important to complete the third stage of the analysis and look deeper into the relationships that exist among financial decisions of the firm and relationships of the firm and market related independent variables by the use of canonical correlation analysis.

Canonical Correlation Analysis

This portion of the analysis will set out to achieve two results. The first is to confirm the relationships set forth in the previous two analyses and the second is to consider closely the relationships that exist among groups of independent variables and groups of dependent variables and the trade-off effects of the dependent variables.

Roots of the four canonical correlations may be found in tables that correspond to their individual discussions. The intercorrelation results of the linear compounds may be found in similar tables that also correspond to their discussions. Both of these sets of tables will be used to assist in understanding the meaning and aid in the difficult interpretation of the canonical correlation results.

The Verification of Original Models Through Canonical Analysis

Results of the multiple linear regression models as supported by the simultaneous equation models in general hold up quite well when subjected to the canonical correlation analysis. It is the intent of this section to check the consistency of the canonical correlation analysis with respect to the basic variables used in the multiple regression models are consistent before looking at the interaction effects of the financial decisions via canonical correlation analysis.

The first of these models to be checked for consistency is the working capital decision model. The relationship can best be seen from Table XIII.

In the first canonical correlation it appears that of the eight variables in the original working capital model seven turn out to show the same relationship with the level of working capital. The reason that the first canonical correlation is used is that from Table XIV it can be seen

TABLE XIII

COEFFICIENTS FOR CANONICAL CORRELATION NUMBER ONE

Prob > Chi - Sq = .0001 R^2 = .98

DIVC	.2846	DIVL	.2257	PERR	-.0000022
WCLC	.0769	WCLL	.0728	EXRN	-.0000073
CAPEC	.03347	ERLC	.0484	VERN	-.000016
DBLC	-.0138	SPHC	.00179	EIR	-.00031
		CAPL	.0008	CRTDR	-.0069
		SZFC	.0003	EGR2C	-.00736
		LEAN	.0-	DBBL	-.0083
		TA	.0-		

TABLE XIV

CORRELATION COEFFICIENTS BETWEEN EACH CANONICAL VARIABLE OF A GROUP AND THE VARIABLES OF THAT GROUP

Canonical Correlation Number One:					R^2 = .98
WCLC	.8538	WCLL	.8620	VERN	-.0177
DIVC	.6443	DIVL	.6339	EIR	-.1118
CAPEC	-.3975	ERLC	.5707	LEAN	-.1411
DBLC	-.5796	SZFC	.3691	TA	-.1689
		EGR2C	.2810	CAPL	-.4568
		SPHC	.2059	DBBL	-.5018
		EXRN	.1092		
		CRTDR	.0205		
		PERR	.0122		

that the working capital variable dominates this correlation result.

Variability of earnings which is not significant in either model is the only variable that does not show the same relationship as in the multiple regression model. The other variables in the canonical analysis in the financial decision dependent variables will be considered in the next section of this paper. It is clear that by using canonical correlation it is possible to increase the R^2 of models by additing the relationships that exist among dependent variables but at this point the important fact is that the relationships in the previous two statistical methods are borne out here to be consistent.

The second model to be analyzed is the capital expenditure model. This can best been from the fourth canonical correlation shown in Table XV.

Canonical correlation number four shows that of the nine variables in the original model, eight have the same results. Sales level is the one variable with the wrong sign, but this is to be expected since it was not significant in the previous equations. The reason for using the fourth canonical correlation can readily be seen from Table XVI.

The financing decision model is the third to be analyzed. The canonical correlation results can best be seen from the first and third canonical correlations. Canonical correlation number three is shown in Table XVII.

TABLE XV

COEFFICIENTS FOR CANONICAL CORRELATION
NUMBER FOUR

Prob Chi - Sq = .0001 R^2=.6185

CAPEC	.4103	CAPL	.3464	SZFC	-.0017
WCLC	.0507	EGR2C	.3301	LEAN	-.00000002
DIVC	.0047	ERLC	.0736	PERR	-.000008
DBLC	-.00347	WCLC	.0439	VERN	-.0001
		SPHC	.0215	DBBL	-.0096
		EIR	.0028	CRTDR	-.0517
		EXRN	.00006	DIVL	-.1389
		TA	.00000009		

TABLE XVI

CORRELATION COEFFICIENTS BETWEEN EACH CANONICAL VARIABLE OF A GROUP AND THE VARIABLES OF THAT GROUP

$R^2 = .6184$

Canonical Correlation Number Four:

CAPEC	.8912	CAPL	.8054	WCLL	-.0222
DBLC	.1182	EGR2C	.4453	DIVL	-.0329
DIVC	-.0275	SPHC	.2670	VERN	-.0378
WCLC	-.0767	ERLC	.2330	CRTDR	-.0696
		EIR	.1268		
		EXRN	.1224		
		SZFC	.0855		
		DBBL	.0328		
		PERR	.0236		
		TA	.0196		
		LEAN	.0026		

TABLE XVII

COEFFICIENTS FOR CANONICAL CORRELATION NUMBER THREE

Prob Chi - Sq = .0001 R^2 = .855

DIVC	.4027	DIVL	.4672	LEAN	-.00000001
DBLC	.1801	DBBL	.15878	TA	-.00000001
WCLC	.0265	WCLL	.0131	VERN	-.00004
CAPEC	-.0417	EGR2C	.0779	SPHC	-.00019
		SZFC	.00033	CAPL	-.0079
		EIR	.00013	CRTDR	-.0161
		EXRN	.000012	ERLC	-.0260
		PERR	.0000025		

From the first canonical correlation it can be seen that seven out of the eight variables have the same sign as they have in the ordinary least squares model and the simultaneous equation model. The variable that does not have the same sign is total assets which is not significant in the previous results anyway.

Results from the third canonical correlation can also be used in the analysis. The third canonical correlation which is dominated by the financing decision as seen from Table XVIII shows six of eight variables with the correct sign.

The two with the incorrect sign, credit tightness and total assets, were not significant in the original models anyway, so the discrepancy is not important.

The fourth model is the dividend decision model. In this model variables in the second canonical correlation which is dominated by the dividend decision have the same signs as in the previous two approaches. The second canonical correlations dominance by dividends can be seen in Table XIX.

Summarized results of the coefficients of the second canonical correlation may be seen in Table XX.

In summary of this section, it is clear that the first step in the analysis of the canonical correlation results indicates that the previous models specified still have the proper relationships among the independent variables and the dependent variables. With this out of the way, one can

TABLE XVIII

CORRELATION COEFFICIENTS BETWEEN EACH CANONICAL VARIABLE OF A GROUP AND THE VARIABLES OF THAT GROUP

Canonical Correlation Number Three					R^2 = .855
DBLC	.7563	DBBL	.7571	VERN	.0302
DIVC	.0884	DIVL	.0962	PERR	.0209
WCLC	.0371	CAPL	.0893	CRTDR	.0196
CAPEC	.0018	LEAN	.0776	SPHC	-.0167
		EIR	.0737	EXRN	-.0168
		TA	.0599	EGR2C	-.0281
		WCLL	.0370	SZFC	-.0922

TABLE XIX

CORRELATION COEFFICIENTS BETWEEN EACH CANONICAL VARIABLE OF A GROUP AND THE VARIABLES OF THAT GROUP

Canonical Correlation Number Two					R^2 = .9755
DIVC	.7592	DIVL	.7592	VERN	-.0525
CAPEC	.2186	ERLC	.6031	EIR	-.0780
DBLC	-.2795	EGR2C	.2685	LEAN	-.1135
WCLC	-.5136	CAPL	.2150	SPHC	-.1607
		EXRN	.2079	SZFC	-.2415
		TA	.1411	DBBL	-.4064
		CRTDR	.9741	WCLL	-.5020
		PERR	.0231		

TABLE XX

COEFFICIENTS FOR CANONICAL CORRELATION
NUMBER TWO

Prob Chi - Sq = .0001 R^2 = .9755

DIVC	.5015	DIVL	.4509	PERR	-.000001
CAPEC	-.0087	EGR2C	.0545	VERN	-.000006
DBLC	-.0094	ERLC	.0427	EXRN	-.00002
WCLC	-.0665	SZFC	.00026	CRTDR	-.0006
		EIR	.00027	DBBL	-.0053
		TA	.00004	CAPL	-.0077
		LEAN	-.00000	SPHC	-.00507
				WCLL	-.0644

begin to analyze the canonical correlation results on their own merit and begin to look for more meaningful relationships among and within groups of variables.

Interpretation of Canonical Correlation Results

Results of the canonical correlation analysis are shown in summary form in the previous tables. These same tables should be referred to for the following interpretations.

It is through the interpretation of these results that it is possible to understand how financial decisions are jointly determined by sets of market and firm related variables. In the first canonical correlation it appears that firms working capital dividend and capital expenditures are positively influenced by eight variables, seven of which are firm variables (see Table XIII). The variables with positive signs on their coefficients are one-period lagged dividend level, one-period lagged working capital level, earnings level, one-period lagged capital expenditure level, total assets, sales predictability, the level of economic activity, and sales level. The variables that have a negative relationship with working capital level, dividend level, and capital expenditure level, the price earnings ratio relative to the five year average price earnings ratio, the variability of earnings, the expected inflation rate, credit tightness, excess returns, the one-period

lagged debt level, and the average earnings growth. The relationship found in the canonical analysis must be carefully interpreted. As in the case of the first canonical correlation working capital is the overwhelming portion of the left hand side linear compound and the one-period lagged working capital is the major portion of the right hand side linear compound as can be seen from Table XIII. Because of this dominance it may be necessary to look at the second, third, and fourth canonical correlations to further interpret the results.

By looking at the coefficient size and direction of influence on the right side of the canonical correlation equation it is possible to determine the flexibility that the firm has in making the financial decision on the left hand side of the canonical correlation equation. In other words, it is possible to obtain a score for a firm based on the relative strengths and weaknesses of its financial variables and those of the market. In the tables the results are given in descending order from the most positive to the most negative in terms of their impacts on the dependent financial decisions with positive coefficients and vice versa for dependent variables with negative coefficients.

From the standpoint of the financial manager the more favorable the terms on the right hand side the greater flexibility he has in making decisions on the left hand side or financial decisions. From the first canonical

correlation it appears that firms with high previous dividend levels and working capital levels, current earnings levels and past period capital expenditures and low past period debt levels, in periods of credit looseness, with low expected inflation rates, small variability of earnings are in the most flexible position relative to working capital, dividend and capital expenditures decisions. It is important to note that earnings growth is negatively related to these first three dependent variables, but probably not for the wrong reason. In other words, the debt level dependent variable has a negative coefficient and the higher levels of average earnings growth the more likely a firm is in having in using more debt. The point is that the relationships must be analyzed with some prior knowledge of the structural relationships developed in the multiple regression models. The negative sign of the average earnings growth should not be matched with the positive sign of the first three dependent variables but is more influenced by the negative sign of debt level. If one looks at the correlation matrix it is clear that earnings growth is positively related to working capital levels, dividends, and capital expenditures and negatively related to the level of debt. In other words, firms that have higher average earnings, have more flexibility as to the first three dependent variables and also to debt level, but tend to have lower levels of debt. The reason for average earnings growth to appear as it does is because of the high

correlation (.56) between it and the earnings level of the firm.

A very interesting aspect of the first canonical correlation is the trade-off effect or flexibility the firm has to maintain the same score by various financial decisions given the right hand side variables. For example, if a firm has favorable levels of the first six independent variables and the last five independent variables are also favorable, i.e., those with coefficients large enough that will have a measurable effect on financial decisions, the firm may elect to adjust the levels of the left hand variables to maintain a constant score if that is their desire. The variables with larger coefficients contribute more to the score and hence take up more of the score if that variable is increased. For example, based on the first canonical correlation the firm with favorable right hand side variables can trade off between increasing working capital, dividends, capital expenditures, or decreasing debt. The degree to which dividends may be increased to maintain a constant firm score is less, however, than the increase that can take place in working capital or capital expenditures. If the firm wishes to increase dividends, it is more costly in terms of the increase necessary to maintain a specific score than to increase dividends. If the firm wishes to reduce debt, it will have to reduce debt more than it would have to increase any of the other three variables to maintain the same score. If the firm wanted to reduce

the debt level, it could not trade off equally between debt level and any of the other variables since the coefficients all differ.

In order to have flexibility in terms of financial decisions it has been previously noted that the firm must have the favorable right hand variables of the correct amounts. It is now time to look at the right hand side to determine the trade-offs here that may favorable affect the firms so-called flexibility. The variable that has the largest coefficient is the previous period or one-period lagged dividend level. In effect then, the most significant factor in the flexibility of the firm is the one-period lagged dividend level. This may indicate the importance of the informational content of dividends upon the financial flexibility of the firms. It is also important to note from Table XIV that the left hand canonical variable and dividends have a correlation coefficient of .85 and also the right hand side canonical variable and the one-period lagged dividends have a .86 correlation coefficient. This indicates that the left hand side and right hand side of the first canonical correlation are correlated with dividend policy. This is further evidenced by observing that the coefficients of dividends on the left hand side is nearly the same as the coefficient for the one-period lagged dividend level on the right hand side. In other words, the level of the one-period lagged dividend on the right hand side with a coefficient of .23 has about the same influence

in terms of the right hand side weights in predicting the left hand side or this period's dividends have with a coefficient of .28 of estimating the right hand side.

Second most in importance in terms of the size of its coefficient of the right hand side variables is the one-period lagged working capital level. It is also important to note from Table XIII that the coefficient of the working capital level on the left hand side, .077, is nearly the same as the coefficient of the one-period lagged working capital on the right hand side of .073.

Earnings level and sales predictability are the next most important variables in that order in terms of positive coefficients and their effects. The coefficients for the level of economic activity and total assets while small, are positive. The reason for its appearing as a positive zero is that it is positive, but the number of decimal places needed to show an integer in a place was beyond the capacity of the computer.

Beginning at the bottom of the right hand side of the first canonical correlation, Table XIII, it is clear that the firm with the higher average earnings growth and previous periods debt level may have the largest amount of debt and have a less need for high levels of working capital dividends and capital expenditures to maintain a constant score. The tighter the credit is the less favorable this is to the firm's overall flexibility. The higher the expected inflation rate and variability of the more it

hampers the flexibility of the firm in the trade-off in financial decisions. The higher these variables with negative coefficients the lower the score must be for the left hand variables except debt levels.

Canonical correlation number one is the most important in the case of looking at trade-offs, since starting with the second canonical correlation the R^2 begins to decrease and the results become less accurate. If one uses Tables XIV, XVI, XVIII, and XIX, however, to look at the correlations of each variable with the canonical variable of the group, it aids in understanding the groups of variables that most affect the individual financial decisions. This is the technique used in the previous section to help validate the relationships shown in the original traditional models.

Given that one may interpret the first canonical correlation as flexibility, one may ask what the remaining three canonical correlations mean. In this particular case in this paper it is not at all clear that one can attach a meaning to the remaining of these canonical correlations. No attempt is made here to tie these remaining canonical correlations to specific interpretations.

It is important to note that the results presented in the previous eight tables on the left hand side support the hypothesis that financial decisions are interrelated. If one looks at the dominant variable in terms of its correlation with the canonical variable on the left hand side and

compare the signs of the other coefficients and their size to it, then it becomes clear there is a trade-off effect to complement the simultaneous relationships found in the simultaneous equation results.

Important results that can be summarized from this section are in three parts. First, the hypothesis that firm variables affect financial decisions is again verified. This set of results is nothing new and is verified by the multiple regression and simultaneous equation results, and finally the canonical correlation results. The second hypothesis that market factors influence financial decisions is also verified through all three statistical tests. The final result, however, is the most significant. This result is that there is a simultaneous nature to financial decisions that is meaningful and there is a trade-off among financial decisions that can be made to maintain the flexibility of the firm that is dependent upon firm and market factors. It appears clear, then, that firms financial decisions are not made in isolation from one another. It is also clear that given levels of independent variables the firms trade-offs among financial decisions do not all have equal weights or effects. A firm cannot simply substitute a higher level of one financial variable for a lower level of the same magnitude of another. The magnitudes of changes in the levels of financial decision variables will depend on their relative importance to the overall financial flexibility of the firm, which in turn

depends on the favorable nature of the independent firm and market variables that enter the decision process.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was two-fold. The first was to establish the traditional financial models with one dependent variable and firm and market variables as independent variables and observe the descriptive models as they existed with the 218 firms used in this study. The second and primary purpose was to explore the relationship that existed among firms financial decisions given firm and market information. The analysis revealed that interrelationships among firm financial decisions do exist. This set of relationships led to the detailed analysis of the nature of these relationships and what it means for the firm.

The nature of this study was descriptive, not predictive. It cannot be concluded from this study that all firms are affected in the ways described here. The understanding of the relationships of one variable on another in a one-to-one relationship in a regression situation or simultaneously with other decision variables was increased and this hopefully will provide impetus for further research in integrating positive studies and theoretical model building.

Overview of the Study

Traditional models of how firms make financial decisions are well documented in the literature. The study of how financial decisions are integrated in the firm, however, are not. Only a few of these studies exist as is pointed out in the literature review section. The works of Vickers [139], Modigliani and Miller [99, 102], Dhrymes and Kurz [31], Myers [105], Myers and Pogue [106], and Hite [57], provided the impetus for this study. Attempts to integrate financial decision making using more sophisticated analysis tools are relatively new. Based on the need for more integrated financial decision making the following three hypotheses were designed for testing in this study:

Hypothesis I: Firm financial decisions are not made in isolation but are jointly determined and there is a trade-off of effect among them and this can be tested by the use of simultaneous equation estimation and canonical correlation analysis.

Hypothesis II: Firm financial decisions are influenced in part by specific firm related financial conditions and this can be tested using multiple linear regression with the maximum R^2 option simultaneous equation estimation, and canonical correlation analysis.

Hypothesis III: Firm financial decisions are influenced in part by specific market related variables and this can be tested by the use of multiple linear regression with the maximum R^2 option simultaneous equation and canonical correlation analysis.

The methodology of this study involved taking 218 firms from the primary COMPUSTAT Industrial Tapes file and data on GNP levels, one-period Treasury Bill rates, and bank loans outstanding for the years 1955-74 for analysis. The first test that was performed on this data was multiple linear regression to test the basic traditional decision models of finance. The second test was to estimate simultaneous relationships among the linear regression models using the two-stage least squares technique to test for significance of the simultaneous relationship that existed among financial decisions. The third stage of the analysis was to perform canonical correlation analysis on the data to look into the nature of the relationships among financial decisions, among independent firm variables, among independent market variables, and the effects of the independent variables on the set of dependent variables. Specifically, the trade-off relationships of financial decision variables was of interest in the last section.

The Research Results

Tests of the first and second hypotheses involved the test of four linear equation relationships. The first model was the working capital level decision model. All eight of the variables in this model had the correct sign. Four of these variables (sales predictability, level of economic activity, the expected inflation rate, and one-period lagged working capital level) also had statistically

significant coefficients. Overall, this model did quite well with 50 percent of the coefficients significant and with the correct sign and an R^2 statistic of .957.

Capital expenditures was the second model tested. In this model, seven out of nine variables had the correct sign and six (average earnings growth, credit tightness, total assets, expected inflation rate, level of economic activity, and one-period lagged capital expenditures) of nine had both the correct sign and were statistically significant. Overall, this model did not do as well as the working capital model but did do an acceptable job with 67 percent of the variables being both statistically significant and with correct signs and an R^2 statistic of .472.

The third model tested was that of the financing decision. This model did very well in describing the relationships that existed here. The signs of the coefficient of the variables in this model were as hypothesized in seven out of eight cases. Five out of eight of the variables had both the correct sign and were statistically significant. These variables were sales level, level of economic activity, total assets, expected inflation rate, and one-period lagged debt level. The model in general gave very good results. The R^2 statistic for the model was .796 and 63 percent of the coefficients were both statistically significant and with signs as hypothesized.

The dividend decision was the fourth model tested. In this model four out of five variables had the hypothesized

sign. The same four (earnings level, credit tightness, level of economic activity, and one-period lagged dividend level) were highly statistically significant. In other words, 80 percent of the independent variables in this model had the hypothesized signs and the same 80 percent were statistically significant and hence, were usable in the analyses. This model showed excellent results with an R^2 statistic of .954 and having 80 percent of the independent variables both statistically significant and with the correct signs.

All of these relationships of firm and market related variables to their respective dependent variables were verified by the next two tests carried out. The first thing checked for when the simultaneous equation relationship was constructed was whether these variables held the same relationship as they had in the multiple linear regression models. The results were that consistent relationships did exist. The third test was then begun and canonical correlation analysis was performed. The first step of this analysis was also to test to see if the firm financial decisions depended on the same firm and market related variables as they had in the previous two results. The result was they did, and hence, the relationships were confirmed in all three models.

Tests of the third hypothesis were carried out by the use of the two-stage least squares technique of

simultaneous equation estimation and canonical correlation analysis. In the simultaneous equation models it was found that in fact, working capital, capital expenditures, financing, and dividend decisions are made simultaneously taking firm and market related factors into account. This relationship was then the basis for continuing with canonical correlation analysis. Canonical analysis gave positive results for hypotheses that there are trade-offs to the simultaneous relationships that exist among the four basic financial decisions of the firm and specified the coefficients associated with these trade-offs.

Results of this study tend to confirm the findings of Dhrymes and Kurz and oppose those of Higgins and McDonald, et al. Furthermore, these results are consistent with the theoretical works of Hite [57] and Myers and Pogue [106]. The study goes beyond that of Dhrymes and Kurz [31], Higgins [51], and McDonald, et al. [92], and that it considers explicitly the working capital decision as well as the capital expenditure, financing and dividend decisions. Specifically, in the working capital decision the capital expenditure decision and the dividend decision are extremely important and statistically significant. The debt financing decision is not as important and has an observed significance level of .14. In the capital expenditure decision the working capital decision is somewhat important and highly significant statistically, while dividends are extremely important and highly significant. Financing decisions here

seem to be of lesser importance and statistically are not significant. The debt decision is most strongly influenced by the working capital and capital expenditure decision and are both highly significant. The dividend decision is not as important here and is not statistically significant at the .10 level. In the dividend decision process capital expenditures are the most important followed by working capital, then debt financing, all of which are statistically significant at a minimum of the .0004 level.

Canonical correlation analysis provided important information regarding the trade-offs that exist among the financial cecisions of the firm. The first canonical correlation coefficient was .983 which is better than any other model used in this study, indicating an improvement in the description of the financial decision making process by using canonical correlation analysis to take into account all four financial decisions at once.

Implications of the Study

This paper offers a number of insights into the way firms may make financial decisions. First, the relationship of firm and market related variables to the respective dependent financial decisions of the firm are set out and clarified. This is a start in the more specific and detailed study of the underlying structural relationships that exist in financial decision making of the firm.

The second contribution of this study is that it

attempts to establish not only relationships among firm and market related variables, but considers the financial decisions in a simultaneous model. In other words, it explicitly sets out relationships that indicate that financial decisions are not made in isolation from one another, but must be considered as a package.

The third major contribution of this study is to describe a trade-off effect of financial decisions with different weights for each decision. Even though this study is not strictly a theoretical study, it is based on existing theory and it is not predictive in nature, it does appear to strengthen the theoretical basis for more integrated financial model construction.

From this evidence if the firm is to make rational decisions it must make financial decisions in an integrated manner. This greatly complicates the decision making process. The traditional models should be supplemented with these interaction effects and researchers should rethink some of the commonly held views of how financial decisions are made. The current textbook single decision approach is the first step for understanding how financial decisions are made. However, the analysis is incomplete unless it is supplemented by a discussion and analysis of how financial decisions affect one another. Possibly the concepts of mathematical programming will need to be introduced at this point to indicate how the relationships can be viewed and a solution arrived at with this new added complexity considered.

The empirical tool of canonical correlation can also be used to aid in decision making for a financial manager. In the aggregate, the financial manager can find out what a group of firms take into consideration when making financial decisions. He can also observe the trade-offs that occur among financial decisions in that group. If the financial manager wishes to reduce the group size to look at more specific relationships, he can do so and see how this alters the analysis, if at all. Finally, the financial manager may use canonical correlation analysis on his firm individually to see if his firm conforms to the way an aggregated group does or to other individual firms. He may also use it to evaluate the ways in which decisions have been made in the firm relative to specified financial policy. In other words, the policy of the firm may indicate that when a particular independent variable affecting the firm moves in one direction the firm should make a specific adjustment or set of adjustments in its four financial decision areas. The financial manager, by using canonical correlation analysis may find out if this policy is, in fact, being carried out. Also, by knowing the weight of the dependent financial decision variables, the financial manager has a clearer idea of how he may interchange levels of these variables to better achieve his desired results.

In short, this study not only provides insights into how researchers should view financial decisions, but also provides a useful type of analyses for the financial manager

to better understand the financial decision making process as it occurs in his field and industry.

Recommendations for Future Research

The recommendations for future research can be made in five areas. The first is in the area of different types of disaggregated studies. For example, future research may be done to determine the significance, magnitude, and direction of coefficients in the multiple dependent variable model during different sub time periods. The sub periods may be broken up based on economic trends, political trends, or many other conceivable influencing factors during a particular time period.

Another type of disaggregated study may be the analysis of particular industries or firms to see if significant differences exist among them and their implication. In other words, is it possible that financial institutions, manufacturing, and service industries make financial decisions in significantly different ways. Is it even further possible that some types of manufacturing firms make financial decisions in different ways than others.

The second area for further research is that even though we can observe certain behavior in firms making financial decisions is this behavior optimal. In other words, this study just completed is positive in nature; but is the behavior it describes optimal? The descriptive studies do not necessarily indicate that the way financial

managers perceive and make financial decisions is the optimal.

A third area for future research is in the area of linking the investment behavior studies and studies of firm behavior such as this one. This involves an integration of the vast literature from the well developed area of investments and that of financial theory.

A fourth area for future study is the interaction, if any, of the various industries, such as financial institutions, manufacturing firms, service industries, and Federal Government policies and practices. It may be found that if the financial decision models of a group of different types of firms are looked at with respect to the financial decisions of each, that a type of interaction will exist that will further aid in explaining the way firms make financial decisions.

The final area perceived here for future research is based on the concept of multiple firm goals. This type of research would draw upon existing financial, economic, production, and behavioral theories of the firm. This type of research would be based on the concept set forth in the mid fifties of firms being formed by coalitions. Taking into account the various coalitions as sub systems, one may take a total systems approach, employing contingency theory and form a totally integrated financial and behavioral theory of the firm.

In summary, this study has expanded the conceptual and empirical base for further theoretical and empirical

development and testing of the interrelated nature of the financial decisions of firms. Continued research in this area should yield a better understanding of how financial decisions are interdependent and should provide an impetus for the development of a totally integrated theory of the firm.

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APPENDIX A

LIST OF VARIABLES

CAPEC Normalized capital expenditure level =

$$\frac{\text{capital expenditure level in current time period}}{\text{total assets}}$$

CAPL Normalized one period lagged capital expenditure level =

$$\frac{\text{one period lagged capital expenditure level}}{\text{total assets}}$$

CRTDR Credit tightness =

$$\frac{\text{loans outstanding one period lagged - loans outstanding this period}}{\text{loans outstanding one period lagged}}$$

DBBL Normalized one period lagged debt level =

$$\frac{\text{one period lagged debt level}}{\text{total assets}}$$

DBLC Normalized debt level =

$$\frac{\text{debt level in current time period}}{\text{total assets}}$$

DIVC Normalized dividend level =

$$\frac{\text{current period dividend level}}{\text{total assets}}$$

DIVL Normalized one period lagged dividend level =

$$\frac{\text{one period lagged dividend level}}{\text{total assets}}$$

EGR2C Normalized five year average growth of earnings =

$$\frac{\text{five year average growth of earnings}}{\text{total assets}}$$

EIR Expected inflation rate - one year Treasury Bill rate

ERLC Normalized earnings level =

$$\frac{\text{earnings available to common stockholders}}{\text{total assets}}$$

EXRN Excess returns =

$$\frac{\text{average five year earnings before depreciation, interest, and taxes /total assets}}{\text{standard deviation of these returns}}$$

LEAN — Level of economic activity - Gross National Product in the current time period

PERR — Price earnings relative - $\frac{\text{current price earnings ratio}}{\text{five year average price earnings ratio}}$

P_1 — Normalized working capital level estimated in the first stage of the two stage least squares procedure.

P_2 — Normalized capital expenditure level estimated in the first stage of the two stage least squares procedure.

P_3 — Normalized debt level estimated in the first stage of the two stage least squares procedure.

SPHC — Normalized sales predictability - the absolute value of $\frac{\text{predicted sales (last period sales) - this period's sales}}{\text{total assets}}$

SZFC — Normalized sales level - $\frac{\text{current period sales}}{\text{total assets}}$

TA — Total assets

VERN — Variability of earnings - coefficient of variation for earnings before depreciation, interest, and taxes

WCLC — Normalized working capital level - $\frac{\text{current working capital level}}{\text{total assets}}$

WCLL — Normalized one period lagged working capital level- $\frac{\text{one period lagged working capital level}}{\text{total assets}}$

APPENDIX B

LIST OF FIRMS

Amax Inc .
Asarco Inc
Cleveland-Cliffs Iron Co
Intl Nickel of Canada
Molycorp Inc
Texasgulf Inc
Cominco Ltd
Hudson Bay Mining & Smelt-A
St. Joe Minerals Corp
Giant Yellowknife Mines
Homestake Mining
McIntyre Mines Ltd
Pittston Co
Aztec Oil & Gas
Dome Petroleum Ltd
Freeport Minerals Co
Morrison-Knudsen
Alpha Portland Inds
Kellogg Co
Esmark Inc
Greyhound Corp
Hormel (Geo.A.) & Co
Borden Inc
Carnation Co
Kraftco Corp
American Bakeries Co
Ward Foods Inc
Helme Products
Hershey Foods Corp
Wrigley (Wm.) Jr. Co
Anheuser-Busch Inc
Minneapolis Shareholders
Pabst Brewing Co
Coca-Cola Co
Dr Pepper Co
Pepsico Inc
American Brands Inc
Liggitt & Myers Inc
Philip Morris Inc
Reynolds (R.J.) Inds
Bayuk Cigars Inc
Graniteville Co
Adams-Millis Corp
Cluett, Peabody & Co
Munsingwear Inc
Phillips Van Heusen
Brown Co
Kroehler Mfg Co
American Seating Co
Crown Zellerbach
Domtar Ltd
Hammermill Paper Co
Intl Paper Co
Scott Paper Co
Westvaco Corp
Diamond Intl Corp
Federal Paper Board Co
Simplicity Pattern Co
McGraw-Hill Inc
Moore Corp
Allied Chemical Corp
American Cyanimid Co
Celanese Corp
Grace (W.R.) & Co
Monsanto Co
Stauffer Chemical Co
Union Carbide Corp
Diamond Shamrock Corp
Olin Corp
Pennwalt Corp
Airco Inc
Akzona
Chemetron Corp
Dart Inds
Inmont Copr
Koppers Co
American Home Products Corp
Lilly (Eli) & Co
Merck & co
Searle (G.D.) & Co
Miles Laboratories Inc
Colgate-Palmolive Co
Avon Products
Cook Paint & Varnish
Conwood Corp
Imperial Oil Ltd-Cl A
Atlantic Richfield Co
Cities Service Co
Continental Oil Co
Marathon Oil Co
Quaker State Oil Refining
Standard Oil Co. (Ohio)
Sun Oil Co
Union Oil Co of California
Gulf Oil Corp
Standard Oil Co of Calif
Texaco Inc
Robertson (HH) Co
Dayco Corp
Goodyear Tire & Rubber Co.
Mansfield Tire & Rubber Co
Corning Glass Works
American Can Co
Anchor Hocking Corp
Continantal Can Co Inc
Crown Cork & Seal Co Inc

National Can Corp
Owens-Illinois Inc
General Portland Inc
Ideal Basic Inds Inc
Lehigh Portland Cement Co
Lone Star Inds
Missouri Portland Cement Co
U.S. Gypsum Co
General Refractories Co
Armco Steel Corp
Bethlehem Steel Corp
Inland Steel Co
Interlake Incl
Lukens Steel Co
McLouth Steel Corp
Penn-Dixie Inds
Copper Range Co
Inspiration Cons Copper Co
Kennecott Copper Corp
Phelps Dodge Corp
Aluminum Co of America
Cerro Corp
General Cable Corp
N L Inds
Revere Copper & Brass Inc
Stanley Works
Carrier Corp
Crane Co
Owens-Corning Fiberglas Corp
Tecumseh Products Co
Trane Co
Diebold Inc
Fansteel Inc
Signode Corp
Combustion Engineering Inc
Masssey Ferguson Ltd
Bucyrus-Erie Co
Caterpillar Tractor Co
Clark Equipment Co
FMC Corp
Rexnord Inc
Dresser Inds Inc
Reed Tool Co
Giddings & Lewis Inc
Monarch Machine Tool Co
Skil Corp
Emhart Corp
Ex-Cell-O Corp
Midland-Ross Corp
Otis Elevator Co
Chicago Pneumatic Tool Co
Mesta Machine Co
Stewart-Warner Corp
Pitney-Bowes Inc
Xerox Corp
Honeywell Inc
General Electric
Westinghouse Electric Corp
McGraw-Edison Co
Cutler-Hammer Inc
Square D Co
Maytag Co
Motorola Inc
Zenith Radio Corp
Ambac Inds Inc
Conrac Corp
Fairchild Camera&Instrument
High Voltage Engineering
Raytheon Co
Mallory (P.R.) & Co
Sprague Electric Co
Chrysler Corp
General Motors Corp
Cummins Engine
Furehauf Corp
White Motor Corp
Eaton Corp
Timken Co
Grumman Corp
General American Trans Corp
Ametek Inc
General Signal Corp
Robertshaw Controls
Bausch & Lomb Inc
Bell & Howell Co
Polaroid Corp
HMW Inds Inc
Brunswick Corp
Insilco Corp
Ronson Corp
Consolidated Freightways Inc
American Airlines Inc
Continental Air Lines Inc
Eastern Air Lines
Northwest Airlines Inc
Trans World Airlines
UAL Inc
Emery Air Freight Corp
American Tele & Telegraph
ASSD Dry Goods Corp
Marshall Field & Co
May Department Stores Co
Mercantile Stores Co Inc
Neisner Bros Inc

Grant (W.T.) Co
Kresge (S.S.)
Murphy (G.C.) Co
Woolworth (F.W.) Co

Jewell Cos Inc
Kroger Co
McCrory Corp
Host Intl Inc

APPENDIX C

GROSS NATIONAL PRODUCT

GROSS NATIONAL PRODUCT*

Year	Billions of $	Year	Billions of $
1960	503.7	1968	864.2
1961	520.1	1969	930.3
1962	560.3	1970	977.1
1963	590.5	1971	1054.9
1964	632.4	1972	1158.0
1965	684.9	1973	1294.9
1966	749.9	1974	1397.4
1967	793.9		

*Proxy for level of economic activity variable.

APPENDIX D

TREASURY BILL RATES

TREASURY BILL RATES*

Year	Percent	Year	Percent
1960	3.41	1968	5.46
1961	2.81	1969	6.79
1962	3.01	1970	6.49
1963	3.30	1971	4.67
1964	3.74	1972	4.77
1965	4.06	1973	7.01
1966	5.07	1974	7.71
1967	4.71		

*Proxy for the expected inflation rate--expressed as a percentage

APPENDIX E

TOTAL LOANS OUTSTANDING

TOTAL LOANS OUTSTANDING*

Year	Billions of $	Year	Billions of $
1960	114.3	1968	243.0
1961	119.6	1969	270.0
1962	129.9	1970	283.0
1963	144.8	1971	304.6
1964	162.9	1972	346.9
1965	186.1	1973	420.0
1966	207.9	1974	482.1
1967	221.7		

*Expressed in billions of dollars

APPENDIX F

CORRELATION MATRIX

CORRELATION MATRIX

WCLC	WCLC	CAPEC	DBLC	DIVC	WCLL
	1.000	---	---	---	.9774
					.0001
	CAPL	DBBL	DIVL	LEAN	SPHC
	-.5266	-.1951	.1564	-.5924	.2402
	.0001	.0001	.0001	.0007	.0001
	TA	EIR	ERLC	VERN	SZFC
	-.2115	-.0585	.1624	.0142	.4239
	.0001	.0008	.0001	.4172	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.0164	.0793	-.0188	-.0017	---
	.3482	.0001	.2826	.9193	---
	P_2	P_3	P_4		
	-.6509	-.3579	.1676		
	.0001	.0001	.0001		

CAPEC	WCLC	CAPEC	DBLC	DIVC	WCLL
		1.0000	---	---	-.4563
			---	---	.0001
	CAPL	DBBL	DIVL	LEAN	SPHC
	.6681	.1263	-.1041	.0322	.0324
	.0001	.0001	.0001	.0654	.0640
	TA	EIR	ERLC	VERN	SZFC
	.1068	.0969	.0342	-.0252	-.1485
	.0001	.0001	.0507	.1503	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.0258	.1929	.0692	.0131	-.4709
	.1397	.0001	.0001	.4524	.0001
	P_2	P_3	P_4		
	---	.2247	-.1013		
	---	.0001	.0001		

DBLC	WCLC	CAPEC	DBLC	DIVC	WCLL
			1.0000	---	-.3320
					.0001
	CAPL	DBBL	DIVL	LEAN	SPHC
	.3183	.8888	-.5084	.1617	-.0648
	.0001	.0001	.0001	.0001	.0001

DBLC	TA	EIR	ERLC	VERN	SZFC
	.0979	.1420	-.5435	.0412	-.1979
	.0001	.0001	.0001	.0184	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.0236	-.2190	-.1209	.0002	-.3315
	.1764	.0001	.0001	.9094	.0001
	P_2	P_3	P_4		
	.2877	---	-.527		
	.0001	---	.0001		

DIVC	WCLC	CAPEC	DBLC	DIVC	WCLL
				1.0000	.1774
					.0001
	CAPL	DBBL	DIVL	LEAN	SPHC
	-.1371	-.5621	.9717	-.1676	.0056
	.0001	.0001	.0001	.0001	.7504
	TA	EIR	ERLC	VERN	SZFC
	.0017	-.1252	.7959	-.0472	.0465
	.9211	.0001	.0001	.0069	.0078
	CRTDR	EGR2C	EXRN	PERR	P_1
	.0704	.3672	.2198	.0261	.1673
	.0001	.0001	.0001	.1362	.0001
	P_2	P_3	P_4		
	-.1399	-.568	---		
	.0001	.0001	---		

WCLL	WCLC	CAPEC	DBLC	DIVC	WCLL
					1.000
	CAPL	DBBL	DIVL	LEAN	SPHC
	-.5111	-.2042	.1713	-.0837	.2156
	.0001	.0001	.0001	.0001	.0001
	TA	EIR	ERLC	VERN	SZFC
	-.2137	-.0655	.1653	.0119	.4188
	.0001	.0002	.0001	.4963	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	.0112	.1030	-.0139	-.000006	---
	.5215	.0001	.4259	.9997	---
	P_2	P_3	P_4		
	-.6439	-.3661	.1815		
	.0001	.0001	.0001		

CAPL	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	1.000	.2276	-.1261	.0191	-.0286
	---	.0001	.0001	.2732	.1021
	TA	EIR	ERLC	VERN	SZFC
	.1030	.0570	-.0363	-.0274	-.1586
	.0001	.0011	.0378	.1168	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	.0825	.1458	.0502	.02217	-.5377
	.0001	.0001	.0040	.2050	.0001
	P_2	P_3	P_4		
	---	.3509	-.1403		
	---	.0001	.0001		

DBBL	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
		1.0000	-.5614	.2179	-.0345
			.0001	.0001	.0488
	TA	EIR	ERLC	VERN	SZFC
	.0779	.1779	-.5657	.06237	-.1582
	.0001	.0001	.0001	.0004	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.0456	-.2437	-.1562	-.0016	-.1992
	.0091	.0001	.0001	.9262	.0001
	P_2	P_3	P_4		
	.1783	---	-.575		
	.0001	--	.0001		

DIVL	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
			1.0000	-.148	.0057
				.0001	.7437
	TA	EIR	ERLC	VERN	SZFC
	.0048	-.108	.7543	-.0491	.0357
	.7834	.0001	.0001	.005	.0413
	CRTDR	EGR2C	EXRN	PERR	P_1
	.0869	.3222	.2245	.02674	.1597
	.0001	.0001	.0001	.1263	.0001

	P_2	P_3	P_4
DIVL	-.1469	-.5605	---
	.0001	.0001	---

LEAN	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
				1.000	.1855
					.0001
	TA	EIR	ERLC	VERN	SZFC
	.0048	.8619	-.0969	.5721	.0078
	.0001	.0001	.0001	.0011	.6571
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.5017	-.043	-.0076	-.0243	-.0605
	.0001	.0139	.6653	.1642	.0005
	P_2	P_3	P_4		
	.0455	.1783	-.1715		
	.0093	.0001	.0001		

SPHC	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
					1.0000
	TA	EIR	ERLC	VERN	SZFC
	-.0425	.1895	.1383	.0144	.4462
	.015	.0001	.0001	.4098	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.2121	.0752	-.016	.0118	---
	.0001	.0001	.3582	.5001	---
	P_2	P_3	P_4		
	.4572	-.0715	.0057		
	.0089	.0001	.7449		

TA	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	1.000	.0902	-.0178	-.0125	-.1207
		.0001	.3093	.4764	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.0479	-.0062	.1975	.0027	-.216
	.0061	.7216	.0001	.8773	.0001

	P_2	P_3	P_4
TA	.1507	.108	.0018
	.0001	.0001	.9193

EIR	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
		1.000	-.0530	.0456	.0138
			.0024	.0054	.4306
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.4078	.0562	.0246	-.0121	-.0597
	.0001	.0013	.1604	.4871	.0006

P_2	P_3	P_4
.1367	.1565	-.1281
.0001	.0001	.0001

ERLC	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
			1.000	-.0198	.07967
				.2586	.0001
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.0578	.5593	.2376	.0131	.1658
	.001	.0001	.0001	.4524	.0001

P_2	P_3	P_4
.0482	-.5992	-.8142
.0058	.0001	.0001

VERN	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
				1.000	-.0070
					.6876
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.0279	-.0247	-.0516	-.0046	.1449
	.1161	.1587	.0032	.7944	.4074

	P_2	P_3	P_4
VERN	-.0355	-.0454	-.0483
	.0423	.0094	.0057

SZFC	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
					1.000
	CRTDR	EGR2C	EXRN	PERR	P_1
	-.0335	.1024	.0734	.0037	.4329
	.0555	.0001	.0001	.8341	.0001

P_2	P_3	P_4
-.2096	-.2182	.0476
.0001	.0001	.0065

CRTDR	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	CRTDR	EGR2C	EXRN	PERR	P_1
	1.000	-.0127	-.019	.0097	-.0168
		.4588	.2767	.5779	.3381

P_2	P_3	P_4
-.0365	-.0261	.0720
.0371	.1361	.0001

EGR2C	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	CRTDR	EGR2C	EXRN	PERR	P_1
		1.000	.1918	.0174	.0810
			.0001	.3208	.0001

P_2	P_3	P_4
---	-.2414	.3756
---	.0001	.0001

EXRN	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	CRTDR	EGR2C	EXRN	PERR	P_1
			1.000	.0189	-.0192
				.2788	.2725

P_2	P_3	P_4
---	-.1333	.2248
---	.0001	.0001

PERR	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	CRTDR	EGR2C	EXRN	PERR	P_1
				1.000	-.0018
					.9176

P_2	P_3	P_4
.0186	---	.0267
.2889	---	.1274

P_1	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	CRTDR	EGR2C	EXRN	PERR	P_1
					1.000

P_2	P_3	P_4
-.6646	-.3655	.1711
.0001	.0001	.0001

P_2	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	CRTDR	EGR2C	EXRN	PERR	P_1

	P_2	P_3	P_4		
P_2	1.000	.3172	-.1431		
		.0001	.0001		
P_3	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	CRTDR	EGR2C	EXRN	PERR	P_1
	P_2	P_3	P_4		
		1.000	-.5811		
			.0001		
P_4	WCLC	CAPEC	DBLC	DIVC	WCLL
	CAPL	DBBL	DIVL	LEAN	SPHC
	TA	EIR	ERLC	VERN	SZFC
	CRTDR	EGR2C	EXRN	PERR	P_1
	P_2	P_3	P_4		
			1.000		

VITA

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