STUDIES OF SMALL BUSINESS FINANCE

Application of the Modern Theory of Finance to Small Business Firms

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THE INTERAGENCY TASK FORCE ON SMALL BUSINESS FINANCE

Board of Governors of the Federal Reserve System
Federal Deposit Insurance Corporation
Office of the Comptroller of the Currency
Bureau of the Census
Small Business Administration
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APPLICATION OF THE MODERN THEORY OF FINANCE TO SMALL BUSINESS FIRMS

I. Introduction

In this paper we attempt to distill from recent developments in the theory of finance those elements that are of most relevance to the owners and managers of small business firms. The theory of finance is concerned with the way in which capital markets facilitate the reallocation of resources through time by individuals and firms. For our purposes, the theory of finance is especially concerned with the way in which capital markets provide signals to managers that help them in choosing among alternative production-investment opportunities and with the way in which capital markets facilitate fund-raising by firms for the purposes of financing their production-investment decisions.

The core of finance theory is developed under a set of assumptions generally referred to as perfect market assumptions. In a perfect capital market no individual or firm is large enough to affect security prices (i.e., all individuals are "atomistic" competitors), all information relevant to the pricing of securities is costlessly available to all market participants, all market participants have equal access to the capital market, there are no transactions costs associated with the purchase or sale of securities, and there are no taxes levied on the income of either firms or individuals. Additionally, it is usually assumed that individuals value securities or ownership of firms because of the future consumption opportunities which ownership provides. This is known as the "only wealth counts" assumption.
The set of conclusions about firms' investment and financing decisions that emerges from this set of assumptions is straightforward and elegant in its simplicity. The primary conclusion is that a firm's investment and financing decisions are separable. Firms can choose among all available investment projects the set which is "best" without regard to the way in which they will be financed. Furthermore, the theory directs that the best set of investment projects is that set which maximizes the total market of the firm or, more precisely, the total market value of the firm's currently outstanding securities.

The dictum that financial managers should choose investment projects so as to maximize the value of the firm is usually referred to as the "market value rule" of asset selection. For investment decisions, there remains only the problem of implementing the market value rule. However, in a perfect capital market that is a simple task. When a new investment project becomes available to the firm, management need only announce publicly the information relevant to the valuation of the project. If the market value of the company's outstanding securities increases, the project should be accepted. If not, the project should be rejected. Since information relevant to the pricing of securities is freely and instantaneously available to all market participants (once it is made public), the market value of the firm's securities will provide reliable signals about alternative investment opportunities to managers who adhere to the market value rule.

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1 Excellent presentations of the theory of finance under perfect market assumptions are contained in Fama and Miller (1972) and Haley and Schall (1979).
In the perfect capital market setting, financing decisions are even simpler than investment decisions. In this market environment, the value of the firm is independent of the way in which investment projects (once selected) are financed. Since the owners and managers of firms are assumed to be concerned only with maximizing the value of the firm and, since the value of the firm is independent of its financing decisions, financial managers need not be terribly concerned with designing and implementing optimal financing strategies. Any one strategy will be as good as any other.

Unquestionably, the perfect market assumptions do not provide an accurate description of the world that business firms and individuals actually confront. Taxes are a fact of life as are the transactions costs associated with the purchase and sale of securities. Furthermore, all information relevant to valuing securities is not immediately and costlessly available to all investors. Conclusions derived when the perfect markets assumptions are relaxed are likely to have much greater relevance to the managers of small businesses that those derived under the perfect market assumptions. Financial scholars have devoted substantial effort to extending the theory to incorporate various types of capital market imperfections. Unfortunately, nothing approaching unanimity, or even consensus, of opinion has been achieved.

The approach that we will take here is to review five basic subject areas: capital budgeting, cash management, capital structure management, dividend policy, and pricing of financial contracts. Decisions about the
first two of these fall into the general category of investment decisions and the last three the category of financing decisions. In our discussion of these topics we will proceed as if the separation property of finance holds in perfect and imperfect markets. This will allow us, at least initially, to consider investment and financing decisions separately.

Some conclusions derived about the topic areas considered are strictly applicable only under the perfect markets assumptions. Others are applicable when one or more of the perfect market assumptions is relaxed. As we proceed we will attempt to indicate the assumptions necessary for the conclusions to hold. We will also attempt to assess which conclusions are most likely to be relevant to the owners and managers of small businesses. Rather than present a rigorous analysis of the topics considered, we will review and summarize original research published elsewhere. The original source, typically an academic journal, will be cited for detailed elaboration of the points discussed.

II. The Investment Decision

Investment Decision Strategy

One of the fundamental assumptions of financial theory is that securities have value only because of the future consumption opportunities which they will provide. In the U.S., consumption goods are usually paid for with currency. Thus, it is only a short step from the assumption that securities are valued for the consumption
opportunities which they provide to the assertion that securities are valued for the future cash returns which they will yield their owners. In finance theory, the firm is viewed as a bundle of claims against future cash flows. So long as there exists a capital market in which individual investors can buy and sell these claims, when choosing among alternative investment opportunities managers need only concern themselves with maximizing the aggregate market value of the claims against the firm's future cash flows.

Maximizing aggregate market value is equivalent to maximizing each individual security owner's utility function. If a security holder does not like the particular configuration of future cash flows (i.e., investments) selected by the manager, the investor can always exchange his set of claims for some other set that represents a configuration that is preferred. If the firm has adopted the set of investment projects that maximizes the market value of its currently outstanding securities, the investor can sell his securities and purchase more of the preferred configuration than if the firm had chosen any other set of investment projects. For this reason, theory concludes that investment decisions which maximize the value of the firm will be unanimously preferred by all security holders. This is often referred to as the market value rule.

With the market value rule established, the theory goes on to determine which particular set of investment projects will maximize the

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2 In order for the value maximization principle to hold it is necessary that markets either be perfect or complete. This is equivalent to the assumption that investors and firms have equal access to the capital market or that there exist perfect substitutes for any security issued by a firm [see, Fama (1978)].
value of the firm. Since existing securities holders are concerned with increases in (or increments to) the value of the firm, it is concluded that new investment projects should be accepted if the current market value of the incremental future cash flows associated with the new project exceeds the incremental initial cost of the project. This is the first lesson that finance theory provides for the owners and managers of small businesses.  

The acceptability of investment opportunities should be judged on the basis of incremental future cash flows which they provide to the firm's security holders. This rule is as important for what it does not say as for what it does say. Specifically, projects should not be judged on the basis of their impact on accounting profits, or earnings per share, nor should they be judged on the basis of the well-known pay-back period criterion. Each of these is typically not related or only indirectly related to the future cash flows provided by the project.

Also implicit in the market value rule is the principle that economically independent projects can be evaluated independently. For purposes of the small business, this means that the potential for diversification of risk across projects need not be considered when projects are evaluated. We will label this the principle of independent project evaluation.

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3 Excellent presentations of the practical aspects of asset selection are contained in Bierman and Smidt (1980) and Johnson (1977).


5 Myers (1968).
Two investment opportunities are economically independent if the cash flows from one are not affected by whether or not the other opportunity is accepted. Two opportunities are economically dependent if the cash flows of one depend upon whether or not the other is accepted. Economic dependence stands in contrast to stochastic dependence. Two investment opportunities are stochastically dependent if the future cash flows are correlated. If future cash flows provided by two projects are less than perfectly correlated, then adoption of both projects will reduce the total risk of the firm's future cash flows. According to the principle of independent project evaluation, diversification accomplished by adopting projects whose cash flows are less than perfectly correlated need not be considered when projects are evaluated. While the reason for this conclusion is not obvious, it derives from the assumption that individual investors can buy and sell securities in the capital market.

If investors desire more diversification than is provided by a single firm or a few firms, they can always sell some fraction of these firms and invest that fraction of their wealth in other firms so as to achieve greater diversification. So long as investors can achieve adequate diversification of risk through their personal portfolio transactions, financial managers of individual firms need not be concerned with risk diversification when evaluating individual projects.

The principle of independent projects may appear trivial at first blush. However, some examples will demonstrate its importance. Suppose a firm has three investment opportunities under consideration. If these
opportunities can be evaluated independently, the manager of the firm must only evaluate three projects. If, however, the opportunities must be considered jointly, manager will be required to evaluate eight possible combinations of the opportunities. In general, if the firm has $n$ opportunities there will be $2^n$ different combinations. If $n=10$, $2^{10}=1,024$ different combinations. However, if the opportunities can be evaluated independently, there will be only ten opportunities to evaluate. For a small business with a limited financial staff, the principal of independent project evaluation can represent a substantial saving of managerial time and resources.

The key assumption underlying the principle of independent project evaluation is that the owners of the firm (normally the stockholders in large firms) are able to diversify risk on their own behalf by buying and selling securities in the capital market. It can be argued that small businesses are typically owner-managed. Furthermore, the owner typically has a disproportionate fraction of his wealth (perhaps his entire life savings) invested in his own business. As a consequence, his diversification is extremely limited. When given the choice between investing an incremental dollar in a different line of business (i.e., one whose cash flows are not perfectly correlated with the cash flows of the firm's existing activities) the owner-manager may not be immune to the diversification which the new opportunity offers. As a consequence, it might be argued that the project acceptance criterion for the risk-diversifying project will be lowered. In the context of financial
theory, that means the market value rule will be ignored because the new project, even though it may yield a smaller increase (or possibly a decrease) in the value of the firm, will be chosen because it provides diversification to the owner-manager's portfolio.

The response to this argument, according to financial theory, is that the principle of independent project evaluation does not depend upon how large a fraction of his wealth the owner-manager currently has invested in his firm. Rather, it depends upon whether or not there exist potential buyers of his firm's securities. If so, the owner-manager can issue securities to other investors and use their funds to undertake the value-maximizing set of projects. He can diversify by using his own funds to buy securities issued by other firms that also follow the market value rule.

If there do not exist potential buyers of the firm's securities, the principle of independent project evaluation breaks down. Stated alternatively, if the firm does not have access to the capital market, the principle of independent project evaluation fails. But, if the small business does not have access to the capital market, the theory of finance has little to offer in the way of guidelines to the financial manager of the small businesses.

In the absence of a capital market, the theory of finance merely states that the owner-manager of the firm choose that combination of projects which offers the most desirable configuration of future cash flows. In the parlance of economics, the owner-manager should choose
that set of projects that maximizes his personal utility for consumption. But that advice is equivalent to no advice.

Thus, in the absence of access to the capital market, the theory of finance has little to offer the manager of the small business by way of advice about project selection. Other papers in this study are devoted to answering questions about the degree to which small businesses have access to the capital market. However, because of the importance of capital market access to the issues addressed in this paper, some brief reflection on the subject is appropriate here as well.

When we think of the capital market, the images that usually come to mind are those of Wall Street and the New York Stock Exchange. However, these institutions comprise only a small part of the total capital market. In actuality, the capital market encompasses all transactions in which a claim against a future cash flow is exchanged for cash today. When I issue an I.O.U. to a colleague in exchange for 25¢ to buy a cup of coffee we have entered the capital market. All deposits in and loans from commercial banks, savings associations, and credit unions are transactions in the capital market. All loans extended by finance companies, insurance companies, mortgage companies, and individuals take place in the capital market. All trade credit extended by one company to another is also a capital market transaction. When defined in this way, it seems to us that small businesses and their owner-managers have considerable access to the capital market.
In the final analysis, the issue becomes one of degree and the applicability of the principle of independent project evaluation becomes one of opinion. In our opinion, most small businesses probably have sufficient access to the capital market so that economically independent projects can be evaluated independently.

Once we have accepted the principle of independent project evaluation, implementation of the market value rule is an easier task. It is easier because we can consider the lessons of modern finance theory to the management of two broad classes of assets separately. These are (1) management of fixed assets, often referred to as capital budgeting; and (2) cash management.

**Fixed Asset Management: Capital Budgeting**

Given that the theory of finance directs that a firm should accept a capital project if the present market value of the incremental future cash flows to be yielded by the project exceed the project's initial cost, it becomes necessary to develop a means of valuing future cash flows. It is here that finance theory has made its greatest contribution to business practice. Two models of valuation have received the bulk of the attention in the finance literature. These are the time-state-preference (T-S-P) model\(^6\) and the mean-variance or two-parameter model of asset pricing.\(^7\)

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\(^6\) For further discussion, see Arrow (1971), Breeden and Litzenberger (1979), Debreu (1959), and Hirshleifer (1966).

\(^7\) Origin of the model is due to Lintner (1965), Mossin (1966), Sharpe (1964), and Treynor (1961). Important extensions are due to Black (1972) and Fama (1968).
The T-S-P model has been widely used in the finance literature to analyze what are otherwise intractable problems. Because it is an extremely general model it has allowed relaxation of certain restrictive assumption necessary to obtain results with other modes of analysis. However, the generality of the model has also limited its practical usefulness.

The T-S-P model assumes that uncertain future outcomes can be classified into "states." Associated with each future state is a current market price for a one dollar payoff in that state. The present market value of the future cash flows yielded by a project is equal to the product of the possible cash payoffs from the project in each possible state multiplied by the state price for the relevant state summed over time. Application of the model to value future cash flows requires estimates of the current state prices as well as estimates of the cash flows from the project in each future time period and state.

With one notable exception [Banz and Miller (1978)] the T-S-P model has not been moved very far toward practical application, primarily because of the difficulty involved in specifying future states and estimating associated state prices. For that reason it seem unlikely to us that the T-S-P model is of much use to the owners and managers of small business firms.

In contrast to the T-S-P model, the primary virtue of the mean-variance model is its ease of implementation. The mean-variance model assumes that individuals choose among portfolios of securities on
the basis of expected return and variance (or standard deviation) of return. Furthermore, investors are assumed to prefer more wealth to less and to be risk-averse in their portfolio decisions. Thus, for any given level of expected return investors are assumed to prefer the portfolio with the smallest variance (or standard deviation) of return and for any given level of variance (or standard deviation) or return investors are assumed to prefer the portfolio with the highest level of expected return.

Because expected return on a portfolio of securities is merely the weighted average of the expected returns on the individual securities, but variance of return on the portfolio is less than a weighted average of the variances of returns on the individual securities in the portfolio, investors can reduce variance of return without sacrificing expected return by adding securities to their portfolios. In particular, the total variance of a portfolio composed of a large number of securities is equal to the weighted sum of the covariances among the securities. The risk added to a portfolio by an individual security is just the covariance of that security with all other securities in the portfolio. Because investors are concerned only with the incremental risk and incremental expected return provided by a security, they will only be concerned with the expected return on the security and with the covariance of return between that security and all other securities in their portfolios.

When the additional assumptions are added that there exists a risk-free security and that all investors have homogeneous expectations it can be shown that all investors will hold the same portfolio of risky
securities and that they will adjust the risk of their portfolio to their individual risk preferences by buying and selling different amounts of the risk-free security. The portfolio of risky securities that all investors hold is typically called the market portfolio. The incremental risk of an individual security is the covariance between its return and the return on the market portfolio.

With the basic results derived above and the some additional manipulation, it can be shown that, in equilibrium, the expected return on a security is equal to the current risk-free rate of return, \( R_f \), plus the covariance of the return on the security with the return on the market portfolio times the market price of risk. This relationship can be stated symbolically as

\[
\bar{R}_j = R_f + \text{COV}(\bar{R}_j, \bar{R}_m) \lambda
\]  

(1)

where \( \bar{R}_j \) is the expected return on security \( j \), \( R_f \) is the return on the risk-free security, \( \text{COV}(\bar{R}_j, \bar{R}_m) \) is the covariance between security \( j \) and the market portfolio, and \( \lambda = (\bar{R}_m - R_f) / \sigma_m^2 \) is the market price of risk (\( \sigma_m^2 \) is the variance of return on the market portfolio). The relationship in equation (1) is often stated in a form that is easier to work with:

\[
\bar{R}_j = R_f + \beta_j (\bar{R}_m - R_f)
\]  

(2)

where \( \beta_j = \text{COV}(\bar{R}_j, \bar{R}_m) / \sigma_m^2 \) is a measure of "market sensitivity" of security \( j \). The attractive feature of this result is that the expected return on
any security $j$ can be estimated if one knows the current risk-free rate available in the market, the current expected return on the market portfolio, and the security's measure of market sensitivity, $\beta_j$.

With some further manipulation of the model it can be shown that the current market value of any security is just its future expected cash flow discounted at the expected rate of return on the security, $\bar{R}_j$.

If $R_f$ is known, and if $\beta_j$, $\bar{R}_m$, and the future expected cash flow on the security can be estimated, then the current market value of any security can be estimated as well. This valuation model can also be applied to investments in real (as opposed to financial) assets. The rate $\bar{R}_j$ is the risk-adjusted market required return or cost of capital for investment alternatives with market sensitivity $\beta_j$.

For capital budgeting purposes, the financial manager needs only to estimate the future incremental expected cash flow associated with the project under consideration. Given the risk-free rate, $R_f$, and an estimate of the expected return on the market portfolio, $\bar{R}_m$, if the manager can estimate the project's $\beta_j$, estimating the current market value of the project's future incremental expected cash flow at the rate $\bar{R}_j$. If the estimated market value of the expected cash flows exceeds the project's initial cost it should be accepted. If not, it should be rejected.¹⁰

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⁹ Rubinstein (1973).

¹⁰ For practical application of the criterion, see Bierman and Smidt (1980) and Johnson (1977).
Two questions remain before the two-parameter model can be completely endorsed as a project evaluation instrument for small businesses. One of these is technical, the other theoretical.

The technical one is: how can the financial manager estimate the project's market sensitivity? For a company whose common stock is publicly-traded, $\beta_j$ can be estimated from the historical relationship between the returns on the company's stock and a representative market index. $\beta_j$ is the estimated coefficient when the returns on a stock are regressed against the market index.\(^\text{11}\) Such a regression can be accomplished with many hand calculators. If it is assumed that the cash flows associated with current and future investment opportunities available to the firm have risk characteristics that are similar to those of the firm's past activities, the $\beta_j$ estimated with historical data can be used to generate a discount rate for the firm's current and future investment opportunities.

However, the same direct estimation technique is not available to the managers of small businesses. Almost by definition small businesses are businesses whose common stocks are not traded on a public stock exchange. Thus, no historical price series exists for estimation of the firm's $\beta_j$. Fortunately, this problem is not insurmountable.

As we noted above, $\beta_j$ is independent of company size. If the owner-manager of a small business can identify a publicly-traded firm or

\(^{11}\) For discussion of estimation techniques, see Blume (1971).
a group of publicly-traded firms that are in approximately the same industry as his (i.e., have approximately the same product mix) he can estimate the $\beta_j$ of the publicly-traded firm. With this $\beta_j$ he can estimate a required return as described above. The required return can be used to discount future expected cash flows from his firm's available and investment opportunities and the market value criterion can be used to accept or reject these potential projects.

The remaining theoretical question is more subtle than the technical one. The mean-variance model is in actuality applied only to single-period investment opportunities. It was developed under the assumption that all investors have single-period consumption-investment horizons. Much work has been done and is currently underway that attempts to extend the model to a multiperiod framework.\(^{12}\) However, many problems remain unresolved.

Recently Fama (1978) has spelled out the conditions under which a simple single-period risk-adjusted required return can be used to discount cash flows over more than one time period. Among these are that the future riskless rate of interest and the future market prices of risk be known with certainty. These conditions are probably not met exactly. However, the errors associated with using a single-period risk-adjusted required return to discount multiperiod cash flows are probably small. For most projects this approach will yield the correct investment acceptance/rejection decision. More importantly, until finance theory

\(^{12}\) Merton (1973) and Breeden (1979).
can resolve remaining problems in multiperiod valuation and develop models simple enough to be used widely, the single-period model is the best one finance theory has to offer. The owner-managers of small businesses should find the model useful in capital project evaluation as described above.

Cash Management

Management of a firm's cash position is a subset of the problem of managing the firm's working capital accounts. Working capital accounts include the firm's marketable securities, accounts receivable, inventory, accounts payable and short-term bank loans. The problems associated with management of each of these asset categories is deserving of a separate report. Unfortunately, the theory of finance has not given each of these topical areas the attention which they deserve. The theory has, however, given considerable attention to the problem of managing the firm's cash balance.

Theoretical attempts to find optimal solutions to the cash management problem have followed two distinct modes. Under the first, net cash flow, defined as the difference between cash receipts and expenditures, over any given interval is assumed to be random. Under the second, net cash flow is assumed to be predictable. All of the models assume that there are costs associated with moving funds from a cash account to a marketable securities account and vice versa. Likewise there is assumed to be an opportunity cost of building up excessive cash reserves and a "stockout" or penalty cost associated with cash shortages.
Under both approaches to the cash management problem the objective of the financial manager is assumed to be the minimizing of the net cost of managing the firm's cash position. With certain assumptions this objective is consistent with the market value rule. In particular, if it is assumed that the planning horizon is short, the objective of minimizing the costs of managing the cash position is approximately equivalent to the objective of maximizing the market value of the firm.

Solutions achieved under the assumption that net cash flows are a random variable are typically classified as control limit models. The most well-known of the control limit models is the Miller-Orr (1966) model. Miller and Orr assume that a Bernoulli process generates each of the many cash flows occurring during a single day, so that the distribution of aggregated daily net cash flows is approximately normal. They also assume that the firm incurs a fixed, lump-sum charge each time a marketable security is bought or sold. Furthermore, the marketable security is assumed to have an infinite maturity.

The model yields a simple set of guidelines for managing the firm's cash position. When the mean or average of the net cash flow distribution is zero, the decision rule is as follows: The cash balance is adjusted to an optimal return point $Z^*$ when the cash balance is less than zero or greater than an optimal upper limit, $h^*$, where $h^* = 3Z^*$.

Determination of $Z^*$ and $h^*$ requires relatively little information. The solutions are
\[ z^* = 3fs^2/4r \]^{1/3} 

and

\[ h^* = 3z^*. \]

where

\[ s^2 = \text{variance of net daily cash flows} \]

\[ r = \text{daily opportunity rate (i.e., rate on interest on the secondary asset)} \]

\[ f = \text{fixed or "lump sum" cost in dollars of making a transfer between cash and the secondary asset}. \]

Implementation of the model requires only that the manager have sufficient historical data to be able to estimate the variance, \( s^2 \) of net daily cash flows. The variance itself can easily be computed on many readily available desk calculators, as can \( z^* \) once \( s^2 \) has been estimated. Once the control limits are determined, the cash management function can be turned over to a clerical assistant. If the behavior of the firm's daily net cash flows and the form of the transactions costs which the firm incurs are adequately described by the Miller-Orr assumptions, then the simple guidelines established by their model will be as good as or better than results yielded by more extensive monitoring of the cash position.

The Miller-Orr model has been criticized as being "too simplistic" and a number of authors have attempted to extend the basic model in one
way or another by relaxing various of the models' assumptions. Transfer charges that are independent of the size of the transfer (i.e., asymmetric lumpy transfer charges) have been modeled, as well as charges that are strictly proportional to the size of the transfer. Furthermore, the model has been extended to include more than two types of assets. Although these modifications lead to changes in the decision rules, the basic structure of the model and its solution remain relatively intact.\footnote{Eppen and Fama (1969), Homonoff and Mullins (1975), Girgis (1968), Hausman and Sanchez-Bell (1975) and Neave (1970).}

Neave (1970) has developed a very general extension of the Miller-Orr model. His model generalizes the Miller-Orr model in several ways: (1) the model incorporates both fixed and variable costs (not necessarily symmetric) for sales and purchases of marketable securities; (2) the daily net cash flows need only be independently distributed (as opposed to identically independently distributed); and (3) the model incorporates a loss function for both \textit{ex ante} holding and penalty costs (which can differ from period to period) in the objective function. Unfortunately, solution of the Neave model, and of many of the models that relax the Miller-Orr assumptions, is no trivial task. Solution of the dynamic programming problem requires relatively powerful computer capacity as well as a relatively sophisticated financial analyst to interpret the results. Complexity of these models may preclude their usefulness for small businesses.
The common property of all of the control limit models is the net cash flows are assumed to be random variables. At the other extreme are those models that assume either that net cash flows can be perfectly predicted, or at least predicted with a high degree of accuracy. These solutions to the cash management problem include two steps. The first step is the development of a cash flow forecasting model. The second is the development of an "optimal" short-term planning model.

Solution to the first step run the gamut from managerial intuition to statistically based forecasting models. Solutions to the second step almost invariably involve the development of a linear programming model that seeks to minimize the net cost of managing the cash position over a fixed planning horizon. Many different linear programming models have been developed.\textsuperscript{14}

The common thread uniting the linear programming models is that they seek to minimize the net cost of managing the firm's cash position subject to a set of constraints on the amount of funds which the firm can borrow and lend in each period and the type of securities that the firm can buy and sell. Typically these constraints differ across future time periods, so that it is necessary to set one constraint for each period for each type of transaction. The models also include fixed and variable transactions costs as well as forecasts of future interest rates in addition to forecasts of future net cash flows.

\textsuperscript{14} For example, Pogue and Bussard (1972), Robichek, Teichrow, and Hones (1965), and Maier and Van der Weide (1978).
The question of whether or not the control limit models, based on the assumption that net cash flows are a random variable, or the linear programming models, based on the assumption that cash flows are predictable, provide better solutions to the cash management problem depends, in part, upon whether or not net cash flows are predictable. The degree to which net cash flows are predictable will, of course, depend upon the particular firm in question. Because of this fact, tests of the models must either be performed on a case-by-case basis or must be conducted with simulated data.

Unfortunately, relatively few tests of the models with either type of data have been reported. Miller and Orr (1967) tested their model and with data provided by the Union Tank Car Corporation. The data conformed reasonably well to the model's assumptions. Management of the company recognized that uncertain nature of daily net cash flows and made no attempt to forecast daily net cash flows. However, the model's assumption of a normal distribution of daily net cash flows was violated, since the distribution contained an excessive number of large net cash flows.

Miller and Orr report, in this instance, that their model outperformed the manager. However, there are a number of problems with their results such that it is difficult to determine precisely why the model performed well.

In an effort to overcome some of the problems in the Miller-Orr analysis Homonoff and Mullins (1975) analyze 231 days of cash flow data
from an unnamed manufacturing firm. They found that the data did not conform well to the assumptions of the model. To accommodate these departures from the assumptions, the model was modified in an ad hoc manner. When they applied the adjusted model, they found that it outperformed the firm's manager.

...control limit models work well in each case analyzed...The most significant benefit of simple inventory models is their ability to routinize day-to-day cash management while minimizing the managerial time and effort allocated to this task [Homonoff and Mullins (1976, p. 521)].

Daellenbach (1974) goes beyond the Miller-Orr model in his analysis of the performance of the control limit models. Using simulated cash flow data, he compared the Miller-Orr model, his own dynamic programming model [Daellenbach (1971)], and the Eppen and Fama (1968) dynamic programming model against each other and against a hypothetical treasurer. Daellenbach argued that the decision rule followed by his hypothetical treasurer closely approximates the actual behavior of corporate treasurers. Implicit in the decision rule followed by the corporate treasurer is the assumption that net cash flows are predictable to some limited extent.

Perhaps not surprisingly, Daellenbach concluded that the hypothetical treasurer performed better (relative to the control limit models), the more predictable the daily net cash flows were. Overall Daellenbach concluded that the more complex dynamic programming models are not worth the cost of implementation in most instances and that the simple Miller-Orr model will outperform the corporate treasurer only if the net
cash flows are not predictable to any great extent. Otherwise, a corporate treasurer who takes advantage of the predictability of net cash flows will generate better results.

A question yet to be answered is whether sophisticated attempts to predict cash flows coupled with linear programming planning models can outperform a simple rule followed by a hypothetical treasurer who takes advantage of predictable cash flows. Scott (1980) has recently reported the results of the first such test of the models.

Scott uses three years of daily cash flow data from the L. B. Foster company in his analysis. Scott first conducts an exhaustive statistical analysis of the data. He finds that net cash flows are approximately random, but that cash receipts alone are predictable. He then explores three possible forecasting models to determine which one provides the "best" estimate of future net cash flows.

Scott develops a dummy variable regression model of the sort first applied to cash forecasting by Stone (1977), a univariate autoregressive-moving average time series model as described by Box and Jenkins (1970) an adaptive filtering model. He finds that the dummy variable regression yields the "best" predictions for his data set. However, the results are only slightly better than those yielded by the other two forecasting techniques. Because the costs of developing, maintaining, and updating the dummy variable regression model substantially exceed those of the other models, Scott concludes that the simple adaptive filtering model is probably a superior model for most situations.
Scott then compares the costs of managing the company's cash position with the Miller-Orr model, a dynamic programming model, and a linear programming model [described in Maier and Van der Weide (1978)]. He uses the dummy variable regression model to generate cash flow forecasts for the linear programming model. He finds that for this company the dynamic programming model yields better results than the Miller-Orr model. He also finds that when the cash flow forecasting model is not updated frequently, the dynamic programming model outperforms the linear programming model. However, when forecasts are updated frequently, the linear programming model yields the best results. Perhaps his most important result is that all of the models outperform the company's actual policy.

Given Scott's results, the question remains as to what policy is optimal for small businesses. If we assume that the owner-manager of a small business has limited computer resources available and if we assume that the cash balances which the manager must work with are "small," the empirical tests of the model appear to indicate that the Miller-Orr model should be adopted. The solution to the model is simple to compute and it is inexpensive to implement. While it is true that the linear programming models outperform the control limit model, the gains appear to be small. Given that implementation of the linear programming model requires a forecasting model, which itself will be costly to develop and implement, the gain will, in most instances, be less than the costs.
III. Capital Structure Management

Financial Policy

The theory of finance has at one and the same time both very much and very little to offer the owners and managers of the small firm about the best way to finance his business. Judging by the volume of literature published on the subject, the theory has a lot to offer. And indeed it does. Hypotheses abound. Unfortunately, a review of the literature very quickly reveals that no consensus of opinion has emerged among theoreticians as to whether or not there is a best set of securities for a particular firm to issue to finance its activities, and among those theoreticians who argue that there is an optimal financing strategy for an individual firm, no consensus has emerged as to what it should be or even what factors are relevant in establishing it.

The unsettled state of the art of the theory of capital structure management is not a new phenomenon. Indeed, a brief review of the historical development of the theory indicates that the same divergence of views has more frequently than not characterized thinking on the subject. The demarcation point between the traditional and modern theory of capital structure theory is generally acknowledged to be a paper published by Franco Modigliani and Merton Miller in 1958.

In their 1958 paper Modigliani and Miller demonstrated that, under a highly restrictive set of assumptions, the value of a firm is independent of the types of securities used to finance it. Specifically, they demonstrated that the value of a firm is independent of the proportions
of debt and equity used to finance it, once the firm has made its investment decisions. Subsequently, in a paper published in 1961, they demonstrated, under a set of similar assumptions, that the value of a firm is also independent of its dividend policy, once its investment policy has been established. They demonstrated this by noting that dividend policy is merely another aspect of financing policy, since earnings not paid out as dividends reduce the firms need to raise additional funds through the issuance of debt or equity securities. In combination these papers established the proposition that the value of a firm is invariant to financial policy. The assumptions required by Modigliani and Miller to establish the original invariance proposition were that firms could be categorized into discrete "risk classes," firms and individuals could issue default-free debt, and capital markets were perfect--no transactions costs, no corporate or personal taxes, no costs of bankruptcy, and information relevant to the pricing of securities is costlessly available to all market participants.

Almost immediately after the publication of the Modigliani-Miller papers, researchers began to explore two avenues of inquiry in attempts to extend their work. Those following the first path sought to demonstrate the legitimacy of the invariance proposition under less restrictive assumptions. It was subsequently shown that the risk-class assumption was unnecessary and that the invariance proposition also held when firms issued risky as well as riskless debt.\(^\text{15}\) Although proof of

\(^{15}\) Robichek and Myers (1966), Schall (1971), Stiglitz (1969), and Stiglitz (1974).
the proposition with risky debt requires either the assumption that all
securities are protected from expropriations of wealth due to
recapitalization or that perfect substitutes for all securities
exist.\textsuperscript{16} The common thread uniting these efforts is that in each, the
capital structure of an individual firm is indeterminate. There is no
"optimal" set of securities to issue. Any one choice of financing
strategy is as good as any other.

Researchers following the second avenue of inquiry sought to
determine conditions under which the invariance proposition fails.
Ironically, the first generally acknowledged demonstration that the
invariance proposition failed was produced by Modigliani and Miller
(1963). They demonstrated that when corporate taxes are introduced and
interest payments are tax deductible (in a fashion similar to the U.S.
tax code) the value of the firm is an increasing function of its
debt-to-total value ratio. Thus, they demonstrated that it is optimal
for firms to seek to maximize their use of debt financing. However,
given a debt-to-total value ratio, the value of the firm was still
invariant to dividend policy. These conclusions were also derived under
the assumptions that firms could be categorized into risk classes, that
individuals and firms could issue default-free debt, and that, except for
corporate taxes, capital markets are perfect. This conclusion, like
their first was, and still is, controversial.

\textsuperscript{16} See, Fama (1978) and Stiglitz (1974).
Again two general avenues of inquiry were pursued. Those following the first avenue attempted to demonstrate that the leverage maximization proposition holds under less restrictive assumptions than those employed by Modigliani and Miller. Again it was demonstrated that the risk-class assumption is unnecessary as well as the assumption of default-free debt.\textsuperscript{17} According to this view, the value of the firm is a deterministic function of the amount of debt financing employed.

Researchers following the second avenue of inquiry noted that the maximum leverage proposition implied that firms' should always find it advantageous to use debt financing. Since most firms had capital structures which were comprised of less than 30 percent or 40 percent debt, these researchers concluded that an important element must be missing from the Modigliani-Miller (1963) corporate tax model. They sought to discover the solution to this puzzle.

A number of hypotheses have been presented. Ross (1977) and Leland and Pyle (1976) suggested that capital structure decisions serve as signals by management to investors about the company's future profitability. Depending upon the firm's outlook for the future, management may have a lot or very little debt in the company's capital structure. Jensen and Mecklin (1976) have hypothesized that there are monitoring costs associated with both debt and equity financing so that firms will choose the proportion of each that minimizes the total of

\textsuperscript{17} Stiglitz (1969).
these costs. Myers (1977) has argued that when a firm has "too much" debt in its capital structure it will be led to underinvest in profitable projects. That is, firm's with too much debt will not adhere to the market value rule. If this is true, "too much" debt will be bad for stockholders. As a consequence, even when there is a tax advantage to debt financing, firms will limit their reliance on debt as a source of funds. Donaldson (1963) has hypothesized that managers are risk-averse and limit their firm's use of debt financing to protect their jobs. Yet another possible explanation for firms' failure to be heavily debt financed is that banks ration credit.18 Undoubtedly, there is some truth in each of these hypotheses.

However, the most promising approach to solving the problem, until recently, appeared to be that bankruptcy costs act as a counterweight to the tax deductibility of interest payments. Several authors have proposed models along this line.19 According to these models, the present value of the tax shield on interest payments increases as the firm increases its use of debt financing, but the present value of the costs associated with potential future bankruptcy also increase. At some point, the marginal present value of the tax shield on interest payments just equals the marginal present value of the bankruptcy costs. At that point the value of the firm is maximized. Until recently, there appeared

18 Jaffee and Russell (1976).

to be a consensus of opinion emerging that corporate taxes and bankruptcy costs, if not the only determinants of corporate capital structure policy, were major ingredients.

However, very recently Miller (1977), Warner (1977) and Haugen and Senbet (1978), taking slightly different tacks, collectively have raised serious doubts about the importance of bankruptcy costs as a determinant of corporate financing policy.

The bankruptcy cost literature has identified three types of costs as being potentially relevant to the determination of a firm's optimal mix of debt and equity financing:

1. the direct administrative expenses paid to various third parties involved in the bankruptcy proceedings. (These include payments made to the attorneys for both the creditors and the debtor, trustees, auctioneers, referees, accountants, appraisers, expert witnesses, and so on. Filing fees are an additional cost of the bankruptcy process.)

2. the "short-fall" in realized value when assets are sold in liquidation or the "indirect" costs of reorganization.

3. the loss of tax credits which the firm would have received had it not gone bankrupt.

In different contexts Miller, Warner, and Haugen and Senbet all argued that the "short-fall" in asset value and the "indirect" costs of reorganization are unrelated to a firm's financial policy. Rather, they are attributable to the investment decision and this decision is independent of the firm's capital structure policy. Further, they argued that if the costs of bankruptcy through the courts are large, firms can avoid them by liquidating or reorganizing outside the court system. A
firm can be easily reorganized outside the court system by negotiation among stockholders and creditors or by one set of security holders buying out the other. Since either of these can be accomplished at relatively low cost, it must be that bankruptcy through the courts is itself a relatively low-cost undertaking.

Evidence on the magnitude of the costs of bankruptcy for large firms has been provided by Warner (1977). He tabulated the administrative expenses incurred in the bankruptcy process by 11 railroads that were in bankruptcy between 1933 and 1955. At the date of bankruptcy, the market values of these companies ranged from $10.4 million to $114.7 million. Warner found the bankruptcy costs average 5.3 percent of the market value of the firm at the date of bankruptcy. It can be argued that these are not relevant for small businesses. However, in a study of 88 businesses that filed for bankruptcy in the Western District of Oklahoma between 1964 and 1978, Ang, Chua, and McConnell (1980) also found that bankruptcy costs averaged about 5.0 percent of the liquidating value of the enterprises involved. The businesses in their sample had liquidating values ranging up to $1,136,467. Their study indicates that bankruptcy costs for small businesses are not large relative to the alleged tax advantage of debt within the bankruptcy cost models.

Coincidentally, Miller (1977) hypothesized that the missing ingredient in the capital structure puzzle is not bankruptcy costs, but personal taxes. He presented a model that includes both a corporate income tax and personal taxes on income from securities. He demonstrated
that when personal taxes are included in the analysis in a particular way, the value of a firm is again independent of its debt-to-total value ratio. In particular, he introduced a personal tax rate on income from corporate bonds that is progressive and extends on either side of the corporate tax rate. However, he argued that various loopholes in the tax laws allow investors to shelter all income from equity securities such that the personal tax rate on income from common stock is effectively zero for all investors. Under this set of assumptions there are some investors who prefer to own firms with a lot of debt financing and some investors who prefer to own firms with very little debt financing. But investors are indifferent as to which firms provide the leverage so that in equilibrium the value of individual firms is independent of its financial policy. This indifference proposition, like the original one, has been greeted with controversy and attempts either to extend it or to demonstrate its limitations.\textsuperscript{20}

In parallel with efforts to extend or qualify the debt/equity irrelevance proposition, there have been a number of efforts to extend and/or qualify the dividend policy irrelevance proposition. In many instances the same cast of characters has been involved and the arguments and counterarguments have proceeded along similar lines. For example, it has been argued that dividends serve as signaling devices and that

\textsuperscript{20} Chenard Kim (1979), Kim, Lewellen, and McConnell (1979), and Litzenberger and Van Horne (1978).
dividend policy is a function of monitoring costs. Likewise the effects of taxes on dividend policy and common stock valuation has been extensively examined.

As far as consensus of opinion, it appears as if most researchers are persuaded by the argument that, short of a signal on how well the firm is doing, the value of the firm is independent of dividend policy. Whether the firm pays high or low dividends does not matter since any policy that is in force can almost costlessly be undone by individual share owners. For the small business, however, there may be some relevance. If small firms are characterized as having few owners who have a substantial portion of their wealth invested in the firm, then it would seem appropriate for the small business to develop a policy that minimizes the tax burden on the owner. With multiple owners, the decision becomes more complex, but side payments can be used to equalize the effect of a given policy as long as the number of owners is few.

In the final analysis, the theory of finance appears to have relatively little to offer the owner-manager of the small business in the way of guidelines about developing strategy for managing his firm's capital structure. However, if one looks closely enough there is perhaps some advice even if it is not definitive.

21 Kalay (1978).

There are two groups of researchers with opposing recommendations. One group argues that capital structure is irrelevant, and that the selection of one structure is as good as any other. The second group argues that because of tax incentives and bankruptcy costs, the value of the firm is a positive function of debt, up to some optimum and then a negative function of debt thereafter. Yet, no one has been able to show that capital structure is an important determinant of value, or, in other words, that value rises rapidly—then falls rapidly with the use of debt. All of this suggests that the cost to the firm of having more or less than the optimum is not great. A manager who employs the strategy of using debt so long as the amount of debt is not "too great" or "too little" will probably not be too wrong.

Implementing the Strategy

The key to implementing a financing strategy, once one has been chosen, is evaluating alternative financing arrangements. Whatever strategy is chosen, the owner-manager wants to get the "best deal" each time a specific financial arrangement is negotiated. Or, stated alternatively, the manager wants to pay the lowest price possible whenever funds are raised.

Typically, when a firm decides to raise funds it will search among several possible sources, each of which may offer to make funds available on certain (although different) terms. The terms will be specified in the original contract. The type of arrangements may also differ. Examples of alternative contracts include straight debt, convertible
debt, financial leases, preferred stock and so on. Furthermore, the specific terms may differ widely among each type of security. With straight debt, contract terms will include term-to-maturity, the contract interest rate, and subordination clauses. When confronted with this potentially bewildering array of financing opportunities, the financial manager would like to be able to select the one that offers the most favorable terms.

One of the areas of finance theory that has evolved most rapidly in the past five or six years has been the pricing of financial claims. The launching pad for this development is typically identified as a paper published by Fisher Black and Myron Scholes in 1973. In this paper, Black and Scholes developed a closed-form equation for pricing call options on common stock. Pricing of call options with this equation requires only data that is readily available or can be easily estimated.

In their paper Black and Scholes also made a significant observation. They noted that many types of financial claims can be thought of as options on some other underlying asset. For example, common stockholders of a firm that has debt outstanding can be thought of as holding a call option on the underlying value of the firm. At the maturity date of the debt, the stockholders will exercise their option to buy the firm if the value of the underlying assets exceeds the face value of the debt. Otherwise they will let the bondholders take ownership of the firm.

The Black-Scholes model was developed under a set of restrictive assumptions. In particular, the model assumes that the short-term
interest rate is known with certainty, the underlying stock pays no dividends, and that the option had a single fixed maturity date. Since the publication of the Black-Sholes paper, well over 50 papers have been published that extend their results to the pricing of other types of financing contracts under less restrictive assumptions.

The model has been extended to price subordinated debt, convertible bonds, convertible preferred stock, extendable bonds, retractable bonds, lease contracts, bonds denominated in foreign currencies, various types of insurance contracts, and others. The model has been extended to allow for variable or stochastic interest rates and to allow for multiple maturity dates, usually referred to as compound options.

23 Black and Cos (1976).
26 Brennan and Schartz (1977b).
27 Brennan and Schartz (1977b).
28 Schallheim (1980).
29 Jaquillat (1979).
30 Brennan and Schwartz (1976).
31 Cox, Ingersoll, and Ross (1979).
The basis of all the pricing models is that under certain conditions—or assumptions—they can be used to determine if the particular financial security in question is priced "properly" relative to other available securities. The models are especially important if the contracts in question are either complex or are not publicly-traded.

If contracts are simple, it is relatively easy for the financial manager to determine whether or not he is getting a "fair" deal. Likewise, if the security in question (or one similar to it) is traded in a public market, the financial manager can observe current market prices to determine if the security is priced "properly." However, most of the financing alternatives faced by the owner-managers of small businesses will be complex, usually because of the idiosyncrasies of their businesses, and virtually none will be publicly-traded. For these managers evaluating individual financing arrangements will be a crucial ingredient to the success of his business. The recent development of financial claim pricing models may very well have significant potential applications for small businesses.

However, before the pricing models can be used widely by the managers of small businesses two issues must be resolved. First, the many of the more interesting models involve relatively complex mathematics. Solutions to the models often require not only mathematical sophistication, but also sufficient computer capacity to solve the mathematical functions. Much work is currently underway that attempts to find simple solutions to the equations and to develop standardized computer routines for solving
them. Until further progress is made along these lines, the usefulness to small businesses of recent financial claim's pricing models will be limited.

The second issue is more appropriately stated as a question: Do the models work? Stated alternatively--do the models yield prices that are consistent with prices for which the securities in question would sell in the capital market if all participants in the market had access to all relevant information? This question is an empirical one. If the answer to it is affirmative, then the pricing models can be used to price (i.e., evaluate) financial contracts that are not publicly-traded.

To date, empirical testing of the pricing models has been limited. Furthermore, those results that have been reported are not encouraging. In some instances prices yielded by the models are not consistent with market prices even for very simple financial claims. However, as the models are further refined and as the data bases for testing the models become more complete, these early results will in all likelihood be reversed. For the time being, however, although the new pricing models contain substantial promise for small businesses, they do not appear to be practical. Until the models become more refined and easier to use, the owner-managers of small business are probably best advised to shop for the best financing arrangement and to let intuition be their guide in choosing among alternative arrangements.
In this paper we have reviewed major recent developments in the theory of finance with the goal of highlighting those aspects of the theory with the greatest significance for small businesses. We have purposely avoided technical derivations of the results. The derivations are available elsewhere. Most of the major results have been applied to large (typically publicly-traded) corporations. What has been lacking in the theory is any attempt to demonstrate the applicability of the results to small businesses. We have attempted to fill that gap. This effort should be viewed as a first step. Further developments in the theory as well as further recognition of the importance of small businesses in the U.S. economy will undoubtedly lead to further efforts to apply the modern theory of finance to small business firms.

In the meantime, the theory suggests that the owners and managers of small businesses should accept new capital investments if the project increases the net present value of the firm's equity. Furthermore, economically independent projects can be evaluated without concern for the stochastic relationship between the project's cash flows and those of the cash flows of other projects the firm either owns or has under consideration.

The net present value of the project can be estimated discounting incremental expected cash flows from the project of a risk-adjusted discount. The discount rate can be estimated along the lines of the two-parameter asset pricing model. Although some technical difficulties
remain in the application of this model to small businesses, they are not insurmountable.

In managing its cash balance position, the small business should follow a strategy suggested by the Miller-Orr control limit model. Implementation of this model requires very little data. Once the model has been implemented, the task of managing the cash position can be delegated to a clerical staff person. Thus, it is a low-cost method of managing the cash position.

The theory has less definitive guidelines to offer the owners and managers of small businesses about the optimal mix of debt and equity in their capital structures. The best recommendation, at present, appears to be that the small business should have some debt in its capital structure—but not too much! How much is too much? Probably the safest strategy is to use about the same level of debt as other firms in the same industry.

As regards dividend policy, the theory again is not definitive. The safest approach for the small business appears to be to structure its dividend policy to minimize the personal taxes of its owners. If the firm has many owners such a strategy can be difficult to determine, but if the number of owners is relatively small or if the owners are all in about the same tax situation, developing such a strategy should not be too difficult.

Until additional research in the theory of finance can provide more definitive answers, the guidelines outlined above are the best we have to offer.
References


References - contd.


References - contd.


References - contd.


