The Capital Structure Paradigm: Evolution of Debt/Equity Choices

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PRAEGER

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What we experience of nature is in models . . .
—Richard Buckminster Fuller

Preface

Central Tenet: The analysis of paradigm shifts provides a worthwhile means of thinking about capital structure decision making.

STATEMENT OF PURPOSE

This book presents the current thinking about how to determine the mix of financing sources for a modern business entity. The book is designed to appeal to three audiences: (1) academic research community, (2) business school students, and (3) business professionals. In general, the capital structure decision includes the mix of private and public securities, the mix of short-term and long-term securities, as well as a mix of debt and equity securities. In this book we focus on the last issue, namely, the mix of debt and equity.

We describe in this book the evolution of the firm debt/equity paradigm from the initial foundations to the present time. We follow the evolution of the paradigm through two stages: (1) identification of the individual factors that affect the firm's debt/equity position and (2) development of a synthesizing framework that includes the dynamics of interactions among the factors. Then the book looks forward from

the current knowledge frontier to outline future opportunities for research and improvements of capital structure analyses. Each chapter contains three components: (1) a theoretical development, (2) empirical evidence, and (3) simple explanations of implications for a business professional or a business student.

The literature on this subject is so enormous that it is futile to aim for a comprehensive review. Therefore, we have opted for a selective review of literature that helps us trace the evolution of thought in the field. Still, the book aims to serve as a useful reference of capital structure research well beyond one reading. To this end, there is an author index for use in literature searches. There is also a topical index for reference purposes. In addition to the theoretical/empirical paradigm development, we have included a chapter of practical observations from executives based on interviews about the decision-making process of capital structure.

The issues of capital structure have formed a central facet of corporate decision making from the start of the industrial revolution more than two hundred years ago. The industrial revolution created a need for immense amounts of capital and, at the same time, caused a separation between the owners of the capital and its users, namely, the managers. These decisions were mostly ad hoc in nature until about fifty years ago when business schools began to examine the theoretical foundations to help managers make informed capital structure decisions. This book begins with the theoretical analysis of Modigliani and Miller (1958) and examines the debt/equity tradeoff paradigm development to the present time. Then, we extrapolate into the future the potential changes that we can expect.

Our audience for this book includes the academic community (researchers and students) in finance and accounting, investment bankers who deal with the issuance of these securities, and business managers who make the decisions on the mix. They all have an interest in this topic because they are interested in the best financing mix and size from their own viewpoints. Furthermore, an optimal capital structure implies the lowest weighted average cost of capital that in turn will generate the highest net present value of future firm projects. Given that firm value maximization is an objective of firm owners, this issue has great importance for firm behavior.

ORGANIZATION

The first chapter serves as an introduction, covers general themes, and identifies key variables used throughout the text. Chapter 2 lays the foundation of the capital structure paradigm with an analysis of the Modigliani and Miller (1958) propositions. Under these MM assump-

tions, capital structure choice is irrelevant. Chapter 3 adds corporate taxes to the paradigm as per the Modigliani and Miller (1963) correction. The consequence is that firms should maximize value by issuing as much debt as necessary. In Chapter 4, we incorporate personal taxes and corporate debt tax shields. Now the capital structure paradigm shifts to a set of possible outcomes that includes an interior optimum, as well as the extremes of zero debt and maximum debt positions.

Bankruptcy costs are covered in Chapter 5. Firm distress costs mitigate the tax advantages of debt, but the extent of such mitigation remains in dispute. Agency costs are discussed in Chapter 6. These costs progressively reduce the value of pursuing an all-equity firm policy or a maximizing debt policy and favor an interior optimum leverage position. Chapter 7 addresses the information asymmetry between management and investors. The effect of signaling financing decisions and their ultimate impact on firm value are discussed.

In Chapter 8, we consider firm value and capital structure as functions of simultaneous equation effects. The discussion evolves from the key premise that the firm is a nexus of contracts and that capital structure is simultaneously determined with other important variables. Chapter 9 also takes an interactive perspective on the firm's capital structure but, partly in contrast to Chapter 8, looks at it from management's point of view. Surveys of management thinking are discussed along with the presentation of several interviews with company financial officers.

Chapter 10 reviews the state of the research frontier. Then, from gaps in the research frontier a set of potential research directions is discussed. The last chapter, Chapter 11, provides a summary and conclusions.

SUMMARY

The capital structure decision is a key factor in the success of the firm. This book discusses the development of the capital structure paradigm and its implications. There is no unique formula that solves a firm's capital structure allocation, nor is there likely to be one. However, a careful study of the field should enable individuals to specify appropriate boundaries of how much of each type of financing is reasonable. We also identify areas where future investigations should better resolve the firm decision.

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REFERENCES

Modigliani, F., and M. Miller. 1958. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* (June): 261–97.

Modigliani, F., and M. Miller. 1963. "Corporate Income Taxes and the Cost of Capital," *American Economic Review* (June): 433–43.

1

Introduction

Central Tenet: "Why then do economists keep trying to develop models that assume rational behavior by firms?"—Merton Miller (1977)

GENERAL OVERVIEW

The introduction describes in overall terms the evolution of the debt/equity structure paradigm to the current state of the research frontier. Subsequent chapters discuss stages of paradigm shifts and associated empirical findings. The objective of the book is to provide the reader with a framework for examining debt/equity decisions. We have organized each subsequent chapter in the following manner: Each chapter begins with a discussion of the central tenet for that chapter. Next, both the theoretical research and empirical evidence pertaining to the tenet are discussed. The final part of the chapter summarizes the implications of the paradigm shift for both current and for future research and practice. The last section of the introduction presents the organization of the book, with a brief synopsis of each chapter.

DEFINITIONS

Our focus in this book is to examine the trade-off between debt and equity in the firm's capital structure. We shall define capital structure as the mixture of long-term[1] debt and equity that is used to finance the firm's productive assets. Debt is a contractual arrangement between the firm and the debt holders that includes the principal, relevant interest and maturation date. Equity defines ownership where the holder has certain rights to the overall direction of the firm and the disposition of residual assets at the dissolution of the firm. A firm target capital structure is the debt/equity tradeoff that management determines to be ideal. However, a firm's target capital structure may not necessarily be optimal in terms of return and risk to the stockholders. This issue is the subject of agency conflict in Chapter 6.

To place these concepts in perspective, consider a typical United States firm's annual report balance sheet. The financing section side generally is divided into three major parts. The current liabilities[2] are those obligations that will come due within one year.

A second section of the liabilities in the balance sheet includes long-term liabilities. This is the place where long-term debt number(s) is (are) reported. Long-term debt has maturity of greater than one year. With the exception of consol bonds that have no maturity date, this debt has an identifiable date when the principal must be repaid. Accounting statement footnotes also include information about the payment of interest and relevant debt agreement terms and covenants. It must be noted that long-term liabilities also include other obligations such as deferred taxes and pension liabilities. We discuss only the long-term debt decision. We examine other long-term liabilities only insofar as some research might have included them as variables in addressing the capital structure decision.

The third section of the financing side of the balance sheet describes the firm's equity. There are three major subsections of a firm's equity: (1) owner's stock contributed capital description, (2) retained earnings (the cumulative firm profits), and (3) a miscellaneous category covering items that do not pass through the income statement such as cumulative foreign exchange translation adjustments of overseas subsidiaries. In this book we are primarily concerned with owner's stock contribution and retained earnings, as these categories are the sources that firms use to finance their productive assets.

Leverage is a frequently used business term and is sometimes used interchangeably with the term *capital structure.* There is no exact definition of what leverage is. In Chapter 9 we cover executives' rankings of numerous alternative leverage measures where the times-interest-earned ratio was the most frequently chosen measure. Financial analy-

sis textbooks (e.g., Penman 2001) define leverage as the proportion of assets financed by equity. Another typical measure of leverage is total debt divided by equity. Financial analysis texts also emphasize the impact of leverage in increasing the earnings power of equity. This ratcheting-up effect is the reason that the British call leverage "gearing." This book analyzes the capital structure paradigm, and accordingly we focus on financial leverage where equity is a proportion of the financing of assets.

A number of other variables have been developed to explain capital structure. These variables are discussed in the respective chapters when they are needed. It should be noted that one of the problems of capital structure research is that researchers have created some sophisticated concepts to explain firm/management/investor behavior, but these variables are often not directly observable for reasons including information asymmetry (Titman and Wessels 1988). We shall point out these problems as they appear within the book.

CENTRAL THEMES

The question in this chapter's epigraph—"Why then do economists keep trying to develop models that assume rational behavior by firms?"—has a simple yet profound response. We are dealing with an important issue that needs to be scientifically investigated, and the results will enable firms to make better capital structure decisions. The next question is: How effective are the results of academic research on practice? The answer depends on the strength of the cause and effect. Let's look at one anecdotal example. When one of the authors of this book was taking a Ph.D. seminar, the professor teaching the class told the students not to bother empirically testing the Black-Scholes' option pricing theory model. When the class apparently looked surprised, the professor said that all the traders were using computerized Black-Scholes computations to figure the option price. One of the authors of the book does remember well the introduction of handheld calculators on the floor of the Chicago Board of Trade, which did compute option prices. After everyone was using the Black-Scholes calculated prices, the prospect of measuring differences from the market to the calculated price became a moot point.

The moral of the story is that rational pricing models can impact on the decision process. So, how does this story relate to the capital structure decision? First, let's cut to the chase and state that there is no one formula that gives a "right" answer. This point is a central recurring theme of this book. If, and only if, there is no "right" answer, there is value to start from the basics and work through the history of ideas to

the current research frontier. We will address the learning curve of capital structure models that continues to develop. In looking at the capital structure paradigm development, we start out with the basics and then add complexity, moving toward the best rational behavior model(s). With these models, firms (and, by extension, the economy) can optimize the scarce resource allocation process (a definition of economics).

On one level, this book organizes capital structure literature like a reference guide that provides value in and of itself. On another level, we use a paradigm development approach to help readers organize their own models for a particular application or theoretical analysis. However, we need to settle a basic question of the value of this approach. For this justification, we turn to the scientific method and consider the alternative of not organizing the information. Suppose we merely place all the data in a hat and let the computer sort out some approach. In fact, a computerized approach to sorting out capital structure theory has been made. Titman and Wessels (1988) utilize a factor analytical approach, LISREL, which assesses unobserved or latent variables that may explain a dependent variable through linear functions of observed variables and a random error term. Recall the previous discussion in this chapter that leverage has no universally accepted definition. The authors use six different measures of leverage, and they combine these measures into one composite debt ratio proxy. The leverage measures are debt (long-term [LT], short-term [ST], and convertible [C]) divided by equity (book [BVE] and market [MVE]).

The attributes chosen by Titman and Wessel (1988) attempt to span the space of capital structure factors. Their determinants are collateral value of assets, non-debt tax shields, growth, uniqueness of the business, industry classification, volatility, and profitability. We shall examine these variables in more detail to help us appreciate at the outset the difficulty of making the capital structure decision. The collateral value of the assets reflects interdependence between financing and investment. We will revisit the linkage between financing and investment because it is an important point, whether or not a separation exists between investment and financing. *Collateral* is a simple idea that the firm pledges something that the investor (lender) can acquire if the investee (borrower) fails to satisfy the contractual terms of the investment. The authors defined collateral value with the ratio of intangible assets to total assets (INT/TA). The logic is that the ratio has an inverse relation to the proportion of physical goods that the investor can get in the event of financial distress. They also use the ratio of inventory and gross plant and equipment divided by total assets (IGP/TA).

The second category of Titman and Wessels' (1988) attributes concerns non-debt tax shields, which are depreciation and investment tax

credits. The logic for including this attribute is that it serves as a substitute for debt whose interest is also tax deductible in terms of increasing the bottom line by lowering tax expense. There is a presumption that part of the purpose of issuing debt is to get the tax advantage of interest deductions. The tax shield variables are investment tax credit divided by total assets (ITC/TA) and also depreciation divided by total assets (D/TA). The authors also make another estimate of non-debt tax shields by taking operating income; subtracting interest payments; and subtracting tax payments divided by a tax rate. Then the estimate is divided by total assets to produce a ratio (NDT/TA).

Next, Titman and Wessels (1988) considered the prospect that management might try to take advantage of debt holders by issuing debt that will be invested in projects of higher risk than the debt holders were led to believe, creating a potential transfer of wealth from debt holders to stock holders and management. For a fixed return on investment, the debt holders absorb all the risk, but get locked into contractual interest payments for their returns. If the new project succeeds, the equity holders get the rewards, and if the project causes bankruptcy, then the stock holders walk away leaving the debt holders with nothing. The authors proxy growth for this agency factor on capital structure choice. Growth variables include capital expenditures divided by total assets (CE/TA) and percentage change in total assets (GTA). Research and development divided by sales (RD/S) is also used as a growth variable. Clearly, growth may proxy for factors other than agency risks. Thus, the reader can see the potential problems of variable identification in capital structure decision models.

The ability of firms to get some form of monopoly rent for its service or product is a firm attribute that can impact on its capital structure because firms will have an identifiable guaranteed cash flow with which to pay interest to debt holders. Titman (1984) made the case that a firm bankruptcy will be increasingly avoided by suppliers, customers, and workers when the firm has increasingly unique characteristics that cannot be easily replaced in the market. Thus, the firm's debt ratio should have an inverse relation with the firm's uniqueness. For example, most electric utilities have relatively high debt rates. Titman and Wessels (1988) measured uniqueness as research and development divided by sales (RD/S), which was used also as a growth factor. Recall that the factor-analytical technique tries to model a linear combination of underlying variables and therefore the variable can repeat its usage. A second variable for uniqueness is the ratio of selling expenses to sales (SE/S). A third variable is quit rates (QR), which is the percentage of workers in the industry who left their jobs during the sample years.

In a related attribute to uniqueness, Titman and Wessels (1988) included an attribute for industry classification. Rather than define indus-

try by a set of categories indicative of function, however, the authors assign a zero/one dummy variable only to firms producing machines and equity in SIC codes between 3400 and 4000. Their reasoning is similar to the aforementioned liquidation issue of Titman (1984). In practice, there is a tendency for a firm's leverage ratios to be near industry means (Lev 1969). Thus, this attribute could potentially be improved on.

Size is another attribute used by Titman and Wessels (1988). In many research studies, size potentially proxies for numerous unobservable variables. Titman and Wessels measured size as the natural logarithm of sales (Ln(S)). The authors were again trying to proxy for bankruptcy costs that arguably should affect the amount of debt in a firm's capital structure. The authors also used a quit ratio (QR) to indicate size because larger-firm employees will be in a better labor market situation than those at smaller firms.

The issuance of new financing is generally quite costly. Therefore, an advantage exists for firms to use their own capital to finance projects. However, a firm can only use their own retained earnings (if they exist and represent accessible resources). Thus, profitability is another attribute used by Titman and Wessels (1988) to model the hierarchy of external and internal financing. They measured profitability by the ratio of operating income to sales (OI/S) and operating income divided by total assets (OI/TA).

Titman and Wessels (1988) included volatility as an attribute without much foundation, but it is definitely a significant factor according to findings in Chapter 8. In fact, many of these variables are used in the empirical analyses that are covered in this book. Their volatility variable is defined as the standard deviation of the percentage change in operating income (SIGOI).

Are the variables used by Titman and Wessels (1988) completely exhaustive given the advances in the research frontier between 1988 and the present? The answer is definitely no, and this is part of the reason that an organized approach of a paradigm development is useful. First, let us look at the factor loading of the observed variables on the factors in Titman and Wessels' Table II, which is Table 1.1. As we can see the loadings are mostly of good size and highly significant. There is a fair degree of correlation between growth and the non-debt tax shield factor that raises some concern about the independence of the factors. This result is of concern for anyone trying to make sense of any model of capital structure. The simple fact is that most of the financial statement numbers move together over time, and there will be multicollinearity because the accounting equation (assets = liabilities + equity) will naturally result in variables explaining each other. In other words, the process of transformation of a firm's assets in the normal course of

TABLE 1.1 Measurement Model: Factor Loadings for Independent Variables[a]

	Attributes								
Variables	*Growth*	*Uniqueness*	*Non-Debt Tax Shields*	*Asset Structure*	*Size*	*Profitability*	*Volatility*	*Industry Dummy*	*Variance*
NDT/TA									0.393
			0.779 (26.7)						
ITC/TA									0.744
			0.606 (19.2)						
D/TA									0.280
			0.848 (30.1)						
RD/S	0.246 (6.6)	0.781 (21.6)							0.401
SE/S		0.681 (19.7)							0.536
CE/TA	0.951 (26.4)								0.095
INT/TA				-0.331 (-8.7)					0.891
IGP/TA				1.180 (15.7)					-0.392
Ln(S)									0.120
					0.938 (7.9)				
GTA	0.471 (13.9)								0.778
QR		-0.228 (-5.6)			-0.273 (-5.5)				0.896
OI/TA						0.641 (18.8)			0.589
OI/S						0.998 (27.8)			0.005
SIGOI							1.000		0.000
IDUM								1.000	0.000

[a]The T-statistics are in parentheses.

business links directly to a firm's equity and some of the liabilities. This problem is another good reason why it might be better to work through a reasoned path to determine capital structure.

The estimates for the structural coefficients in Table 1.2 are reproduced from Titman and Wessels' Table IV. This table answers the question that was originally posed about firm variables and capital structure values. Consistent with Titman (1984), firms with high uniqueness also have low debt ratios. The profitability coefficients are high and signifi-

TABLE 1.2 Estimates of Structural Coefficients[a]

	Attributes							
Debt Measures	*Growth*	*Uniqueness*	*Non-Debt Tax Shields*	*Asset Structure*	*Size*	*Profitability*	*Volatility*	*Industry Dummy*
1. LT/MVE	-0.068	-0.263	-0.058	0.041	-0.033	-0.213	-0.031	-0.106
	(-0.7)	(-3.7)	(-0.6)	(0.8)	(-0.6)	(-3.7)	(-0.7)	(-2.1)
ST/MVE	-0.112	-0.260	-0.041	-0.046	-0.183	-0.179	-0.017	-0.063
	(-1.2)	(-3.7)	(-0.4)	(-0.9)	(-3.2)	(-3.1)	(-0.4)	(-1.2)
C/MVE	-0.067	-0.076	-0.050	0.004	0.055	-0.108	-0.027	0.026
	(-0.7)	(-1.0)	(-0.5)	(0.1)	(1.0)	(-1.8)	(-0.6)	(0.5)
2. LT/MVE	0.230	-0.281	-0.113	-0.076	-0.132	-0.052	-0.043	-0.066
	(2.4)	(-3.6)	(-1.1)	(-1.4)	(-2.3)	(-0.9)	(-0.9)	(-1.2)
ST/MVE	0.140	-0.185	-0.079	-0.096	-0.284	-0.044	-0.038	-0.051
	(1.5)	(-2.4)	(-0.8)	(-1.7)	(-4.1)	(-0.7)	(-0.8)	(-0.9)
C/MVE	0.028	-0.065	-0.156	-0.019	0.050	0.026	-0.016	0.074
	(0.3)	(-0.8)	(-1.5)	(-0.3)	(0.9)	(0.4)	(0.3)	(1.3)

[a]The coefficient estimates are scaled to represent the estimated change in the dependent variable, relative to its variance, with respect to a change in an attribute, relative to its variance. T-statistics are in parentheses.

cant, which gives support to the pecking order hypothesis[3] for financing. The results suggest that small (large) firms are more likely to use short- (long-) term financing.

The conclusions from placing the variables in a hat and letting the computer generate a model are at best hypothetical. In particular, we don't know whether the capital structure choice is relevant or irrelevant to firm value maximization. Also, the sensitivity of factors to deviations is not clear from this factor-analytical approach. In conclusion, the weight of the evidence indicates that the best alternative is to try to understand capital structure decisions by reasoning through rational economic model building using the paradigm development approach of this book.

PARADIGM SHIFTS

As was previously discussed, researchers will always endeavor to make better rational models of capital structure decisions. Thus, we begin our exposition with the early Modigliani and Miller (1958) model of the impact of debt/equity on firm value. Then we progressively trace the historical developments and the paradigm shifts in capital structure decision making. Kuhn (1970) originated the proposition of paradigm formulation and the reasons that paradigms are resistant to change. Subsequently, Zupan (1991) articulated reasons why paradigms retain

favor, such as these: (1) adherents of old paradigms have economic incentives not to change, or (2) the intellectual mindset of the field does not easily accept theories out of the box. Capital structure research has provoked considerable controversy, and all the paradigm factors that are resistant to change are present.

Alternatively, Taubes (2001) advanced the proposition that the research community welcomes new paradigms, but only if they are right, because an assessment of the state of the research frontier and its potential for change governs intellectual process and value creation. This paradigm shift feature is the characteristic that sets this current work apart from other analyses of capital structure. Key questions facing researchers and practitioners are these: Is the identification of the frontier of knowledge clear with respect to debt/equity alternatives? Could a major paradigm shift change the nature of firm valuation with respect to debt/equity choices?

As the capital structure paradigm has evolved, there have been controversies about the correct "solution" for the firm. For example, Gordon (1982) developed a one-period economy with perfect capital markets where he successively adds conditions of corporate income taxes and various personal taxes. The end result is an interior optimum capital structure policy. However, Jaffe et al. (1984) made a firm behavioral adjustment to an aspect of Gordon's (1982) analysis and concluded that capital structure is irrelevant.

IMPLICATIONS OF PARADIGM SHIFTS

The development of paradigms for the trade-off between debt and equity in firm capital structure is particularly complicated by the difficulty in defining the factors affecting the decision process. These factors (1) are subjective, (2) include estimates of future possible events, and (3) deal with interactions between firm and market behavior. Not surprisingly, they can have definition and measurement problems.

We suggest trigger points (5 percent of firm value) of market imperfection factors to initiate the consideration of the need for in-depth investigations. While somewhat arbitrary, any capital structure decision that causes a variation of 5 percent of firm value from expectations will certainly be noticed by equity and debt investors. Also, the 5 percent factor is a commonly used threshold for materiality in financial statement audits.

CAPITAL STRUCTURE CHARACTERISTICS

Figure 1.1 shows factors that impact on a firm's capital structure. Beginning with Chapter 3, similar graphs are included featuring shaded

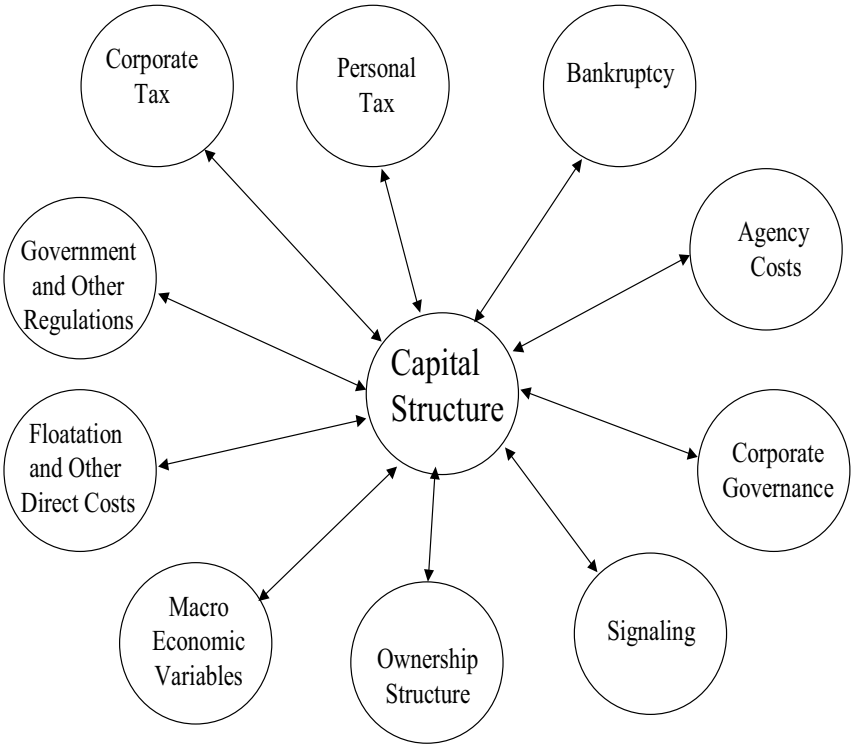


Figure 1.1 The graph that begins each chapter.

circles indicating factors specifically addressed in each chapter. For example, in Chapter 5 the bankruptcy circle is shaded.

We now briefly define the terms of the graph that begins each chapter. The corporate tax is the combined tax burden paid by the company to various government agencies. The personal tax refers to the taxes paid by individuals (including individual investors) to government. There are two personal tax components. First, there are the personal taxes (i.e., ordinary income) paid on corporate debt instruments. Second, there are the personal taxes paid on equity returns (e.g., capital gains). It is important to distinguish between the two types of personal taxes because they affect the capital structure decision.

Bankruptcy concerns the issues of default costs on debt, which may be direct (e.g., filing costs) or indirect (e.g., lost executive time and market share). Bankruptcy costs also may raise the price of corporate debt interest. Floatation and other direct costs refer to issuance expenses when a firm sells securities to the public.

Agency costs are hidden effects arising from conflicts between stakeholder groups. For example, management shirking could increase the cost of equity. Or, management could promise debt holders that debt was going to finance a secure project and then substitute a risky project. Given that debt holders anticipate these asset substitutions, the price of debt will accordingly increase, adding an agency cost. Corporate governance describes firm management (i.e., proper and responsible) and is related to agency costs. Ownership structure identifies the significant players (or the lack of them) in affecting power through board of director elections.

Management may try to signal the investing public about firm quality. Management sends signals to the market hoping to achieve the lowest cost of capital, which, in turn, will generate the greatest possible firm value (and generally highest management wealth). Firms make capital structure decisions that (1) increase leverage, (2) decrease leverage, or (3) swap one form of leverage for another. Consequently, these decisions could increase or decrease the size of the firm or leave it at the same level. The decisions are prompted by a complex set of variables including the firm's investment opportunity set (IOS), that is, its future growth options.

Every senior business executive knows that government regulations have a strong influence on firm behavior. Government regulations include financial and tax reporting mechanisms that could affect capital structure through disclosure factors. On a related issue, macroeconomic variables can impact capital structure. When interest rates are low, firms have incentives to finance with debt so as to minimize the weighted average cost of capital and presumably maximize firm value. On the other hand, when economic conditions are volatile, there is an increased risk of default, and firms are influenced to reduce debt in the capital structure.

As we review this list we see a comprehensive set of variables that can be used when making capital structure decisions. Thus, the variable charts in the book provide a reference mechanism to review issues.

SUMMARY

This chapter sets the boundaries on the issues covered in the book and provides a layout of the format for each chapter. Here we provide key definitions and describe factors that impact on a firm's capital structure. There is no unique formula for computing the capital structure of a firm. However, management's decision about capital structure is an important factor in a firm's success or failure. Thus, we discuss the nature of paradigm shifts as a means of understanding firm capital structure.

NOTES

1. Greater than one year.
2. In this book, we do not consider the decision of how to manage current liabilities.
3. The pecking order hypothesis posits that internal funds get used first before external funds. Unlike deciding on the mix of debt and equity, if the pecking order hypothesis is valid, some attention needs to be paid to the mix of internal and external funds

REFERENCES

Gordon, M. 1982. "Leverage and the Value of a Firm under a Progressive Personal Income Tax." *Journal of Banking & Finance* 6 (December): 483–93.

Jaffe, J., R. Westerfield, and M. Gordon. 1984. "Leverage and the Value of a Firm under a Progressive Income Tax: A Correction and Extension/Reply." *Journal of Banking & Finance* 8 (September): 491–97.

Kuhn, T. 1970. *The Structure of Scientific Revolutions*. 2d ed. Chicago: University of Chicago Press.

Lev, B. 1969. "Industry Averages as Targets for Financial Ratios." *Journal of Accounting Research*, Autumn: 290–99.

Miller, M. 1977. "Debt and Taxes." *Journal of Finance* 32 (May): 261–75.

Modigliani, F., and M. Miller. 1958. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* (June): 261–97.

Penman, S. 2001. *Financial Statement Analysis & Security Valuation*. Boston: McGraw-Hill Irwin.

Taubes, G. 2001. "Rethinking the Paradigm Paradigm." *Technology Review* 104 (November): 90–91.

Titman, S. 1984. "The Effect of Capital Structure on a Firm's Liquidation Decision." *Journal of Financial Economics* 13 (March): 137–51.

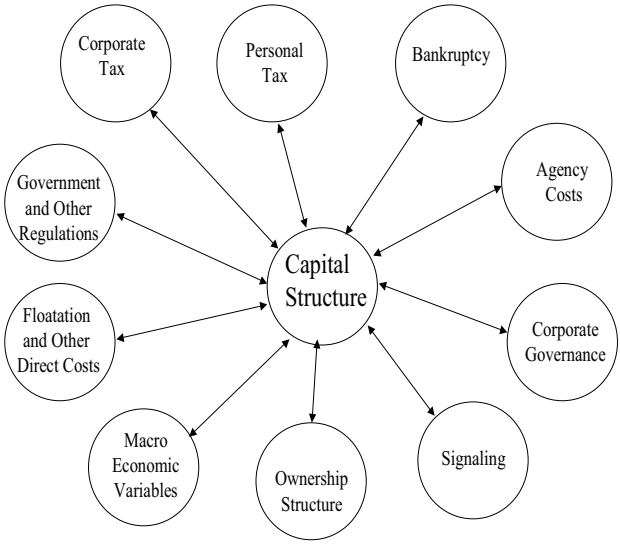
Titman, S., and Wessels, R. 1988. "The Determinants of Capital Structure Choice." *Journal of Finance* 43 (March): 1–19.

Zupan, M. "Paradigms and Cultures: Some Economic Resources." *American Journal of Economics and Sociology* (January): 99–103.

2

Foundations–Is the Debt/Equity Decision Irrelevant?

Central Tenet: Under MM (1958) assumptions including no taxes, the debt/equity decision is irrelevant.



INTRODUCTION

The issue of how capital structure affects the cost of capital has challenged both economic theorists and corporate finance professionals for a long time. Corporate finance specialists are concerned about implementing the appropriate capital structure that will ensure the firm's survival and growth. They are also interested in the microissue of capital budgeting and how to integrate the financing sources and project returns into a single method of project and financing alternative choice. On the other hand, the economic theorist is interested in explaining the investment behavior and policy implications. The absence of a theoretical framework before 1958 made this issue both complex and subjective.

The first theoretical analysis of the issue was by Modigliani and Miller (1958).[1] They showed theoretically that the choice of a firm's debt/equity financing mix has no impact on its firm value under certain assumptions. Their analysis and assumptions formed the foundation for almost all subsequent analyses of debt/equity decisions. In particular, it focused the research direction on the assumptions that they made. This chapter explains the Modigliani and Miller (MM) proposition, that capital structure decisions are irrelevant. The chapter then notes close developments and extensions of the basic MM proposition along with implications.

THEORY

Basic Proposition I and II

The basic MM proposition is as elegant as it is simple. They make the following simplifying assumptions: (1) markets are perfect[2]; (2) markets are complete[3] (Copeland and Weston 1988); (3) firms can be categorized into equivalent risk classes such that the inherent business risk is the same for all firms in that class; (4) all investors have common beliefs about the securities; and (5) all investors are rational. It is also assumed that there are no agency costs and that the managers are interested in maximizing the value of the firm.[4] Within the preceding framework of assumptions, MM asserted that a firm cannot change the total value of its outstanding securities by changing the proportion of its capital structure. They assumed that there is no tax, no growth, depreciation is zero for the firm, and the firm will last forever; therefore, the firm value can be defined as the present value of the perpetual operating cash flows.

$$\text{Firm Market Value} = \text{present value function } [OCF_1 + OCF_2 + OCF_3 + \cdots + OCF_\infty],$$

where OCF_t is the operating cash flow at time t.

Because there are no taxes or transaction costs or depreciation, earnings before interest and tax (EBIT or operating income) is equal to operating cash flow. Based on the preceding assumptions, the firm value is the sum of the present values of all perpetual operating cash flows. Thus, the firm value can be written as equation (2.1).

$$V = \bar{X}/R \text{ or } R = \bar{X}/V \tag{2.1}$$

where:
V = value of firm,
$\bar{X}$ = firm expected operating cash flows
(i.e., Earnings before Interest (EBI) + Depreciation) and,
R = discount rate.

By definition the value V of a firm is equal to the sum of the market value of the stock S and its debt D, which is $V \equiv S + D$. Placing this definition into equation (2.1) gives the result:

$$R = \bar{X}/(S + D) \tag{2.2}$$

From (2.2), it is clear that if $\bar{X}$ is not affected by the debt/equity mix, the value of the firm will also not be affected by the mix. Because $\bar{X}$ is operating cash flow before interests and taxes, $\bar{X}$ is not affected whether or not the firm issues debts. Therefore, $\bar{X}$ is not affected by the firm's capital structure. Thus, MM showed that the firm's cost of capital is unaffected by the relative proportion of equity/debt financing. It is the so-called MM proposition I. MM demonstrated their proposition with an arbitrage argument. Given the MM assumptions, investors can use "homemade leverage" to replicate managers' capital structure decisions with no cost at the personal portfolio level. Consequently, capital structure decisions made by managers do not add value to the firm. They show in equilibrium that investors cannot create an investment profit from market transactions between the ownership of securities of the unlevered[5] firm and levered firm.

How does the homemade leverage work? Let's consider two firms that generate the same net operating income, where firm L is a levered firm and firm U is an unlevered firm. Suppose firm U is a firm with full equity financing. The capital structure of firm L is 50 percent equity and 50 percent debt. Under MM assumptions, there is no tax and the depreciation is zero. Assume that both firms are the same size of $1 million in total assets and have the same operating income of $100,000. Firm U is fully equity financed and has $1 million in total equity. Firm L has $500,000 in equity and $500,000 in total debt. We shall also suppose that both the individual and the firm can borrow at an annual interest rate of 10%. Thus, the interest payment of the corporate debt is $50,000

($500,000 × 10%). The value of net income available to shareholders of firm L is $50,000 ($100,000 – $50,000). For the unlevered firm U, we can presume that firm will issue $500,000 more equity to pay off the debt of $500,000. In order not to dilute the share price, all newly issued shares are sold to the existing shareholders. Thus, the levered firm L becomes an unlevered firm U by doubling its equity and eliminating its debts without changing the share price and the book value of the company. To digest those newly issued shares, however, shareholders as a whole must borrow $500,000 for purchasing those new shares. Because there is no interest payment to firm U, the operating income and net income are the same, $100,000. Yet, those shareholders of U are responsible for the interest payment, $50,000 (i.e., $500,000 × 10%), for the money borrowed for the newly issued shares. Thus, the value of net income available to the shareholders is equal to $50,000 ($100,000 – $50,000).

A simple financial statement is shown as Table 2.1. Based on the aforementioned example of homemade leverage, firm value is not independent of the capital structure. Shareholders also are not concerned whether the firm reaches the optimal capital structure because shareholders can replicate the ideal capital structure by themselves.

We can also think of the problem in a different way. Arbitrage opportunities might exist if capital structure matters to the firm value under the perfect financial markets. Suppose we consider an equilibrium in which the levered firm has a higher value than an equivalent unlevered firm that generates the same profits as the levered firm. If an investor owned a fraction of the levered firm, then it should not be possible, in equilibrium, to gain an arbitrage profit by (1) selling the levered stock, (2) borrowing from a bank at the corporate levered rate, and (3) buying shares in the unlevered company from the proceeds of (1) and (2). If it were possible, all the investors who own shares in the levered firm would pursue that strategy and this security activity would create a demand imbalance for both the levered and unlevered firm stocks. As a result, the levered firm price will fall and the unlevered firm price will increase. Such trading action contradicts the claim that the prices were already in equilibrium. A similar

TABLE 2.1 Leveraged versus Unleveraged Firm Example

	Firm L	*Firm U*
Operating income	$100,000	$100,000
Interest payment	50,000	0
Net income	50,000	100,000
Shareholders' interest payment	0	50,000
Value of net income to shareholders	$50,000	$50,000

argument can be made if the value of the unlevered stock is assumed to be higher than the value of the levered stock. Therefore, the capital structure of firms will be irrelevant. Another way of looking at this argument is that the investors can replicate any capital structure with their own investments. They will neither subsidize nor overcharge for the firm to do it for them in the absence of transaction costs, liquidity constraints, personal/corporate differences in interest rates, tax rates, bankruptcy costs, and agency costs. Other authors (Hirshleifer 1966, Stiglitz 1969) have also proven the MM irrelevancy results under perfect and complete market conditions.

In addition to the basic proposition I, MM also present two other propositions in their seminal article. Proposition II states that the cost of equity of a firm increases linearly with leverage in such a way that the market-value-weighted average of the equity and debt costs remains a constant. The origin of this concept comes from the formulation of the weighted average cost of capital (WACC). Perfect markets are still assumed. Tax is still not considered. Thus, WACC can be written as follows:

$$\text{WACC} = (E/V) \times K_E + (D/V) \times K_D \tag{2.3}$$

where V is the value of the firm, which is also the sum of market value of equity (E) and market value of debt (D). K_E and K_D are the costs of equity and debt, respectively. By rearranging equation (2.3), we get equation (2.4), which forms MM proposition II.

$$K_E = \text{WACC} + (\text{WACC} - K_D) \times (D/E) \tag{2.4}$$

The detail of equation (2.3)'s derivation is shown in section D of this chapter. Based on equation (2.4), MM proposition II shows that the cost of equity depends on the required rate of return of firm assets (WACC), firm's cost of debt (K_D), and firm's debt-equity ratio (D/E). Thus, MM proposition II without tax consideration shows that the cost of equity is a positive linear function of the firm's capital structure (Figure 2.1).

We can also prove MM proposition I in Figure 2.1. Based on Figure 2.1, the cost of the firm capital (WACC) is irrelevant to the debt-equity ratio (D/E). In other words, capital structure does not matter for the firm WACC. The rationale is that the cost of debt is lower than the cost of equity. The lower cost of debt offsets the higher cost of equity. Thus, the change of the capital structure (E/V and D/V) is exactly offset by the cost of equity, and the cost of firm capital (WACC) remains constant.

The third MM proposition addresses the capital budgeting issue and states that the hurdle rate for any investment return is the weighted average cost of capital that is independent of leverage, irrespective of

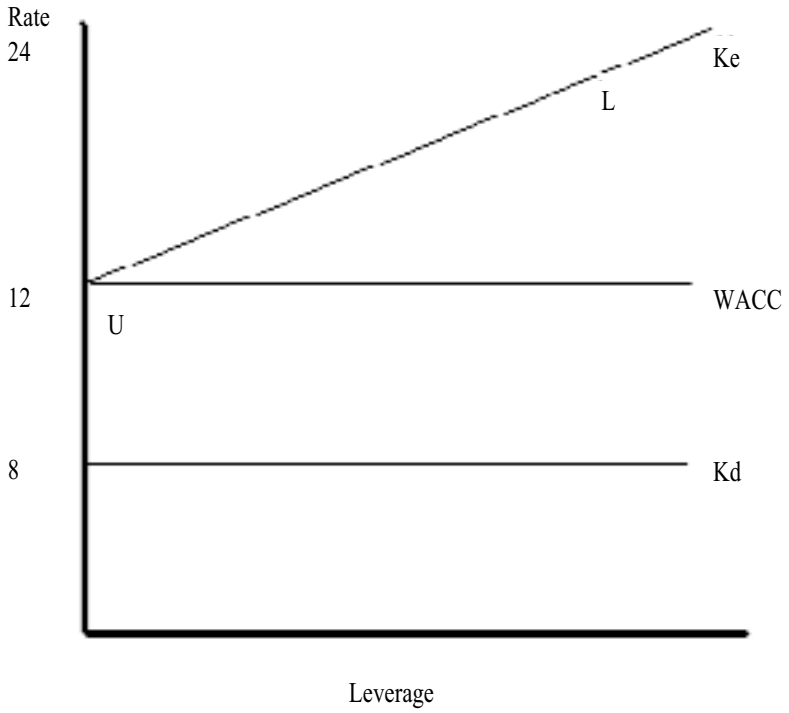


Figure 2.1 Capital rates under perfect market conditions.

whether that particular investment is being financed with debt or equity or a combination of the two.

The MM arbitrage argument is well grounded and is capable of further development. For example, Titman (2002) argued that the nature of market conditions may play a key role in the financing activity. Stiglitz (1974) extended MM (1958) to a multiperiod setting with a general equilibrium that also indicates that firm capital structure policy is irrelevant. Several authors (e.g., Hamada 1969; Brenner and Subrahmanyam 1977) demonstrated in equilibrium that the MM propositions are consistent with the capital asset pricing model (CAPM). Lachenmayer (1984) analyzed the MM and CAPM theories with respect to international firms. The author concluded that it doesn't matter if such a firm is financed domestically or internationally. Also, Rajan and Zingales (1995) found that the leverage ratios are similar across the G-7 countries. In a similar study, Wald (1999) investigated the relationship of factors in the capital structure of firms in France, Germany, Japan, the United Kingdom, and the United States. On average, Wald found no differences across the board in the mean leverage. Rajan and

Zingales expressed the opinion that a theoretical reasoning for their empirical findings is unknown. Wald suggested that firm variable correlations across countries may be attributable to agency costs, information asymmetries, and bankruptcy costs.

Mehta et al. (1980) expand the MM model of firm policy including dividend payout and growth within a capital market framework. The authors concluded that the MM propositions hold under an expanded concept of the firm. On the other hand, Lang et al. (1996) conducted an empirical analysis relating growth to leverage. They found a negative relation between growth and leverage for firms that have poor investment opportunities (low Tobin's Q). For firms with good investment opportunities (high Tobin's Q), they report that leverage does not lower growth. In a similar vein, Barclay et al. (2001) investigated growth options and leverage. Their analysis indicated a negative relation of growth options and debt.

Sargent and Smith (1987) developed a single-good two-period model to investigate whether the MM propositions require a rate of return dominance or whether all agents have access to the complete set of state contingent markets. They determined that neither condition is necessary for irrelevance. Varela (1986) extended the MM cost of capital analysis to include the cost of labor and concluded that arbitrage opportunities are still eliminated within a firm class.

Arditti and Pinkerton (1978) pointed out that MM theory is limited and argued that it places too much value on growth because the firm value reflects an increased debt capacity from future projects' expected returns. Haugen and Kumar (1974) identified another real limitation to MM propositions—that it is difficult to maintain a book-to-market leverage ratio that reduces their usefulness because "growth" stocks do not fit in the framework. Schwab and Thompson (1980/1981) gave another word of caution that increasing leverage does not necessarily generate firm value. They noted that firm operating costs are independent of capital structure and that firm revenue will not be affected by a firm's capital structure. In addition, while inflationary times may encourage leverage, unions and other creditors may also demand increasing payments, which will diminish the value of leverage. Thus, one should not make simplistic conclusions about the value of leverage. Also the capital structure formulation can become complex fairly quickly as more variables are added. Glickman (1997) argued that the lack of bankruptcy is potentially one big problem with MM's 1958 proposition. Glickman noted that real-world business people probably set debt-to-equity ratios according to bankruptcies' risks. This issue is discussed in further detail in Chapter 5.

Durand (1989) addressed the issue that although MM tried to define a perfect market, they seemed unable to avoid market imperfections in

the form of monopolistic advantages for some firms. MM attributed the growth of stocks selling at premium multiples of earnings and book value to permanent monopolistic advantages in what seems to be a two-tier market. Durand (1989) attributed this phenomenon to the continuing creation (mostly by R&D) of new, temporary advantages in a world that still has a long way to go before reaching the long-run equilibrium. Hamada's (1972) capital markets' equilibrium derivation of MM propositions provided a good example of the potential pitfalls of not including variables such as corporate taxes and factors such as the limited liability of equity. Gordon (1989) argued that financial and nonfinancial organizations would be no more than legal fictions if the MM perfect market assumption were correct, in which case those companies have no purpose beyond serving their shareholders. Because the levered firm and unlevered firm have the same value under MM proposition I, the pecking order hypothesis would be invalid.[6] The firm will be indifferent to issuing more equities or debts to raise more funds; however, it does matter to the firm in the real world. The next chapter shows the case of MM proposition I and II with taxes and solves some of the aforementioned puzzles.

Modigliani and Miller (1958) modeled the firm under static conditions. We know that the real world treats firm questions in a dynamic framework. Swanson and Kissinger (1996) developed a dynamic version of MM, which is included in appendix 1 of this book. Their article also includes empirical evidence.

Financing/Investment

Proposition 3 of the MM (1958) analysis shows independence of financing and investment. This issue has been relatively controversial. Kumar (1974) demonstrated the difficulty of proving an MM proposition for investment/financing purposes within a capital markets' framework. Counter to the MM assumption, Greenberg et al. (1978) developed models that have direct relations between asset and financial markets. Greenberg argued that product-pricing decisions directly impact on a firm's financial market risk-return position. Peterson and Benesh (1983) examined empirically the linkage between financing and investment. The study utilizes two different statistical approaches. The results of both analyses indicated a linkage between financing and investment that is counter to MM's independence assumption. MM's proof is also based on the assumption that firms are in specific risk classes for investment purposes. Brunner's (1988) results disputed the firm behavioral assumption. His findings indicated that in mergers and acquisitions, the targets have significantly more leverage than the acquirers.

Leasing is one firm decision in which a direct link between operating asset and financing activity will be most pronounced. Lewellen and Emery (1981) presented a proposition of a linkage. Bowman (1980) showed empirically that leases are leverage. Bayless and Diltz (1990) constructed a leasing firm model that relates debt and levered and unlevered equity. If the risk of the leased assets differs dramatically from other firm assets, then the identification of the leased assets becomes an important issue for investors.

EMPIRICAL EVIDENCE

A direct empirical validation of this model is rendered unfeasible because the assumptions are rarely satisfied fully in practice; however, there have been attempts to provide indirect empirical validations. If the leverage decision did not matter, we would expect the leverage to be randomly distributed across the economy; however, definite clustering of leverage occurs in practice by industry. For example, utility companies have very high levels and new software companies have very low levels of debt.

Modigliani and Miller (1958) performed regressions of the oil and electric utility industry that report little association of the weighted cost of capital with leverage (Table 2.2). Howe (1977) includes regulatory factors in a regression and the results agree with MM's findings. On the other hand, Patterson (1983) finds that only for low levels of leverage for utilities does the value of the firm increase with leverage. Otherwise, there is a concave relation between leverage and firm value.

Given that direct MM tests are not feasible, researchers have used various techniques to control for factors that affect the proposition. Joy and Jones (1975) made tests by constraining risk to be constant and the results support the MM irrelevance proposition. Litzenberger and Rao (1972) noted that under certainty a firm's cost of capital is directly observable, but under uncertainty it is not directly observable. Thus, Litzenberger and Rao (1972) used a structural econometric equation analysis in which firm risk is heterogeneous and determines the cost of capital for chemical industry firms that were impacted by leverage and

TABLE 2.2 MM Industry WACC Regression

Industry	*Dependent Variable*	*Intercept*	*Regression Coefficient*	*R Square*
Electric Utilities	WACC	= 5.3	+ .006d (.008)	r = .12
Oil Companies	WACC	= 8.5	+ .006d (.024)	r = .04

other variables. Boness and Frankfurter (1977) also argued that MM single equation approach is not properly specified for homogeneity and controls for the MM risk-class concept with a random coefficient regression. They found that leverage matters.

When firm growth is considered by Weston (1963) as a control variable to explain the weighted average cost of capital, the leverage decision becomes relevant. Boness and Frankfurter (1977) also reported that growth affects the capital structure analysis. Haugen and Kumar (1974) concluded that the MM (1958) irrelevance proposition only holds when growth opportunities are not present.

Using data between 1975 and 1979, Peterson and Benesh (1983) found that financing decisions do impact investment decisions. They attributed the connection to market imperfections. It is easy to read the *Wall Street Journal* and see large-scale projects that are specifically financed. This relation is sometimes seen as a limiting factor on the MM arbitrage argument. Another potential with MM's framework is indicated by empirical regression findings of Chittenden et al. (1996), who find a relation between profitability and leverage for small British firms. Also, Chowdhury and Miles (1989) ascertained that higher profitability in a sample of British firms leads to debt principal repayments. The prospect of an interaction between leverage and profitability casts doubt on the MM assumption of separability between financing and investment because investment generates profits. Minton and Schrand (1999) investigated another aspect of the linkage between investment and financing. They concluded that the cash flow volatility of investments impacts on financing. Firms with higher cash flow volatility have to access the capital markets more often and they pay higher financing costs.

MM's (1958) empirical work on the irrelevance theory proposition gaves researchers and practitioners a starting point in which the preponderance of the evidence indicates that the debt/equity mix decision is irrelevant. However, numerous studies have refuted the MM (1958) empirical findings after reasoning that other factors apply.

IMPLICATIONS OF THE FOUNDATION PARADIGM

In practical terms, let us presume we are managers about to finance a business with public offerings. The firm must make an investment in assets equal to $100. There are two capital structure alternatives: one with debt and one without (i.e., equity equals assets of $100). We want to choose the alternative with the lowest WACC because it will create the maximum value of the firm, assuming it is a perpetuity of firm Value equal to Assets divided by WACC. Our world has been devised accord-

ing to perfect market assumptions (e.g., no taxes). Our assets will give a return on assets equal to K, which will be 12 percent.

Our first scenario is to finance our assets exclusively with equity (E = total assets). The net income will be:

$$NI_E = K \times Assets_E \tag{2.5}$$

For the firm with no debt (the unlevered firm), the return on equity will be the WACC as per:

$$WACC_E = K_E = NI_E \; / \; E \tag{2.6}$$

Substituting in equation (2.3) into (2.4) and knowing that $Assets_E$ are exactly financed by E (the equity), the WACC must equal R.

$$WACC_E = K \times Assets_E / \; E = K \tag{2.7}$$

For purposes of our sample firm, the all-equity-financing $WACC_E$ is therefore 12 percent.

In the second scenario, we consider a firm financed partially with debt (D). For purposes of example, the debt rate R_D will be 8 percent and the firm will be financed with 75 percent debt. Thus, D will be 75 and E will be 25. With the inclusion of debt into the capital structure, the $WACC_D$ is:

$$WACC_D = K_D \times D/(D+E) + K_E \times E/(D+E) \tag{2.8}$$

In this scenario all the variables are defined except one. We must now compute K_E. As before, we first compute the net income NI_D and then divide by equity E. In this scenario, we shall consider assets ($Assets_E$) financed by equity and assets ($Assets_D$) financed by debt. This distinction is arbitrary for purposes of computation because assets will have a return on assets K irrespective of the financing source. Net income for the debt scenario is the earnings from the equity-financed asset plus earnings from the debt-financed asset minus the interest on the debt :

$$NI_D = K \times Assets_E + K \times Assets_D - K_D \times D \tag{2.9}$$

Next, we divide through by E to get the return on equity or cost of equity:

$$K_E = K \times Assets_E \; / E \times K \times Assets_D \; / E - K_D \times D/E \tag{2.10}$$

Substituting the "fact" that $Assets_E = E$ and $Assets_D = D$, the consequence is:

$$K_E = K \times E/E + K \times D/E - K_D \times D/E \tag{2.11}$$

And collecting terms the result is:

$$K_E = K + (K - K_D) \times D/E \tag{2.12}$$

In our example the value of K_E is:

$$K_E = .12 + (.12 - .08) \times 75/25 = .24$$

We plug all of the variables into equation (2.8) for WACC and the answer is:

$$WACC_D = .08 \times 75/(75+25) + .24 \times 25/(75+25) = .12$$

This partially debt-financed result is the same as for an all-equity-financed firm. The WACC will be the same for any mix of debt and equity (Figure 2.1). Scenario 1 (Point U on Figure 2.1) is the all-equity financing and Scenario 2 (Point L on Figure 2.1) is the partially debt-financed firm. There is a constant trade-off between the cost of equity, cost of debt, and the relative proportion of their financing in the capital structure. The value of the firm (833 = 100/.12 in the example) is independent of the capital structure because it is equal to a perpetuity of the total assets (100 in the example) divided by the WACC (.12 in the example).

The key implication of the MM (1958) irrelevance proposition is that it does not matter how firms finance themselves in the absence of taxes. While this proposition may appear simplistic to current capital structure issues, MM provide a conceptual foundation to build theory. As the capital structure paradigm evolves through the course of this book, the assumptions of perfect and complete markets are addressed in ways that permit increasingly improved characterizations of actual markets and firm behavior.

MM (1958) also make us respect the prospect of arbitrage in a capital structure transaction. When one examines complex capital structure transaction arguments, if investors can create a riskless profit from arbitrage, then there is something wrong for the company doing the transaction.

Titman (2002) explored supply side implications of MM (1958). He addressed issues that weaken the MM perfect markets assumption. He argued that investor clientele will demand that firm securities be re-

packaged by intermediaries/companies to meet demands of investor clienteles. If the repackaging is costless, then the MM proposition still holds even when markets are not complete. If the repackaging becomes costly, however, then investment bankers and corporate finance specialists step in to create contracts acceptable to investors. The consequence of costly repackaging is also an impact on firm capital structure decisions because clientele market conditions affect the debt/equity mix. Thus, capital structure irrelevance won't hold when investor clienteles express demands in the market place. Because of the dollars involved, issuers of debt/equity securities must pay attention to market conditions in the corporate leverage decision.

SUMMARY

MM (1958) present a proposition of firm capital structure irrelevance with an arbitrage argument that forms the basis for an important part of corporate finance decision making. Researchers immediately probed limitations of the MM assumptions and generally have found the capital structure decision to be relevant, contrary to MM's original proposition. The key principle of MM's arbitrage should be considered in every capital structure decision by asking the "what if" question: What are the various conditions that make this situation depart from the MM irrelevance proposition, and are these conditions appropriately priced? For example, the introduction of corporate taxes dramatically changes the results and is discussed in the next chapter.

NOTES

1. Modigliani, Franco and M. H. Miller. 1958. "The Cost of Capital, Corporation Finance and the Theory of Investment." *American Economic Review* 48: 261–97; Modigliani, Franco, and M. H. Miller. 1959. "The Cost of Capital, Corporation Finance, and the Theory of Investment: Reply." *American Economic Review* 49: 655–68; Modigliani, Franco, and Merton Miller. 1963. "Corporate Income Taxes and the Cost of Capital: A Correction," *American Economic Review* 53: 433–42; Modigliani, Franco, and M. H. Miller. 1965. "The Cost of Capital, Corporation Finance, and the Theory of Investment: Reply." *American Economic Review* 55: 524–25; Modigliani, Franco, and Merton H. Miller. 1969. "A Comment on the Modiglinai-Miller Cost of Capital Thesis: Reply." *American Economic Review* 59: 592–95.

2. The following conditions are necessary for perfect markets:

a) The markets can have no "friction" (i.e., no transaction costs, no taxes, no regulatory restrictions and all assets must be traded on an atomistic level);

b) The product and security markets must be competitive in that producers supply goods at the average cost and everyone in the security market is a price taker where there is no bankruptcy;

c) Firms and individuals can borrow and lend at the same risk-free rate;

d) Information must be simultaneously available to all individuals at no cost; and

e) Individuals are rational utility maximizers.

3. To have complete markets, it should be possible to anticipate all probable states of nature and contract on them on a contingent.

4. In the world of certainty, the maximization of profits and the maximization of value yield the same result. Under uncertainty, they don't. Optimization of the capital structure is defined in terms of maximizing the market value.

5. The terminology of unlevered and levered has been used historically to simplify phrases such as "firms with no debt" or "firms with no leverage" for unlevered firms.

6. See Baskin (1989) for the detail of the pecking order hypothesis.

REFERENCES

Arditti, F., and J. Pinkerton. 1978. "The valuation and cost of capital of the levered firm with growth opportunities." *Journal of Finance* 33 n1 (March): 65–73.

Barclay, M., E. Morellec, and C. Smith. 2001. "On the Debt Capacity of Growth Options." University of Rochester, working paper.

Baskin, J. 1989. "An Empirical Investigation of the Pecking Order Hypothesis." *Financial Management* 18: 26–35.

Bayless, M., and J. Diltz. 1990. "Corporate Debt, Corporate Taxes and Leasing." *Managerial & Decision Economics* 11 (February): 13–19.

Boness, J., and G. Frankfurter. 1977. "Evidence of Non-Homogeneity of Capital Costs within 'Risk-Classes.' " *Journal of Finance* 32 (June): 775–87.

Bowman, R. 1980. "The Debt Equivalence of Leases: An Empirical Investigation." *Accounting Review* 55 (April): 237–53.

Brenner, M., and M. Subrahmanyam. 1977. "Intra-Equilibrium and Inter-Equilibrium Analysis in Capital Market Theory—A Clarification." *Journal of Finance* 32 (September): 1313–17.

Brunner, R. 1988. "The Use of Excess Cash and Debt Capacity as a Motive for Merger." *Journal of Financial & Quantitative Analysis* 23 (June): 199–217.

Chittenden, F., G. Hall, and P. Hutchinson. 1996. "Small Firm Growth, Access to Capital Markets and Financial Structure: Review of Issues and an Empirical Investigation." *Small Business Economics* 8 (February): 59–67.

Chowdhury, G., and D. Miles. 1989. "Modelling Companies' Debt and Dividend Decisions with Company Accounts Data." *Applied Economics* 21 (November): 1483–1508.

Copeland, T., and F. Weston. 1988. *Financial Theory Corporate Policy.* 3d ed. Reading, MA: Addison-Wesley Publishing Company.

Durand, D. 1989. "Afterthoughts on a Controversy with MM, Plus Thoughts on Growth and the Cost of Capital." *Financial Management* 18: 12–18.

Glickman, M. 1997–98. "A Post-Keynesian Refutation of Modgliani-Miller on Capital Structure." *Journal of Post Keynesian Economics* 20 (Winter): 251–74.

Gordon, M. J. 1989. "Corporate Finance under the MM Theorems." *Financial Management* 18: 19–28.

Greenberg, E., W. Marshall, and J. Yawitz. 1978. "The Technology of Risk and Return." *American Economic Review* 68 (June): 241–51.

Hamada, R. 1969. "Portfolio Analysis, Market Equilibrium, and Corporation Finance." *Journal of Finance* 24 (March): 13–31.

Hamada, R. 1972. "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stocks." *Journal of Finance* (May): 435–52.

Haugen, R., and P. Kumar. 1974. "The Traditional Approach to Valuing Levered Growth-Stocks: A Clarification." *Journal of Financial & Quantitative Analysis* 9 (December): 1031–44.

Hirshleifer, J. 1966. "Investment Decisions under Uncertainty: Application of the State-Preference Approach." *Quarterly Journal of Economics* 80 (May): 262–77.

Howe, K. 1977. "Public Utility Valuation and Cost-of-Capital Models: Some Regulatory and Economic Considerations." *Quarterly Review of Economics & Business* 17 (Winter): 57–76.

Joy, M., and C. Jones. 1975. "Leverage and the Valuation of Risk Assets—an Empirical Test." *Quarterly Review of Economics & Business* 15 (Winter): 81–92.

Kumar, P. 1974. "Market Equilibrium and Corporation Finance—Some Issues." *Journal of Finance* 29 (September): 1175–88.

Lachenmayer, H. 1984. "The Effect of Currency Exchange Risks on the Cost of Equity Capital of the International and Multinational Firm." *Management International Review* 24: 28–37.

Lang, L., E. Ofek, and R. Stulz. 1996. "Leverage, Investment, and Firm Growth." *Journal of Financial Economics* 40 (January): 3–29.

Lewellen, W., and D. Emery. 1981. "On the Matter of Parity Between Financial Obligations." *Journal of Finance* 36 (March): 97–111.

Litzenberger, R., and C. Rao. 1972. "Portfolio Theory and Industry Cost of Capital Estimates." *Journal of Financial & Quantitative Analysis* 7 (March): 1443–62.

Mehta, D., E. Moses, B. Deschamps, and M. Walker. 1980. "The Influence of Dividends, Growth, and Leverage on Share Prices in the Electric Utility Industry: An Econometric Study." *Journal of Financial & Quantitative Analysis* 15 (December): 1163–96.

Minton, B., and C. Schrand. 1999. "The Impact of Cash Flow Volatility on Descretionary Investment and the Costs of Debt and Equity Financing." *Journal of Financial Economics* 54 (December): 423–60.

Modigliani, F., and M. Miller. 1958. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* 48 (June): 261–97.

Patterson, C. 1983. "The Effects of Leverage on the Revenue Requirements of Public Utilities." *Financial Management* 12 (Autumn): 29–39.

Peterson, P., and G. Benesh. 1983. "A Reexamination of the Empirical Relationship between Investment and Financing Decisions." *Journal of Financial & Quantitative Analysis* 18 (December): 439–53.

Rajan, R., and L. Zingales. "What Do We Know about Capital Structure? Some Evidence from International Data." *Journal of Finance* 50 (December): 1421–60.

Sargent, T., and B. Smith. 1987. "Irrelevance of Open Market Operations in Some Economies with Government Currency Being Dominated in Rate of Return." *American Economic Review* 77 (March): 78–92.

Schwab, B., and M. Thompson. 1980/81. "Some Indirect Costs of Corporate Debt Financing: An Exploratory Note." *Journal of General Management* 6 (Winter): 53–57.

Stiglitz, J. 1969. "A Re-Examination of the Modigliani-Miller Theorem." *American Economic Review* 59 (December): 784–93.

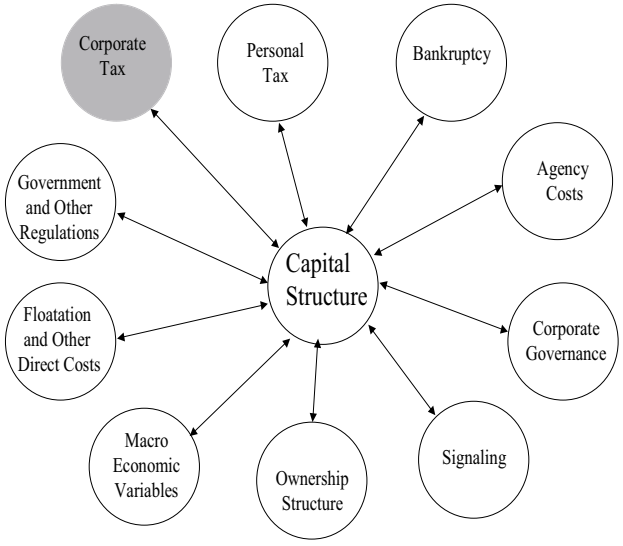
Stiglitz, J. 1974. "On the Irrelevance of Corporate Financial Policy." *American Economic Review* 64 (December): 851–66.

Swanson, Z., and J. Kissinger. 1996. "The Relationship between Accounting Cost of Capital and Stock Market Returns." FMA Meeting, New Orleans.
Titman, S. 2002. "The Modigliani and Miller Theorem and the Integration of Financial Markets." *Financial Management,* Spring: 101–15.
Varela, O. 1986. "Firms' Factor Cost Responses to the Modigliani-Miller Propositions." *Review of Business & Economic Research* 22 (Fall): 55–68.
Weston, J. 1963. "A Test of Capital Propositions." *Southern Economic Journal* (October): 105-12.
Wald, J. 1999. "How Firm Characteristics Affect Capital Structure: An Informational Comparison." *Journal of Financial Research* 22 (Summer): 161–87.

3

Impact of Corporate Tax

Central Tenet: With corporate taxes and no personal taxes, the optimum debt level shifts to 100 percent.



INTRODUCTION

Modigliani and Miller (MM) (1963) added the effect of corporate taxes to the capital structure framework. Contrary to their earlier result (MM 1958) showing the debt/equity question to be irrelevant, MM (1963) found that firm value is maximized when the firm is financed entirely with debt. However, their analysis assumes that there is no potential bankruptcy cost (see Chapter 5) or agency cost (see Chapter 6) or signaling implications (see Chapter 7). Anecdotal evidence tells us that no firm has a 100 percent debt level, which is of course impracticable because some ownership equity must exist in a firm, and most state incorporation laws require at least minimal levels of equity ownership. The conclusion is that taxes theoretically affect capital structure, but the tax effect is not so dominant empirically as to negate the potential costs of bankruptcy, agency, and signaling that result from all-debt financing.

THEORETICAL FRAMEWORK

Modigliani Miller (1963)

MM (1958) showed that the capital structure decision is irrelevant; that is, a firm may use any combination of debt and equity, but the overall value of the firm will be unaffected. MM (1963) reconsidered and revised their capital structure analysis with corporate taxes and demonstrated that capital structure does have relevance for firm value. They demonstrated that, given the deductibility of taxes, firms should use the maximum amount of debt attainable. All of the same MM (1958) perfect market assumptions are made in MM (1963), except that taxes are added as an imperfection. MM (1963) began their analysis with a definition of an unlevered firm, as shown in equation (3.1), which is a renamed version of equation 2.1 from their general MM (1958) description of firm value.

$$V_U = (1-\tau)\bar{X}/\ R \text{ or } R = (1-\tau)\bar{X}/\ V_U \tag{3.1}$$

where:

V_U = value of unlevered firm,
$\bar{X}$ = firm expected income,
R = discount rate, and
τ = corporate tax rate.

MM (1963) hypothesized that investors value the levered firm using the after-tax returns, which have two components. The first component

is shown in equation (3.1). The second component is the market value of debt (assuming the debt is risk free), which they define as:

$$D = I/r \tag{3.2}$$

where:

D = value of firm debt,
r = debt interest rate, and
I = debt payments.

The levered firm must pay taxes on the cash flows generated from the debt investment. Combining the two components results in a levered firm value of:

$$V_L = (1-\tau)\bar{X}/\ R + \tau D \tag{3.3}$$

MM (1958) showed that no arbitrage is possible to buy and sell shares of levered and unlevered firms that would give an economic advantage to either form of capital structure (hence irrelevance). MM (1963) went through the same buying and selling process used in MM (1958) and demonstrated an advantage to levered firms over unlevered firms attributable to the deductibility of corporate taxes.

Theoretical Analysis of MM (1963) Components

In MM's reconsideration and correction (1963), they break up the expected cash flow streams from the capital investments into their component parts, discounting each stream by the rate appropriate to that stream. Thus, they decompose the firm's cash flow stream into its certain and uncertain components, discount each by the appropriate rate, and derive a formula for the firm's marginal and average cost of capital as a function of the firm's leverage. Arditti (1974) expanded on MM (1963) by mathematically deriving the conditions under which a firm's cash flow streams may be broken down into its component streams and each discounted by a rate appropriate to that stream.

Further Theoretical Analysis of Market Equilibrium

Researchers have exploited the impact of debt and its related tax shield on capital structure decisions. Elton and Gruber (1975) explored the optimal capital structure pattern for firms subject to regulation. They showed that such firms should add the maximum amount of debt,

regardless of the form of debt constraint. Bierman and Oldfield (1979) were concerned with the effect on corporate value of substituting debt for equity in the presence of corporate taxes. They showed that assigning systematic risk to a corporation's debt and tax shelter eliminates the problems that arise from a simple valuation problem.

In a capital markets framework, Auerbach and King (1983) showed that, where investors are faced with different tax rates, no equilibrium exists unless certain constraints are imposed. For the MM theorem to hold in a world without taxes, short sales of debt and equity must be allowed for investors to be able to engage in homemade leverage (homemade leverage is discussed in Chapter 2).

The capital structure framework of MM assumes that securities can be neatly classified into either debt or equity. Emmerich (1985) addressed the confusion over how hybrid securities—securities that are neither strictly "debt" nor strictly "equity"—should be classified for tax purposes. Emmerich (1985) discussed the origins and consequences of the debt-equity distinction and the Treasury's attempts to police the distinction. He also proposed a test to govern the classification of debt and equity for instruments issued in arm's-length transactions by large, publicly held corporations. Under this test, only those instruments that closely resemble straight debt would be accorded debt treatment with the associated tax deduction under the Internal Revenue Code. All other hybrid instruments would be treated as equity unless they were sold as packages of separately salable debt and equity instruments. The author argued that such an approach is the only satisfactory way to handle the debt-equity classification problem.

Engel et al. (1999) used the features of trust-preferred stock to investigate alternative tax and financial reporting issues. Trust-preferred stock, first issued in 1993, is a hybrid security, classified as preferred equity in financial statements and as debt for tax purposes. Their analysis sheds light on the magnitude of net tax benefits associated with leverage-increasing financing decisions and the extent to which investor-level taxation imposes implicit taxes on securities (see Chapter 4).

Under the MM framework, the value of the firm is inversely proportional to the weighted average cost of capital. Therefore, tax law changes that decrease the corporate tax rates should increase firm value. Accordingly, Downs and Hendershott (1987) showed that the tax law changes brought about by the Tax Reform Act of 1986 (TRA86) should have raised equity values by 10 percent to 13 percent. In contrast, Nadeau and Strauss (1991) modeled the impact of TRA86 and showed that it will reduce the real cost of equity and also reduce the tax advantage of debt financing over equity financing.

Because of the increased desirability of equity financing over debt financing, they expect a decrease in leverage and hence a decrease in the likelihood of bankruptcy and its associated social costs. The impact of TRA86 on the real after-tax financial cost of capital is thus ambiguous.

Mauer and Lewellen (1987) derived a model for the corporate debt-management problem whereby they demonstrated that long-term debt in a corporation's capital structure becomes a valuable tax-timing option that can be exercised by the firm on behalf of the shareholders. Obviously, this option is not available for fully equity-financed firms. This analysis suggests that debt has a positive effect on total firm value even if there is no such effect related to the tax deductibility of the interest payments on debt.

Though the theoretical relationship between corporate taxes and corporate capital structure has been investigated in the literature, the relationship between taxes and the capital structure of partnerships, real estate investment trusts (REIT), and related flow through entities has been largely ignored. Jaffe (1991) filled this gap. The author showed that, in contrast to the impact of debt-related tax shields in a MM (1963) corporate world, under a general model, the value of a partnership, REIT, or related entity is invariant to leverage.

In addition, Miles (1983) examined the interaction of taxes and inflation within a MM capital structure framework. His analysis revealed that investment is an increasing function of the inflation rate; when it is assumed that investments are written off against taxable income after one period at historical cost, investment is a decreasing function of the inflation rate.

Investment/Financing

A large body of previous literature links the asset and financing sides of the balance sheet (see, e.g., Ravid 1988). For example, increases (decreases) in tax rates, by reducing (increasing) the cost of capital to the firm, may reduce (increase) the discount rate used to evaluate capital expenditure proposals. However, increases in tax rates also decrease the cash inflow. Therefore, an important question is: Does an increase in tax rates increase or decrease capital investment? Haley (1971) showed that for certain types of firms, the tax-induced reduction in discount rate is sufficient to more than offset the reduction in cash flow resulting from higher taxes, thereby leading to an increase in capital spending. Similarly, Myers and Dill (1976) established the linkage between financing and assets by demonstrating that tax savings appear to be the only motive that is both obvious and substantial to the lease-versus-purchase decision.

EMPIRICAL EVIDENCE

General

The MM (1963) capital structure framework suggests that firms that take advantage of the tax deduction offered by interest payments increase their equity value. Empirical tests of this basic hypothesis, however, have produced contradictory results. Arditti and Levy (1977) argued that these contradictory results were in part due to misspecification of the MM model. In particular, they argued that prior studies failed to include certain other real-world variables that affect firm valuation. Arditti and Levy (1977) demonstrated that the inclusion of personal and capital gains taxes into the MM (1963) capital structure framework reduces the positive impact of corporate debt on the value of the firm.

Peles and Sarnat (1979) tested the MM (1963) proposition by using the British economic environment. As explained by Peles and Sarnat (1979), before 1966, British companies were subject to a tax on profits and an income tax. A uniform corporate tax replaced both of those taxes. A differential taxation was restored to dividends because distributed profits were subject to both corporate and income taxes. This tax regulatory move provided an incentive for reinvesting corporate profits, which should serve to lower the firm's debt-to-equity ratio. Peles and Sarnat (1979) tested the proposition that there were significant changes in firms' debt-to-equity ratio after 1966, and their results were generally consistent with their prediction.

Downs and Tehranian (1988) developed and tested a model for estimating windfalls resulting from tax policy changes. The authors also simulated the effect on fundamental equity value of the policy changes enacted with the Economic Recovery Tax Act (ERTA) of 1981, and the results are used as predictions about stock price windfalls. They estimated that ERTA caused the stock market at-large to suffer a 6.1 percent windfall loss.

Brick and Ravid (1985) showed theoretically that long-term debt will increase the present value of the tax benefits of debt if the term structure of interest rates, adjusted for risk of default, is increasing. Brick and Ravid (1991) extended this argument to allow for the presence of stochastic interest rates. They analyzed the debt maturity decision under two alternative pricing equations: the return to maturity expectations hypothesis and the local expectations hypothesis. They found that, under uncertainty, a debt capacity factor will create an additional incentive to issue long-term debt.

Brick and Palmon (1993) examined the tax benefits of several debt refunding mechanisms where there is a decline in the bond yield. They demonstrated that issuing the traditional callable bond with a fixed

schedule of call prices is tax inferior other alternative debt refunding mechanisms.

Investment/Financing

Graham et al. (1998) demonstrated a positive relation between debt levels and tax rates. This finding was the first unambiguous evidence supporting the hypothesis that low tax rate firms lease more and have lower debt levels than high tax rate firms. Graham uses a TOBIT regression to investigate the determinants of debt, capital, and operating leases. The statistical results are in Graham's Table VI, which is our Table 3.1. This table shows a positive relation between debt levels and tax rates, which is a controversial issue (Myers 1984). The TOBIT regression equation is:

$$\begin{aligned} FC = {} & a_0 + a\,MTR + a_1\,ECOST + a_2\,Zscore + a_3\,OENEG \\ & + a_4\,MKTBK + a_5\,TEL + a_6\,UTIL + a_7\,CLATR + a_8\,Size \\ & + a_9\,S2000 + a_{10}\,S3000 + a_{11}\,S4000 + a_{12}\,1986 \\ & + a_{13}\,87\text{-}92 + e \end{aligned} \tag{3.4}$$

where

FC = fraction financial claim (debt, capital lease, or operating lease) of firm total market value,
MTR = before-financing marginal tax rate,
ECOST = standard deviation of the first difference of (earnings before depreciation, interest and taxes/mean level of book asset value) × (R&D and advertising expense/assets)
Zscore = Altman's (1968) zscore (modified),
OENEG = 1 if the book value of common equity is negative and zero otherwise,
MKTBK= market value over book value,
TEL = 1 if a telecommunications firm (SIC 4812 through 4813) and zero otherwise,
UTIL = 1 if a utility firm (SIC 4900-4939) and zero otherwise,
CLATR = firm collateral of net property, plant, and equipment over asset book value,
Size = log of firm value,
S2000 = 1 if a firm has SIC code 2000 through 2999 and zero otherwise,
S3000 = 1 if a firm has SIC code 3000 through 3999 and zero otherwise,
S4000 = 1 if a firm has SIC code 4000 through 4999 and zero otherwise,
1986 = 1 if an observation is for 1986 and zero otherwise,
87-92 = 1 if an observation if for 1987 through 1992 and zero otherwise, and
e = error.

TABLE 3.1 Censored (TOBIT) Regressions of Financial Claims as a Fraction of Firm Value

Variable	*Debt-to-Value*	*Capital Lease-to-Value*	*Operating Lease-to-Value*
Intercept	0.1205	0.0135	0.2068
	(0.0001)	(0.0001)	(0.0001)
MTR	0.0740	-0.0037	-0.0339
	(0.0001)	(0.3317)	(0.0001)
ECOST	-0.1032	0.0260	0.0626
	(0.0001)	(0.0007)	(0.0001)
Zscore	-0.0118	0.0005	0.0005
	(0.0001)	(0.0399)	(0.0439)
OENEG	0.0741	0.0018	0.0036
	(0.0001)	(0.4330)	(0.2014)
MKTBK	-0.0549	-0.0069	-0.0127
	(0.0001)	(0.0001)	(0.0001)
TEL	0.0728	-0.0679	-0.0643
	(0.0074)	(0.0001)	(0.0001)
UTIL 2	0.0706	-0.0350	-0.0652
	(0.0001)	(0.0001)	(0.0001)
CLATR	0.1269	0.0793	0.0074
	(0.0001)	(0.0001)	(0.0301)
Size	0.0081	-0.0006	-0.0088
	(0.0001)	(0.0169)	(0.0001)
S2000	0.0139	-0.0250	-0.0814
	(0.0001)	(0.0001)	(0.0001)
S3000	-0.0010	-0.0251	-0.0851
	(0.6994)	(0.0001)	(0.0001)
S4000	0.0155	-0.0256	-0.0313
	(0.0011)	(0.0001)	(0.0001)
1986	0.0016	-0.0130	0.0015
	(0.6841)	(0.0001)	(0.4909)
87-92	0.0027	-0.0210	0.0103
	(0.2428)	(0.0001)	(0.0001)
R square	0.130	0.143	0.253

IMPLICATIONS OF CORPORATE TAXES FOR THE CAPITAL STRUCTURE PARADIGM

In this section, we develop a capital structure decision example with corporate taxes. The example has unlevered and levered scenarios, which are defined in a format similar to the one used in the implications section of Chapter 2, where taxes were not considered. Thus, the reader can compare the shift in the capital structure paradigm.

As before, we shall assume that we are managers who are going to finance a new business with public offerings. Management must decide between two capital structure alternatives: one with debt and one without. Our world will have the same MM perfect market assumptions with one exception—it will now have corporate taxes. We shall assume that the corporate tax rate τ is 25 percent. For purposes of using a similar fact pattern to Chapter 2, our firm will make an investment in assets equal to $100. These assets will have a return on assets (ROA) of an all-equity financed firm, which we assign to be 12 percent, the same return given in Chapter 2. The rational decision is to maximize the value of the firm, as we did in Chapter 2. Thus, we will choose the alternative with the lowest weighted average cost of capital (WACC) because it generates the maximum firm value, assuming it is a perpetuity, where firm value equals operating asset cash flow divided by WACC. In general the weighted average cost of capital is (as can be confirmed from the MM proposition III by plugging in cost of equity, as computed below):

$$WACC = (1-\tau)\, K_D \times D / (D+E) + K_E \times E / (D+E) \qquad (3.5)$$

where:

WACC = weighted average cost of capital,
τ = corporate tax rate,
K_D = cost of debt,
D = debt, and
K_E = cost of equity.

All the variables are readily apparent except the cost of equity K_E; therefore, we will derive the cost of equity under MM conditions. The objective of the derivation is to compute the return on equity (which is also the cost of equity capital) (i.e., net income [NI] divided by equity [E]). First, we state the MM firm value with taxation of equity and debt components for the firm cash flows to equity and debt investors as :

$$CF_{investors} = (1-\tau)(ROA\times E+ROA\times D-K_D\times D) + K_D \times D \qquad (3.6a)$$

Or

$$CF_{investors} = (1-\tau)(ROA\times E+ROA\times D) + \tau \times K_D \times D \qquad (3.6b)$$

where:

$CF_{investors}$ = cash flow to all investors,

ROA = return on assets,
E = equity, and
D = debt.

Discounting each cash flow of equation (3.6b) at the rate appropriate to its investment classifications, the total firm value result is equation (3.7). To simplify the exposition, we define the net operating income as NOI equal to ROA × E + ROA × D.

$$D + E = (1-\tau)(NOI)/\rho + \tau \times D \tag{3.7}$$

where:

ρ = discount factor for an all-equity-financed firm.

Multiply the second term by the identity term expressed as ρ over ρ.

$$D + E = (1-\tau)(NOI) \ / \ \rho + \rho \times (\tau \times D) \ / \ \rho \tag{3.8}$$

Collect terms.

$$D + E = [(1-\tau)(NOI) + \rho \times (\tau \times D)] \ / \rho \tag{3.9}$$

Subtract debt D on the left and debt as $\rho/\rho \times D$ on the right.

$$E = [(1-\tau)(NOI) + \rho \times (\tau \times D) - \rho \times D] \ / \ \rho \tag{3.10}$$

Substitute from an identity (3.11) of firm cash flows into equation (3.10) to get equation (3.12).

$$NOI\ (1-\tau) = NI + R_D\ (1-\tau)\ D \tag{3.11}$$

where:

R_D = interest rate on debt,
NI = firm net income.

$$E = [Ni + R_D\ (1-\tau)\ D + \rho \times (\tau \times D) - \rho \times D]/\rho \tag{3.12}$$

Factor out D.

$$E = [Ni + [(1-\tau)Rd + \rho \times (\tau) - \rho] \times D]/\rho \tag{3.13}$$

Collect terms.

$$E = [Ni - (1-\tau)(\rho - Rd)D]/\rho \tag{3.14}$$

Solve for the cost of capital NI/E.

$$\rho\, E = [NI - (1-\tau)(\rho - Rd)D] \tag{3.15}$$

Divide by E.

$$\rho = Ni/E - (1-\tau)(\rho - Rd)\, D/E$$

Rearrange terms to get the cost of equity K_E or return on equity:

$$K_E = Ni/E = \rho + (1-\tau)(\rho - Rd)D/E \tag{3.16}$$

In the first scenario, we will finance our assets entirely with equity (E = total assets), and debt (D) equals zero. In this case, the WACC of equation (3.5) will only be the return on equity of ρ, the return on the assets that are completely financed by equity. We shall define the firm size to be \$100 and the return on assets equal to 12 percent, similar to Chapter 2. The WACC result is

$$WACC_E = 0 + .12 \times 100 \,/\, (0+100) = .12 \tag{3.17}$$

For our second scenario, we will finance the firm partially with debt (D). Similar to our example in Chapter 2, the pretax debt rate K_D will be 8 percent and firm will be financed with 75 percent debt. Therefore, D will be equal to 75 and E will have the value of 25. Equation (3.4) is the after-tax $WACC_D$ as calculated with debt included in the capital structure.

In our example the value of K_E is:

$$K_E = \rho + (1-\tau)(\rho - Rd)D/E\ ,$$

which is

$$K_E = 12 + (1-.25) \times (.12-.08) \times 75/25 = .21$$

We plug all of the variables into equation (3.4) for WACC and the answer is:

$$WACC_D = (1-.25) \times .08 \times 75 \,/\, (75+25) + .21 \times 25 \,/\, (75+25) = .0975$$

If there is a separation between financing and investment as MM presumed, then we will choose the lowest WACC as previously discussed. Partially funding with debt results in a lower WACC, and therefore the firm would utilize debt in the capital structure.

Scenario 1 (Point U on Figure 3.1) is the all-equity financing and Scenario 2 (Point L on Figure 3.1) is the partially debt-financed firm. There is a constant trade-off between the cost of equity, cost of debt, and the relative proportion of their financing in the capital structure. The value of the firm will be higher because of the tax deductibility of debt in the capital structure.

The key implication of the MM (1963) capital structure proposition is that it does matter how firms finance themselves when corporate taxes are present. While this proposition may still seem simplistic with respect to current capital structure issues, MM (1963) provides a conceptual framework to further develop firm financing decision making. As the capital structure paradigm further evolves through the course of this book, the assumptions of perfect and complete markets are addressed in ways that permit increasingly improved characterizations of actual markets and firm behavior.

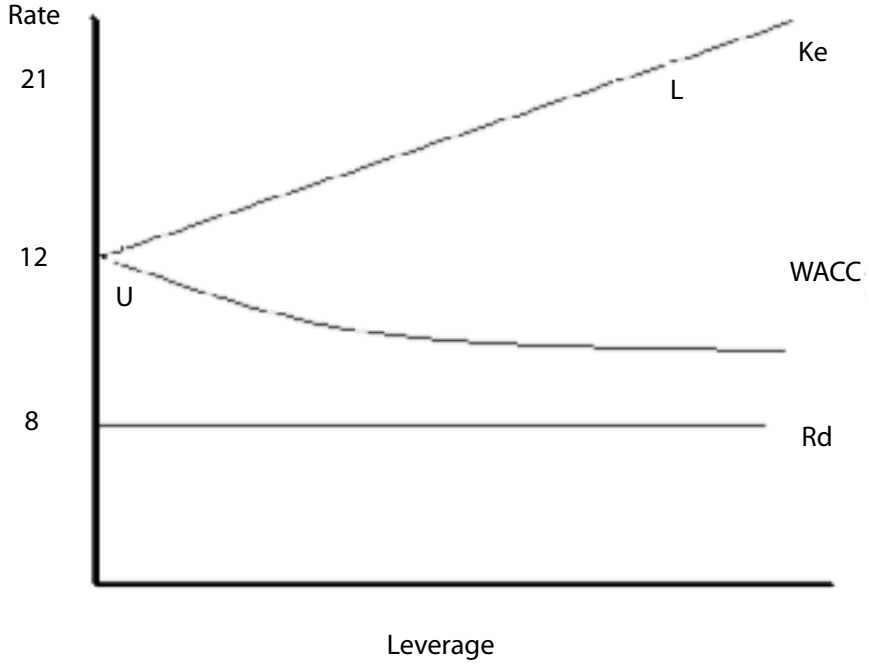


Figure 3.1 Capital rates under perfect market conditions including corporate tax.

SUMMARY

The logic of MM (1963) is as strong as the MM (1958) conclusions, from a theoretical point of view. The only imperfection that is added to the MM (1963) perfect markets' set of assumptions is taxes. Thus, no particular challenges have been made to the MM (1963) statement of the capital structure paradigm at its stage of development. However, the conclusion of Chapter 3 about the capital structure paradigm is directly opposite that of Chapter 2. Here, the maximum level of debt is the preferred choice. The tax deductibility of debt is the key factor. This paradigm shift will not be the last one in the development of this book.

The empirical evidence on taxation tends to focus on features of the tax law and how changes in the tax laws affect firm value. A major problem with the capital structure paradigm at this stage is in the empirical research design. The vast majority of firms have some measure of debt in their capital, which of course makes it difficult to compare levered firms with unlevered firms. Also, the complexity of the tax codes and multiple jurisdictions where firms operate means that a unique tax rate is hard to assess. Without some credible assessment of an appropriate tax rate, the specification of firm value under the MM (1963) theoretical regime is problematic. A notable exception to these empirical tax problems is the study by Graham et al. (1998) about leasing, which was discussed in this chapter.

REFERENCES

Altman, E. 1968. "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy." *Journal of Finance* 23: 580–609.

Arditti, F. 1974. "A note on discounting the components of an income stream." *Journal of Finance* 29 (June): 995–99.

Arditti, F., and H. Levy. 1977. "Taxes, Capital Structure and the Cost of Capital: Some Extensions." *Quarterly Review of Economics & Business* 17 (Summer): 89–96.

Auerbach, A. J., and M. A. King. 1983. "Taxation, Portfolio Choice, and Debt-Equity Ratios: A General Equilibrium Model." *Quarterly Journal of Economics* 98 (November): 587–609.

Bierman, H., and G. Oldfield. 1979. "Corporate Debt and Corporate Taxes." *Journal of Finance* 34 (September): 951–56.

Brick, I., and O. Palmon. 1993. "The Tax Advantages of Refunding Debt by Calling, Repurchasing, and Putting." *Financial Management* 22 (Winter): 96–105.

Brick, I., and A. Ravid. 1985. "On the Relevance of Debt Maturity Structure." *Journal of Finance* 40 (December): 1423–37.

Brick, I., and A. Ravid. 1991. "Interest Rate Uncertainty and the Optimal Debt Maturity Structure." *Journal of Financial & Quantitative Analysis* 26 (March): 63–81.

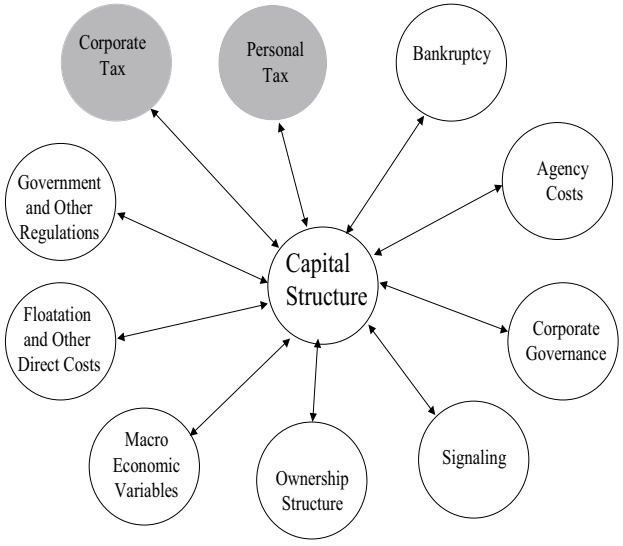
Downs, T., and P. Hendershott. 1987. "Tax Policy and Stock Prices." *National Tax Journal* 40 (June): 183–90.

Downs, T., and H. Tehranian. 1988. "Predicting Stock Price Responses to Tax Policy Changes." *American Economic Review* 78 (December): 1118–30.
Elton, E. J., and M. Gruber. 1975. "Financial Models of Regulated Firms—Valuation, Optimum Investment and Financing for the Firm Subject to Regulation." *Journal of Finance* 30 (May): 401–25.
Emmerich, A. O. 1985. "Hybrid Instruments and the Debt-Equity Distinction in Corporate Taxation." *University of Chicago Law Review* 52 (Winter): 118–148.
Engel, E., M. Erickson, M. Maydew, and E. Maydew. 1999. "Debt-Equity Hybrid Securities." *Journal of Accounting Research* 37 (Autumn): 249–74.
Graham, J., M. Lemmon, and J. Schallheim. 1998. "Debt, Leases, Taxes, and the Endogeneity of Corporate Tax Status." *Journal of Finance* 53 (February): 131–62.
Haley, C. W. 1971. "Taxes, the Cost-of-Capital, and the Firm's Investment Decision." *Journal of Finance* 26 (September): 901–71.
Jaffe, J. 1991. "Taxes and the Capital Structure of Partnerships, REIT's, and Related Entities." *Journal of Finance* 46 (March 1991): 401–7.
Mauer, D. C., and W. G. Lewellen. 1987. "Debt Management under Corporate and Personal Taxation." *Journal of Finance* 42 (December): 1275–91.
Miles, J. 1983. "Taxes and the Fisher Effect: A Clarifying Analysis." *Journal of Finance* 38 (March): 67–77.
Modigliani, F., and M. Miller. 1958. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* 48 (June): 261–97.
Modigliani, F., and M. Miller. 1963. "Corporate Income Taxes and the Cost of Capital." *American Economic Review* 53 (June): 433–43.
Myers, S. C., and D. Dill. 1963. "Valuation of Financial Lease Contracts." *Journal of Finance* 3 (June): 799–819.
Myers, S. 1984. "The Capital Structure Puzzle." *Journal of Finance* 39: 572–92.
Nadeau, S., and R. Strauss. "Tax Policies and the Real and Financial Decisions of the Firm: The Effects of the Tax Reform Act of 1986." *Public Finance Quarterly* 19 (July): 251–92.
Peles, Y. C., and M. Sarnat. 1979. "Corporate Taxes and Capital Structure: Some Evidence Drawn from the British Experience." *Review of Economics & Statistics* 61 (February): 118–20.
Ravid, S. A. 1988. "On Interactions of Production and Financial Decisions." *Financial Management* 17 (Autumn): 87–99.

4

The Modifying Impact of Personal Taxes on Investors

Central Tenet: With corporate and personal taxes, the optimum debt level shifts to one of two extremes—either 0 or 100 percent—but non-debt tax shields can move it to an interior optimum point.



INTRODUCTION

The focus of our discussion in this chapter expands on the impact of taxes on the capital structure decision, which was introduced in Chapter 3. The first major development in capital structure tax-related research after Modigliani and Miller (1963) was made by Miller (1977). The author formulated a theory of capital structure that incorporated personal taxes into the previous framework. According to Miller (1977), the supply and demand of corporate debt depends on both corporate and personal tax rates. The two tax rates can result in conditions that make it optimal for firms to have 100 percent debt, but an entirely different set of tax rates can result in conditions where the optimal debt level is 0 percent. In Chapter 3, the corporate tax rate works to the advantage of higher leverage ratios. Here, personal tax rates are explicitly introduced into the capital structure paradigm.

DeAngelo and Masulis (1980) made the next significant theoretical advance on the road to addressing applicable real-world issues in the capital structure paradigm with respect to taxes. The authors elaborated on Miller (1977) by incorporating tax shields other than interest payments on debt (e.g., depreciation and investment tax credits) to show an optimal level of debt. The results of empirical studies are mixed with respect to tax shields.

Up through the late 1980s, the capital structure paradigm with respect to taxes was regarded as having a very limited role (see Shackelford and Shevelin 2001). At that time, Scholes and Wolfson (e.g., Scholes and Wolfson 1992) became prime movers in an effort to get researchers to take an in-depth conceptual view of tax analyses. The framework that they advanced specified a comprehensive approach: (1) all parties to a tax-related transaction must be considered, (2) all relevant taxes to the transaction must be included in the calculation of the outcome, and (3) all applicable costs must be considered in the decision process. As the reader may better see on reflection at the end of the chapter, Miller (1977) and DeAngelo and Masulis (1980) do trend toward the research direction later outlined by Scholes and Wolfson.

Taken in the larger context of the paradigm shift development of this book, Scholes and Wolfson's approach also fits neatly into the general agency theory conceptual framework covered in Chapter 6, where the firm is described as a nexus of contracts (Jensen and Meckling 1976). However, we elected to cover taxes separately as an issue in Chapters 3 and 4 for the organizational purpose of keeping the focus of our discussion as tight as possible, given that anyone who has been following tax issues at the academic level will definitely think synonymously of Scholes and Wolfson precepts when they think of tax issues.

THEORETICAL FRAMEWORK

Miller (1977)

Miller (1977) included personal taxes in the solution for capital structure. This conceptual framework builds on the capital structure paradigm of MM (1963). As before, the firm is modeled with two investment components that generate value and they are equity and debt. The market value of the equity or debt will be reduced by a factor of 1 minus the personal tax rate. Thus, in Miller (1977) the present value of the cash flows is defined as:

$$V_L = (1-\tau_c)\,(1-\tau_s)\bar{X}/\rho + \tau\, R[(1-\tau_b) - (1-\tau_c)\,(1-\tau_s)]/r \qquad (4.1)$$

where:

τ_c = corporate tax rate
τ_s = personal tax rate on corporate equity distributions, and
τ_b = personal tax rate on corporate bond interest.

or

$$V_L = (1-\tau_c)\,(1-\tau_s)\bar{X}/\rho + B[1 - (1-\tau_c)\,(1-\tau_s)/\,(1-\tau_b)] \qquad (4.2)$$

where:

$B = \tau\, R(1-\tau_b)/r$.

If all tax rates are zero, then there is no gain to leverage, and capital structure is irrelevant as it was in MM (1958). Miller (1977) used an equilibrium analysis to demonstrate conditions where firms would be inclined to hold either no debt or near 100 percent maximum. He also discussed investor tax clienteles to motivate the equilibrium analysis.

Miller 1977 Extensions. Barnea et al. (1981) generalized the Miller (1977) equilibrium analysis to an environment that includes the costs of tax avoidance and the agency costs of debt to derive a modified equilibrium relationship for corporate debt. If such costs increase, as Barnea et al. (1981) showed, the equilibrium interest rates rise; higher agency costs cause the supply curve of funds available and the interest rate on corporate debt to fall.

In Shelton (1981), the reasoning inherent in Miller's (1977) equilibrium analysis of aggregate corporate debt, which suggests that firms have a price advantage over debt offered by individuals, is expanded.

Individuals and corporations have joint access to the debt market, but not on an equal basis. Shelton (1981) resolved the issue of unequal access to the debt market between individuals and firms by developing a general equilibrium made up of aggregate levels of both personal and corporate debt.

Scholes and Wolfson (1992) introduced the concept of explicit and implicit taxes into the theoretical framework. The impact of explicit taxes is relatively obvious. When an investor receives an interest payment, the investor pays an explicit tax on the receipt of the cash. The impact of the interest payments has a direct affect on the value of the firm, as was demonstrated in Chapters 2 and 3. Thus, the relative advantage of debt over equity is affected by the interest rate. Scholes and Wolfson also indicated that parties are affected by implicit taxes as well. In the Miller (1977) equilibrium, investors are faced with implicit taxes on municipal bond interest, which are not taxed directly. This is reflected in the lower yield on municipal bonds versus a corporate bond interest payment. Thus, the lower rate on municipal bonds reflects an implicit tax and affects the Miller (1977) general equilibrium. An artifact of the United States Federal Tax Code is that corporations that invest in other companies get a dividends-received deduction (the amount of the deduction is dependent on ownership percentages) on dividends received from the other firms. The dividend-received deduction has implications for capital structure decisions because the double taxation of dividends will shift a greater advantage over to debt. A dividend-received deduction will act in exactly the opposite way to shift more advantages to equity over debt. Empirical results would be dependent on each company's unique facts and circumstances.

Braswell and Summers (1982) argued that firms would like to issue debt to individuals in low tax brackets. Jaffe (1985) expanded Miller (1977) by studying the relationship between inflation and interest rates in the presence of taxation. Haugen and Senbet (1986) concluded that the Miller (1977) equilibrium can account for redundant tax shelters and endogenous progressive tax rates. Their study leads to alternative predictions that include the possibility of optimal internal leverage ratios and critical tax rates in corporate debt returns, which are substantially below the corporate tax rate.

Rashid and Amoako-Adu (1987) analyzed the impact of an inflation-nonindexed progressive tax system. The authors argued that inflation causes a "bracket-creep" effect, decreasing the demand for corporate debt, while the tax-deductibility of nominal interest reduces the cost of debt financing. Under these conditions, the firm should lever with as much debt as possible because it is a more advantageous decision than financing with equity.

Hodder and Senbet (1990) generalized the Miller (1977) equilibrium to an international capital markets setting with taxation and inflation. In this framework, when a government permits inflation, both foreign lenders and domestic investors benefit to the detriment of the government, while firms are neither helped nor hurt. A key message is that corporate tax arbitrage is an important part of an international capital structure equilibrium.

DeAngelo and Masulis (1980)

DeAngelo and Masulis (1980) broaden Miller's (1977) work by incorporating non-debt tax shields (e.g., depreciation, depletion, and investment tax credits) into the capital structure paradigm. In contrast to Miller's (1977) debt irrelevance proposition, DeAngelo and Masulis (1980) showed that there is an optimal, non-zero, level of debt. They also demonstrated that in the presence of positive bankruptcy costs, there is a trade-off between the marginal expected benefit of the interest tax shield and the marginal expected cost of bankruptcy. Their theoretical one-period model defines a set of four states contingent on earnings. The states are described in Table 4.1

DeAngelo and Masulis (1980) used the fact that the location of a firm's maximum value is where its derivative with respect to an independent variable is equal to zero. They computed firm value as the sum of debt and equity. The value of debt is equal to an integration

TABLE 4.1 DeAngelo and Masulis State Space Description

State Outcome	*State Space Outcome X of Earnings before Interest and Tax*	*Debt Value*	*Equity Value*
0 to s^1	0 < X < interest	X	0
s^1 to s^2	Interest < X < zero tax state	B	X - B
s^2 to s^3	Zero tax state < X < state where deductions and credits are fully utilized	B	X - B - τ_c (X-Δ-B) + $\theta\tau_c$ (X-Δ-B)
s^3 to $\bar{s}$	state where deductions and credits are fully utilized < X	B	X-B-τ_c (X-Δ-B)+Γ

Where

X = state space earnings before interest and tax,

B = debt face value,

Δ = corporate tax deductions,

Γ = corporate tax credits,

τ_c = marginal tax rate, and

θ = maximum fraction of gross tax liability that can be shielded by tax credits.

over all contingent state possibilities of the price of firm debt $P_D(s)$. Likewise, the value of equity is the integration over contingent state possibilities of the price of firm equity $P_E(s)$. Then, they differentiate firm value with respect to debt in order to determine the optimum debt/equity mix.

The value of firm debt is:

$$D = \int_0^{s^1} X(s)P_D(s)ds + \int_{s^1}^{\bar{s}} BP_D(s)ds \tag{4.3}$$

The value of firm equity is:

$$E = \int_{s^1}^{s^2} \{X(s) - B\}P_E(s)ds + \int_{s^2}^{s^3} \{X(s) - B - (1-\theta)\tau_c(X(s)-\Delta-B)\}$$
$$\times P_E(s)ds + \int_{s^3}^{\bar{s}} \{X(s) - B - (1-\theta)\tau_c(X(s) - \Delta - B) + \Gamma\}P_E(s)ds$$

Leverage will be irrelevant if the derivative of the total firm value with respect to debt is zero. This derivative is:

$$\delta V/\delta B = \int_{s^1}^{s^2} \{P_D(s) - P_E(s)\}ds + \int_{s^2}^{s^3} \{P_D(s) - P_E(s)(1-\tau(1-\theta}))\}ds$$
$$+ \int_{s^3}^{\bar{s}} \{P_D(s) - P_E(s)(1 - \tau_c)\}ds \tag{4.4}$$

Given that the tax variables of Δ and Γ must have positive values, their tax shield will substitute for some debt firm choices, and equation (4.4) will not equal zero. Thus, leverage has relevance when non-debt tax shields are introduced into the capital structure paradigm.

DeAngelo and Masulis 1980 extensions

Two articles identified a formulation problem in the DeAngelo and Masulis (1980) work. Talmor et al. (1985) argued that a variable is computed incorrectly because DeAngelo and Masulis's model was based on the assumption that tax deductions can be taken on the payment of both the debt principal and interest. Accordingly, the leverage–firm value relationship is reanalyzed based on the assumption that only

interest is tax deductible. Under this condition, it is shown that, as debt increases, the marginal value of the tax subsidy on risky debt increases, promoting corner solutions to the problem of optimally structuring capital. For individual firms, equilibrium is characterized by either all equity or all debt. In the entire corporate sector, though, the amount of debt is finite.

Similarly, Zechner and Swoboda (1986) distinguished between repayment of principal and interest. They derived the implicit tax rate that makes a firm indifferent between debt and equity and reanalyzed the relationship between this tax rate and the amount of debt issued by a firm. Their analysis offers insight into how bankruptcy, non-debt tax shields, and the firm's uncertain earnings jointly determine the tax advantage of debt.

In a later article, Sick (1990) developed models for discount rates that are adjusted for the interest tax shields of a firm in general tax equilibrium where there is cross-sectional variation in corporate tax rates. The author also derived a formula for the present value of the interest tax shield when the firm maintains a predetermined debt level. Fung and Theobald (1984) extended the DeAngelo and Masulis analysis to other tax systems, including Germany, the United Kingdom, and France, in which firm and shareholder credits are available.

Downs (1991) examined an alternative approach for establishing a common stock's fundamental value. The author derived a pretax cash flow stream consistent with a zero net present value investment equilibrium in the market for real assets, and constructs the depreciation tax shield from historical capital expenditures data and tax practices. The real asset cash flow model is then used to generate estimates of the fundamental value for 13 industries over an 11-year sample period. Next, the author calculated the fundamental value and the market value to generate a ratio that shows whether a firm is overvalued or undervalued. The ratio has considerable time-series and cross-sectional variation. Thus, his results indicate that the model has potential discriminatory power.

More Theoretical Market Equilibrium Analysis

Several researchers have examined alternative equilibrium formulations that include tax. Litzenberger and Van Horne (1978) compared (1) a regime of capital structure and dividend decisions in a complete capital market without bankruptcy costs under the present tax system with (2) a regime that includes the corporate deduction and shareholder credit methods for eliminating the double taxation of dividends. They argued that the firm's shareholders usually do not unanimously prefer that the firm increase the amount of debt in its capital structure on the

presumption that there are significant deadweight costs to bankruptcy. Therefore, a shift of the combined incidence of corporate and individual taxes may make the shareholder worse off if his fractional holdings of stock are less than the aggregate market value. The article discussed the policy implications of corporate taxes and bankruptcy costs in a complete capital market and in cases where the number of future contingencies in the world exceeds the number of linearly independent marketable securities in an incomplete capital market.

Mehta et al. (1980) investigated the effect of changes in financial policy variables within a capital market equilibrium framework. To do this, they developed and tested an integrative valuation model based on capital market theory. According to Mehta et al. (1980), this approach permits not only the examination of the interactions among the variables of financial policy (i.e., dividend payout, leverage, and growth), but also enables the construction of a model in which the value of the firm is assessed within a capital market context. The authors showed that, except for the tax shield on interest payments, leverage through debt or preferred stock financing equally affects the cost of capital for the firm. They also demonstrated the validity of the Modigliani and Miller revised propositions concerning the irrelevance of leverage policy.

Franks and Pringle (1982) expanded on the premise that security prices and shareholder returns reflect used and unused debt capacity if other corporations, acting as financial intermediaries, capture the tax breaks of an operating company's unused debt capacity in project and firm valuations. They argued that incremental tax benefits should be included in project valuations. Accordingly, shares of companies that have unused debt capacity (i.e., are underlevered) are best held by corporate taxpaying intermediaries so that security prices reflect the tax benefits of debt capacity, even when not used by the firm. Presumably the intermediaries can buy shares in the firm and borrow to use its tax benefits. Franks and Pringle found that, despite the benefits, operating companies still borrow rather than use financial intermediaries.

Gordon (1982) investigated the relation between a firm's value and its leverage. He conducted the investigation in a restricted, one-period economy with perfect capital markets. The author concluded that (1) the value of a firm is a convex function of its leverage rate, (2) the optimal policy for each firm is the maximum possible leverage rate, and (3) a tax-exempt government debt does not modify either of the first two conclusions. Gordon also found that both a person's portfolio decisions and the firm's capital structure decisions tend to raise their marginal tax rates toward the effective statutory corporate rate. The extent to which this movement reduces the rise in a firm's value with its leverage rate depends on the degree of inequality in the distribution of wealth among persons and on the leverage rates of firms.

Auerbach (1983) attempted to organize and present the effects of taxation, via the cost of capital, on the incentive to invest. He emphasized the cost of capital, capital income taxation, personal taxation and inflation, uncertainty and the cost of capital, and uncertainty and taxation. The author argued that taxes need not distort the incentive to invest nor influence the cost of capital, because they may be capitalized in the value of assets, or because they may affect only an asset's expected but not risk-adjusted return. He concluded that if taxes change the cost of capital, they may do so in different ways for different investors.

Financial theory suggests that, in the absence of agency costs and personal taxes, each dollar of debt contributes to the value of the firm in proportion to the firm's tax rate. To produce this result, incremental debt is assumed permanent. Miles and Ezzell (1985) demonstrated that, when the firm acts to maintain a constant market value leverage ratio, the marginal value of debt financing is much lower than the corporate tax rate. They derive an unlevering method that is consistent with the assumption of a constant leverage ratio. Gordon (1994) argued that the neoclassic theory of finance and investment under uncertainty requires the truth of five propositions, each of which is more or less false. The author states the propositions as follows:

1. Individuals hold only securities of firms who then hold all the real risky assets;
2. Firms maximize the current market value without regard for potential future bankruptcy probability;
3. Capital structure is irrelevant;
4. Dividend policy is irrelevant; and
5. A firm's investment opportunity set (IOS) is independent of its history.

Gordon (1994) proposed an alternative theory and constructed a simulation model of a system of proprietors in which the values of variables are in fact determined on the microlevel. Aggregating over the microvalues of the variables for the proprietors in the system leads to macrovalues.

Investment/Financing

The introduction of taxes has some significant effects on the investment/financing linkage previously discussed in Chapters 2 and 3. In particular, as long as a default does not occur, leasing is mutually beneficial to lessor and lessee when the lessor is in a higher tax bracket than lessee. Researchers have investigated various aspects of leasing to

model actual business situations. Faig and Shum (1999) focused on how the asymmetry of the corporate tax, imperfect loss carryovers, and different degrees of investment irreversibility affects both incremental investment and entry decisions. Steele (1984) concluded that tax complexities affect alternative formulations of difference equations for the adjusted present value of a lease contract. In a larger context, Marston and Harris (1986) argued that debt and leases are close substitutes, which suggests that a generalization of lease formulations might be possible.

EMPIRICAL EVIDENCE

General

Several theoretical valuation models exist that have empirically testable implications of the effect taxes will have on a firm's financial policy. These models have been heavily tested, but it is difficult to get an absolute conclusion about tax effects due to confounding and marginal effects, as we shall now see. In fact, in an analysis, Auerbach (1983) found that taxes need not affect investment. The issue is often argued in the popular press, that companies do not pay taxes and by extension taxes do not affect capital structure policy. Cordes and Sheffrin (1983) reported that only 56 percent of firms pay the maximum tax rate on marginal earnings. Seetharaman et al. (2001) reported a higher percentage having near-maximum marginal tax rate information, but a significant proportion of firms have empirical marginal tax rates of 5 percent and lower.

A number of studies do find that taxes impact capital structure values. Auerbach (1984) determined that the cost of capital varies by estimated tax rate. Brick and Wallingford (1985) reported that tax rates affect debt characteristics (i.e., bond call provisions). Rutterford (1985) found that leverage varies by country according to their tax rates.

Graham (2000) approached the empirical impact of the tax value of debt in the capital structure with an examination of marginal benefits. Through this analysis, the capitalized tax of debt is estimated to be 9.7 percent. The author defined a variable named "kink," which describes a point where the additional marginal value of debt reduces firm worth. Graham simulated the "kink" for firms in a sample longitudinally and also cross-sectionally. It appears that firms made more aggressive use of debt during first half of the 1990s than in the 1980s.

Graham (2000) took a set of firm variables and regressed them against kink to see how they affect the kink. The variable descriptions are:

Kink	=	[interest required to make tax rate function slope downward] / actual interest
I(No dividend)	=	1 for dividend and 0 otherwise,
I(Negative owners' equity)	=	1 for negative owners' equity and 0 otherwise,
I(NOL carryforward)	=	1 for NOL and 0 otherwise,
I(chemicals and allied products)	=	1 for chemical industry and 0 otherwise,
I(computers)	=	1 for computer industry and 0 otherwise,
I(semiconductors)	=	1 for semiconductor industry and 0 otherwise,
I(wholesale chemicals)	=	1 for wholesale chemical industry and 0 otherwise,
I(aerospace)	=	1 for aerospace industry and 0 otherwise,
I(other)	=	1 for SIC 340-400 except 357, 367, 372 and 376 and 0 otherwise,
Cyclical		standard deviation of operating earnings / firm mean assets over 2 digit SICs,
Return on Assets	=	operating cash flow / total assets,
Ln(real sales)		natural log of sales deflated by implicit price deflator,
Z-score	=	a modified Altman's (1968) Z score
ECOST	=	[standard deviation of first difference of taxable earnings / assets] $\times$ [advertising + R&D] / sales,
Current Ratio	=	current assets / current liabilities,
Quick Ratio	=	[cash + short-term investments + receivables] / current liabilities,
PPE/assets	=	net property, plant and equipment / total assets,
Q-ratio	=	[preferred stock + market value of common equity + net current liabilities] / assets
Advertising/sales	=	advertising expense / sales {variable is set to zero for missing values},
R&D/sales	=	R&D expense / sales {variable is set to zero for missing values},
Asset Herfindahl	=	Herfindahl index on assets for 2 digit SIC,
Sales Herfindahl	=	Herfindahl index on sales for 2 digit SIC,
Capital Expenditures	=	cash flow statement investing activity of year t + 1 and t +2,
Acquisitions	=	cash flow statement investing activity of year t + 1 and t +2,
CEOSTOCK	=	percentage of stock owned by CEO,
CEOOPT	=	percentage of stock vested by CEO options,
YRSCEO	=	log of the tenure of number years for CEO,
BOARDSZ	=	log of the number of directors on the board,
PCTOUT	=	percentage of outside directors, and
BDSTOCK	=	percentage of common owned by non-CEO board members.

The regressions of Graham's (2000) Table VI are shown in Table 4.2. Some of the significant findings are that firms that make minimal use of debt also (1) pay dividends, (2) are generally profitable, and (3) have low prospects of financial distress. This result is consistent with the old proverb that those who can afford to borrow don't, or at least face lower borrowing costs. These results are also consistent with the pecking order hypothesis for capital structure policy.

TABLE 4.2 TOBIT Regressions Using the Kink as a Dependent Variable

	A		*B*		*C*	*D*	
	Term	*(Term)^2*	*Term*	*(Term)^2*	*Term*	*Term*	*(Term)^2*
Intercept	0.354*		0.412*		1.635*	1.260*	
I(No dividend)	-0.483*		-0.384*			0.273	
I(Negative owners' equity	-0.426*		-0.456*			0.076	
I(NOL carryforward)	-0.459*		-0.456*			0.277*	
I(chemicals and allied products	0.067*		0.054**			0.069	
I(computers)	0.276*		0.263*			0.426*	
I(semiconductors)	0.040		0.008			0.318**	
I(wholesale chemicals)	0.665*					9.835	
I(aerospace)	0.052		0.056			0.285*	
I(other)	0.114*		0.117*			0.194*	
Cyclical	-0.308*		-0.176*			-0.992*	
Return on Assets	2.334*	2.700*	2.130*	2.887*	7.029*	1.603*	4.413*
Ln(real sales)	0.048*	-0.002**	0.049*	-0.002*	-0.092*	0.330*	-0.046
Z-score	0.126*	0.004*	0.124*	0.004*		0.513*	-0.063*
ECOST	-0.117*	0.003*	-0.119*	0.003*		-0.647**	-0.324***
Current Ratio	0.127*	-0.009*	0.135*	-0.009*		-0.009	0.002
Quick Ratio	0.253*	-0.006*	0.250*	-0.006*		0.262*	-0.014
PPE/assets	-1.395*	1.375*	-1.428	1.355*	-0.865*	-2.194*	2.276*
Q-ratio	0.503*	-0.046*	0.527*	-0.047*		0.573*	-0.579*
Advertising/sales	-0.155	11.74*	-0.558	14.39*		-0.479	7.071
R&D/sales	1.466*	-0.891*	1.417*	-1.034*	0.899**	3.285*	-6.581*
Asset Herfindahl			-0.515*	0.569*			
Sales Herfindahl			0.247	-0.323***			
Capital Expenditures			0.215***	-0.078			
Acquisitions			0.749	-2.176*			
CEOSTOCK					-0.591*	0.071	
CEOOPT					-11.46**	-6.705	
YRSCEO					0.039*	-0.003	
BOARDSZ					-0.105**	0.014	
PCTOUT					-0.294*	-0.351*	
BDSTOCK					0.213	0.014	
OLS Rsq	.502		.495		.445	.612	
Observations	65,373		55,644		2,910	2,773	

*,**, *** = significance at the 1, 5, and 10 percent levels, respectively.

Miller (1977)

The evidence to examine the Miller (1977) hypothesis is fairly limited because no data are directly available about investors' personal tax rates. Thus, one must infer statistics according to observable market variables, and the differentiation between alternative hypotheses becomes challenging. McConnell and Schlarbaum (1981) gave some indirect evidence through a test of exchanges of preferred stock for "income" bonds. The results are more consistent with Miller (1977) than with MM (1963).

Fama and French (1998) performed regression analyses on the difference between market value and book value with respect to a set of variables: earnings, interest, dividends, and research and development. They employed differencing because they argued a heterogeneity-size problem would confound the findings. Their research design logic was that the slopes on dividend and interest variables should isolate tax effects if the variables in their regression equations represent the complete firm cash flow picture to the market. In classic MM terms, firm value should equal to the value of an all-equity firm plus the tax effects of debt and dividends. Two of their regression equations (Their equations 1 and 2 are (4.5) and (4.6) here).

$$\begin{aligned}(V_t - A_t)/A_t = {} & a + a_1 E_t/A_t + a_2\, dE_t/A_t + a_3\, dE_{t+2}/A_t \\ & + a_4\, dA_t/A_t + a_5\, dA_{t+2}/A_t + a_6\, RD_t/A_t + a_7\, dRD_t/A_t \\ & + a_8\, dRD_{t+2}/A_t + b_1\, I_t/A_t + b_2\, dI_t/A_t + b_3\, dI_{t+2}/A_t \\ & + b_4\, D_t/A_t + b_5\, dD_t/A_t + b_6\, dD_{t+2}/A_t \\ & + c_1\, dV_{t+2}/A_t + e_t \end{aligned} \tag{4.5}$$

$$\begin{aligned}(V_t - A_t)/A_t = {} & a + a_1 E_t/A_t + a_2\, dE_t/A_t + a_3\, dE_{t+2}/A_t \\ & + a_4\, dA_t/A_t + a_5\, dA_{t+2}/A_t + a_6\, RD_t/A_t + a_7\, dRD_t/A_t \\ & + a_8\, dRD_{t+2}/A_t + b_1\, I_t/A_t + b_2\, d(I_t/A_t) + b_3\, d(I_{t+2}/A_t) \\ & + b_4\, D_t/A_t + b_5\, d(D_t/A_t) + b_6\, d(D_{t+2}/A_t) \\ & + c_1\, dV_{t+2}/A_t + e_t \end{aligned} \tag{4.6}$$

where:

V_t = market value at time t,
A_t = asset value at time t,
E_t = earnings before extraordinary items at time t,
ET_t = earnings before taxes at time t,
d signifies a difference between time t plus 1 or 2 and time t,
RD_t = R&D expense at time t,
I_t = interest expense at time t.
D_t = dividends at time t,
e_t = error term.

We present Fama and French's (1998) Table 2 as our Table 4.3. The alternative hypotheses are MM (1963) and Miller (1977). If Miller's (1977) equilibrium is at work, then the interest expense variables should have a zero slope because debt should not matter, as the personal tax rates are already factored into corporate debt rates, which are presumably dependent on the corporate tax rate. On the other hand, the interest expense variable would have a positive coefficient in pretax earnings regressions and a negative coefficient in after-tax earnings regressions. Some of the differenced results of Table 4.3 have a negative debt coefficient, which can be considered consistent with Miller (1977). However, the before- and after-tax results are not consistent with Fama and French's propositions. The authors did further testing that does not support the Miller (1977) equilibrium. They suggested that profitability obscures the relations. This analysis exemplifies the difficulties for investigations into capital structure issues, with the potential of complex interactions affecting the results.

DeAngelo and Masulis (1980)

The evidence about non-debt tax shields is somewhat in favor and somewhat against, in part because of the difficulty in formulating a research design. For example, Cooper and Franks (1983) found that corporations with tax losses behave virtually the same as a firm subject to effective tax rates lower than the full corporate tax rate. Allen and Mizuno (1989) investigated the relation of non-debt tax shields with debt ratios for a sample of Japanese firms. They find the association to be insignificant, indicating there is no non-debt tax shield value. Furthermore, Chang and Rhee (1990) reported that larger debt ratios correlate with bigger non-debt tax shields.

On the other hand, Gau and Wang (1990) investigated a sample of real estate transactions and found that the level of debt seems to be inversely related to the amount of available non-debt tax shields, as well as financial distress costs, and the market interest rate. Also, the results of Cloyd et al. (1997) indicate that, for a sample of closely held companies, firms appear to substitute non-debt tax shields and debt tax shields in situations where additional tax shields could lower tax rates. This same study also reported that closely held firms with high tax rates pay more interest than firms with low tax rates.

Callahan et al. (2001) provided some indirect evidence that a firm's net operating loss (NOL) as a tax shield is important. They investigated tax and regulatory implications of the issuance of non-voting, non-convertible preferred stock and found that industrial firms try to keep tax attributes because issuing preferred stock does not change ownership characteristics. Although these firms could have issued straight debt

TABLE 4.3 Average Coefficients and Their t-Statistics from Regressions to Explain the Level of $(V_t–A_t)/A_t$

Panel A: Average Regression Coefficients and t-Statistics for the Averages

	Mean	*t(mean)*	*Mean*	*t(mean)*	*Mean*	*t(mean)*	*Mean*	*t(mean)*
Int	-0.17	-2.82	-0.13	-2.35	-0.16	-2.56	-0.13	-2.29
E_t/A_t	1.8	-2.61			2.29	-3.18		
ET_t/A_t			0.95	-2.85			1.24	-3.44
dE_t/A_t	0.43	-2.43			0.76	-4.48		
dET_t/A_t			0.79	-7.8			0.94	-8.46
dE_{t+2}/A_t	0.8	-3.08			1.16	-4.14		
dET_{t+2}/A_t			0.44	-4.24			0.56	-5.01
dA_t/A_t	0.66	-12.21	0.44	-8.24	0.54	-10.04	0.34	-7.77
dA_{t+2}/A_t	0.45	-5.48	0.41	-5.14	0.36	-4.9	0.34	-4.69
RD_t/A_t	4.29	-7.24	4.64	-7.77	4.12	-6.72	4.49	-7.35
dRD_t/A_t	4.3	-3.74	3.74	-3.37	4.8	-3.98	4.07	-3.55
dRD_{t+2}/A_t	5.66	-6.86	5.31	-6.54	5.7	-6.82	5.29	-6.45
I_t/A_t	-1.17	-1.54	-0.35	-0.46	-3.36	-3.58	-1.87	-2.5
dI_t/A_t	-4.21	-5.94	-3.09	-3.90				
$d(I_t/A_t)$					0.11	-0.16	0.92	-1.3
dI_{t+2}/A_t	-4.57	-5.24	-3.61	-4.50				
$d(I_{t+2}/A_t)$					-2.17	-2.19	-1.01	-1.17
D_t/A_t	4.22	-5.42	4.2	-5.53	5.92	-8.4	5.63	-7.9
dD_t/A_t	6.63	-6.08	6.39	-5.98				
$d(Dt/A_t)$					2.62	-3.26	2.35	-3.09
dD_{t+2}/A_t	8.1	-9.98	6.88	-8.81				
$d(D_{t+2}/A_t)$					5.66	-5.38	4.04	-3.73
dV_{t+2}/A_t	-0.16	-2.62	-0.17	-2.75	-0.15	-2.49	-0.16	-2.63

Panel B: Means and Standard Deviations of the Regression Variables

	Mean	*Std*
$(V_t-A_t)/A_t$	0.35	0.835
E_t/A_t	0.07	0.065
ET_t/A_t	0.108	0.097
dE_t/A_t	0.013	0.066
dET_t/A_t	0.036	0.12
dE_{t+2}/A_t	0.019	0.082
dET_{t+2}/A_t	0.034	0.166
dA_t/A_t	0.17	0.222
dA_{t+2}/A_t	0.255	0.392
RD_t/A_t	0.013	0.028
dRD_t/A_t	0.003	0.013
dRD_{t+2}/A_t	0.004	0.018
I_t/A_t	0.021	0.017
dI_t/A_t	0.004	0.012
$d(I_t/A_t)$	0.001	0.011
dI_{t+2}/A_t	0.006	0.017
$d(I_{t+2}/A_t)$	0.001	0.011
D_t/A_t	0.016	0.018

continues on next page

TABLE 4.3 continued

Panel B: Means and Standard Deviations of the Regression Variables

	Mean	*Std*
dD_t/A_t	0.002	0.008
$d(D_t/A_t)$	0	0.008
dD_{t+2}/A_t	0.003	0.009
$d(D_{t+2}/A_t)$	0	0.008
dV_{t+2}/A_t	0.371	1.004

and not changed ownership conditions, they probably don't because of the costs associated with financial distress. The authors also indicated that the issuance of preferred stock will serve to maximize foreign tax credits.

Other

Subsequent to the appearance of Scholes and Wolfson's (1987) thinking on a conceptual framework for tax decisions, the majority of the profession has been profoundly influenced by their themes, even if the other researchers do not directly cite them. Thus, it is appropriate to consider how the Scholes and Wolfson framework, which was outlined in the introduction, might affect writing in the field. Scholes and Wolfson bring a comprehensive approach that merges microeconomic theory with tax law.

This comprehensive framework is basically a good idea. However, while the difficulty of measuring observable variables is a problem with both the Miller (1977) and DeAngelo and Masulis (1980) frameworks, Scholes and Wolfson present research with another subtle scientific method problem that is also present in Chapter 6.[1] The statement of a hypothesis for an empirical investigation with the scientific method requires the identification of a null and an alternative proposition. Scholes and Wolfson's framework is holistic and that feature is something that one wants in a paradigm. What propositions does a researcher identify as a null and an alternative? In the alternative, do decision makers formulate policy using incomplete information by not considering all parties, all taxes, and all costs to a decision? If the answer is yes, then a logical conclusion is that a "bad" decision maker is present. Perhaps the decision maker rationally truncates self-imposed second order effects to make a timely decision, as we know that real-world decision makers are always faced with time constraints. However, sometimes these approximations could have disastrous consequences. The design of any such experiment to assess the deviation from the optimal Scholes and Wolfson framework is a challenging task. Thus, the framework should be thought of in terms of a set of

guideposts for tax professional decision makers and as a good group of postulates of ideal behavior against which researchers can compare their empirical research designs.

The other empirical tax works from the late 1980s to the present time can be categorized in three groups of: (1) an issuance of securities, (2) acquisitions of assets, and (3) a sale of assets. In the first category, Engel et al. (1999) are notable because their security of interest (trust preferred stock, TRUPS) has differing tax and financial reporting characteristics. TRUPS is not considered as debt under generally accepted accounting principles (GAAP). However, the Internal Revenue Service (IRS) treats the TRUPS dividends as interest on a corporate tax filing. What are the capital structure implications? The authors report that firms use the proceeds from issuing TRUPS to retire debt. On the one hand, the GAAP financial statements look better in financial ratios because the equity value increases. On the other hand, the TRUPS dividend deductibility maintains a leverage ratio that should drive a similar market value to that of firm's situation when they had debt.

The second category concerns the acquisition of another company. The acquisition can have taxable consequences to the target or can be a tax-free transaction for the target. The key issue is the tax ramifications on the market value of the target equity and by extension the firm capital structure because firms posture themselves before an acquisition. There are also implications for the acquirer in the means of payment, which then result in consequences to the acquiring firm's capital structure. Note: goodwill in a merger is deductible for tax purposes only if acquirer makes a step-up in basis of the assets.

There is controversy about the impact of taxes in acquisitions. Some empirical evidence indicates that these tax implications are factored into security prices in acquisitions (Hayn 1989). However, research has also failed to find significance to tax variables in an acquisition (Erickson 1998). There may also be implicit value consequences according to Henning et al.'s (2000) study on acquirer prices of target firm tax characteristics, except that Erickson (2000) critiqued the aforementioned study on methodological grounds. The tax implications of acquisitions are unresolved and appear to be in need of further research.

The third category on the divesture of a business is the flip side of the second category. Divestures can be made as sales (proceeds are taxable) or spin-offs, where current shareholders get ownership in a separated line of business and the transactions are typically organized to have no tax effects. Not surprisingly, Alford and Berger (1998) reported that spin-offs are more likely when tax effects of a sale are relatively large. One can surmise that market value of a firm reflective of its capital structure, if calculated on its component line of businesses, will be affected by these tax considerations. Both Alford and Berger (1998) and

Maydew et al. (1999) found that financial statement factors and cash limitations may mitigate the impact of taxes on the decision to do a spin-off or sale.

IMPLICATIONS OF CORPORATE TAXES TO CAPITAL STRUCTURE PARADIGM

To consider the implications of Miller (1977), we have created a series of three tables/graphs of tax regimes where corporate tax is 0, 25, and 50 percent, respectively. We are simulating the leverage gains of 1 dollar of debt according to Miller's formula (See equation 4.2).

$$G = [(1 - (1-\tau_c)\ (1-\tau_s)/\ (1-\tau_b)] \tag{4.7}$$

Miller's (1977) equilibrium of capital structure irrelevance occurs if

$$(1-\tau_b) = (1-\tau_c)\ (1-\tau_s) \tag{4.8}$$

When we look at Figures 4.1, 4.2, and 4.3 with their associated Tables 4.4, 4.5, and 4.6, we see that the prospect of Miller's equilibrium occupies a single line in Figure 4.1 where the corporate tax is 0 percent, and similarly there is a single line in Figure 4.2 where the corporate tax is 25 percent. However, there is only a single point of Miller's equilibrium on the graph of Figure 4.3 when personal equity and personal debt taxes are zero. Clearly, Miller's equilibrium is going to occur only in rare circumstances. On the other hand, decision-makers might want to consider these figures if they are dealing with a small set or an individual investor in the design of an organization's capital structure.

This chapter gives some indication (e.g., Callahan et al. 2001) that there are tax implications for any particular capital structure decision. Practitioners are well advised to gain legal advice from tax professionals before making any change or addition to a firm's capital structure.

SUMMARY

This chapter is a good example of how the capital structure paradigm can shift. At the beginning of the chapter, Miller (1977) argued that capital structure is irrelevant in a general equilibrium where personal taxes are included. This argument is a fundamental reversal of the previous conclusion, illustrated in Chapter 3, of MM's (1963) discussion, that the inclusion of corporate taxes will drive capital structure policy to a corner solution where as much debt as possible should be included in the firm's financing mix. Next, DeAngelo and Masulis

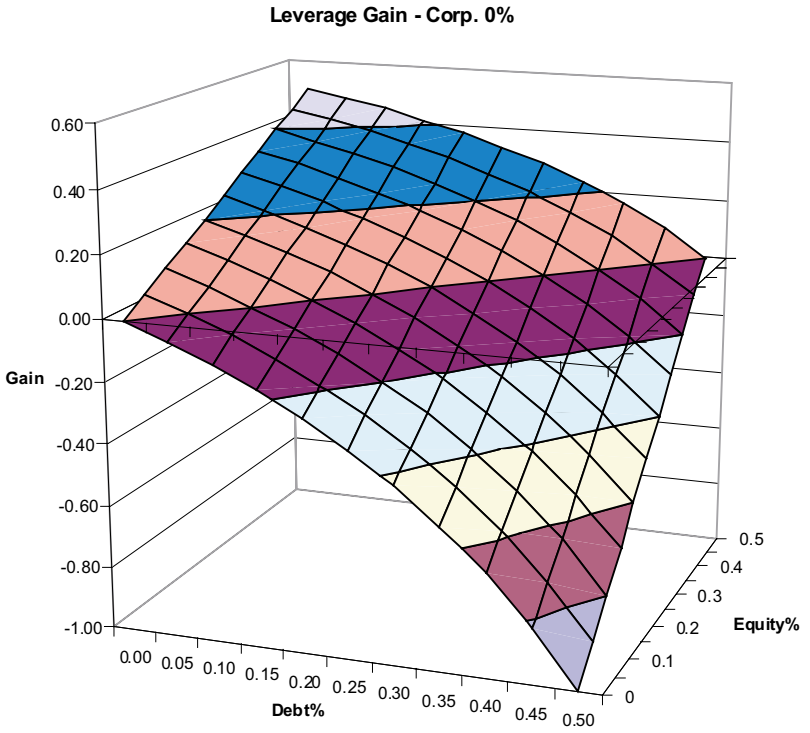


Figure 4.1 Corporate tax rate 0%.

TABLE 4.4 Corporate Tax Rate 0%

0.00	*Debt%*										
	0.00	*0.05*	*0.10*	*0.15*	*0.20*	*0.25*	*0.30*	*0.35*	*0.40*	*0.45*	*0.50*
Equity%											
0.00	0.00	-0.05	-0.11	-0.18	-0.25	-0.33	-0.43	-0.54	-0.67	-0.82	-1.00
0.05	0.05	0.00	-0.06	-0.12	-0.19	-0.27	-0.36	-0.46	-0.58	-0.73	-0.90
0.10	0.10	0.05	0.00	-0.06	-0.13	-0.20	-0.29	-0.38	-0.50	-0.64	-0.80
0.15	0.15	0.11	0.06	0.00	-0.06	-0.13	-0.21	-0.31	-0.42	-0.55	-0.70
0.20	0.20	0.16	0.11	0.06	0.00	-0.07	-0.14	-0.23	-0.33	-0.45	-0.60
0.25	0.25	0.21	0.17	0.12	0.06	0.00	-0.07	-0.15	-0.25	-0.36	-0.50
0.30	0.30	0.26	0.22	0.18	0.13	0.07	0.00	-0.08	-0.17	-0.27	-0.40
0.35	0.35	0.32	0.28	0.24	0.19	0.13	0.07	0.00	-0.08	-0.18	-0.30
0.40	0.40	0.37	0.33	0.29	0.25	0.20	0.14	0.08	0.00	-0.09	-0.20
0.45	0.45	0.42	0.39	0.35	0.31	0.27	0.21	0.15	0.08	0.00	-0.10
0.50	0.50	0.47	0.44	0.41	0.38	0.33	0.29	0.23	0.17	0.09	0.00

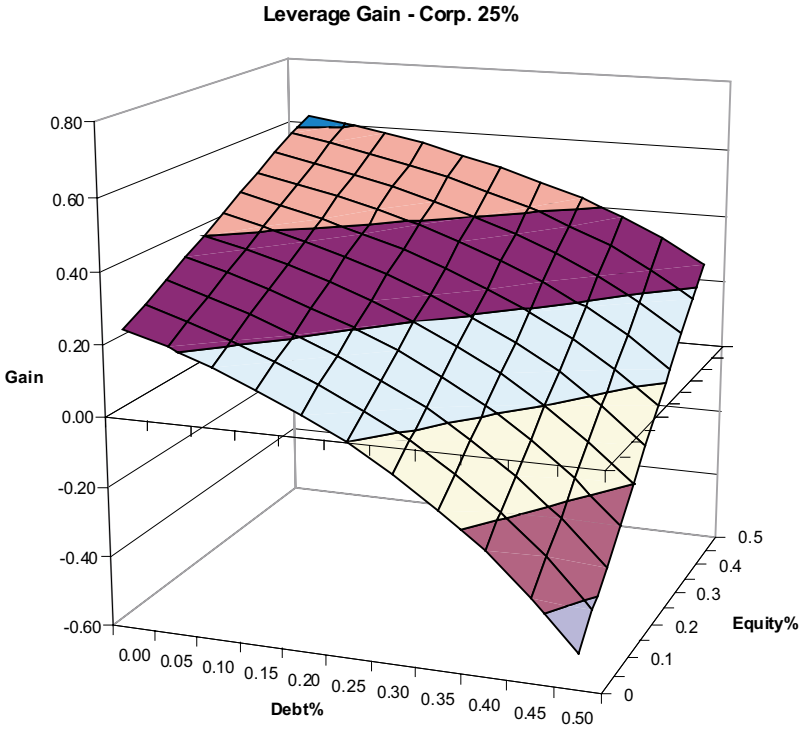


Figure 4.2 Corporate tax rate 25%.

TABLE 4.5 Corporate Tax Rate 25%

0.25	*Debt%*										
	0.00	*0.05*	*0.10*	*0.15*	*0.20*	*0.25*	*0.30*	*0.35*	*0.40*	*0.45*	*0.50*
Equity%											
0.00	0.25	0.21	0.17	0.12	0.06	0.00	-0.07	-0.15	-0.25	-0.36	-0.50
0.05	0.29	0.25	0.21	0.16	0.11	0.05	-0.02	-0.10	-0.19	-0.30	-0.43
0.10	0.33	0.29	0.25	0.21	0.16	0.10	0.04	-0.04	-0.13	-0.23	-0.35
0.15	0.36	0.33	0.29	0.25	0.20	0.15	0.09	0.02	-0.06	-0.16	-0.28
0.20	0.40	0.37	0.33	0.29	0.25	0.20	0.14	0.08	0.00	-0.09	-0.20
0.25	0.44	0.41	0.38	0.34	0.30	0.25	0.20	0.13	0.06	-0.02	-0.13
0.30	0.48	0.45	0.42	0.38	0.34	0.30	0.25	0.19	0.13	0.05	-0.05
0.35	0.51	0.49	0.48	0.43	0.39	0.35	0.30	0.25	0.19	0.11	0.02
0.40	0.55	0.53	0.50	0.47	0.44	0.40	0.36	0.31	0.25	0.18	0.10
0.45	0.59	0.57	0.54	0.51	0.48	0.45	0.41	0.37	0.31	0.25	0.18
0.50	0.63	0.61	0.58	0.56	0.53	0.50	0.46	0.42	0.38	0.32	0.25

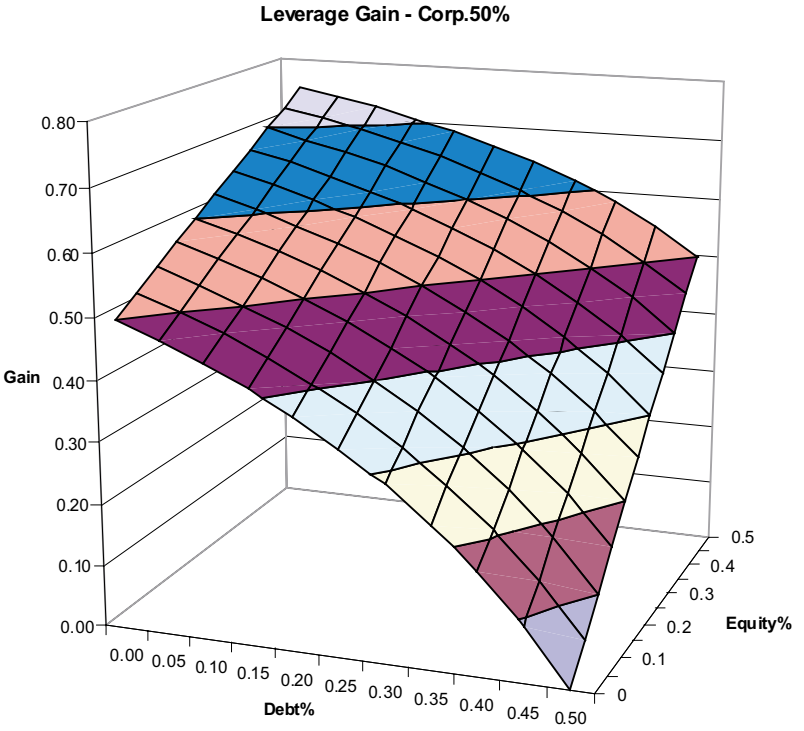


Figure 4.3 Corporate tax rate 50%.

TABLE 4.6 Corporate Tax Rate 25%

0.50	*Debt%*										
	0.00	*0.05*	*0.10*	*0.15*	*0.20*	*0.25*	*0.30*	*0.35*	*0.40*	*0.45*	*0.50*
Equity%											
0.00	0.50	0.47	0.44	0.41	0.38	0.33	0.29	0.23	0.17	0.09	0.00
0.05	0.53	0.50	0.47	0.44	0.41	0.37	0.32	0.27	0.21	0.14	0.05
0.10	0.55	0.53	0.50	0.47	0.44	0.40	0.36	0.31	0.25	0.18	0.10
0.15	0.58	0.55	0.53	0.50	0.47	0.43	0.39	0.35	0.29	0.23	0.15
0.20	0.60	0.58	0.56	0.53	0.50	0.47	0.43	0.38	0.33	0.27	0.20
0.25	0.63	0.61	0.58	0.56	0.53	0.50	0.46	0.42	0.38	0.32	0.25
0.30	0.65	0.63	0.61	0.59	0.56	0.53	0.50	0.46	0.42	0.36	0.30
0.35	0.68	0.66	0.64	0.62	0.59	0.57	0.54	0.50	0.46	0.41	0.35
0.40	0.70	0.68	0.67	0.65	0.63	0.60	0.57	0.54	0.50	0.45	0.40
0.45	0.73	0.71	0.69	0.68	0.66	0.63	0.61	0.58	0.54	0.50	0.45
0.50	0.75	0.74	0.72	0.71	0.69	0.67	0.64	0.62	0.58	0.55	0.50

(1980) presented the case that non-debt tax shields can offer a trade-off against debt, which should result in an interior capital structure solution. Both of these theoretical paradigms have solid foundations in basic conceptual thought, but have problems in implementation. The empirical evidence is mixed on these two major paradigm propositions because of the difficulty in getting observable variables to measure the effects of taxes at the margin. The exception is Graham (2000), who does make an attempt to investigate effects at the margin and finds that tax has a significant firm value effect.

NOTE

1. The reader may want to review the Chapter 4 discussion about the Scholes and Wolfson precepts again after reading the material about agency theory in Chapter 6.

REFERENCES

Alford, A., and P. Berger. 1998. "The Role of Taxes, Financial Reporting and Other Market Imperfections in Structuring Divisive Reorganizations." University of Pennsylvania Wharton School working paper.

Allen, D., and H. Mizuno. 1989. "The Determinants of Corporate Capital Structure: Japanese Evidence." *Applied Economics* 21 (May): 569–85.

Auerbach, A. J. 1984. "Taxation, Corporate Financial Policy and the Cost of Capital." *Journal of Economic Literature* 21 (September): 905–40.

Auerbach, A. 1984. "Taxes, Firm Financial Policy and the Cost of Capital: An Empirical Analysis." *Journal of Public Economics* 23 (February/March): 27–57.

Barnea, A., R. A. Haugen, and L. W. Senbet. 1981. "An Equilibrium Analysis of Debt Financing under Costly Tax Arbitrage and Agency Problems." *Journal of Finance* 36 (June): 569–81.

Braswell, R. C., and D. L. Summers. 1982. "The Effect of Taxes on the Appropriate Coupon Rate Strategy for Issuing Corporate Bonds." *National Tax Journal* 35 (December): 437–48.

Brick, I., and B. Wallingford. 1985. "The Relative Tax Benefits of Alternative Call Features in Corporate Debt." *Journal of Financial & Quantitative Analysis* 20 (March): 95–105.

Callahan, C., W. Shaw, and W. Terando. 2001. "Tax and Regulatory Motivations for Issuing Non-voting and Non-convertible Preferred Stock." *Journal of Accounting Research* 39 (December): 463–80.

Chang, R., and G. Rhee. 1990. "The Impact of Personal Taxes on Corporate Dividend Policy and Capital Structure Decisions." *Financial Management* 19 (Summer): 21–31.

Cloyd, B., S. Limberg, and J. Robinson. 1997. "The Impact of Federal Taxes on the Use of Debt by Closely Held Corporations." *National Tax Journal* 50 (June): 261–77.

Cooper, I., and J. Franks. "The Interaction of Financing and Investment Decisions When the Firm Has Unused Tax Credits/Discussion." *Journal of Finance* 38 (May): 571–83.

Cordes, J., and S. Sheffrin. 1983. "Estimating the Tax Advantage of Corporate Debt." *Journal of Finance* 38: 95–105.

DeAngelo, H., and R. Masulis. 1980. "Leverage and Dividend Irrelevancy under Corporate and Personal Taxation." *Journal of Finance* 35 (May): 453–64.
Downs, T. W. 1991. "An Alternative Approach to Fundamental Analysis: The Asset Side of the Equation." *Journal of Portfolio Management* 17 (Winter): 6–16.
Engel, E., M. Erickson, and E. Maydew. 1999. "Debt-Equity Hybrid Securities." *Journal of Accounting Research* 37: 249–74.
Erickson, M. 1998. "The Effect of Taxes on the Structure of Corporate Acquisitions." *Journal of Accounting Research* 36: 279–98.
Erickson, M. 2000. "Discussion of 'The Effect of Taxes on Acquisition Price and Transactions Structure.' " *Journal of the American Taxation Association* 22 (Supplement): 18–33.
Faig, M., and P. Shum. 1999. "Irreversible Investment and Endogenous Financing: An Evaluation of the Corporate Tax Effects." *Journal of Monetary Economics* 43 (February): 143–71.
Fama, E., and K. French. 1998. "Taxes, Financing Decisions, and Firm Value." *Journal of Finance* 53 (June): 819–44.
Franks, J. R., and J. J. Pringle. 1982. "Debt Financing, Corporate Financial Intermediaries, and Firm Valuation." *Journal of Finance* 37 (June): 751–61.
Fung, W. K. H., and M. Theobald. 1984. "Dividends and Debt under Alternative Tax Systems." *Journal of Financial & Quantitative Analysis* 19 (March): 59–72.
Gau, G., and K. Wang. 1990. "Capital Structure Decisions in Real Estate Investment." *Journal of the American Real Estate & Urban Economics Association* 18 (Winter): 501–21.
Gordon, M. J. 1982. "Leverage and the Value of a Firm under a Progressive Personal Income Tax." *Journal of Banking & Finance* 6 (December): 483–493.
Gordon, M. J. 1994. "Finance, Investment, and Their Macroeconomic Implications." *Quarterly Review of Economics & Finance* 34 (Spring): 1-11.
Graham, J. 2000. "How Big Are the Tax Benefits of Debt?" *Journal of Finance* 55 (October): 1901–42.
Haugen, R., and L. Senbet. 1986. "Corporate Finance and Taxes: A Review." *Financial Management* 15 (Autumn): 5–21.
Hayn, C. 1989. "Tax Attributes as Determinants of Shareholder Gains in Corporate Acquisitions." *Journal of Financial Economics* 23: 121–53.
Henning, S., W. Shaw, and T. Stock. 2000. "The Effect of Taxes on Acquisition Price and Transactions Structure." *Journal of the American Taxation Association* 22 (Supplement): 1–17.
Hodder, J., and L. Senbet. 1990. "International Capital Structure Equilibrium." *Journal of Finance* 45 (December): 1495–1516.
Jaffe, J. 1985. Inflation, the Interest Rate, and the Required Return on Equity," *Journal of Financial & Quantitative Analysis* 20 (March): 29–44.
Jensen, M. C., and W. Meckling. 1976. "The Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure." *Journal of Financial Economics* 3: 305–60.
Litzenberger, R. H., and J. C. Van Horne. "Elimination of the Double Taxation of Dividends and Corporate Financial Policy." *Journal of Finance* 33 (June): 737–50.
Marston, F., and R. Harris. 1986. "Substitutability of Leases and Debt in Corporate Capital Structures." University of North Carolina working paper.
Maydew, E., K. Schipper, and L. Vincent. 1999. "The Impact of Taxes on the Choice of Divesture Method." *Journal of Accounting and Economics* 28: 117–50.

McConnell, J., and G. Schlarbaum. 1981. "Evidence on the Impact of Exchange Offers on Security Prices: The Case of Income Bonds." *Journal of Business* 54 (January): 65–85.

Mehta, D. R., E. A. Moses., B. Deschamps., and M. C. Walker. 1980. "The Influence of Dividends, Growth, and Leverage on Share Prices in the Electric Utility Industry: An Econometric Study." *Journal of Financial & Quantitative Analysis* 15 (December): 1980, 1163–96.

Miles, J. A., and J. R. Ezzell. 1985. "Reformulating Tax Shield Valuation: A Note." *Journal of Finance* 40 (December): 1485–92.

Miller, M. 1977. "Debt and Taxes." *Journal of Finance* 32 (May): 261–75.

Modigliani, F., and M. Miller. 1958. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* 48 (June): 261–97.

Modigliani, F., and M. Miller. 1963. "Corporate Income Taxes and the Cost of Capital." *American Economic Review* 53 (June): 433–43.

Rashid, M., and B. Amoako-Adu. 1987. "Personal Taxes, Inflation and Market Valuation." *Journal of Financial Research* 10 (Winter): 341–51.

Rutterford, J. 1985. "An International Perspective on the Capital Structure Puzzle." *Midland Corporate Finance Journal* 3: 60–72.

Scholes, M., and M. Wolfson. 1987. "Taxes and Organizations Theory." Stanford University working paper.

Scholes, M., and M. Wolfson. 1992. *Taxes and Business Strategy: A Planning Approach.* Englewood Cliffs, New Jersey: Prentice Hall, 1992.

Seetharaman, A., Z. Swanson, and B. Srinidhi. 2001. "Analytical and Empirical Evidence of the Impact of Tax Rates on the Trade-Off between Debt and Managerial Ownership." *Journal of Accounting Auditing & Finance* 16 (Summer): 249–72.

Shackleford, D., and T. Shevlin. 2001. "Empirical Tax Research in Accounting." *Journal of Accounting and Economics* 31 (September): 312–87.

Shelton, J. 1981. "Equal Access and Miller's Equilibrium." *Journal of Financial & Quantitative Analysis* 16 (November): 603–23.

Sick, G. 1990. "Tax-Adjusted Discount Rates." *Management Science* 36 (December): 1432–50.

Steele, A. 1984. "Difference Equation Solutions to the Valuation of Lease Contracts." *Journal of Financial & Quantitative Analysis* 19 (September): 311–28.

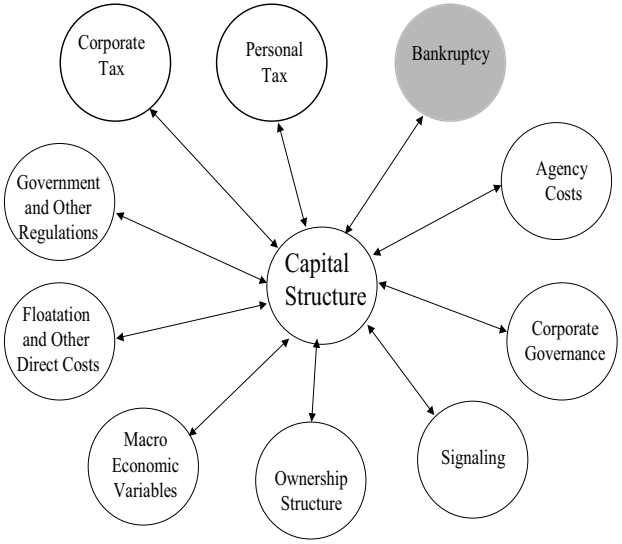
Talmor, Eli., R. Haugen, and A. Barnea. 1985. "The Value of the Tax Subsidy on Risky Debt." *Journal of Business* 58 (April): 191–202.

Zechner, J., and P. Swoboda. 1986. "The Critical Implicit Tax Rate and Capital Structure." *Journal of Banking & Finance* 10 (October): 327–41.

5

Bankruptcy Cost's Effect

Central Tenet: With bankruptcy cost and taxes, the optimal debt-to-equity ratio will be at an interior point, not at an extreme point.



INTRODUCTION

The theory of how bankruptcy risk can affect firm value is relatively straightforward. One of the simplest models of firm value postulates that the present value of the firm is equal to the expected cash flow divided by the discount rate, which is the weighted average cost of capital. Thus, the value of the firm is maximized at the lowest weighted average cost of capital, and any increase in the cost of debt from bankruptcy risk will result in shifting to a higher proportion of equity in the mix.

What are bankruptcy's costs? Schneller (1980) identified three categories of firm distress costs. They can be divided into *ex ante* and *ex post* categories. Before the fact, firms face increased interest costs of risky debt and the loss of future tax deductibility (Brennan and Schwartz 1978). Altman (1984) further defined two types of bankruptcy costs after the fact. One distress cost is the direct cost of filing bankruptcy from trustee, lawyer, accountant, filing fees, and other administrative expenses. The second type of distress cost is the indirect cost of lost profits. There are several sources of lost profits for a firm in financial distress. First, management will be preoccupied and will do a relatively poor job running the company. Second, suppliers will increase the financial/logistic responsibilities of the distressed firm because the suppliers will want to be paid for current purchases and will tightly control deliveries. Past debts are included in any plan of arrangement. For the third cost, customers are concerned about the firm's warranty/service and reduce purchases from the distressed firm in favor of its competitors.

Bankruptcy costs are difficult to model theoretically because they are only measurable indirectly or as the result of future probabilistic events. The empirical question is much simpler: Are the bankruptcy costs sufficient to affect the debt/equity decision? Firms face substantial direct and indirect costs as the likelihood of bankruptcy increases (Altman 1984; Warner 1977). Altman (1984) found that both costs are significant, but Warner (1977), who only investigated direct cost in a regulated industry, did not find it significant. The impact of risky debt on the capital structure of firms who are not in bankruptcy is still an open question.

Reported research on bankruptcy costs is split into two separate legal regimes. The Bankruptcy Act was replaced by the Bankruptcy Code of 1978, which became effective October 1, 1979. The Code dramatically increased management's powers during the reorganization process. While articles written under the Act are often the only research on point, prior studies will be revisited with a revisionist view as researchers report on more recent experience.

THEORETICAL FRAMEWORK

General

While the concept of a firm defaulting on its debt is simple, the incorporation of bankruptcy into the capital structure paradigm adds theoretical complexity very quickly. Researchers have used a variety of different approaches to address the problem. Next, this section reviews several techniques.

Kraus and Litzenberger (1973) developed a state preference model to explain capital structure choice. According to their model the tax advantages of debt make it the optimal means of financing as long as the firm will not become insolvent. In states where the firm faces an insolvency problem, the firm will finance with equity. The capital structure "solution" is not necessarily at an interior point. Each firm must identify the states, and the capital structure solution is a consequence. While this approach has its appeal, the practical problem of state assignments is not easily resolved except for the simplest of firm situations.

Litzenberger and Van Horne (1978) addressed capital structure issues from a Pareto optimum point of view. They incorporated corporate taxes and bankruptcy costs in the analyses. They argued that issuing firm risky debt with bankruptcy costs is an inferior Pareto solution because the social cost of bankruptcy is a greater deadweight loss to society than the direct bankruptcy cost of lawyers, etc. In their framework, however, investor decisions cannot be resolved when the number of future contingencies exceeds the number of linearly independent securities in the market. The problem is similar to the inability to define state preferences in the previously mentioned discussion of Kraus and Litzenberger (1973).

Schneller (1980) also considered default conditions within the context of a state preference framework. The author built on Miller (1977) by considering personal and capital gains taxes with respect to default conditions. Under these circumstances, Schneller determined that an interior optimum is possible.

Baron (1975) articulated the bankruptcy cost question by placing a series of bounds on the value of debt within a partial equilibrium frame, starting from a risk-free situation. The author postulated that, as the level of debt increases, the nominal interest rate increases. The consequence of increasing rates is a probable firm condition where the default costs exceed the tax advantage of debt and an interior optimum capital structure point will occur.

Similar to Baron (1975), Scott (1976) formulated a multiperiod model of firm value as a function of expected future earnings and asset liquidation value. The model's comparative statistics indicate that firm

value increases with respect to the corporate tax rate and the liquidating value of firm assets. During the 1970s, the idea of estimating firm asset liquidating value could be reasonable, given that most firm assets were physical in nature (Ip 2002). By the turn of the century, however, the composition of firm assets had become increasingly intangible, and statistically approximately half of firm asset value came from intangible assets (Ip 2002). In the midst of a financial crisis, the intangible assets associated with firm reputation may be impaired. Witness the 2002 Enron case, where financial asset value was in part measured by the firm's reputation. When Enron's reputation became damaged, the financial asset values were destroyed as well.

Kale and Noe (1992) developed a model based on Scott's (1976) framework, which seeks to explain empirical issues raised by Miller (1977), that actual firm debt is relatively low (e.g., percentages in the twenties). The question is: If the tax advantage of debt is so good, why are the debt levels so low? Kale and Noe addressed the bankruptcy cost issue by creating a state specifically for the point when a firm would enter into technical default of being unable to pay interest on the debt. Their approach moved the impact of bankruptcy's costs from the point of filing to significant marginal probabilities at any level of leverage. The authors argued this shift of distress costs to the incidence of a technical default is sufficiently high to explain the relatively low levels of corporate debt found in practice.

Turnbull (1979) also investigated firm capital structure variables by deriving closed-form solutions for firm debt and equity. Then the author manipulated the face value of the debt and determined that increases in the debt's face value reach a maximum that is lower than a firm's market value. Assuming that firms will maximize market value and the maximum debt value is also the maximum that creditors will lend, Turnbull concluded that firms will always reach the optimum capital structure before hitting the firm's debt capacity. There is support for Turnbull's concept from Glenn (1976), who argued that an interior optimum exists because the issuance of debt is constrained by the firm in order to receive preferential bond ratings. In a related analysis, Skarabot (2001) showed through closed-form solutions of the capital structure factors that an interior optimum will result from the use of asset securitizations.

Nakamura and Nakamura (1982) also derived a formula for the long-term debt ratio of a firm. The authors investigated model properties with respect to the firm's maximum present value. They determined that this firm value is positively related to the cost of equity and negatively related to the cost of debt, capital productivity, and retained earnings. Using a similar approach, Bradley et al. (1984) developed a capital structure model that includes personal taxes on debt and equity,

firm non-debt tax shields, and distress costs. The authors used a simulation approach and concluded that leverage ratios should be inversely related to firm earnings volatility. Leland (1994) and Leland et al. (1996) also developed closed-form solutions of debt, equity, and the firm. They included bankruptcy costs endogenously and investigated the optimal maturity of debt. A conclusion is that debt advantages must be traded off against agency and bankruptcy costs. Counter to the DeAngelo and Masulis (1980) interior optimum conclusions of the foregoing works, Talmor et al. (1985) argued that while the impact of risky debt does increase interest costs, these interest costs are coincidentally tax deductible, and therefore a corner solution of all debt or all equity will result. It should be noted that Talmor et al. did not consider the indirect bankruptcy costs within their approach.

Rubenstein (1973) proved the Modigliani-Miller proposition of capital structure irrelevance in a capital asset pricing model (CAPM) framework with risky debt. However, the application of CAPM to capital structure is dependent upon the interpretation of the CAPM assumptions. Gonzalez and Litzenberger (1977) found the CAPM mis-specified when the interest on firm debt is included in the CAPM framework and the debt is presumed risky. Gonzalez's problem was that the CAPM assumes a quadratic utility function for investor preference purposes, but the introduction of risky debt makes the mean-variance formulation inappropriate. The author suggested that hyperbolic absolute risk averson (HARA) utility functions in a more complex extended version of the CAPM will be necessary to investigate capital structure issues with the CAPM. Rhee (1984) added the restriction to a CAPM analysis of capital structure that risky debt bankruptcy must necessarily be costly or there is a potential consequence that shareholder equity can be driven negative, which is impossible.

Stulz and Johnson (1985) investigated the monitoring costs of secured debt with a contingent claims analysis. They determined that the value of debt is higher when part of a new project is financed with secured debt. Picker (1992) used game theory to analyze the monitoring of secured debt. His analysis concluded that monitoring will most likely be used in situations where there is a potential high risk of bankruptcy as opposed to a low risk. Picker's approach is potentially useful in the formulation of debt contracts. Creditors use Picker's arguments to justify placing limitations on the debtor borrowing more money, incurring additional fixed charges, or increasing other cash expenditures.

Options Pricing Theory

Several authors have used options pricing theory (OPT) to investigate the impact of firm debt on capital structure. Galai and Masulis (1976)

showed with an OPT analysis that risky debt affects capital structure according to Modigliani and Miller's (1958) theory. Smith (1979) formulated an OPT model using the assumption that the firm's capital structure is irrelevant. Under Smith's model, equity's value is the same as a call option where the assets of the firm comprise the underlying instrument. The value of debt is equal to the price of firm assets plus a call option to repurchase the assets where the exercise price is the face value of the debt. Options have been traded for many years and the OPT characteristics are well known, which makes this approach attractive for the investigation of capital structure. But a word of warning is necessary because options of this type are not routinely traded, and the consequence is that the analysis is subject to a fair degree of ambiguity.

By incorporating OPT, the CAPM, and the Modigliani-Miller framework, Hsia (1981) analyzed the impact of risky debt (i.e., bankruptcy factors) on firm value. Hsia's article is pivotal in its coverage of three major theoretical frameworks. An in-depth examination of his article provides insight with respect to OPT because the option pricing framework is a very coherent theoretical method that facilitates examination of the issues surrounding default. The OPT methodology also has extensive market applications, which prove useful in a wide range of circumstances. The preceding approaches might be appealing, but their empirical application is extremely subjective.

A key advantageous characteristic of the OPT is the manner in which it can be used to value debt and equity because the model can price claims on an underlying security, which for the firm is its assets. Hsia (1981) defined the value of debt in terms of expectations of distributions for the case of default and the case of non-default. The firm model is a simple one-period case where debt D is a zero coupon redeemed at the end of period T. Hsia's equation (15a) is:

$$B = E(DZ_T' \mid V_T > D) + E(V_T Z_T' \mid V_T \leq D) \tag{5.1}$$

where:

B = market value of debt,
V_T = firm value at time T, and
Z_T' = marginal rate of substitution of the future date T uncertain consumption claim for current consumption.

Next, place equation (5.1) in terms of returns by first substituting $R_T = V_T/V_0$ given that the current time is 0 (Hsia's equation[15b]):

$$B = V_0\, E(D/V_0\, Z_T' \mid R_T > D/V_0) + V_0\, E(R_T Z_T' \mid R_T \leq D/V_0) \tag{5.2}$$

Assuming continuous compounding, by defining $R_T = e^r$ and $Z_T' = e^{z'}$ and substituting into equation (5.2), the expression can be reworked as Hsia's equation (15c):

$$B = D\, E[e^{z'} \mid r > \ln(D/V_0)] + V_0\, E[e^r\, e^{z'} \mid r \leq \ln(D/V_0)] \qquad (5.3)$$

Firm debt (equation (5.3)) can be expressed in the familiar OPT format below by using the r and z' b-variate normally distributed characteristics and Rubenstein's (1976) methodology (Hsia's equation 16):

$$B = D\, R_f^{-t}\, N(d_2) + V_0\, N(-d_1) \qquad (5.4)$$

where:

$$d_1 = \frac{\ln(V_o/D) + (\ln R_f + 1/2\sigma^2)t}{\sigma\sqrt{t}},$$

$d_2 = d_1 - \sigma\sqrt{t}$,
N(.) = cumulative normal probability function,
t = time to maturity T,
R_f = one plus the risk-free rate, and
σ = instantaneous standard deviation of a firm's value.

By accounting identity, the equity value S of the firm is equal to:

$$S = V_O - B = V_O\, N(d_1) - D\, R_f^{-t}\, N(d_2) \qquad (5.5)$$

Hsia (1981) took these OPT variables and a continuous CAPM formulation to prove the basic MM propositions. Thus, the OPT, CAPM, and MM are all consistent within the context of efficient market conditions. Hsia's approach used a normal distribution for returns. His results may be made more specific through use of Monte Carlo simulations or finite Markov chain processes, which can model different distributions. Duan and Simonato (2001) used a finite Markov chain process for pricing complex options. They indicated the Markov procedure may be adjusted to use any distribution that is parametrically definable.

From these seminal formulations, researchers have developed over time more complex definitions of OPT firm value. Wiggins (1990) used an OPT framework to examine the maturity of debt and concluded theoretically that the debt maturity should be greater than zero. In another example, Kalaba et al. (1984) investigated the implicit bankruptcy costs of corporate debt where the debt is modeled with a partial differential equation based on Merton's (1974) formulation. By using simulation techniques, they estimate bankruptcy costs where the values

are less than the theoretically predicted price. The problem with the Kalaba et al. approach is that in actual markets, a model of this type may overprice securities (giving an implicit bankruptcy cost) as well as underprice them. These pricing differences are not necessarily attributable to bankruptcy costs. This problem is systematic in this type of research.

Kale (1991) derived an option theory firm framework with personal and corporate taxes based on the propositions of DeAngelo and Masulis (1980). Kale demonstrated a U-shaped relation between business risk and debt. The reason for the U-shaped relation is that an option-priced tax liability is going to be long in its corporate tax option component and short in its personal tax component.

There is a stream of research that tries to define bankruptcy parameters within the OPT framework. Kim et al. (1993) formulated such a model and performed simulation tests. Duffie and Singleton (1999) also model bond pricing probabilistically with a defined default characteristic. They assumed that default occurs as a Poisson-type event, with a time-varying default probability per unit of time, and that the bond investor receives some default payment at the point of bankruptcy. Their approach permits the explicit definition of bankruptcy parameters, but the variables might be hard to estimate. Duffie (1999) did an empirical investigation of the pricing of a model based on Duffie and Singleton (1999). Although Duffie (1999) reported a fair degree of accuracy with his model, it also appears there may be estimation problems that might be attributable to bond ratings. Collin-Dufresne and Goldstein (2001) created a theoretical model of debt that incorporates credit spreads. Their framework leverage ratios are mean-reverting and the firm will adjust the capital structure with respect to its asset value. Morellec and Francois (2002) also used option pricing theory to investigate default issues. They modeled characteristics of U.S. bankruptcy law whereby firms can renegotiate terms of debt and or liquidate assets. If the bankruptcy law renegotiation feature is factored into the model, then, they argue, the leverage decision becomes ambiguous.

EMPIRICAL EVIDENCE

The empirical evidence is divided in four categories: (1) direct bankruptcy costs, (2) indirect bankruptcy costs, (3) risky debt effects, and (4) other. Probably the most important consideration to keep in mind when reviewing the evidence is the concept that leverage ratios will be smaller when leverage imperfections are present in the marketplace (Alberts 1983).

Direct Costs of Bankruptcy

Warner (1977) gave the first empirical evidence on the direct cost of bankruptcy. He examined a small set of 11 railroads and found that the direct costs are a relatively small percentage of firm value. The direct costs run 1 percent of firm value over the seven years before the bankruptcy and 5.3 percent in the year of the bankruptcy. The relative direct costs seem to decline with size. This finding suggests that direct bankruptcy costs are not important. Comparing railroads to other firms is not appropriate because of the regulatory involvement that causes railroads to take a long time to die. In addition, railroad bankruptcies were governed by a different chapter of the Bankruptcy Act in effect during all of Warner's study.

Ang et al. (1982) analyzed 86 commercial firms that entered bankruptcy between 1963 and 1978 and found the mean ratio of administrative costs of bankruptcy to firm liquidation value to be 7.5 percent, with a median value of 1.7 percent. These direct costs in Ang's study are larger than those found by Warner (1977). Ang also found a scale effect similar to Warner in that the administrative costs are a declining function of the firm liquidation value. Weiss (1990) found a somewhat higher direct cost figure of 3.1 percent on a sample of 37 bankrupt firms. In a study of Chapter 11 bankruptcies, Betker (1997) found similar direct costs of 2.85 percent for prepackaged cases and 3.93 percent for regular cases. Tashjian (2000) found slightly lower costs for a sample of prepackaged bankruptcies.

Scherr (1983) did a case study analysis of the W.T. Grant bankruptcy. The author endeavored to compare the costs of a forced sale situation with those costs of normal asset sales. Thus, Scherr estimated the direct costs were between 3.0 and 4.3 percent of assets, which are appreciable. Altman (1984) also investigated the direct costs associated with a set of bankruptcies of non-regulated firms. He found that direct bankruptcy costs are 6 percent of market value in the years preceding the bankruptcy and 6 percent of market value in the year of the bankruptcy. The majority of the studies' direct cost percentages are higher than Warner (1977) and are definitely nontrivial.

Indirect Costs of Bankruptcy

Altman (1984) wrote the seminal work on bankruptcy's indirect costs. His study was motivated by the concept that the managerial opportunity costs will become large when a firm is distressed. At that time, Chrysler almost went out of existence, and the executives had to spend considerable effort to convince suppliers and buyers of the firm's viability. Only after the U.S. government bailed out Chrysler could the

company management devote appropriate time to the core business activities.

Altman (1984) reported on regressions of industry benchmarks and firm performance to estimate lost profits of firms during the time leading up to their bankruptcy. Estimated firm values declined 8.1 percent in the three years before the bankruptcy and 10.5 percent in the year of the bankruptcy. A survey of analysts' forecasts confirmed the regression results. The analysts estimated that the firms lost 17.5 percent in their last year of existence and had an appreciable loss in years preceding their bankruptcy filings. While Altman's sample of 19 firms is relatively small, the implications are clear that indirect bankruptcy costs are significant.

There is the problem that the measurement of indirect costs is potentially like the dog chasing its tail (i.e., profits decrease because the firm is in distress and the firm is in distress because profits are down) (Wruck 1990). Chen and Merville (1995) gave some evidence on this issue. They categorized firms in groups according to Altman's Z score for the probability of financial distress. Then they examined the firms longitudinally for the ones that drop into the lower distress category. The market values on such a transition decline 8.3 percent, which suggests that indirect costs of distress are high and measurable before a firm declares bankruptcy.

Opler and Titman (1994) took a different look at indirect financial distress costs. They found that highly leveraged firms have significant losses in market share (sales) when industry economic conditions decline. The impact is especially significant in highly concentrated industries. Maksimovic and Phillips (1998) also reported that industry conditions are an important factor in bankruptcy costs. Their study differs from the others because they investigated individual plant closings in Chapter 11 proceedings. They did not find indirect bankruptcy costs because they claimed that industry demand and capacity utilization impact on the costs. They reported that the bankruptcy frequency is much higher in declining industries than in growth industries. Thus, if an industry is at maximum capacity, then the plant closing is the consequence of a firm specific problem that another firm can correct.

Andrade and Kaplan (1998) concurred that the costs of financial distress can be high. The authors examined highly levered transactions that later became distressed. They found that the direct and indirect costs of distress range from 10 to 20 percent of firm value.

It should be noted that investors do have the opportunity to deal with bankruptcy costs before a formal filing of bankruptcy occurs. Haugen and Senbet (1978) argued that firms can have an informal reorganization in the marketplace if the trading costs are relatively small. An informal reorganization action avoids bankruptcy costs, is generally

less expensive than a chapter proceeding, and assists management in maintaining its position (Gilson et al. 1990).

Higher Leverage Associates with Riskier Debt

Another stream of research finds that higher leverage associates with more risky debt costs (i.e., bankruptcy). Researchers (e.g., Altman 1968, 1993; Ohlson 1980) have developed models to predict bankruptcy from financial ratios. Leverage ratios are generally present. Altman (1968) used the ratio market value of equity to book value of debt in a multiple discriminant analysis to predict bankruptcy. Ohlson (1980) used measures of firm size, capital structure, performance, and liquidity in a conditional logit regression to predict bankruptcies. Hambrick and D'Aveni (1988) found the equity-to-debt ratios of bankrupt firms to be relatively low for up to ten years before bankruptcy. Higher earnings volatility also increases the prospect of default (or debt risk) (Baxter 1976). Bradley et al. (1984) found that firm leverage is inversely related to earnings volatility. John (1993) considered liquidity factors as part of the firm capital structure decision. The author found an inverse relation between distress costs and leverage. The acid test of many propositions is: What do investors think? If risky debt is factored into investors' thinking, then there should be an association between bankruptcy risk and returns. Dichev (1998) investigated this proposition and found the contrary. Higher bankruptcy risk is associated with lower subsequent returns. Clearly, more work needs to be done in relating firm value and, by inference, capital structure decisions to financial distress.

Given that there is a connection between leverage and bankruptcy, the next question is: How significant is the effect? Empirical evidence from Flath and Knoeber (1980) indicates that firm operating characteristics have a greater impact on capital structure than tax effects. They defined failure as default on debt payments and not the cessation of the firm. Their definition of failure is well taken because default on debt payments affects stockholders and bondholders alike. Bond values drop precipitously when the issuer defaults, triggering protective covenants and opening up the possibility of protracted legal proceedings. Stock values drop as the trustee contemplates declaring the bonds in default and accelerating the debt, both of which are likely to precipitate a bankruptcy filing from the issuer or creditors.

One should be careful of blanket conclusions, as Kaplan (1994) found in a case study of Federated; this particular restructuring resulted in a gain in excess of the distress cost. In general the costs of any recovery are not going to be that great, which indicates substantial costs to bankruptcy. Altman and Kishore (1997) reported market value recoveries from defaulted bonds to be around 40 percent. Altman and Eberhart

(1994) found a slightly higher bond recovery value of 52.57 percent coming out of Chapter 11 proceedings.

The prospect of bankruptcy associated with high leverage levels is exacerbated by financial market conditions (Melicher and Hearth 1988). Barniv and Bulmash (1988) reported similar international evidence that the volatility of an economy affects the usage of risky debt. Default premiums should increase as interest rates move radically in relation to pro forma cash flows. In a related analysis, Francis (1990) found that stockholders are more likely to default on debt when the market rates have declined with respect to the debt coupon rates. Applebaum (1993) also concluded that government policy interventions can impact a firm's capital structure.

Firm size is another factor that may influence risky debt costs. Bates (1990) found that more heavily financed firms tend to survive, but that firm leverage was not a distinguishing factor between active firms and firms that went defunct. In a similar study of smaller English firms, Hall (1992) found that the likelihood of bankruptcy is inversely related to firm size. Hall also reported that bankrupt firms' managers indicate a problem with insufficient capital. So, failing small firms definitely have leverage problems, but small firms that survive appear to do so for reasons possibly not related to their capital structure. However, Ozkan (2001) reported that size had little impact on leverage for a sample of English firms.

One general characteristic of larger firms is an international dimension. Chen et al. (1997) found a negative relation between bankruptcy costs and firms' debt-to-equity ratio. Furthermore, after controlling for bankruptcy costs, international firms have lower debt in their capital structure than domestic firms. Wald (1999) reported that the relation between leverage and risk varies by country, which implies that bankruptcy costs may be affected by institutional factors. The differences in institutional factors both between countries and within a country may lead to differences in the types of risky debt that firms issue.

The packaging or components of risky debt present several options for firms' financing. For example, firms can finance with private or public debt. Johnson (1997) empirically investigated firm decisions between bank and private non-bank debt. In particular, he found that firms that choose public financing over private financing have lower bankruptcy costs. Private debt holders would have a more focused view to collect from a defaulting debtor, whereas public debt holders operate through a more diffuse trustee or bond holder's committee. Johnson also found that firms tend to use a variety of financing sources rather than rely on one type.

Risky debt packaging appears more of an art than a science, with components such as maturity, taxes, and bankruptcy costs playing a

role. Researchers including Stiglitz (1974), Morris (1976a, 1976b), Brennan and Schwartz (1978), and Brick and Ravid (1985) examined the maturity structure of debt to see if it impacts capital structure. If perfect markets are assumed with no bankruptcy costs and taxes, then according to Stiglitz (1974), debt maturity is irrelevant, but according to the other researchers, it is relevant.

Brick and Ravid (1991) specifically introduced a default probability into firm valuation and the maturity structure analysis. They addressed a question that practitioners answer every time that debt is issued: "How long should the debt maturity date be?" Brick and Ravid simulate the answer for various term structure alternatives. We will examine some details of their analysis and in particular look at a simulation of firm values, which appears to be a worthwhile means of showing the complexity of these issues. To compare the alternative values of short- versus long-term policy with a default probability, Brick and Ravid (1991) defined firm value according to a simplified model from Brick and Ravid (1985). On default, their model assumes that no equity remains in their capital structure in the second period of their framework. Thus, firm value V is:

$$\max_{D_L+R_LD_L} V = \frac{(1-t)X_1 + t(R_1D_1+R_LD_L)}{(1+R_1)} + \frac{(1-t)X_2 + tR_LD_L}{(1+R_1)(1+E(\tilde{R}_{F2}))} + \frac{tE(\tilde{R}_2\tilde{D}_2)}{(1+R_{F1})(1+E(\tilde{R}_{F2})} \tag{5.6}$$

where:

X_i = cash flow from operations at end of time i,
D_i = short-term debt market value at the beginning of time i,
R_i = short-term debt interest rate for time i,
$R_1 = (1 + R_{F1})/(1-F) - 1$,
F = probability of default in time period 1,
R_{F1} = single period riskless interest rate in time period 1,
D_L = long-term debt face value,
R_L = long-term debt interest rate,

$$D_1 + (X_1 - R_LD_L)(1-t) + D_2^M$$

$$D_2^M = \frac{(X_2 - R_LD_L)(1-t) + D_L}{(1+R_2^F(1-t)}$$

$$E_b(\tilde{R}_2\tilde{D}_2) \equiv \int_0^{R_2^F} \tilde{R}_2\,\tilde{D}_2\,dG(\tilde{R}_2), \text{ and}$$

$G(\tilde{R}_2)$ is the CDF of $\tilde{R}_2$

From the valuation formula (5.6), Brick and Ravid (1991) argued that firms should favor long-term debt when interest rate term structures are increasing. Alternatively when interest rate term structures are decreasing, firms should favor short-term debt. To visualize this proposition, they calculated the present value of the tax benefits of short- and long-term debt in their Table 1 for an increasing interest rate term structure, which is shown in Table 5.1. Clearly, the capital structure decision-making paradigm can become fairly complicated when one introduces numerous factors, and simulating an appropriate range of variables in a table or graph is highly recommended.

There also appears to be an interaction between firm size and debt maturity. Demirguc-Kunt and Maksimovic (1999) found that larger firms have longer debt maturities. Conceptually, usually, but not always, debt with longer maturity pays a higher interest premium than earlier maturing debt (Robichek and Myers 1966). In general, term structure issues have been heavily researched. In simple terms, investors attach an increasing maturity premium to debt that has more distant

TABLE 5.1 Short- versus Long-Term Debt Policy Tax Benefits

Short-Term Debt Policy			*Long-Term Debt Policy*						
TBS	D_1	D^M_2	*TBL*	$D_{L,}$	R_1	R_L	D_{L1}	*F*	R^H_2
$9.89	$188.36	$147.78	$9.89	$145.60	0.100	0.060	$43.43	0.00	0.03
13.73	183.38	147.86	13.76	143.57	0.158	0.089	40.38	0.05	0.03
17.33	178.14	147.93	17.37	141.37	0.222	0.122	37.23	0.10	0.03
20.66	172.62	148.00	20.71	138.99	0.294	0.158	33.99	0.15	0.03
23.70	166.80	148.08	23.75	136.41	0.375	0.199	30.66	0.20	0.03
10.73	186.32	145.63	10.77	145.06	0.100	0.068	42.92	0.00	0.06
14.44	181.48	145.81	14.56	143.03	0.158	0.098	39.88	0.05	0.06
17.93	176.01	145.99	18.09	140.83	0.222	0.130	36.75	0.10	0.06
21.15	171.01	146.16	21.35	138.45	0.294	0.167	33.52	0.15	0.06
24.10	165.34	146.34	24.32	135.87	0.375	0.208	30.21	0.20	0.06
11.53	184.32	143.54	11.63	144.54	0.100	0.076	42.42	0.00	0.09
15.13	179.63	143.82	15.33	142.50	0.158	0.105	39.39	0.05	0.09
18.50	174.68	144.09	18.79	140.30	0.222	0.138	36.27	0.10	0.09
21.62	169.45	144.37	21.97	137.93	0.294	0.175	33.07	0.15	0.09
24.48	163.91	144.65	24.86	135.35	0.375	0.216	29.77	0.20	0.09
12.29	182.39	141.51	12.45	144.02	0.100	0.083	42.92	0.00	0.12
15.77	177.84	141.88	16.08	141.98	0.158	0.113	38.91	0.05	0.12
19.04	173.02	142.25	19.45	139.79	0.222	0.146	35.81	0.10	0.12
22.07	167.92	142.62	22.56	137.42	0.294	0.183	32.62	0.15	0.12
24.84	162.52	142.99	25.38	134.84	0.375	0.225	29.34	0.20	0.12
13.02	180.51	139.53	13.24	143.51	0.100	0.090	41.44	0.00	0.15
16.39	176.08	139.99	16.79	141.48	0.158	0.120	38.44	0.05	0.15
19.55	171.40	140.45	20.10	139.29	0.222	0.154	35.36	0.10	0.15
22.49	166.44	140.91	23.13	136.91	0.294	0.191	32.18	0.15	0.15
25.17	161.16	141.38	25.88	134.34	0.375	0.233	28.92	0.20	0.15

future maturities because they are affected by events subject to greater unknowns, including the prospect of default, interest rate change, or debt marketability. The capital structure consequences may be an interior optimum because of the increasing interest debt costs if debt issues, such as equity, which has no expiration, are considered in perpetuity. In other words, firms should incrementally finance with debt up to the point that the marginal tax benefits (revenue) equal the marginal bankruptcy costs (Morris 1982).

Without bankruptcy costs, Lewis (1990) formulated a multiperiod theoretical model where taxes are the only market imperfection and concluded that the debt maturity structure is immaterial to firm value. On the other hand, Brick et al. (1983) developed a multi-period mathematical programming model whose objective is to determine optimal leverage subject to firm constraints including taxes and bankruptcy. This type of analysis is complicated by a company's risk class because a firm's maturity structure of debt will likely relate to the assets financed (Boot and Frankfurter 1972). Also, interest rate changes subsequent to a capital structure debt decision may prompt a bond refunding, which could further alter a firm's capital structure (Lewellen 1975).

Scherr and Hulburt (2001) investigated firm factors that may influence debt maturity. Their focus is on comparative differences between large and small firms. Similar to Guedes and Opler's (1996), their results showed a negative association between size and maturity, in contrast to two other studies (Barclay and Smith 1995, Stohs and Mauer 1996) that found a positive association. Scherr and Hulbert find that firms align their debt maturity with their asset maturity. Growth options do not appear to affect debt maturity.

FINANCING/INVESTMENT

To consider the bankruptcy implications of the linkage between investments and financing, Barker (1977) presented a simple example of two investments that have mean and variance characteristics. If both investments have the same mean return, then the investment with the higher variance has the higher risk of bankruptcy. This consequence is fairly obvious, but is quite powerful.

The separation of investment and financing has also been previously discussed in Chapter 4. Recall that there are two scenarios, capital structure irrelevance or a gain from leverage resulting from a tax advantage of debt/non-debt tax shield effect. Theoretically, Dotan and Ravid (1985) derived a model with risky debt that incorporates non-debt tax shields. Their model simultaneously solves investment and financing problems and thereby demonstrates a link between the two.

One interesting characteristic of their model is that operating and financial leverage are inversely related. Empirical research in this area has been attracted to investigating debt characteristics and leasing.

Clearly, a capital lease[1] has a direct relation between financing and investment in the firm. Bowman (1980) found that investors assess the risk associated with debt and leases in a similar fashion. Ely (1995) found that operating leases also affect asset and liability risk because investors/analysts evaluate operating risks in terms of the lessee firm having property rights. Indirectly, Lewellen and Emery (1981) also showed that leases are a debt liability by arguing that adding leases reduces the debt capacity of a firm. Bayless and Diltz (1990) determined the significance of the lease financing/investment to be related to the difference in risk between the leased assets and those that are not. The authors used an analytical model to define the relationship between the expected returns to debt, levered equity, and unlevered equity.

Other firm financing/investment connections are less obvious. In particular, the firm risk is also a potential factor in any financing/investment linkage. Beranek (1977) linked firm risk and the financing/investment decision, and the author made this case for a broad generalization that firm risk affects net present value (NPV) decisions. Specifically, Prezas (1992) showed that using risk-free debt associates with higher optimal asset lives, which indirectly indicates that financing and investment are related in a world with different risk classes. Applebaum (1992) also analyzed risk sharing/shifting between investors and a company. The author showed that tax rates and risky debt impact on capital structure potentially to such an extent that an all-equity firm could be optimal. From another perspective on how company bankruptcy characteristics affect capital structure, Boot et al. (1987) showed how a firm's current liquidity position may affect the value of its debt financing. The author used a Nash equilibrium game to find that firms with liquidity are better off paying a commitment fee for future access to loans.

Empirically, Balakrishnan and Fox (1993) showed that if firm-specific assets are unique, then the variance in leverage becomes higher. Firms might choose specific assets to enhance their competitive position, but these assets' unique characteristics apparently also affect the composition of the capital structure. Ambrose et al. (1996) provided other risky debt empirical evidence that financing is linked to investment with empirical data that interest coverage ratios are more important than loan-to-asset ratios for lender decisions. Brander and Lewis (1988) used game theory in an oligopoly to develop a relation between firm output and debt because of bankruptcy costs. Thus, the optimal capital structure decision of the firm may be affected not only by the investment but also by output from the investment.

IMPLICATIONS OF BANKRUPTCY TO CAPITAL STRUCTURE PARADIGM

The dollar size of funds lost to firm distress is increasing over time. Witness the $50 billion Enron collapse in 2002. Therefore, the cost of default to capital structure decisions is becoming more important as well. One implication of this chapter is that firms with a significant probability of bankruptcy should be analyzed for both researchers and practitioners. There are indicators for investors and analysts to predict bankruptcy (i.e., Altman's Z score) (Altman 1968, 1993). Logically, firms with high prospects of firm distress (low Z scores) need a bankruptcy factor in their capital structure analysis or should be investigated with a capital structure especially suited to bankruptcy analysis. This rule of thumb should be applied on an industry basis bearing in mind that industries with higher rates of default generally have lower leverage (Castanias 1983).

A basic example follows that anyone with a spreadsheet can do. Conditions of non-default are illustrated first as per Modigliani-Miller (1963) and then a risky debt default set of conditions is added. For the non-default situation, we define the firm value as originating from two cash flows: equity and debt-financed assets. The firm value $V_{levered}$ is equal to two perpetuities, one from each financing source as per the following equation:

$$V_{levered} = \frac{NOI(1-\tau_C)}{\rho} + \frac{R_d D \tau_C}{R_b} \tag{5.7}$$

where:

$V_{levered}$ = firm value,
NOI = expected net operating income,
τ_C = corporate tax rate,
ρ = return on equity-financed assets,
D = corporate debt,
K_b = interest rate paid on the face value of corporate debt D, and
K_d = market discount rate on corporate debt D.

A set of sample numbers has been prepared in Table 5.2. The expected income NOI is 10 and the return on assets ρ is .1. With a tax rate τ_C of .4, the value of an unlevered firm $V_{unlevered}$ is 60 throughout. Figure 5.1 shows this relation between firm value and leverage.

Next, we add default conditions by altering the rate of risky debt. First, we need to consider when default debt risk should affect the firm value. Let us consider the point that generally firms' leverage clusters

TABLE 5.2 No Default Risk

D/E	$V_{levered}$	$V_{unlevered}$	Debt Gain	$R_dD\tau_c$	R_d	D	τ_c	R_b
0.00	60.000	60	0.000					
0.25	63.333	60	3.333	0.40	0.1	10	0.4	0.120
0.50	66.667	60	6.667	0.80	0.1	20	0.4	0.120
0.75	73.333	60	13.333	1.60	0.1	40	0.4	0.120
1.00	76.667	60	16.667	2.00	0.1	50	0.4	0.120
1.20	80.000	60	20.000	2.40	0.1	60	0.4	0.120
1.60	86.667	60	26.667	3.20	0.1	80	0.4	0.120
2.00	93.333	60	33.333	4.00	0.1	100	0.4	0.120

around the industry average. For the purposes of our example, this firm's industry average will be D/E equal to one. At what point should we be concerned about this firm being different from the industry? Five percent is an often used rule of thumb in many business and audit situations. In this situation, 1.05 times the industry average D/E is 1.1. We shall presume that any leverage above D/E equal to 1.1 will be impacted by default risk.

A major question that has be discussed in this chapter is: How severe will be the impact of default risk and how do we calculate it? There are increasingly more sophisticated OPT models that incorporate default

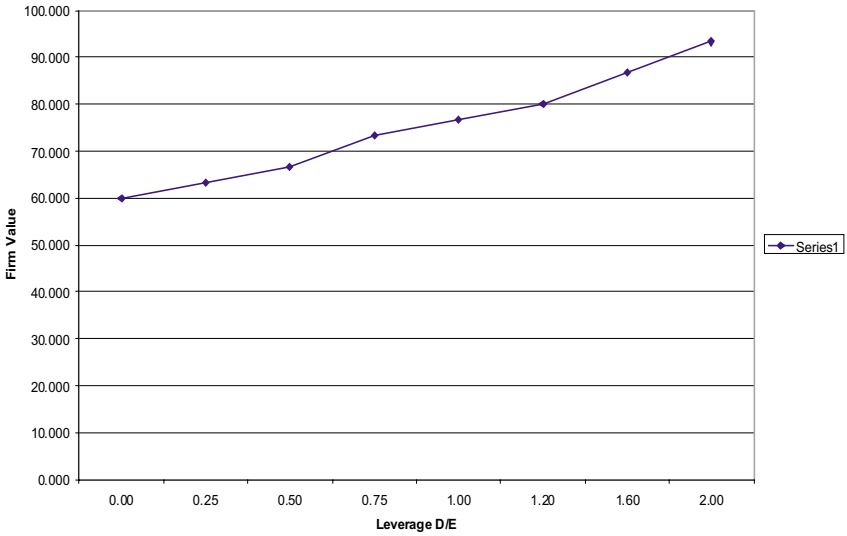


Figure 5.1 Panel A. No Default

risk by using firm statistical volatility factors. This area is still the subject of research, and we are simulating data for purposes of an example. As described previously in the example, the first point where the default factor becomes relevant is where the D/E ratio is 1.2. We will use an arbitrary example of 100 times the square of the interest rate of .12 for a default factor. For a D/E equal to 1.2, the default factor calculation is $100 \times .12 \times .12$ or 1.44. The computation of this factor is purely illustrative, but it gives how the capital structure affects the firm value calculation (see Table 5.3).

Graphically, the relation between firm value can be seen in Figure 5.2. Note that firm value begins to decline with the introduction of default

TABLE 5.3 Default Risk

D/E	$V_{levered}$	$V_{unlevered}$	Debt Gain	$R_d D \tau_c$	R_d	D	τ_c	R_b
0.00	60.000	60	0.000					
0.25	63.333	60	3.333	0.40	0.1	10	0.4	0.120
0.50	66.667	60	6.667	0.80	0.1	20	0.4	0.120
0.75	73.333	60	13.333	1.60	0.1	40	0.4	0.120
1.00	76.667	60	16.667	2.00	0.1	50	0.4	0.120
1.20	73.889	60	13.889	2.40	0.1	60	0.4	0.173
1.60	70.717	60	10.717	3.20	0.1	80	0.4	0.299
2.00	66.163	60	6.163	4.00	0.1	100	0.4	0.649

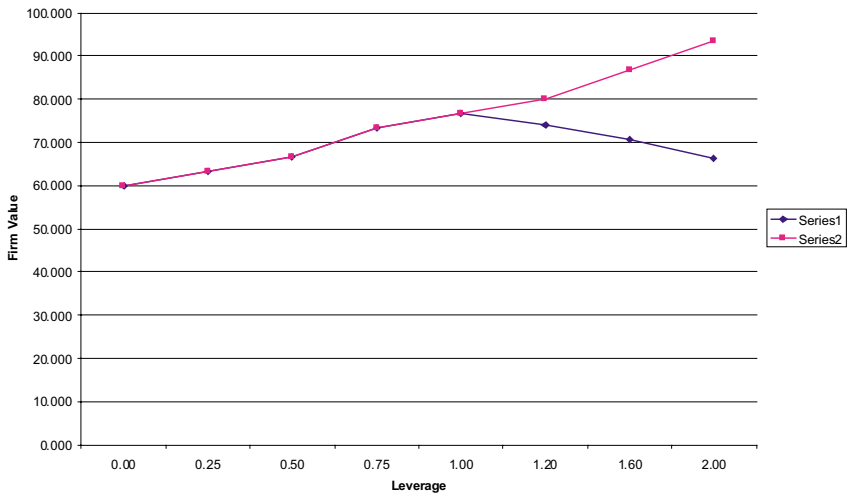


Figure 5.2 Panel B. Default and Non-Default

risk. An interior optimum capital structure occurs at the industry average in contrast with the results shown in Figure 5.1, where the firm optimum value is at a right corner solution.

There is another fairly simple approach to analyze the implications of firm distress. Narayanaswamy et al. (2001) demonstrated how the binomial option model can be used to compute the value of debt and equity under various conditions. Bear in mind that their model requires an assessment of probabilities for alternatives, but the probabilities can be varied in sensitivity analyses.

The implications of two other points have critical bearing on investor and firm capital structure decisions. The question of who bears the risk of a default is also an important practical issue. Sherman (1972) demonstrated that if a firm shifts the default risk to shareholders from the lenders, then the firm can carry more debt (i.e., have a higher leverage ratio).

Firm size is a potentially important factor in the capital structure decision for management. Approximately 50 percent of firms (particularly small ones) go out of business in their first five years because they have insufficient capital resources (Laitinen 1992). The wave of dot-com bankruptcies during the late 1990s is a sobering example of the risk of "new" firms. These firms have limited capabilities to offer asset collateral for debt. Thus, even though tax advantages for debt might appear to dominate a firm's capital structure, particularly smaller firms will have difficulties accessing the debt market. With the risk of default being relatively high, the lenders will charge commensurate interest rates. The consequence is an interior optimum point for leverage.

SUMMARY

Beyond a conceptualization of the bankruptcy issue, the overall conclusion of the theory about bankruptcy costs is that general equilibrium models are difficult to apply because the bankruptcy variable is firm specific. Partial equilibrium models using option pricing theory better capture unique firm conditions. The empirical evidence is mixed. Thus, the extent of the impact of bankruptcy costs remains an open question.

The extent of a paradigm change between the previous chapter, which included taxes, and this chapter, which includes bankruptcy costs, depends on the assessment of significance of the bankruptcy costs. While the extent of the empirical impact of bankruptcy costs is a matter of debate, the fact that bankruptcy costs theoretically affect the capital structure is clear. Thus, the paradigm does shift in a theoretical sense,

but the application to specific actual business situations is probably going to require the judgment of an expert(s), keeping in mind that the market is going to price bankruptcy costs as well.

NOTE

1. Financial Accounting Standard Board rule number thirteen defines a capital lease when:
   1. A transfer of ownership has occurred.
   2. A bargain purchase option exists at the end of the life of the lease.
   3. The lease period exceeds 75 percent of the asset life.
   4. The present value of the minimum lease payments exceeds 90 percent of asset fair value.

These characteristics are indicative of a purchase of an asset and a loan to finance it.

REFERENCES

Alberts, W., and G. Hite. 1983. "The Modigliani-Miller Leverage Equation Considered in a Product Market Context." *Journal of Financial & Quantitative Analysis* 18 (December): 425–37.

Altman, E. 1968. "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy." *Journal of Finance* 23: 580–609.

Altman, E. 1984. "A Further Empirical Investigation of the Bankruptcy Cost Question." *Journal of Finance* 39: 1067–89.

Altman, E. 1993. Corporate Financial Distress and Bankruptcy. 2d ed. New York: John Wiley & Sons.

Altman, E., and A. Eberhart. 1994. "Do Seniority Provisions Protect Bondholders' Investments?" *Journal of Portfolio Management* 20(4): 67–75.

Altman, E., and V. Kishore. 1997. "Default and Returns on High Yield Bonds: Analysis Theory 1997." NYU Working Paper Series S-98-1.

Ambrose, B., J. Benjamin, and P. Chinloy. 1996. "Credit Restrictions and the Market for Commercial Real Estate Loans." *Real Estate Economics* 24 (Spring): 1–22.

Andrade, G., and S. Kaplan. 1998. "How Costly Is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions That Became Distressed." *Journal of Finance* 53 (October): 1443–93.

Ang, J., J. Chua, and J. McConnell. 1982. "The Administrative Costs of Corporate Bankruptcy: A Note." *Journal of Finance* 37 (March): 219–26.

Appelbaum, E. 1993. "Bankruptcy, Warranties and the Firm's Capital Structure." *International Economic Review* 33 (May): 399–412.

Appelbaum, E. 1992. "Government Policy and the Firm's Capital Structure." *European Economic Review* 37 (August): 1185–96.

Balakrishnan, S., and I. Fox. 1993. "Asset Specificity, Firm Heterogeneity and Capital Structure." *Strategic Management Journal* 14 (January): 3–16.

Barclay, M., and C. Smith. 1995. "The Maturity Structure of Corporate Debt." *Journal of Finance* 50, 609–31.

Barker, H. 1977. "Bankruptcy Costs and the Firm's Optimal Debt Capacity = A Positive Theory of Capital Structure." *Southern Economic Journal* 43 (April): 1453–65.

Barniv, R., and S. Bulmash. 1988. "New Public Stock Issues by Seasoned and Unseasoned Firms: A Comparative Analysis in a Turbulent Environment—The Case of Israel." *Managerial & Decision Economics* 9 (March): 27–34.

Baron, D. 1975. "Firm Valuation, Corporate Taxes, and Default Risk." *Journal of Finance* 30 (December): 1251–64.

Bates, T. 1990. "Entrepreneur Human Capital Inputs and Small Business Longevity." *Review of Economics & Statistics* 72 (November): 551–59.

Baxter, N. 1967. "Leverage, Risk of Ruin and the Cost of Capital." *Journal of Finance* 22 (September): 395–404.

Bayless, M., and J. Diltz. 1990. "Corporate Debt, Corporate Taxes and Leasing." *Managerial & Decision Economics* 11 (February): 13–19.

Beranek, W. 1977. "The Weighted Average Cost of Capital and Shareholder Wealth Maximization." *Journal of Financial & Quantitative Analysis* 12 (March): 17-32.

Betker, B. 1997. "The Administrative Costs of Debt Restructurings: Some Recent Evidence." *Financial Management* 26 (Winter): 56–68.

Boot, J., and G. Frankfurter. 1972. "The Dynamics of Corporate Debt-Management Decision Rules and Some Empirical Evidence." *Journal of Financial & Quantitative Analysis* 7 (September): 1957–65.

Boot, A., A. Thakor, and G. Udell. 1987. "Competition, Risk Neutrality and Loan Commitments." *Journal of Banking & Finance* 11 (September): 449–71.

Bowman, R. 1980. "The Debt Equivalence of Leases: An Empirical Investigation." *Accounting Review* 55 (April): 237–53.

Bradley, M., G. Jarrell, and H. Kim. 1984. "On the Existence of an Optimal Capital Structure: Theory and Evidence/Discussion." *Journal of Finance* 39 (July): 857–80.

Brander, J., and T. Lewis. 1988. "Bankruptcy Costs and the Theory of Oligopoly." *Canadian Journal of Economics* 21 (May): 221–43.

Brennan, M., and E. Schwartz. 1978. "Corporate Income Taxes, Valuation and the Problem of Optimal Capital Structure." *Journal of Business* 51 (January): 103–14.

Brick, I., W. Mellon, J. Surkis, and M. Mohl. 1983. "Optimal Capital Structure: A Multi-Period Programming Model for Use in Financial Planning." *Journal of Banking & Finance* 7 (March): 45–57.

Brick, I., and S. Ravid. 1991. "On Relevance of Debt Maturity Structure." *Journal of Finance* 40 (December): 1423–37.

Brick, I., and S. Ravid. 1991. "Interest Rate Uncertainty and the Optimal Debt Maturity Structure." *Journal of Financial and Quantitative Analysis* 26 (March): 63–81.

Castanias, R. 1983. "Bankruptcy Risk and Optimal Capital Structure." *Journal of Finance* 38: 1617–35.

Chen, C., A. Cheng, J. He, and J. Kim. 1997. "An Investigation of the Relationship between International Activities and Capital Structure." *Journal of International Business Studies* 28 (Third Quarter): 563–77.

Chen, G., and L. Merville. 1995. "The Indirect Costs of Bankruptcy: A Probability Analysis." Financial Management Association Meeting, New York.

Collin-Dufresne, P., and R. Goldstein. 2001. "Do Credit Spreads Reflect Stationary Leverage Ratios?" *Journal of Finance* 56 (October): 1929–57.

DeAngelo, H., and R. Masulis. 1980. "Leverage and Dividend Irrelevancy under Corporate and Personal Taxation." *Journal of Finance* 35 (May): 453–64.

Demirguc-Kunt, A., and V. Maksimovic. 1999. "Institutions, Financial Markets, and Firm Debt Maturity." *Journal of Financial Economics* 54 (December): 295–336.

Dichev, I. 1998. "Is the Risk of Bankruptcy a Systematic Risk?" *Journal of Finance* 53 (June): 1131–48.
Dotan, A., and Ravid, A. 1985. "On the Interaction of Real and Financial Decisions of the Firm under Uncertainty." *Journal of Finance* 40 (June): 501–17.
Duan, J. C., and J. G. Simonato. 2001. "American Option Pricing under GARCH by a Markov Chain Approximation." *Journal of Economic Dynamics and Control* (November): 1689–1718.
Duffie, D. 1999. "Estimating the Price of Default Risk." *Review of Financial Studies* 12: 197–226.
Duffie, D., and K. Singleton. 1999. "Modeling Term Structures of Defaultable Bonds." *Review of Financial Studies* 12: 687–720.
Ely, K. 1995. "Operating Lease Accounting and the Market's Assessment of Equity Risk." *Journal of Accounting Research* 33 (Autumn): 397–415.
Flath, D., and C. Knoeber. 1980. "Taxes, Failure Costs, and Optimal Industry Capital, An Empirical Test." *Journal of Finance* 35 (March): 99–117.
Francis, J. 1990. "Corporate Compliance with Debt Covenants." *Journal of Accounting Research* 28 (Autumn): 326–47.
Galai, D., and R. Masulis. 1976. "The Option Pricing Model and the Risk Factor of Stock." *Journal of Financial Economics* 3 (January-March): 53–82.
Gilson, S., K. John, and L. Lang. 1990. "Troubled Debt Restructurings." *Journal of Financial Economics* 27: 315–54.
Glenn, D. 1976. "Super Premium Security Prices and Optimal Corporate Financing Decisions." *Journal of Finance* 31 (May): 507–24.
Gonzalez, N., R. Litzenberger, and J. Rolfo. 1977. "On Mean Variance Models of Capital Structure and the Absurdity of Their Predictions." *Journal of Financial & Quantitative Analysis* 12 (June): 165–79.
Guedes, J., and T. Opler. 1996. "The Determinants of the Maturity of Corporate Debt Issues." *Journal of Finance* 51: 1809–33.
Hall, G. 1992. "Reasons for Insolvency amongst Small Firms—A Review and Fresh Evidence." *Small Business Economics* 4 (September): 237–50.
Hambrick, D., and R. D'Aveni. 1988. "Larger Corporate Failures as Downward Spirals." *Administrative Science Quarterly* 33 (March): 1–23.
Haugen, R., and L. Senbet. 1978. "The Insignificance of Bankruptcy Costs to the Theory of Optimal Capital Structure." *Journal of Finance* 33 (May): 383–93.
Hsia, C. 1981. "Coherence of the Modern Theories of Finance." *Financial Review* 6 (Winter): 27–42.
Ip, G. 2002. "Mind over Matter—Why High-Fliers Built on Big Ideas Are Such Fast Fallers." *Wall Street Journal*, April 4, A.1.
John, T. 1993. "Accounting Measures of Corporate Liquidity, Leverage, and Costs of Financial Distress." *Financial Management* 22 (Autumn): 91–100.
Johnson, S. 1997. "An Empirical Analysis of the Determinants of Corporate Debt Ownership Structure." *Journal of Financial and Quantitative Analysis* 32 (March): 47–69.
Kalaba, R., T. Langetrieg, N. Rasakhoo, and M. Weinstein. 1984. "Estimation of Implicit Bankruptcy Costs." *Journal of Finance* 39 (July): 629–42.
Kale, J., and G. Ramirez. 1991. "The Effect of Business Risk on Corporate Capital Structure: Theory and Evidence." *Journal of Finance* 46 (December): 1693–1715.
Kale, J., and T. Noe. 1992. "Taxes, Financial Distress, and Corporate Capital Structure." *Quarterly Review of Economics & Finance* 32 (Spring): 71–83.
Kaplan, S. 1994. "Capaeau's Acquisition of Federated Post-Bankruptcy Results" *Journal of Financial Economics* 35: 123–36.

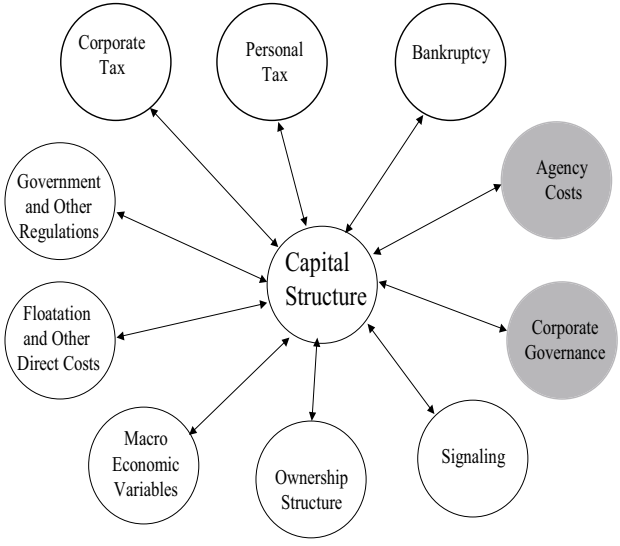
Kim, J., K. Ramaswamy, and S. Sundaresan. 1993. "Does Default Risk in Coupons Affect the Valuation of Corporate Bonds?: A Contingent Claims Model." *Financial Management* 22 (Autumn): 117–31.
Kraus, A., and R. Litzenberger. 1973. "A State Preference Model of Optimal Finance Leverage." *Journal of Finance* 28 (September): 911–22.
Laitinen, E. 1992. "Prediction of Failure of a Newly Founded Firm." *Journal of Business Venturing* 7 (July): 323–40.
Leland, H. 1994. "Corporate Debt Value, Bond Covenants, and Optimal Capital Structure." *Journal of Finance* 49: 1213–52.
Leland, H., and K. Toft. 1996. "Optimal Capital Structure, Endogenous Bankruptcy, and Term Structure of Credit Spreads." *Journal of Finance* 51 (July): 987–1019.
Lewellen, W. 1975. "Some Extensions of Capital Structure Theory." *Journal of Business Research* 3 (January): 13–24.
Lewellen, W., and D. Emery. 1981. "On the Matter of Parity between Financial Obligations." *Journal of Finance* 36 (March): 97–111.
Lewis, C. 1990. "A Multiperiod Theory of Corporate Financial Theory under Taxation." *Journal of Financial and Quantitative Analysis* 25 (March): 25–43.
Litzenberger, R., and J. Van Horne. 1978. "Elimination of the Double Tax on Dividends and Corporate Financial Policy." *Journal of Finance* 33 (June): 737–50.
Maksimovic, V., and G. Phillips. 1998. "Asset Efficiency and Reallocation Decisions of Bankrupt Firms." *Journal of Finance* 53 (October): 1495–1532.
Melicher, R., and D. Hearth. 1988. "A Time Series Analysis of Aggregate Business Failure Activity and Credit Conditions." *Journal of Economics & Business* 40 (November): 319–33.
Merton, R. 1974. "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates." *Journal of Finance* 29(2): 449–70.
Miller, M. 1977. "Debt and Taxes." *Journal of Finance* 33 (May): 261–75.
Modigliani, F., and M. Miller. 1958. "The cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* (June): 261–97.
Morellec, E., and P. Francois. 2002. "Capital Structure and Asset Prices: Some Effects of Bankruptcy Procedures." University of Rochester working paper.
Morris, J. 1976a. "On Corporate Debt Maturity Policies." *Journal of Finance* 31 (March): 29–37.
Morris, J. 1976b. "A Model for Corporate Debt Maturity Decisions." *Journal of Financial and Quantitative Analysis* 11 (September): 339–57.
Morris, J. 1982. "Taxes, Bankruptcy Costs and the Existence of an Optimal Capital Structure." *Journal of Financial Research* 5 (Fall): 285–99.
Nakamura, A., and M. Nakamura. 1982. "On the Firm's Production, Capital Structure and Demand for Debt." *Review of Economics & Statistics* 64 (August): 384–93.
Narayanaswamy, C., D. Schirm, and R. Shukla. 2001. "Financial Distress and the Stockholder-Bondholder Conflict: Application of Binomial Option Pricing Methodology." *Journal of Applied Finance* 11: 35–40.
Ohlson, J. 1980. "Financial Ratios and the Probabilistic Prediction of Bankruptcy." *Journal of Accounting Research* 19: 109–131.
Opler, T., and S. Titman. 1994. "Financial Distress and Corporate Performance." *Journal of Finance* 49 (July): 1015–39.
Ozkan, A. 2001. "Determinants of Capital Structure and Adjustment to Long Run Target: Evidence from UK Company Panel Data." *Journal of Business, Finance & Accounting* 28 (January/March): 175–98.

Picker, R. 1992. "Security Interests, Misbehavior, and Common Pools," *University of Chicago Law Review* 59 (Spring): 645–79.
Prezas, A. 1992. "Effects of Depreciation and Corporate Taxes on Asset Life under Debt-Equity Financing." *Financial Management* 21 (Summer): 24–30.
Rhee, S. 1984. "Shareholder Limited Liability and Mean-Variance Models of Capital Structure." *Decision Sciences* 15 (Winter): 1–13.
Robichek, A., and S. Myers. 1966. "Valuation of the Firm: Effects of Uncertainty in a Market Context." *Journal of Finance* 21 (May): 215–27.
Rubenstein, M. 1973. "A Mean-Variance Synthesis of Corporate Financial Theory." *Journal of Finance* 28 (March): 167–81.
Scherr, F. 1983. "Some Evidence on Asset Liquidation Losses: The Case of W. T. Grant." *Nebraska Journal of Economics & Business* 22 (Summer): 3–23.
Scherr, F., and H. Hulburt. 2001. "The Debt Maturity Structure of Small Firms." *Financial Management* 30 (Spring): 85–111.
Schneller, M. 1980. "Taxes and the Optimal Capital Structure of the Firm." *Journal of Finance* 35 (March): 119–27.
Scott, J. 1976. "A Theory of Optimal Capital Structure." *Bell Journal of Economics* 7 (Spring): 33–54.
Sherman, R. 1972. "How Tax Policy Induces Conglomerate Mergers." *National Tax Journal* 25 (December): 521–29.
Skarabot, J. 2001. "Asset Securitization and Optimal Asset Structure of the Firm." UC Berkeley working paper.
Smith, C. 1979. "Applications of Options Pricing Analysis," in J. Bicksler (Ed.). *Handbook of Financial Economics.* Amsterdam: North-Holland Publishing Company: 273–307.
Stiglitz, J. 1974. "On the Irrelevance of Corporate Financial Policy." *American Economic Review* 64 (December): 851–66.
Stohs, M., and D. Mauer. 1996. "The Determinants of Corporate Debt Maturity Structure." *Journal of Finance* 69: 279–312.
Stulz, R., and H. Johnson. 1985. "An Analysis of Secured Debt." *Journal of Financial Economics* 14 (December): 501–21.
Talmor, E., R. Haugen, and A. Barnea. 1985. "The Value of the Tax Subsidy on Risky Debt." *Journal of Business* 58: 191–202.
Tashjian, E. 2000. "Outcomes in Prepackaged Bankruptcies." *Journal of Corporate Renewal* 13 (March): 4–9.
Turnbull, S. 1979. "Debt Capacity." *Journal of Finance* 34 (September): 931–40.
Wald, J. 1999. "How Firm Characteristics Affect Capital Structure: An International Comparison." *Journal of Financial Research* 22 (Summer): 161–68.
Warner, J. 1977. "Bankruptcy Costs: Some Evidence." *Journal of Finance* 32: 337–47.
Weiss, L. 1990. "Bankruptcy Resolution: Direct Costs and Violation of Priority Claims." *Journal of Financial Economics* 27 (March): 285–314.
Wiggins, J. 1990. "The Relation between Risk and Optimal Debt Maturity and the Value of Leverage." *Journal of Financial and Quantitative Analysis* 25 (September): 377–86.
Wruck, K. 1990. "Financial Distress, Reorganization and Organizational Efficiency." *Journal of Financial Economics* 27: 419–44.

6

Effect of Agency Costs

Central Tenet: With agency costs, bankruptcy costs, and taxes, the relationships become more complicated and the proportion of equity in the optimal capital structure increases.



INTRODUCTION

Thus far, the thrust of our analysis has been to look at the firm as a monolith, where the managers make decisions to maximize the total value of the firm. We have ignored the conflict of interest between the various stakeholders such as the managers, stockholders, and debtholders. In this chapter, we look at the firm as consisting of self-interest maximizing stakeholders who form a nexus of contracts, using the firm as a forum for implementation of those contracts. These stakeholders have different objectives and are part of the firm only insofar as it helps them achieve their own goals. In other words, they "play" a non-cooperative game. In fact, the term *optimal capital structure* is no longer unambiguous because it begs the question—optimal from whose viewpoint?

Agency cost is defined as the total cost of creating and structuring contracts, including monitoring costs, bonding costs, and the residual loss of opportunities that could have been beneficial in the absence of such conflict of interests. First, we note that agency costs are not beneficial per se to any stakeholder. Therefore, it is reasonable to speculate that the contracts will be formed and all decisions will be made to minimize the firm's total agency costs. All the different components of agency costs impact the capital structure of the firm. The optimal capital structure is chosen to minimize the sum of agency costs resulting from that capital structure and the transaction costs needed to implement the capital structure. This overarching framework is what we define as the agency viewpoint of capital structure choice. The concept of optimality that applies when there are multiple stakeholders is that of Pareto optimality. In this economic framework, a capital structure would be optimal if it is not possible to increase the utility of any stakeholder without decreasing the utility of at least another. Of course, this structure need not be unique. In such a case, all the capital structures that satisfy this criterion is considered optimal from an agency perspective. However, we could then use the other perspectives such as tax or bankruptcy or signaling to choose from within this set of efficient points.

As early as 1932, Berle and Means (1932) alluded to the incentive problem that results from the separation of ownership and control. A formal framework to analyze the problem had to wait for another 44 years, to when Jensen and Meckling (1976) produced their seminal article on agency costs. Even though each individual stakeholder acts in his or her own self-interest, it is reasonable to analyze stakeholder groups who might have similar incentives, if not the same utility function. In that vein, we can look at all managers as one agent with a specified utility function. Similarly, all debtholders are categorized into

one homogeneous group and all stockholders into a third interest group with homogeneous motivations.[1] Of particular interest to the capital structure issue are two agency relationships: (1) the relationship between the managers and stockholders and (2) the relationship between stockholders and debtholders. These relationships could result in significant wealth transfers between interest groups. They are also more amenable to public scrutiny.

The agency cost of the stockholder-manager relationship arises from two sources. The first is the unobservability of manager's productive effort. The manager prefers less effort, but this behavior results in (stochastically) less output. However, the manager prefers more compensation and by linking the compensation to a proper measure of the output, this agency cost is reduced. However, the agent is risk averse, and this linkage will increase uncertainty in his compensation that needs to be compensated by paying an additional expected amount. The investor (principal) trades off this cost of inducing higher effort with the benefits of higher output. The resulting effort is less than the effort without this agency problem (called the first best effort). The loss of utility resulting from the reduction of the effort is the agency cost associated with moral hazard.

The second source of agency cost arises from asymmetry of information. The manager is closer to the production process of the firm and is often more skilled in the process. The manager privately knows his or her own ability (adverse selection problem) and often observes signals on the future of the firm that are valuable to the investor but not observed by the investor. The manager extracts "information rent" from this asymmetry, and it constitutes another agency cost. At an intuitive level, if the manager owns a larger part of the firm, the agency cost is reduced. If the manager's investment is held constant and the proportion of debt is increased, the manager's part of equity ownership increases, and this reduces the agency problem. In turn, because the agents want to minimize agency costs in their decisions, this predilection might call for an increase in the debt. Logical arguments such as this one link the capital structure decision to the agency relationship between the manager and the investor.

Conflicts between the stockholders and debtholders could arise because risky projects with high expected returns, but also a higher probability of very negative returns, are asymmetrically beneficial to stockholders and costly to debtholders. Debtholders do not participate in the high positive returns and stockholders do not participate in the high negative returns because of limited liability. This transfer of wealth from debtholders, to stockholders will be rationally expected by debtholders who will increase the cost of debt, effectively transferring back the loss from a suboptimal decision to the stockholders. In effect,

such debt will be overly costly and the capital structure will be adjusted to have higher equity than would be the case if the conflict did not exist. We discuss these effects in greater detail in the next section.

THEORY

Agency Relationship between Stockholders and Managers

As discussed previously, the conflict of interest between managers and stockholders can arise from moral hazard or other information asymmetry considerations. Unfortunately, no general relationship has been postulated between this conflict and the capital structure. A number of logical arguments have been made as to how the two are related. In this section, many of these arguments have been presented.

First, we can look at the areas in which the interests of the manager and the investors might diverge. A moral hazard problem arises from a preference of the manager to expend less productive (unobservable) effort, other things being equal. The investor would prefer more effort because it increases the likelihood of a higher output and consequent higher stockholder return. To motivate higher effort, the investor provides an output-contingent compensation and transfers risk to the manager. If the manager is risk averse, this contingent compensation results in an additional risk premium. The risk premium would have been avoided in the absence of the agency relationship and therefore constitutes an agency cost. Risk and effort aversion on the part of the agent as well as non-contractability of actual effort are necessary conditions for this cost.

A second factor that creates a conflict is bankruptcy. It is generally believed that in the case of a bankruptcy, the manager's cost is much higher than the investor's cost. Reasons could include loss of reputation, concentration of that firm's stock in the personal portfolio, and non-diversifiability of human capital invested in the bankrupt firm. In any case, managers who are more averse to bankruptcy than the investors would choose less risky projects with lower expected profitability than would the investors. For much the same reasons, managers are more averse to takeovers, even if they are in the stockholders' interest. In addition to these factors, accounting also plays a part in increasing the divergence. Accounting is asymmetrically positioned to measure assets-in-place better than growth opportunities, short-term benefits from production and sales activities better than long-term benefits from research and development or training activities, tangible assets rather than intangible assets, redeployable assets with market value better than assets with high specificity, and so on. Because accounting forms the basis of performance evaluation, managers are often interested in

the short-term accounting measures rather than the long-term (not immediately measurable) economic value considerations. The question then is how this conflict affects capital structure decisions. Incentive schemes might involve stock-based compensation that has a direct effect on the capital structure. Even more important are the incentive effects of debt and equity that have differential disciplining and monitoring effects on the manager.

One effect that is analyzed at great depth is the substitutability of incentive schemes and capital structure on monitoring costs. The diversity of research in this area shows that such substitutability is possible in many dimensions. At one end of this spectrum are studies that seem to ignore the effect of incentive schemes altogether. Jensen (1986) argued that managers can use their discretion over the *free cash flow* in the firm (a term that describes the amount of income that is available after needed investments). The greater the discretionary amount available to the manager, the greater the likelihood that the manager will use it for perquisites and shirking. Reducing such discretion will reduce the agency cost. This reduction might be achieved through a capital structure decision. For example, increasing the debt will force the manager to pay off interest and reduces the free cash flow. Similarly, the stockholders could increase the dividends with the same effect. Demsetz and Lehn (1985) indicated that increasing the concentration of stockholders or increased regulation by the government will lower the agency cost associated with monitoring the managers. Grossman and Hart (1982) argued that increasing the leverage increases the probability of bankruptcy and in turn disciplines the managers and increases the firm value. All these studies suggest the use of capital and ownership structures and regulations for reducing the discretion of managers.

We can use capital structure to reduce the *discretionary space* available to managers. We need an incentive scheme to induce the manager to use that discretionary space in the interest of the shareholders. If the incentive scheme is effective, there will be less need to reduce the discretionary space. At the optimum, therefore, we should expect firms that have a lower cost of incentive contracting to rely more on those contracts and firms with a higher cost of incentive contracting to rely more on capital structure to decrease the agency cost between the manager and the investor.

Smith and Watts (1982), among others, examined the effect of compensation plans on controlling the agency costs between the managers and investors. The two relevant elements of performance-based compensation are the stock-based compensation consisting of the award of stock options, restricted stock, and so on and the accounting-based compensation that consists of bonuses based on accounting numbers. In firms with more assets-in-place, accounting measurements are more

precise; therefore, it is less costly to implement incentive mechanisms. In firms with more growth opportunities, accounting measures are less precise and information asymmetry is higher. It is more costly, therefore, to implement incentive contracts. This relation might lead one to believe that the use of debt to discipline the manager is more useful in high-growth firms. However, this condition is generally not true because of two opposing forces.

First, there is an agency problem between the debtholders and the stockholders that we will discuss in detail in the next section. Debtholders are interested more in risk reduction than in risky growth (because they do not share in the growth but will be affected by losses, unlike the stockholders). Anticipating excessive risk-taking by managers acting on behalf of stockholders, debtholders act to constrain the options of managers. These debtholder constraints could stifle the competitiveness of high-growth firms. This economic condition is called the *underinvestment problem* (first identified by Myers 1977), which results in high-growth firms reducing the amount of debt in their capital structure. Second, assets of greater specificity characterize high-growth firms, whereas more redeployable assets characterize assets-in-place firms. The risk to debtholders is higher as assets become more specific. Therefore, debt will be priced higher for high-growth firms on average compared to assets-in-place firms. This will also result in less debt in high-growth firms.

As we see in the preceding arguments, the interaction between incentive schemes, available opportunities, information asymmetry, and capital structure is very complex. Like the seven blind men describing an elephant, researchers have focused on individual components of these interactions. There is, as yet, no integrating theory that can give definite answers in terms of equilibrium or partial equilibrium conditions on the effect of the other factors on capital structure.

In addition to the substitutability of capital structure and incentive schemes on monitoring moral hazard and information asymmetry costs, there has been a lot of thinking (e.g., Francis and Smith 1995; Mann and Sicherman 1991) on the divergence of interest between managers and investors with respect to liquidations and acquisitions. Managers invest their human capital in the current operations of the firm. Such an investment is not easily diversifiable. Therefore, managers should have an interest in continuing the current operations of the firm, even when liquidating the current operations of the firm might be optimal from the investor's viewpoint.

Harris and Raviv (1990) assumed this aforementioned management behavior holds and argued that debt forces default when the cash flows are poor. A default shifts the decision rights from managers to investors, who will then make an unbiased decision. Frequent defaults (caused by

too much debt in the structure) will cause information and investigation costs borne by the investor to increase. Infrequent defaults (caused by too little debt) will allow the managers to continue the firm even when the opportunity costs of the assets are higher than their returns. This analysis suggests that optimal debt level is determined by the optimal trade-off between the two costs. If we assume that firms with more tangible assets that are redeployable and easy to measure (assets-in-place) are likely to have higher liquidation values and low investigative costs, they should have a higher component of debt. This proposition is consistent with empirical findings. Stulz (1990) posited that managers prefer to invest all available funds rather than pay back the shareholders (empire-building incentive versus conflict of interest). This action results from the higher prestige associated with managing a larger firm or a larger division within a firm. Similar to Jensen (1986), Stulz argued that increasing debt reduces the discretionary space for the managers and reduces the likelihood of uneconomic investments.

Hart and Moore (1995) and Hart (1993) developed a stylized model to show that agency conflict between the manager and the investor is a necessary condition for the issuance of senior debt. In the absence of an agency conflict, if the manager is allowed to raise capital (by issuing senior debt) at later times by having junior debt in the beginning, there would really be no need for monitoring. If investments in the future are promising, they will be taken up and if they are not promising, they will be rejected (because the manager is not self-interested). This is in line with the interests of the investors; therefore, they will allow the managers to decide. Having senior debt in the beginning might constrain the manager from taking up a profitable investment later because of prior commitment to pay off the senior debt. It is irrational, therefore, for the firm to have senior debt. However, the fact is that senior debt exists, according to these articles, only because the manager is self-interested and this agency cost cannot be completely eliminated. Hart and Moore (1995) examined the case where the manager is an *empire-builder* and shows that in this case, the issuance of senior debt is necessary to discipline the manager. This article is important because it not only shows that the agency conflict changes capital structure but also demonstrates that the agency conflict is a necessary condition for the existence of the current structures that we observe. In a way, it removes the basis for articles that look at capital structure without simultaneously analyzing the incentive mechanism.

Myers (2000), in his reply to researchers (e.g., Hart 1993), cautioned against the use of arbitrary objective functions to describe the manager. Essentially, if we can arbitrarily assign objective functions to managers, we can show practically anything! Therefore, he urges caution before

we assume, say, that managers are empire-builders or are more averse to liquidation than investors.

Biais and Casamatta (1999) analyzed the relation between leverage and investment by looking at the problem from an industry or macroeconomic point of view. Their theoretical study considered the management decision of unobservable effort, as have the aforementioned works, and included the possibility that management might invest in less profitable ventures. When risk-shifting is a paramount factor, the authors derived an optimal leverage decision. Under these conditions, they concluded the capital structure should have a mixture of debt and equity. The analysis presents possibilities for signaling empirical studies.

There is one other potential mitigating factor on agency conflicts between owners and managers. Laws and regulations may provide mechanisms to reduce agency problems. The nature of legal frameworks on corporate governance is not well understood. The consequences to the Enron bankruptcy and other management abuses around the same time have yet to be sorted out. For example, it is not clear whether the management certification of United States' reports will also affect agency conflicts between owners and managers. Will the impact of these U.S. regulatory steps be significant, and how will they affect management behavior? Time will answer this question, but some good research might help. LaPorta et al. (2000) investigated this issue and suggested some approaches to regulatory control. They presented a comparative analysis across countries with differing legal frameworks and enforcement policies.

In summary, the relationship of the agency conflict between the manager and the investor and the optimal capital structure of the firm is complex. The conflict can be resolved either by capital structure changes or by direct incentive schemes. These two methods can act as substitutes. Moreover, the capital structure also determines the optimal incentive scheme. It is also shown that this agency conflict is a necessary condition for having debts of different seniorities.

Agency Relationship between Stockholders and Debtholders

For the purpose of this section, we suppress (mostly) the agency conflict between the managers and the stockholders. The stockholders will then take actions (either by themselves or through managers) that benefit themselves at the expense of the debtholders. The most researched effect of the agency conflict between the shareholders and debtholders deals with the incentives for shareholders to undertake risky projects that can shift wealth from the bondholders to stockhold-

ers who are not value maximizing for the firm as a whole. Consider the choice of investment in two assets, a1 or a2, where the expected value of the firm is maximized by the choice of a2. Asset a1 is more risky but, if successful, gives a much higher return than a2. In case of failure (lower probability under a2 than under a1), the firm goes bankrupt and neither the shareholders nor the debtholders get anything. In such a case, it is in the debtholder's interest (and in the firm's interest) to undertake a2, but it could be in the stockholder's interest to invest in a1. In effect, the stockholder "substitutes" asset a1 for a2 and thereby increases the shareholder value at the expense of debtholder value and firm value.

A plethora of articles deal with the agency conflicts between stockholders and debtholders. We will restrict our discussion in this section to the following four effects:

1. Stockholders have an incentive to undertake risky projects that transfer wealth from bondholders to stockholders.
2. The investment opportunity set of a firm has a significant impact on the capital structure because of the agency conflict between the stockholders and debtholders.
3. Many features in debt contracts such as convertibility, call provisions, secured debt, and seniority can be explained by the agency conflict between stockholders and debtholders.
4. The agency conflict between the manager and the shareholders might have a mitigating effect on the adverse consequences of the conflict between stockholders and debtholders. For example, the desire of managers to prevent bankruptcy or to maintain their reputation or prevent takeovers might induce them to prefer lower-risk assets that are also preferred by debtholders.

Galai and Masulis (1976) argued that the common stock of a levered firm is equivalent to a European call option. The option is in the money when the value of the firm is higher than the debt and out of money otherwise. Increasing the risk increases the value of the option and therefore of the common stock. This option characteristic provides incentives to stockholders to engage in risky investments that do not maximize the value of the firm as a whole. Jensen and Meckling (1976) argued that this investment behavior will be rationally expected by the debtholders. In response, the debtholders seek protective debt covenants. However, the debt covenants can be written only on observable variables such as accounting numbers. Accounting is only an imperfect measure of firm value. Therefore, it is possible for the stockholders (with the connivance of managers) to manage the earnings number without correspondingly increasing the value of the firm. This inade-

quacy in the contracting for debt results in an incomplete resolution of the agency conflict. Therefore, firms that have greater measurement problems in accounting (for example, firms with a high proportion of intangible assets that cannot be properly valued by accounting) or firms with lower quality of earnings (higher earnings management) should find debt more costly and consequently have less debt in their corporate structure.

Quite apart from the choice of investment projects, capital structure is also affected by the interplay of a firm's investment opportunity set (IOS) and the agency conflict between the stockholders and debtholders. Myers (1977) decomposed the operating assets of a firm into two categories. Assets in place are the tangible assets whose returns are not affected by the further investments in any significant manner. These assets are usually redeployable assets that command an independent value in the market such as buildings, plant, machinery, and trucks. On the other hand, the IOS includes a different set of assets that are mostly intangible and specific to the firm. Knowledge bases, employee motivation and capabilities, management skills, patents, trademarks, copyrights, brand names, technical potential, and unused capacity are examples of these assets. A higher proportion of IOS in the total asset base of the firm makes it easier for a firm's market value to be altered to benefit the shareholders at bondholder's expense. Therefore, for the same leverage, IOS composition with considerable intangible assets results in a greater agency cost between the shareholder and the bondholder. The previous discussion suggests that the firms with high IOS should have lower leverage and that firms with high IOS and the same leverage should have a lower proportion of long-term debt.

The agency conflict between the stockholders and debtholders also explains some of the features of debts and debt contracts. Smith and Warner (1979), as well as Green (1984), argued that the convertibility feature in bonds mitigates the agency conflict. Debtholders have the option of sharing in the higher expected returns of successful risky projects by converting their debt to common stock. This convertibility reduces the potential wealth transfer from debtholders to stockholders and consequently minimizes the agency costs.

Bodie and Taggart (1978) examined the call feature of bonds. Investments in low-risk projects reduce the default risk premium and, therefore, the interest rate on bonds. This behavior increases the value of bonds, transferring some wealth from shareholders to bondholders. The call feature limits the increase in bond value. Therefore, it reduces the incentive of the bondholders to force lower-risk projects on the shareholders and thereby reduces agency costs. However, call provisions come with an implementation cost. Firms will have to trade off

these costs against the benefits of the call provision in mitigating the agency cost. It is reasonable, therefore, to expect firms with longer-term unsecured junior debt that also have high IOS (firms with very high agency costs) to use call feature in bonds.

Park (2000) discussed seniority designations in the face of a severe moral hazard. The author developed a set of propositions for debt contracts that focus on priorities of lenders. The monitoring function is a key activity for debt investors, so the delegation of senior status should also relate to the monitoring activity. To achieve favorable borrowing terms, a firm should choose its debtholders judiciously.

Minority interest equity holdings have been classified in three places on the balance sheet: debt, equity, and in a mezzanine category between debt and equity. Because majority equity holders have voting control over minority interests, a similar agency problem exists. Gomes (2000) argued that it is in the best interest of majority shareholders to commit not to take advantage of minority shareholders. The benefit to majority shareholders of not expropriating from minority shareholders is an increased reputation. The author analyzed the effects over a number of different countries and gives some corroborating evidence that stock prices are higher for firms where majority shareholders are deemed more responsible.

EMPIRICAL EVIDENCE

Agency Conflict between Shareholders and Managers

We first review the empirical hypotheses generated by the agency conflict between the shareholders and managers and the evidence that exists to validate them. Then, we do the same with the hypotheses generated by the agency conflict between the shareholders and debtholders.

There is limited direct evidence of the propositions of Jensen and Meckling (1976) because of the difficulty of gathering the appropriate data. An exception to this situation is presented in an article by Ang et al. (2000), who investigated agency costs and ownership structures of small firms. The authors found that agency costs are higher (lower) when an outsider (insider) manages the firm, which is consistent with the findings of Jensen and Meckling. Also consistent with Jensen and Meckling, they find an inverse relation between agency costs and management ownership percentages.

Both incentive compensation schemes and financing decisions are used as substitutes to mitigate the agency costs arising from the conflict between shareholders and managers. If incentive schemes are used predominantly, the effect of the conflict on capital structure should be

minimal. On the other hand, if the use of incentive schemes is very costly, capital structure decisions will have to take a larger role in mitigating this agency conflict. This substitutability between the two methods gives us an empirical hypothesis that

Ha: debt should be negatively associated with incentive compensation.

Managers will be motivated to diversify their wealth, which means that they may sell the stock option shares soon after they are exercised. This behavior is exactly what Ofek and Yermac (2000) found. Managers' desire to diversify runs counter to firms' motivation to get the managers to align their interests with the other shareholders.

Moreover, convertible debt does not play much of a disciplining role and, therefore, the negative association between debt and incentive compensation should be less for convertible debt. Ryan and Wiggins (2002) showed that stock options as part of CEO compensation are negatively associated with leverage but positively with convertible debt. Begley and Feltham (1999) showed that debt covenants have a significant negative relationship with the CEO cash compensation but an insignificant relation to the CEO equity holdings. Surprisingly, few other studies deal directly with the issue of substitutability between incentive compensation and capital structure in mitigating the shareholder-manager agency conflict. Currently, the evidence is not conclusive on the strength of this substitution effect.

Jensen's free cash flow hypothesis (see Jensen 1986) suggests that increased leverage reduces the discretionary free cash flow. This reduction of discretion will (1) prevent the managers from indulging in negative net present value projects and (2) mitigate investor concerns of underutilization of the capital and consequent undervaluation. If (2) is true, this should make the more leveraged firms less attractive takeover candidates. This interaction introduces a *third* variable that affects the disciplining of managers. Dysfunctional actions (opportunistically increasing their own welfare at the cost of reducing firm value) by managers could be costly because of the increased probability of takeover and consequent loss of job.

High leverage discourages a takeover and, therefore, has a negative effect of such disciplining, while at the same time decreasing discretionary free cash flow and increasing the disciplining effect. No empirical evidence exists on this three-way substitutability among leverage, incentive schemes, and takeover. A number of studies, however, have looked at managerial actions that reduce possible takeovers. One is the adoption of poison pills that often change the capital structure dramatically in case of a hostile takeover. Ryngaert (1988) and Malatesta and Walking (1988) showed that firm value

declines in the short term when poison pills are adopted by managers, especially when no stockholder approval is required. Srinidhi and Sen (2002) showed that adoption of poison pills is followed by a long-term decrease in value, even though research and development and long-term investments increase. These articles provide evidence that the incentive schemes are perhaps inadequate or ineffective in restraining the managers from undertaking value-decreasing decisions, including capital structure decisions.

There is also supporting evidence that compensation contracts do not come close to effectively mitigating the agency conflict. A number of studies have shown that stock repurchases result in a positive market reaction (see Dann 1981; Vermaelen 1981). In the absence of agency considerations, if a firm is, on the average, at an optimal capital structure situation, any change in capital structure should result in a systematic negative return. However, if the agency conflict between the shareholder and the manager is not fully resolved, a stock repurchase will increase the managerial share of the equity and therefore improve the incentives for aligning his interest with that of the remaining stockholders (unless, of course, if the management is already entrenched). This factor could be the driving force for positive stock market reactions to cause stock repurchase decisions. The same reason seems to drive the positive market reaction to leveraged buyouts (DeAngelo et al. 1984) and negative reactions to both swaps of common stocks for debt and common stock offerings.

The presence of a founder in the management has a controversial agency theory impact on firm value. Evidence has been presented for and against the case that founders impact the agency cost structure of the firm (Jensen and Meckling 1976). Specifically, Jayaraman et al. (2000) found that the presence of founders in the management of a firm has no significant impact on the firm's value.

In summary, there is ample empirical evidence that the agency conflict between shareholders and managers is not fully resolved by incentive schemes. Capital structure is used as an alternative means of resolving the stakeholder conflict. However, there is insufficient evidence on the direct effect of any such substitution. The research in this area is also difficult to interpret because of the confounding effects of takeovers, discretionary free cash flows, industry differences, growth opportunities, and so forth.

Agency Conflict between Shareholders and Debtholders

The implications of the agency relationship between shareholders and debtholders on capital structure can be summarized in the following seven empirical hypotheses.

1. Because of asset substitution, stock repurchases with debt should increase the stock price and reduce the bond price.
2. Debt covenants are written to reduce the risk from future projects, dividend payments, and other actions that transfer wealth from debtholders to stockholders.
3. High-debt firms have greater earnings management, and this exploits the defects in the contracting technology (based on accounting).
4. Firms with high IOS have low debt.
5. For a given debt level, firms with high IOS have more short-term and less long-term debt.
6. High IOS firms are likely to have more call provisions and convertibility features than low IOS firms.
7. Older firms with more managerial reputation have more lax debt covenant terms for the same debt level.

Although empirical evidence is not available on all these hypotheses, a number of them have been found to be valid. Smith and Warner (1979) examined debt covenants and found that most of the covenants (91 percent) protect against the issuance of additional debt, 36 percent against the disposal of assets, and 23 percent against dividend payments. They found that weaker-priority loans and loans of firms in a weaker financial condition have more protection from covenants. It seems that the restrictions on projects to be taken up by managers are indirect through dividend and asset disposal constraints. McDaniel (1986) showed that larger firms have weaker covenants. This finding validates hypothesis 7.

Kim et al. (1977) showed that increasing leverage leads to higher stock prices and lower bond prices, thus validating hypothesis 1. Litzenberger (1986) found that debt issuance depressed the price of bonds in oil company restructuring. Lehn and Poulsen (1987) showed that bonds suffer rating reductions after leveraged buyouts.

The direct measurement of agency costs has been limited, in part because the data collection would require a sampling of investor sentiment as the margin for the entire range of debt/equity combinations. Thus, the aforementioned research designs in this chapter generally measure behavior before, after, and at events. Swanson (1995) developed mathematical expressions that are proxies of both debt and equity agency costs. The empirical analysis indicates the proxies are consistent with predictions. This article appears in the Appendix for Chapter 6.

IMPLICATIONS AND SUMMARY

In this chapter, we considered capital structure decisions as an instrument of reducing agency conflicts. In other words, the capital structure

becomes a part of the overall equilibrium with agency conflicts between shareholders and managers, as well as between shareholders and debtholders. Capital structure is decided simultaneously with the incentive contracts and debt contracts. This capital structure theory differs from the thrust in earlier chapters, where we were primarily considering the effect of different individual factors on the capital structure decision.

Therefore, it no longer is meaningful to think of the capital structure decision as a strategic decision that is taken once after considering all the costs and benefits from taxes, bankruptcy and so forth and revised infrequently when the environment changes. Changes in the managerial labor market, the product markets of the firm, the capital market, and the individual managers involved all cause changes to the agency costs in the firm. Therefore, they all cause changes in the optimal capital structure in the firm. Thus, capital structure decisions are dynamic and continuously changing and need to be integrated with the overall management of the firm and its various market environments. This change of viewpoint is the main implication of the agency considerations discussed in this chapter.

In summary, capital structure can be viewed as another tool that is available to provide the right incentives to managers to work in the interest of the shareholders. It is also a tool that can be used to transfer wealth from the bondholders to stockholders. There is evidence that these agency considerations are rarely fully resolved and are therefore continuously evolving over time.

The capital structure paradigm with respect to agency issues is definitely a necessary feature to make the decision making more realistic. In terms of theory, the identification and categorization of issues is clear, and a shift of the paradigm has occurred. However, the problem (theoretically and empirically) of the observability of variables makes it difficult to ascertain the true worth of the contribution of agency theory issues to the capital structure paradigm. There is a great opportunity here for further research.

NOTE

1. These categorizations might change depending on the problem that is being analyzed. For example, in the case of majority and minority stockholders, an agency problem exists between the two groups; therefore, it is better to categorize the shareholders into two or more groups.

REFERENCES

Ang, J., R. Cole, and J. Lin. 2000. "Agency Costs and Ownership Structure." *Journal of Finance* 55: 81–106.

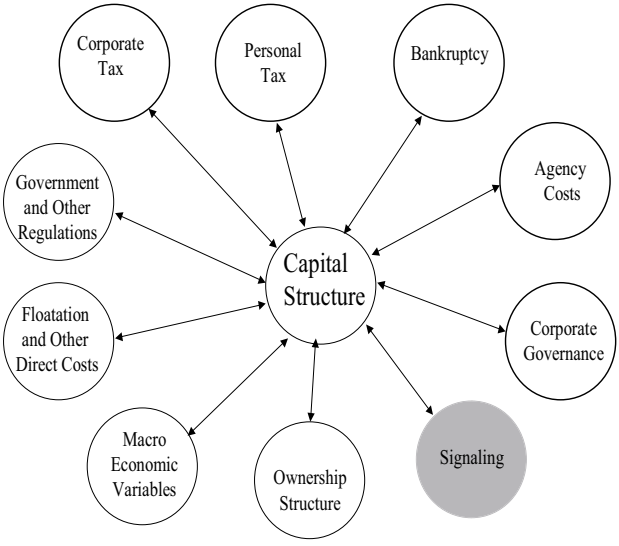
Begley, J., and G. A. Feltham. 1999. "An Empirical Examination of the Relation between Debt Contracts and Management Incentives." *Journal of Accounting and Economics* 27 (April): 229–59.
Berle, A., and G. Means. 1932. *The Modern Corporation and Private Property.* New York: Macmillan.
Biais, B., and C. Casamatta. 1999. "Optimal Leverage and Aggregate Investment." *Journal of Finance* 54 (August): 1291–1323.
Bodie, Z., and R. Taggart. 1978. "Future Investment Opportunities and the Value of Call Provision in a Bond." *Journal of Finance* 33: 1187–1200.
Dann, L. 1981. "Common Stock Repurchases: An Analysis of Returns to Bondholders and Stockholders." *Journal of Financial Economics* 9: 113–38.
DeAngelo, H., L. DeAngelo, and E. M. Rice. 1984. "Going Private: Minority Freezeouts and Shareholder Wealth." *Journal of Law and Economics* 27: 367–401.
Demsetz, H., and K. Lehn. 1985. "The Structure of Corporate Ownership: Causes and Consequences." *Journal of Political Economy* 93: 1155–77.
Francis, A., and A. Smith. 1995. "Agency Costs and Innovation: Some Empirical Evidence." *Journal of Accounting and Economics* 19 (March–May): 383–409.
Galai, D., and R. W. Masulis. 1976. "Option Pricing Model and Risk Factors of Stock." *Journal of Financial Economics* 3: 53–81.
Gomez, A. 2000. "Going Public without Governance: Managerial Reputation Effects." *Journal of Finance* 55: (April): 615–46.
Green, R. 1984. "Investment Incentives, Debt and Warrants." *Journal of Financial Economics* 13: 115–36.
Grossman, S., and O. Hart. 1982. "Corporate Financial Structure and Managerial Incentives," in J. McCall (Ed.). *The Economics of Information and Uncertainty.* Chicago: University of Chicago Press, 107–37.
Harris, M., and A. Raviv. 1990. "Capital Structure and the Informational Role of Debt." *Journal of Finance* 45: 321–49.
Hart, O. 2000. "Theories of Optimal Capital Structure: A Managerial Decision Perspective." Harvard University, 1993 NBER working paper R1806. Available on SSRN.
Hart, O., and J. Moore. 1995. "Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management." *American Economic Review* 85 (June): 567–85.
Jayaraman, N., A. Khorana, E. Nelling, and J. Covin. 2000. "CEO Founder Status and Firm Financial Performance." *Strategic Management Journal* 21 (December): 1215–24.
Jensen, M. C. 1986. "Agency Costs of Free Cash Flow, Corporate Finance, Takeovers." *American Economic Review* 76 (May): 323–29.
Jensen, M. C., and W. Meckling. 1976. "The Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure." *Journal of Financial Economics* 3: 305–60.
Kim, E.H., J. McConnell, and P. Greenwood. 1977. "Capital Structure Re-arrangements and Me-First Rules in an Efficient Market." *Journal of Finance* 32: 789–810.
LaPorta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny. 2000. "Investor Protection and Corporate Governance." *Journal of Financial Economics* 58 (October/November): 3–27.
Lehn, K., and A. Poulsen. 1987. "Leveraged Buyouts: Wealth Created or Wealth Redistributed." Washington University, working paper.
Litzenberger, R. 1986. "Some Observations on Capital Structure and the Impact of Recent Recapitalizations on Share Prices." *Journal of Financial and Quantitative Analysis* 21: 59–71.

Malatesta, P. H., and R. A. Walking. 1988. "Poison Pill Securities: Stockholder Wealth, Profitability and Ownership Structure." *Journal of Financial Economics* 20: 347–76.
Mann, S., and N. Sicherman. 1991. "The Agency Costs of Free Cash Flow: Acquisition Activity and Equity Issues." *Journal of Business* 64 (April): 213–27.
McDaniel, M. W. 1986. "Bondholders and Corporate Governance." *Business Lawyer* 41: 413–60.
Myers, S. 1977. "Determinants of Corporate Borrowing." *Journal of Financial Economics* 5 (November): 147–75.
Myers, S. 2000. "Outside Equity." *Journal of Finance* 55 (June): 1005–37.
Ofek, E., and D. Yermack. 2000. "Taking Stock: Equity-based Compensation and the Evolution of Managerial Ownership." *Journal of Finance* 55 (June): 1367–84.
Park, C. 2000. "Monitoring and Structure of Debt Contracts." *Journal of Finance* 55 (October): 2157–95.
Ryan, H. E., Jr., and R. A. Wiggins III. 2000. "The Interactions between R&D: Investment Decisions and Compensation Policy." *Financial Management* 31 (Spring): 5–29.
Ryngaert, M. 1988. "The Effect of Poison Pill Securities on Shareholder Wealth." *Journal of Financial Economics* 20: 377–417.
Smith, C., and J. Warner. 1979. "On Financial Contracting: An Analysis of Bond Covenants." *Journal of Financial Economics* 7: 117–61.
Smith, C., and R. Watts. 1982. "Incentive and Tax Effects of Executive Compensation Plans." *Australian Journal of Management* 7: 139–57.
Srinidhi, B., and K. Sen. 2002. "Effect of Poison Pills on Value Relevance of Earnings." City University of Hong Kong, working paper.
Stulz, R. 1990. "Managerial Discretion and Optimal Financing Policies." *Journal of Financial Economics* 26: 3–27.
Swanson, Z. 1995. "Leverage Information for Stocks During a 'Deleveraging' Period." *Journal of Accounting Finance Research* 1 (Spring): 12–22.
Vermaelen, T. 1981. "Common Stock Repurchases and Market Signaling." *Journal of Financial Economics* 9: 139–83.

7

Signaling

Central Tenet: With signaling, agency costs, bankruptcy costs, and taxes, the relationships become contingent on the full set of firm characteristics.



INTRODUCTION

So far, an implicit assumption has been made that the managers and investors have symmetrical knowledge[1] about the firm's returns and investment opportunities. This assumption is relaxed in this chapter. In particular, it is assumed that the managers are privately informed about the future returns and investment opportunities better than the investors. Given this information asymmetry, the investors base their decisions on the expectations of returns and opportunities but will update their beliefs when managers make capital structure or other observable decisions. In turn, the managers know that the investors will update their beliefs based on their observable actions and, therefore, will consider the consequences of investor reaction before making capital structure decisions. These are situations in which the privately informed party makes the first move and seeks to achieve a separating equilibrium that is commonly known as a signaling equilibrium. A signaling equilibrium is reached under this setting, with the managers signaling their private information by their actions.

There are a number of ways in which capital structure decisions are affected by the asymmetry of information. First, Myers and Majluf (1984) showed that under information asymmetry, the market undervalues equity. If the undervaluation is large enough, issuing equity to finance a new project might result in the new shareholders capturing more than the net present value (NPV) of the new project, leaving the old shareholders at a loss. Therefore, the shareholders will resist issuance of equity. The implication of their work is that if equity is issued, it signals weakness and the share prices will decline immediately.

Second, Ross (1977) argued that because bankruptcy is personally very costly to managers (separate from the costs that bankruptcy imposes on the firm), they can signal high quality (positive information) by high debt. The low-quality firms cannot imitate because their probability of bankruptcy is higher than that of high-quality firms at any debt level. Miller and Rock (1985) argued that firms that raise external financing by equity sales signal a negative implication for internal funds, particularly current net income. Taken together, Ross (1977) and Miller and Rock (1985) implied that issuing debt signals high quality and issuing equity signals lower quality. Harris and Raviv (1990) also supported the proposition that debts serve as a disciplining device because creditors are allowed to liquidate the firm if the firm defaults. Thus, debts generate information that can be obtained by creditors to evaluate major operating decisions including liquidation.

Third, Leland and Pyle (1977) argued that high-quality (risk averse) managers opt for more debt that makes their equity holdings more risky (but not overly risky because of the expected positive private informa-

tion on cash flow). Even so, the low-quality managers cannot copy the high-quality managers because the equity holdings of low-quality managers become overly risky (especially with the expected negative private information about cash flow) with the same amount of debt.

These three arguments suggest that issuance of debt is a positive signal and issuance of equity a negative one. This result is borne out by empirical research. The next section (Theory) covers many of these linkages.

Even though we have focused on these three major arguments, the signaling literature (see Riley 2001) is quite diverse; however, there are two key issues in this literature. The first is whether the signal results in a separating equilibrium. The second is whether the signal is costless or costly. The diversity in the literature results from examining questions in different settings with different assumptions. Likewise, in the application of signaling literature to capital structure decisions, there are diverse signaling models that make different assumptions on the underlying structure. For example, Heinkel's (1982) model assumes information asymmetry in both the mean and variance of returns. Furthermore, Heinkel assumed that firms with higher value also are more risky and shows that debt acts as a costless signal that achieves separating equilibrium. His result is driven by an implicit assumption that the managers do not suffer from bankruptcy costs. Some other models, such as the one by Blazenko (1987), have focused only on the return aspect of signaling information. Blazenko argued that if managers own stock then they will act to maximize their position. The managers of firms with high (low) value have a lower (higher) risk position and will issue debt (equity). Also, Brick et al. (1998) examined a signaling framework where only risk (variance of returns) is the driver of the signaling equilibrium. If managers have private information, then firms with lower (higher) leverage signal lower (higher) variance of returns.

THEORY

New Capital Decisions

First, we present the Myers and Majluf (1984) hypothesis that leads to the "pecking order hypothesis" for new capital structure decisions. According to this hypothesis, issuance of external equity for project financing is a negative signal and, therefore, managers tend to avoid it if possible. The first preference is to use internal funds, even if they are retained earnings left over after payment of dividends. The second preference is to use the least risky debt followed by risky debt, hybrid securities, and finally external equity financing. Figure 7.1 summarizes this thinking.

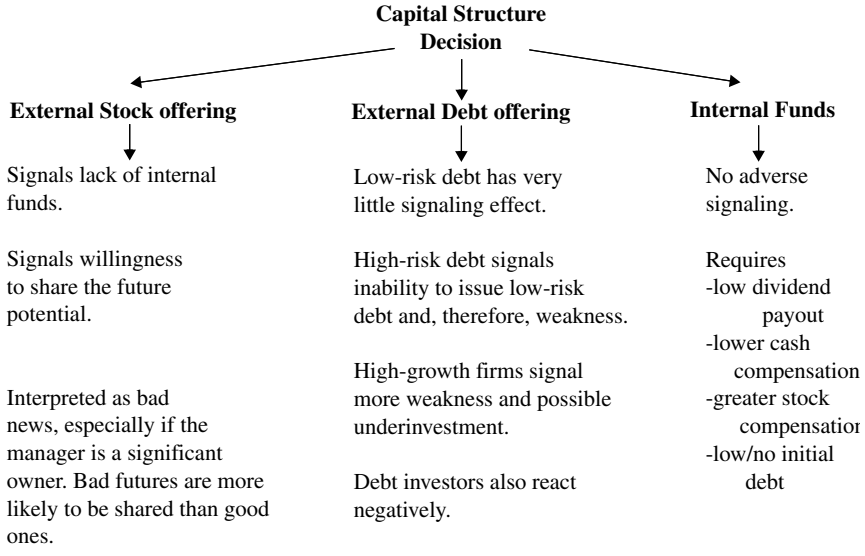


Figure 7.1 Capital structure decisions and signaling.

Myers (1994) explained this proposition in the following manner. Consider a firm that has to raise N dollars to undertake a potentially valuable investment opportunity. Let y be the opportunity's NPV and x is the firm's worth if the opportunity is passed by. The manager knows x and y, but the investors only have a probability distribution over (x,y). The benefit to raising N dollars by a security issue is y, but the cost is the difference between the manager's valuation N_1 and N. (Ex-ante, N = N_1) Therefore, the manager will issue when y is greater than this difference.

At first blush, it seems that if the manager's information is unfavorable, ($N–N_1$) is negative (the firm is overvalued), and the manager will issue the security even to finance a zero-NPV project. On the other hand, if it seems that the information is favorable, the manager will not issue if NPV is higher than the difference. However, if management does issue the security, the investors will perceive it as likely that it has unfavorable information and will push down N_1. This action will increase the difference, and the rationale for issuing security will be weakened. This step will be anticipated by the manager. Thus, we need to consider the rational expectations equilibrium, but it is clear that many positive NPV projects will not be taken up because of the wrong signal. On the other hand, if the firm can finance the project with internal financing, N_1 is not affected and managers undertake all positive expected NPV projects. Similarly, if the firm can issue default-risk-

free debt (whose value is independent of the private information), N_1 is not affected and managers undertake all positive expected NPV projects. Even if the firm issues risky debt, to the extent that the risk is less than that of equity, the underinvestment problem is mitigated. If the manager has unfavorable information, he or she would be tempted to issue equity, but issuing the security will immediately signal overpricing of the stock to the new investors who, in turn, will reduce the price they are willing to pay for the equity. In effect, equity is issued only when the internal financing and debt capacity are exhausted.

Therefore, information asymmetry and signaling lead to the pecking order theory that has been the common wisdom for many years. In general, managers issue equity when the equity is overvalued. It might also signal that the firm has nowhere to borrow debts or issue convertible bonds, which are regarded as the sources with lower costs. The empirical implication of the theory is that when equity is issued, the new investors will rationally expect the managers to have unfavorable information and, therefore, will depress the stock prices. Donaldson (1961) studied the financing practices of a sample of large corporations. These practices are consistent with the pecking order hypothesis. The empirical evidence section lists many articles that show that stock prices drop after the issuance of new equity.

The Myers-Majluf idea has been extended, contradicted, and applied in different contexts by a number of studies. Korajczyk et al. (1992) showed that the underinvestment problem is least severe immediately after earnings announcements, when the information asymmetry is at a minimum. Lucas and McDonald (1990) also dealt with varying information asymmetry and argued that the underinvestment is a temporary phenomenon and that projects that require external equity financing are delayed. Typically, equity is issued after a period of very high returns. They also showed that stock price drops in response to the stock issue. Brennan and Kraus (1987) argued that while issuing equity is a negative signal, issuing equity and redeeming debt is a positive signal. Thus, their analysis and a similar one by Constantinides and Grundy (1989) contradict the pecking order theory. Daniel and Titman (1995) added another dimension to the analysis by categorizing some issuances as dissipative. These dissipative signals reduce firm value.

Overall, the pecking order theory has theoretical justification in the signaling literature and some empirical validation. However, there is ample theoretical and empirical evidence to show that the theory does not hold under all circumstances and cannot explain all capital structure decisions. The important take-away point is that signaling plays a very important role in the determination of project financing. Pecking order theory is one of the possible consequences, but we currently have only a partial understanding of when it holds and when it does not.

Equilibrium Debt and Equity Levels

The second proposition in signaling is that when investment is fixed, the capital structure level reflects the inside information of the managers. Ross's (1977) model is the basis of this signaling hypothesis. Managers signal high quality by taking on high debt and subjecting themselves to discipline. Only managers who have favorable inside information about the future can afford to take the risk of increasing the debt level. Managers with unfavorable information cannot take on too much debt because it significantly increases the probability of bankruptcy, which has the associated personal costs to the manager who cannot diversify away human capital. Therefore, the level of debt results in a separating equilibrium. We can see the working of Ross's signaling model with a simple stylized example. Consider two possible cash flow distributions parameterized by X_1 and X_2 , denoted by $f(x \mid X_1)$ and $f(x \mid X_2)$ where $f(x \mid X_2)$ stochastically dominates $f(x \mid X_1)$ and $X_2 X_1$. The debt is denoted by D. Let the wages, denoted by w(x,D), be increasing in x for all D. If x falls below the debt level, the firm goes into bankruptcy and the net benefit to the manager is w(x) – L, where L is the personal cost of bankruptcy. The manager will choose a level of D such that based on privately observed distribution of the outcome, the manager's expected net benefit is maximized. It is in the interest of the investor to make w an increasing function of D, so that if the manager has observed X_i, it is in his or her interest to reveal it truthfully. It is clear that the manager who has observed X_2 will choose a higher value of D than the manager who has observed X_1.

The main empirical implication of this theoretical proposition is that the firm value and debt-equity ratio should be positively associated. Different modifications of the Ross model have been developed by Poitevin (1989), who looked at firms trying to enter the market. John (1987) and Glazer and Israel (1990) also investigated the issue. In all cases, the dominant empirical implication is that high debt level signals positive news and, therefore, has a positive effect on stock prices.

A third proposition is based on the work of Leland and Pyle (1977). In their model, an entrepreneur has inside information about a project and chooses the fraction of equity retained and also determines the face value of default-free debt to issue. Optimally, it is shown that the entrepreneur's ownership share increases with firm quality. The more ownership retained, the more debt needs to be issued, leading to the result that as the firm's quality increases, the amount of debt issued increases as well. Again, the empirical implication is that higher firm quality is signaled by higher debt proportion.

EMPIRICAL EVIDENCE

The empirical evidence on signaling is a mixed bag of results (e.g., Fama and French 2002). As we have seen previously, many different theories have the same empirical implication, namely, that issuance of debt and having a higher level of debt signal good future performance quality. Although this result is observed empirically, it does not help us to sort out which of the theories are valid and which are not. To do that, we need either direct empirical evidence on the capital structure decision process itself or indirect empirical evidence from an examination of more complex transactions. We present here the empirical evidence on the following issues:

1. What is the effect of security issues and *exchange* offers? Are there signaling explanations for these effects?
2. What is the direct empirical evidence on the pecking order or any other general order of security issue?
3. What is the empirical evidence on the relationship between the existing capital structure and value of firms?

Myers and Majluf (1984) and others who support the pecking order hypothesis suggest there should be no price reaction to the issuance of riskless debt but a negative reaction to the issuance of external equity. Miller and Rock (1985) argued, however, that any external financing signals a scarcity of internal funds and irrespective of whether it is equity or debt issue, there will be a negative signaling effect. There is general support to negative effect of issuance of equity securities. Masulis and Korwar (1986) and Asquith and Mullins (1986) both reported a strong negative reaction to seasoned equity offerings (SEO).

The literature has mixed evidence on the issuance of debt securities. Dann and Mikkelson (1984) showed that the average stock price reaction to debt issue is nearly zero unless it is a convertible debt, in which case the effect is negative. Hansen and Crutchley (1990) found that return on assets (ROA) declines most after an equity issue, followed by convertible bonds and then by non-convertible bonds. Linn and Pinegar (1988) showed no significant effect of issuing preferred stock but a negative effect of issuing convertible preferred stock. Eckbo (1986) reported a small drop of 0.2 percent in stock price subsequent to debt offerings. This evidence seems to support strong negative reaction to equity offerings but no such strong evidence of negative reaction to debt offerings. Consequently, the Myers-Majluf prediction seems to be better supported than the Miller-Rock prediction. More recently, Rajan and Zingales (1995) and Frank and Goyal (2000) showed a negative cross-sectional relation between financial leverage and profitability. They

also showed a negative cross-sectional relation between financial leverage and market-to-book ratio. Complementing these findings, Howton et al. (1998) reported that announcement effect is inversely related to Tobin's Q, which is another measure of the firm's investment opportunities. Beranek and Cornwell's (1995) study supports the proposition that long-term external financing and capital expenditures are positively related, while long-term external financing is negatively related to financial slack. The results confirm that firms prefer internal, rather than external, financing. Bear in mind, cross-sectional studies suffer from the implicit assumption that all the firms are alike in all the other dimensions. As an example of one other dimension that has contrary effects, Jung et al. (1996) reported that large firms are less likely to issue equity even though they are likely to have reduced information asymmetries because of significant analyst followings. The authors attribute this particular effect to agency considerations.

The preceding studies are useful in predicting and examining the settings where new project financing is required. Myers-Majluf theory is silent on capital structure changes that do not involve cash flow implications. For that information, we have to turn to the debt-equity swap literature. The presumed objective of managers is to maximize shareholders' wealth. Jensen's free cash flow hypothesis suggests that investors do not want managers to have discretion over free cash flow because managers might involve themselves in empire building and other negative present value projects. In particular, this situation is exacerbated if there is excessive free cash flow but not much investment opportunity. If extra free cash flows exist and there are no investment opportunities of positive NPV projects, firms should distribute those free cash flows back to shareholders as dividends. However, this hypothesis seems to contradict Myers and Majluf, who suggest that investors prefer managers to have more free cash flow so as to avoid having to go outside for external financing. Firms should keep some free cash flows as cushion to fund those profitable projects. If there are no positive NPV projects to invest, it implies that the future growth of the firm is limited because of the limited investment opportunity. Then, firms should distribute those free cash flows to shareholders in the form of dividends. However, this apparent contradiction is resolved if the effect of investment opportunity set (IOS) is explicitly considered. In the accompanying Figure 7.2, we see that the effect of signaling is higher in high IOS firms.

The implication is that for firms that have high investment opportunities, the Myers-Majluf theory is predominant because the firms need new project financing much more than firms with mostly assets-in-place. Having sufficient free cash flow provides for less expensive internal financing in high IOS firms. On the other hand, for the assets-

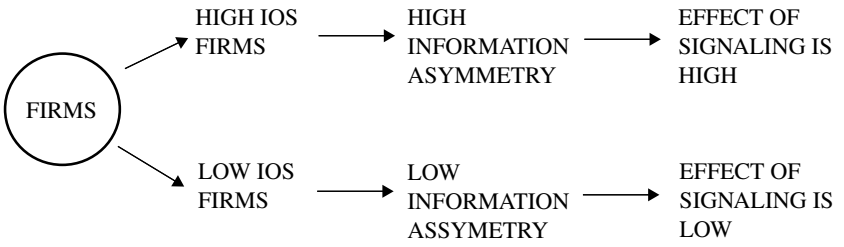


Figure 7.2 Investment opportunity set and the effect of signaling.

in-place firms, availability of high free cash flow and managerial discretion over the free cash flow are deleterious, and, consequently, the Jensen hypothesis is more applicable.

Based on Jensen's free cash flow hypothesis, it can be argued that having more debt is preferable and, therefore, stock repurchases (which increase leverage and/or reduce free cash flow) are positive news. It also predicts that issuance of stocks for retiring debt is negative news and should be associated with decreased valuation. A large number of articles support the positive effect of stock repurchase. Masulis (1980), Vermaelen (1981), and DeAngelo et al. (1984) all provide strong evidence that the market reacts positively to stock repurchases. There is also ample evidence of negative reaction to equity-for-debt exchange offers (EO). Cornett and Travlos (1989) showed a significant wealth increase when debt is used for stock repurchases and a significant negative reaction when stock is issued to retire debt. Born and McWilliams (1997) showed shareholder wealth declines of about 1.84 percent after EO announcements. Erwin and Miller (1998) showed that when a firm repurchases stock, other rival firms show negative returns. Maxwell and Stephens (2001) found that stock repurchases are accompanied by negative bond returns. All these results are consistent with the information effect hypothesis. There is also evidence that stock repurchases using the proceeds of issuing debt transfers wealth from debtholders to stockholders.

There has been some recent evidence on the timing of debt and equity issues. Manuel et al. (1993) showed that debt issue announcements actually result in significant negative stock price reactions if the announcements precede dividend and earnings announcements. However, Johnson (1995) found positive stock returns for firms with low dividends that issue debt.

The empirical evidence on capital structure changes that do not have cash flow implications (such as exchange transactions) seems to be generally consistent with the proposition that a higher debt proportion

is associated with higher firm values. This, in turn, is consistent with Jensen's free cash flow hypothesis. There is little further evidence on the differential implications of free cash flows for high- and low-growth firms.

There has been much recent literature on firm performance after capital structure transactions. Klein et al. (2002) reviewed a number of studies that look at firm performance after capital structure transactions. Shah (1994) showed that cash flows decrease after leverage-decreasing transactions but do not increase after leverage-increasing transactions. On the other hand, leverage-increasing transactions are succeeded by declines in systematic risk, but leverage-decreasing transactions are not followed by increases in systematic risk. There is no corresponding theory on how these capital structure changes signal changes in systematic risk.

The evidence from the studies cited in Klein et al. (2002), on operating performance of firms after repurchases and seasoned equity offerings, indicates underreaction to these announcements by the market. Repurchase announcements are followed by a series of abnormal positive returns, and seasoned equity offerings are followed by a series of abnormal negative returns. The effects linger on for a few years after the event, and currently this underreaction anomaly has not been explained satisfactorily. There is also increasing evidence that the managers act opportunistically in issuing equity and take advantage of higher stock prices. For example, Teoh and Wong (2002) suggested that managers manage earnings opportunistically upwards before SEOs to cause overvaluation in the stocks and make the investors overly optimistic. These deviations from efficient market reaction to capital structure announcements cast doubt on effective signaling (which requires rational and prompt reaction from the market) and, in fact, might partially explain the mixed evidence that we have on the effect of signaling.

In summary, there is some support for the predictions from Myers-Majluf pecking order theory. Even though this evidence seems to be a little stronger than that for the optimal capital structure hypothesis, it is also clear from the evidence presented here that the pecking order theory does not always hold and that other factors might affect the order of financing.

Table 4.1 in Masulis (1988) lists 40 studies that have examined the effect of leverage change on two-day mean annualized returns. We show Masulis's Table 4.1, as Table 7.1. There is very consistent evidence of significant positive effects of leverage-increasing decisions and a significant negative effect of leverage-decreasing decisions. This evidential matter is consistent with the Ross (1977) hypothesis, that firms signal higher quality by higher leverage. In the absence of agency and signaling effects, theoretically, there should be no systematic

TABLE 7.1 Average Stock Price Reactions to Leverage Change Announcements for U.S. Firms

Study	*Type of Announcement*	*Sample*	*Two-Day Mean*
	Leverage-Increasing Decisions		
Masulis (1983)	Exchange offers of debt for common	52	14.0+*
Masulis (1983)	Exchange offers of debt for preferred	24	2.2+*
Pinegar-Lease (1986)	Exchange offers of preferred for common	15	8.1+*
Masulis (1983)	Exchange offers of preferred for common	9	8.3+*
McConnell-Schlarbaum (1981)	Exchange offers of income bonds for preferred	24	2.2 *
Masulis (1980)	Repurchase of common by tender offer	199	16.4 *
Masulis (1980)	Debt-financed repurchase of common by tender offer	45	21.9 *
Dann (1981)	Repurchase of common by tender offer	142	15.4 *
Vermaelen (1981)	Repurchase of common by tender offer	131	14.1 *
Vermaelen (1981)	Secondary market repurchases of common	243	3.4 *
DeAngelo-DeAngelo-Rice (1984)	Going-private actions	72	28.3 *
Linn-Pingar (1985)	Public offering of nonconvertible preferred	294	.8
Dann-Mikkelson (1984)	Public offering of nonconvertible debt	150	-.4
Mikkelson-Partch (1986)	Public offering of nonconvertible debt (IND)	171	-.2
Eckbo (1986)	Public offering of nonconvertible nonmortgage debt	459	-.1
Eckbo (1986)	Public offering of nonconvertible mortgage debt	189	-.2
Mikkelson-Partch (1986)	Private placement of debt (IND)	80	-.6
Mikkelson-Partch (1986)	Bank debt borrowings (IND)	61	-2
Mikkelson-Partch (1986)	Initiation of credit agreements (IND)	155	.9*
Officer-Smith (1986)	Withdrawal of common offering	31	2.4
	Leverage-Decreasing Decisions		
Masulis (1983)	Exchange offer of common for debt	20	-9.9+*
Masulis (1983)	Exchange offer of common for preferred	30	-2.6+*
Pinegar-Lease (1986)	Exchange offer of common for preferred	30	-1.5 *
Masulis (1983)	Exchange offer of preferred for debt	9	-7.7+*
Finnerty (1985)	Private swap of common for debt	113	-1.1 *
Peavy-Scott (1985)	Private swap of common for debt	93	-.6 *
Rogers-Owers (1985)	Private swap of common for debt with no new debt issued	74	-1.1 *
Rogers-Owers (1985)	Private swap of common for debt with new debt issued	34	-.9 *
Asquith-Mullins (1986)	Public offer of common (IND)	128	-3.0 *
Masulis-Korwar (1986)	Public offer of common (IND)	388	-3.3 *
Masulis-Korwar (1986)	Public offer of common (IND) to redeem debt	55	-3.8 *
Mikkelson-Partch (1986)	Public offer of common (IND)	80	-3.6 *
Kalay-Shimrat (1985)	Public offer of common (IND)	455	-3.4 *
White-Luzstig (1980)	Rights offer of common	90	-1.0+*
Eckbo-Masulis (1980)	Rights offer of common (IND)	43	-1.7 *
Eckbo-Masulis (1980)	Standby offer of common (IND)	39	-1.1 *
Dann-Mikkelson (1984)	Rights offer of convertible debt	38	-1.2 *

TABLE 7.1 continued

Study	*Type of Announcement*	*Sample*	*Two-Day Mean*
Dann-Mikkelson (1984)	Public offer of convertible debt	132	-2.3 *
Eckbo (1986)	Public offer of convertible debt (IND)	53	-1.9++ *
Eckbo (1986)	Rights offer of convertible debt (IND)	14	-.8
Mikkelson-Partch (1986)	Public offer of convertible debt (IND)	33	-2.0 *
Jangigian (1987)	Public offer of convertible debt (IND)	234	-1.7 *
Mikkelson (1981)	Calls forcing conversion of convertible debt	113	-2.1 *
Linn-Pinnegar (1985)	Public offer of convertible preferred	63	-1.4 *
Mikkelson (1981)	Calls forcing conversion of convertible preferred	57	-.4
Officer-Smith (1986)	Withdrawals of noncovertible debt	30	-.4 ++

IND, Industrial firms only.
* Significant at 5 percent.
+ Includes two-day returns on initial announcement and in 40 percent of the sample a second return representing a clarifying announcement.
++ Regression coefficient on a dummy variable for the two-day event period.

negative reaction to any capital structure change, because the managers will be taking these actions to increase the value of the firm. Agency effects may cause managers to take self-interest boosting actions that could result in a decline in shareholder wealth. This, in conjunction with signaling, explains the systematic responses associated with leverage changes.

IMPLICATIONS AND SUMMARY

We consider here the implications of the signaling hypothesis for both managers and investors. For managers, the implication is that the capital structure decision (in conjunction with dividend policy, incentive contract, and debt contract decisions) has to consider not only the direct costs and benefits but also the indirect costs and benefits arising from signaling. For firms with high growth potential, the information that the managers have about the future is much higher than the information that the investors have. Two factors contribute to this information asymmetry. The first is that the accounting methods and procedures to measure "opportunities" are inadequate, undeveloped, and, where they exist, noisy and uninformative. The second is that a large part of the firm's market value is based on the perception of mostly uninformed investors on the value of future opportunities. A small change in that perception is likely to cause a large fluctuation in the market value of the firm. Given these two factors, the importance of

signaling is extremely critical in high investment opportunity set (IOS) firms.

In view of the theoretical arguments and the empirical evidence discussed earlier, a pure stock offering is likely to be perceived negatively by the investors, especially in the case of high IOS firms. Potential investors believe that if the prospects of the firm are good, it will not be in the interest of the existing shareholders to share the benefits with new shareholders. Moreover, if managers, who make the capital structure decisions, are also significant shareholders (as is common with smaller and newer firms with high growth potential), it would be irrational for them to share the "fruits of their labor" with new shareholders while they have borne the cost and risk of creating such potential. Therefore, any stock issue will be looked at with skepticism by the prospective shareholders. They will assume the worst, and bid down the price that they are willing to pay to acquire the stock. The previous section provides strong support for this expectation. Therefore, managers of high-growth firms are ill advised to make share offerings to finance new projects, even if the direct cost of equity offering is less than the direct cost of debt offering.

Now that we have argued against stock issues by high IOS firm managers, the question arises as to what alternative sources of funds managers should choose. One choice is to use the internally generated funds. The pecking order hypothesis of Myers-Majluf (1984) suggests that it is best to use internally generated funds. Note that using the retained earnings (actually, retained cash flow) has the same effect on the balance sheet as issuing equity. The pecking order theory distinguishes more between internal and external funds than between equity and debt. As we showed in the previous section, there is significant empirical validity to the pecking order theory. However, the evidence is not overwhelming, as in the case of negative reaction to external equity offerings. If the evidence on pecking order theory is to be believed, the managers should use internally generated funds to finance their better growth projects. To have sufficient internally generated funds, they should also minimize dividend payments. They might also reduce cash compensation payments by having strong stock-based incentive schemes. They should also not start their venture with any debt so as to minimize interest payments. This series of congruent decisions increases the likelihood of sufficient internal funds being available to exploit growth opportunities. Empirical evidence on compensation structures and existing leverage in high IOS U.S. firms is consistent with the previously mentioned series of congruent decisions.

After exhausting internal funds, the next alternative source of funds is external debt. There is some evidence, given in the previous section,

that external debt financing, especially if the debt is low risk, does not have a significant signaling effect. However, there are two implications of this strategy for high-growth firms. First, if debt is issued to finance a current project, less debt capacity will be available in the future to exploit further growth opportunities. Second, in the case of truly high IOS firms, there is little that managers can do to reduce the risk of debt other than tying themselves up with restrictive debt covenants that lead to underinvestment. Both of these situations result in opportunity costs that need to be weighed carefully before pursuing external debt financing.

An implication of signaling costs is that investments by high IOS firms are more restrained than if the signaling costs were not present (in other words, if the information asymmetry is not present). A firm's capital structure is likely to be more heavily weighted toward equity than debt because of these signaling costs, especially in high IOS firms. Therefore, high IOS firms should strive to reduce information asymmetry by greater disclosures, avoid paying too much in the way of dividends, minimize cash compensation payments, and avoid debt that comes with restrictive covenants.

The signaling costs have a less significant implication for low IOS firms. The lower information asymmetry and the greater measurement precision of accounting for assets-in-place enable investors to more fully evaluate the costs and benefits of financing than in the case of high IOS firms. As a consequence, the need, as well as the benefit, of signaling is reduced; and low IOS firms are more likely to have higher debt level, pay more dividends, not follow the pecking order, and have more cash-based compensation than high IOS firms.

Equity investors are very sensitive to decisions of high IOS firms on the capital structure. They are averse to external equity financing. However, investors do not react negatively to the use of internal funds. In fact, they are likely to react negatively to dividend payments by high IOS firms that will reduce the amount of internal financing available for projects. Investors do not react very negatively to external debt financing, but high IOS firms have other costs of debt financing that make the companies averse to debt issues. The situation for low IOS firms, however, is different. Equity investors react negatively to lower dividend payments by low IOS firms with high free cash flow. They would prefer the low IOS firms to have high debt and pay interest to debt holders so that the managers do not have too much discretion in the use of free cash flow. Investors react positively to external debt financing by low IOS firms.

Debt investors are also sensitive to capital structure decisions of high IOS firms. The level of perceived risk of debt in high IOS firms is high because of the lower proportion of assets-in-place. Consequently, debt

covenants placed on issues by high IOS firms tend to be more restrictive and carry a higher interest rate than for similar issues by low IOS firms. All these make debt unattractive for high IOS firms and relatively more attractive for low IOS firms.

The capital structure paradigm of optimality takes on a holistic perspective with the inclusion of the signaling concept. Each transaction between the investors and the firm has to be evaluated on its own merits and the information that it represents. Thus, the capital structure has value in the information that it represents. This thinking is a fundamental shift in the paradigm in theoretical and empirical terms. However, the value of the information for any particular signal is an open question.

NOTE

1. Asymmetrical information analysis has a long, rich history that can be traced back to Akerlof (1970), who used the concept of car warranties as a feature to signal quality.

REFERENCES

Akerlof, G. 1970. "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics* 84: 488–500.

Asquith, P., and D. Mullins. 1986. "Equity Issues and Offering Dilution." *Journal of Financial Economics* 15 (January/February): 61–89.

Beranek, W., and C. Cornwell. 1995. "External Financing, Liquidity, and Capital Expenditures." *Journal of Financial Research* 18: 207–22.

Blazenko, G. 1987. "Managerial Preference, Asymmetric Information, and Financial Structure." *Journal of Finance* 42: 839–62.

Born, J. A., and V. B. McWilliams. 1997. "Equity-for-debt Exchange Offers: Theory, Practice and Evidence." *Financial Review* 32 (May): 273–91.

Brennan, M., and A. Kraus. 1987. "Efficient Financing under Asymmetric Information." *Journal of Finance* 42: 1225–43.

Brick, I., M. Frierman, and Y. Kim. 1998. "Asymmetric Information Concerning the Variance of Cash Flows: The Capital Structure Choice." *International Economic Review* 39: 745–61.

Constantinides, G., and B. Grundy. 1989. "Optimal Investment with Stock Repurchase and Financing as Signals." *Review of Financial Studies* 2: 445–65.

Cornett, M., and N. G. Travlos. 1989. "Information Effects Associated with Debt-for-Equity and Equity-for-Debt Exchange Offers." *Journal of Finance* 44 (June): 451–68.

Daniel, K., and S. Titman. 1995. "Financing Investment under Asymmetric Information," in R. Jarrow, V. Maskimovic, and W. Ziemba (Eds.). *Handbooks in OR and MS.* Amsterdam: Elsevier, v. 9: 721–66.

Dann, L., and W. H. Mikkelson. 1984. "Convertible Debt Issuance, Capital Structure Change and Financing-Related Information: Some New Evidence." *Journal of Financial Economics* 13: 157–86.

DeAngelo, H., L. DeAngelo, and E. M. Rice. 1984. "Going Private: Minority Freezeouts and Shareholder Wealth." *Journal of Law and Economics* 27: 367–401.

Donaldson, G. 1961. *Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of the Corporate Debt Capacity.* Boston: Division of Research, Harvard Graduate School of Business Administration.

Eckbo, B. 1986. "Information Asymmetries and Valuation Effects of Corporate Debt Offerings." *Journal of Financial Economics* 15: 119–51.

Erwin, G. R., and J. M. Miller. 1998. "The Intra-industry Effects of Open Market Share Repurchases: Contagion or Competitive?" *Journal of Financial Research* 21: 389–406.

Fama, E., and K. French. 2002. "Testing Trade-off and Pecking Order Predictions about Dividends and Debt." *Review of Financial Studies* 15: 429–44.

Frank, M., and V. Goyal. 2000. "Testing the Pecking Order Theory of Capital Structure." Hong Kong University of Science and Technology, working paper.

Glazer, J., and R. Israel. 1990. "Managerial Incentives and Financial Signaling in the Product Market Competition." *International Journal of Industrial Economics* 8: 271–80.

Hansen, R. S., and C. Crutchley. 1990. "Corporate Earnings and Financings: An Empirical Analysis." *Journal of Business* 63: (July): 347–71.

Harris, M., and A. Raviv. 1990. "Capital Structure and the Informational Role of Debt." *Journal of Finance* 45: 321–50.

Heinkel, R. 1982. "A Theory of Capital Structure Relevance under Imperfect Information." *Journal of Finance* 37: 1141–50.

Howton, S. D., S. W. Howton, and S. Perfect. 1998. "The Market Reaction to Straight Debt Issues: The Effects of Free Cash Flow." *Journal of Financial Research* 21: 219–28.

John, K. 1987. "Risk Shifting Incentives and Signaling through Corporate Capital Structure." *Journal of Finance* 42: 623–41.

Johnson, S. A. 1995. "Dividend Payouts and the Valuation Effects of Bond Announcements." *Journal of Financial and Quantitative Analysis* 30: 407–23.

Jung, K., Y. Kim, and R. Stulz. 1996. "Timing, Investment Opportunities, Managerial Discretion, and the Security Issue Decision." *Journal of Financial Economics* 42: 159–85.

Klein, L. S., T. J. O'Brien, and S. R. Peters. 2002. "Debt vs. Equity and Asymmetric Information: A Review." *Financial Review* 37 (March): 317–50.

Korajczyk, R., D. Lucas, and R. McDonald. 1992. "Equity Issues with Time-Varying Asymmetric Information." *Journal of Financial and Quantitative Analysis* 27: 397–417.

Leland, H., and D. Pyle. 1977. "Information Asymmetries, Financial Structure and Financial Intermediation." *Journal of Finance* 32: 371–88.

Linn, S. C., and J. M. Pinegar. 1988. "The Effect of Issuing Preferred Stock on Common and Preferred Stockholder Wealth." *Journal of Financial Economics* 22 (October): 155–84.

Lucas, D., and R. McDonald. 1990. "Equity Issues and Stock Price Dynamics." *Journal of Finance* 45: 1019–43.

Manuel, T. A., L. D. Brooks, and F. P. Schandler. 1993. "Common Stock Price Effects of Securities Issue Conditioned by Current Earnings and Dividend Announcements." *Journal of Business* 66: 571–93.

Masulis, R. 1980. "Stock Repurchase by Tender Offer: An Analysis of the Causes of Common Stock Price Changes." *Journal of Finance* 35: 305–19.

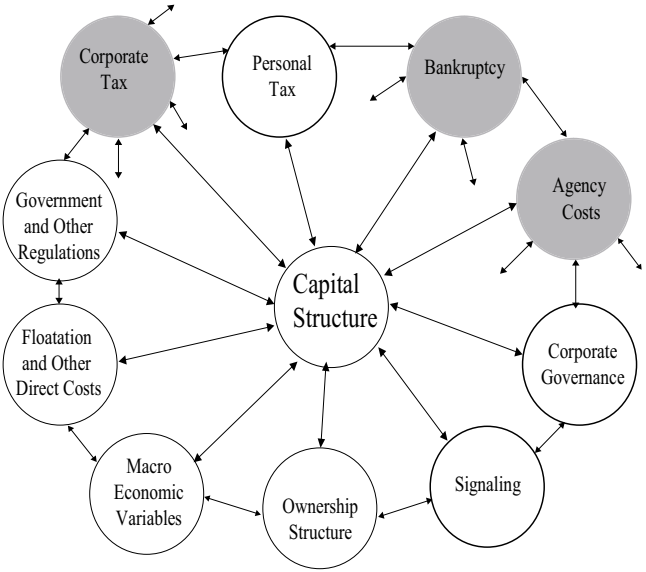
Masulis, R. 1988. "The Debt-Equity Choice: Evidence on Capital Market Reactions, Financial Risk, and Policy Implications." Southern Methodist University monograph.

Masulis, R., and A. Korwar. 1986. "Seasoned Equity Offerings: An Empirical Investigation." *Journal of Financial Economics* 15 (January/February): 91–118.
Maxwell, W., and C. Stephens. 2001. "The Wealth Effects of Repurchases on Bondholders." Texas Tech University and University of Missouri at Columbia, working paper.
Miller, M., and K. Rock. 1985. "Dividend Policy under Asymmetric Information." *Journal of Finance* 40: 1031–51.
Myers, S., and N. S. Majluf. 1984. "Corporate Financing and Investment Decisions When Firms Have Information that Investors Do Not Have." *Journal of Financial Economics* 5: 147–75.
Myers, S. 1994. "The Capital Structure Puzzle," in Ward, K. (Ed.). *Strategic Issues in Finance.* Linacre House, Jordan Hill, Oxford: Butterworth-Heinemann Ltd., 261–82.
Poitevin, M. 1989. "Financial Signaling and the 'Deep Pocket' Argument." *Rand Journal of Economics* 20: 26–40.
Rajan, R. G., and L. Zingales. 1995. "What Do Firms Know about Capital Structure? Some Evidence from International Data." *Journal of Finance* 50: 1421–60.
Riley, G. 2001. "Silver Signals: Twenty-Five Years of Screening and Signaling." *Journal of Economic Literature* 39 (June): 432–78.
Ross, S. 1977. "The Determination of Financial Structure: The Incentive Signaling Approach." *Bell Journal of Economics* 8: 23–40.
Shah, K. 1994. "The Nature of Information Conveyed by Pure Capital Structure Changes." *Journal of Financial Economics* 36: 89–126.
Teoh, S., and T. Wong. 2002. "Why New Issues and High Accrual Firms Underperform: The Role of Analysts' Credulity." *Review of Financial Studies* 15: 869–900.
Vermaelen, T. 1981. "Common Stock Repurchases and Market Signaling." *Journal of Financial Economics* 9: 139–83.

8

Capital Structure as One of Many Simultaneously Determined Variables

Central Tenet: The firm is a nexus of contracts. Capital structure decisions are made simultaneously with other decisions that can be solved by simultaneous equations to compute maximum firm value.



GENERAL OVERVIEW

At this point in the development of the capital structure paradigm, we can see that a number of disparate factors can impact on the decision-making process. We can classify the analysis research under streams: direct tax effects, agency effects, signaling effects, and interaction effects. The question is: Can we resolve the combination of these factors into a unified paradigm of capital structure decision making? At first glance, this task may appear impossible. Most of the thinking has focused on how all these factors affect the capital structure decision. A different approach to this question is to consider capital structure as one of the many simultaneously determined variables in the firm. Instead of the "factors that affect the capital structure" model, we use simultaneous equations to construct an overall framework of the firm as a nexus of contracts (Jensen and Meckling 1976) with all the stakeholders.

It is an open question as to what is the proper specification of the equations in the system to define firm value. The current chapter presents a set of articles that use simultaneous equations to address aspects of the firm nexus of contracts. The measurement of interaction effects is also an issue in this setting. A solution of this gap in the overall research frontier could prompt another paradigm shift.

SIMULTANEOUS EQUATION ECONOMETRIC ISSUES

Most empirical studies of capital structure use ordinary least squares regressions. It is possible to use a system of ordinary least squares for the econometric model. However, Gujarati (1995) demonstrated that the ordinary least squares method will result in biased or inconsistent parameter estimates in a system of equations with potentially interdependent endogenous variables. A common problem in such systems of equations is that ordinary least squares (OLS) signs for key variables will have wrong signs, but they will flip on the use of simultaneous equations to estimate the same data.

Therefore, some form of simultaneous equation solution of regressions is the method of choice. Several techniques are available (Kennedy 1998) to solve the problem, including two-stage least squares regressions and a reduction of equations into their structural forms. In two-stage least squares regressions, the first step is to regress every endogenous variable by all the exogenous variables and compute estimates of the endogenous variables. In the second step, a regression is performed with estimates of the first step. The results will be consistent estimators (see the discussion on instrumental variables later). The reduction of equations into structural forms follows a similar procedure to the two-stage least squares where a set of OLS equations is estimated,

and then these equations are algebraically solved for reduced-form equations (i.e., equations that have only one endogenous variable remaining as the dependent variable).

Another technique is to use the general method of moments in simultaneous equation situations. The general method of moments uses the correlation of residuals across all of the equations of a system as a means of addressing the simultaneity effect. This chapter highlights examples of each of these methods.

Another econometric problem is the definition of which variables are endogenous (i.e., that is related with each other) and which are exogenous. It has been said that econometrics is more of an art than a science. For a further discussion of the nature of endogenous variables, there is nice example in an article by Chauvin and Hirshey (1996). They cover the economic forces that impact on a variable, making it endogenous in a study of ownership and capital structure.

If the reader is trying to consider whether or not a variable is endogenous, there are theoretical relations that can be hypothesized as per the previous chapters in this text. In this situation, it is also partly a matter of researcher's judgment as to which variables are exogenous. The simple correlations between the variables can serve as a guide. If the pairwise correlation of a variable with all other variables is low, then the variable might be considered exogenous (i.e., independent).

The use of instrumental variables is yet another choice in the implementation of a simultaneous equation model. Researchers may use instrumental variables when independent variables may not be independent of the error term. This condition is common where simultaneous equations are required. The result of this econometric situation is that the estimators are not consistent. At the extreme, signs may flip from the expected. Sometimes, researchers will use lagged variables for instrumental variables, but there are no hard and fast rules. The use of instrumental variables has several advantages, including the reduction of simultaneity bias of endogenous variables.

There is another alternative approach to a system methodology of analyzing capital structure than the design discussed previously. Mamaysky (2002) has developed an affine pricing model that will jointly determine equity and debt values subject to a default condition. This joint determination of firm securities can then be used to evaluate capital structure decisions.

SIMULTANEOUS EQUATION EXAMPLES

Example Debt/Ownership/Tax Agency Issues

There are several works (e.g., Crutchley and Hansen 1989; Bathala et al. 1994) that investigate agency effects on firm capital structures

utilizing simultaneous equation analyses with respect to agency issues. Bathala et al. (1994) used a two-equation system where the dependent variables are debt and managerial ownership. They found that debt is inversely related to earnings volatility. This finding implies that bankruptcy impacts on leverage and vice versa. The authors also reported an inverse relation between debt and the ownership holdings of management and institutional shareholders. The inverse relation supports the proposition that an agency cost trade-off exists between debt and the special ownership groups (i.e., management and institutional holders). Notably, the authors argued that simultaneous equation estimation techniques are superior to ordinary least squares estimates.

Jensen et al. (1992) examined insider ownership, debt, and dividend interrelations. They utilized a three-stage least squares technique and modeled an equation for each of the following policy decisions: insider ownership, debt, and dividends. The authors found that higher insider ownership results in lower debt. This finding is consistent with the agency proposition that managers will align themselves with owners, and higher insider ownership will correspondingly increase the agency cost of debt.[1]

Calegari (2000) used a simultaneous equation analysis on debt and taxes after the Tax Reform Act of 1986 (TRA86). The author formulated a three-equation system of changes in debt, discretionary book-tax accruals, and book-only accruals before and after TRA86. The conclusions are that tax-planning objectives drive debt and discretionary accruals.

Seetharaman et al. (2001) examined the alternatives of debt and management ownership to control agency costs with respect to marginal tax effects. They hypothesized that debt and managerial ownership are interrelated and, therefore, their impacts should be simultaneously determined. Seetharaman et al. demonstrated one aspect of interaction effects that was mentioned in the general overview of this chapter. That interaction effect is the marginal tax rate and debt. These three factors—debt, managerial ownership, and an interaction term of the marginal tax rate times the debt—are judged to be endogenous variables.

Using a two-stage least square regression methodology, Seetharaman et al. estimated the following two-equation model (their equations [4.1] and [4.2]):

$$\begin{aligned} DR = {} & a_0 + a_1ISEC1 + a_2ISEC2 + a_3ISEC3 + a_4ISEC5 + a_7ISEC6 \\ & + a_8ISEC7 + a_9BETA + a_{10}(ZPROB)^{-1} + a_{11}INST + a_{12}MTR \\ & + a_{13}IOS^{-1} + a_{14}MSO + e \end{aligned} \tag{8.1}$$

$$MSO = a_0 + a_1INST + a_2LMVAL + a_3DIVY + a_4STKVOL + a_5BETA + a_6(IOS)^{-1} + a_7DR + a_8MTR*DR + e \quad (8.2)$$

where:

ISECn = dummy variable of 1 for industry sector (by SIC) and 0 otherwise,
MSO_{it} = percentage of outstanding shares of common stock held by directors and officers of the firm,
$INST_{it}$ =percentage of outstanding shares held by institutions,
$LMVAL_{it}$ = log of the market value of the company's common shares outstanding,
$DIVY_{it}$ = dividend yield per share,
$STKVOL_{it}$ = standard deviation of the stock return over the previous 16 quarters,
$(IOS)^{-1}_{it}$ = ratio of book value to market value of common stockholder's equity,
DR_{it} = ratio of long-term debt to long-term debt plus book value of equity, and
MTR = marginal tax rate.

According to an interrelationship hypothesis, debt (management ownership) is a dependent variable in the first (second) and an independent variable in the second (first) equation. The other variables were chosen on a basis of hypothesized impact according to the literature. Seetharaman et al. gave details. For example, firms are presumed to cluster around industry averages. Lev (1969) indicated that firms adjust to industry means.

The results of Seetharaman et al. (2001) (their Table 4) for the aforementioned simultaneous equation are shown in Table 8.1. The debt equation of the model exhibits a reasonable goodness of fit in terms of overall statistics, and individual coefficients generally have good *p* values as well as signs consistent with their hypothetical directions. As per Chapter 5, the debt ratio sign indicates a decreasing relation with the probability of bankruptcy. As per Chapter 6, the level of managerial ownership and debt has an inverse relation (Jensen et al. 1992). The managerial equation of the model also exhibits a reasonable goodness of fit, and the individual coefficients are of the hypothesized sign with good significance. The tax variable marginal tax rate (MTR) results are consistent with the hypothesis that debt and managerial ownership are substitutes in the agency problem.

In summary, Seetharaman et al. (2001) find higher agency costs attributable to higher marginal tax rates for the trade-off between debt and managerial ownership. Alternatively, as marginal tax rates increase, the

TABLE 8.1 Simultaneous Equation Estimate of Debt, Management Ownership, and Taxes (n = 3,019)

Regression models:

Equation 1: $DR = a_0 + a_0 + a_1ISEC1 + a_2ISEC2 + a_3ISEC3 + a_4ISEC5 + a_7ISEC6 + a_8ISEC7 + a_9BETA + a_{10}(ZPROB)^{-1} + a_{11}INST + a_{12}MTR + a_{13}IOS^{-1} + a_{14}MSO + e$

Independent Variables	INT.	ISEC1	ISEC2	ISEC3	ISEC5	ISEC6	ISEC7
Coefficient Estimates	.540	-.181	-.172	-.041	-.113	-.303	-.169
t-values	28.36*	-9.12*	-13.68*	-2.08#	-6.88*	-8.82*	-8.20*

Independent Variables	BETA	$(ZPROB)^{-1}$	INST	MTR	MSO
Coefficient Estimates	.005	.033	-.000	-.003	-.001
t-values	.61	8.71*	-.82	-9.56*	-2.27*

Adjusted R^2 = .14, F-statistic = 47.37*

Equation 2: $MSO = b_0 + b_1INST + b_2LMVAL + b_3DIVY + b_4STKVOL + b_5(IOS)^{-1} + b_6DR + b_7MTR*DR + e$

Independent Variables	INT.	INST	LMVAL	DIVY	STKVOL	$(IOS)^{-1}$	DR	MTR*DR
Coefficient Estimates	50.35	-.22	-2.56	-1.83	-3.37	-2.83	-23.99	.25
t-values	23.52*	-15.96*	-13.45*	-9.63*	-4.01*	-4.05*	-4.37*	3.37*

Adjusted R^2 = .31, F-statistic = 198.84*

ZPROB = 1 / (total assets divided by the sum of 3.3 times earnings before interest and taxes plus sales plus 1.4 times retained earnings plus 1.2 times working capital).
* Significant at the .01 level.
# Significant at the .05 level.

relation between managerial ownership and debt weakens. Findings also confirm the propositions that firm leverage is inversely related to bankruptcy probability and managerial ownership.

Example Leverage/Profitability (Value)

Another stream of research has examined the relation between returns and leverage. The earliest analyses (Arditti 1967; Hall and Weiss 1967; Nerlove 1968; Gale 1972) had conflicting results. There were problems of identification of effect. In a working paper by Figlewski and Wang (2000), the authors found that other reasons may explain a leverage effect when stock prices decline. Baker (1973) investigated the

relation of leverage, profitability (and indirectly firm value), and risk with a single equation and simultaneous equation approach. Baker found the single equation has an inverse relation between leverage and profitability, but the simultaneous equation has a positive relation. According to much of the previous research discussed in this book, the relation should be positive (see also Dasgupta and Sengupta 2002). This study shows an example where simultaneous equations can provide a benefit to the research frontier.

Carleton and Silberman (1977) modeled the relation between leverage and rate of return (and indirectly firm value) with a set of variables that is intuitively more appealing than prior research. However, empirical comparisons with prior works are not necessarily verifiable because the authors take an industry view as opposed to an individual firm observation analysis. A total of 81 industries were specified. They formulated three separate equations to explain capital structure and rates of return. Their equations cover (1) a present value objective function (equation [8.3]), (2) a borrowing capacity constraint (equation [8.4]), and (3) an investment opportunities constraint (equation [8.5]). Their general statement of a constrained optimization problem for an industry follows.

$$\Phi_1[E(ROR),Var(ROR), M_1, E(G)] \tag{8.3}$$

$$\Phi_2[E(ROR),Var(ROR), E(i), M_2, D/A] = 0 \tag{8.4}$$

$$\Phi_3[E(ROR),Var(ROR), M_1, E(G)] = 0 \tag{8.5}$$

where:

E(ROR) = expected asset rate of return,
Var(ROR) = estimated asset rate of return variance,
E(i) = expected interest rate on debt,
D/A = ratio of debt to assets,
M_1 = variable representing market imperfections for firm goods,
M_2 = variable representing market imperfections for firm debt, and
E(G) = expected growth rate of firm assets.

The basic propositions that we have covered in this book are reflected in summary form in simultaneous equation analyses. For example, Carleton and Silberman (1977) did not include a debt ration D/A in their investment opportunity constraint. The choice of which variables are endogenous and which are exogenous are also key factors in the

model design. Here, the firm's goods market imperfection factor M_1, and the expected growth rate E(G) are exogenous. The expected return on assets E(ROR) and variance of asset returns Var(ROR) are proposed to be endogenous.

The empirical methodology uses OLS to estimate a set of coefficients and then the authors compute coefficients of reduced form for their simultaneous equation solutions. When the Carleton and Silberman (1977) did their empirical regressions, they only estimated information relevant to the constraints (equations [8.4] and [8.5]) as the observable data. Their Table 1 of the OLS equations is reproduced as Table 8.2, where:

RC = five-year weighted average earnings before interest and taxes (EBIT) on net fixed assets and working capital,
VRC = variance of unweighted average company RCs utilizing the unweighted industry mean RC,
G = log linear growth rate of industry sales over ten years,
PDC = end point year sum of long-term debt in an industry divided by the sum of the total invested capital, and
COV = five-year weighted average fixed charges coverage ratio (EBIT/Fixed Charges).

The structural equations (8.6), (8.7) and (8.8) are computed using estimates from Table 8.2. Carleton and Silberman (1977) only used Table 8.2 equations (2), (4) and (6) in conjunction with (1) because a risk

TABLE 8.2 OLS Estimates of Leverage Variables

Independent Variables	*Dependent Variables*						
	RC	*PDC*		*COV*		*ln COV*	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Constant	8.089[d]	30.982[d]	37.714[d]	4.939[a]	-1.835	1.431[d]	0.803[d]
	(3.90)	(8.59)	(10.82)	(1.74)	(-0.74)	(6.17)	(4.37)
G	0.255[c]	-0.93	0.341	0.144	-0.293	0.028	-0.013
	(2.89)	(-0.30)	(1.17)	(0.58)	(-1.42)	(1.37)	(-0.83)
VRC	0.042[d]	-0.035[c]	-0.0004	0.031[c]	-0.004	0.003[d]	-0.004
	(5.73)	(-2.77)	(-0.03)	(3.13)	(-0.39)	(3.52)	(-0.52)
RC			-0.832[d]		0.837[d]		0.078[d]
			(-4.78)		(6.78)		(8.45)
R square	0.39	0.10	0.30	0.13	0.45	0.18	0.57

[a] Significant at the .1 level.
[b] Significant at the .05 level.
[c] Significant at the .01 level.
[d] Significant at the .05 level.

variable must have a direct impact more than enough to mitigate any indirect effect from increasing returns. Equation (8.6) is calculated from Table 8.2 regressions (1) and (2). Equation (8.7) is computed from Table 8.2 regressions (1) and (4). Equation (8.8) is estimated from equations (1) and (6). The estimated structural equations (with the correlation from the predicted equation in parentheses) are:

PDC	32.428	-.028	VRC	-.179	RC	(8.6)
	(3.91)	(-.0.91)		(-.30)		
COV	2.712	+.020	VRC	+.275	RC	(8.7)
	(0.42)	(0.83)		(0.58)		
lnCOV	1.002	+.006	VRC	+.053	RC	(8.8)
	(1.88)	(0.34)		(1.37)		

Both returns and the variance on returns have negative signs consistent with theoretical propositions for equation (8.6). The key conclusion from this analysis is that the variance of returns is more influential on leverage than returns are.

In a related analysis to returns, Koch and Shenoy (1999) examined the interaction of cash flow, leverage, and dividends on firm performance. The authors created a system of three equations where the dependent variables are cash flows, leverage, and dividends. They found that capital structure and dividend polices impact on future cash flow and that both policies have an interaction effect on cash flows.

Example Capital Structure/Investment

A stream of literature starting with Hite (1977) has addressed the capital structure/investment framework from an overarching point of view. For example, Choi (1988) developed a partial equilibrium model relating real investments with the debt market. What makes Choi's article interesting for this review of the literature is that the author called for a simultaneous equation approach, which is later developed by Stenbacka and Tombak (2002).

As discussed earlier, a key issue is the sign of the relation between investment and leverage. Hite (1977) determined theoretically that the relation is positive. The author postulated that a firm's financial decision determines its real investment and concluded that the firm capital structure choice is irrelevant; however, Dotan and Ravid (1985) examined the same issue and concluded exactly the opposite—that the relation is negative. They also assumed that debt is an exogenous firm input

choice and that the DeAngelo and Masulis (1980) non-debt tax shield is an endogenous variable. The authors reached their conclusion by reasoning that a debt increase will increase the probability of a loss, which correspondingly lowers the firm's tax shelter and results in lower real capital investment.

However, Prezas (1988) further developed this line of research and created a simultaneous equation model that utilizes a more sophisticated view of firm behavior. He concluded that the investment/leverage relation is neither absolutely negative nor positive. The author argued theoretically that the relation depends on firm characteristics of debt and its production function.

Stenbacka and Tombak (2002) investigated the relation between debt, equity, and investment utilizing simultaneous equations. They used an instrumental variable technique in their simultaneous equation methodology. Their model formulation has investment and capital structure as endogenous variables. In a previous study, Kovenock and Phillips (1997) also considered investment and capital structure as endogenous.

Stenbacka and Tombak (2002) specifically examined existing equity shareholders' behavior for value maximization in an investment decision by considering debt and equity alternatives within a firm framework that also incorporates existing equity as a funding source. The authors' approach actually brings into convergence[2] a simplified version of the pecking order hypothesis with the concept that an optimal capital structure exists. In their theoretical formulation there are tradeoffs to existing shareholders between bankruptcy costs and dilution of new equity in the funding of investments.

In summation, the authors concluded that the development of an internal financing source (retained earnings) is a value-enhancing proposition. From a position of the ability to finance internally, debt and equity sources provided complementary benefits. The authors provide a small bit of empirical evidence in support of their contention.

Example Industry Average Adjustment

Most introductory finance textbooks (e.g., Brigham and Houston 2000; Petty et al. 1993) propose that firms set a target capital structure. There is empirical research that supports this proposition. Swanson (1998) found that a target leverage ratio has value relevance. Prior research (e.g., Billingsley et al. 1994) also indicates that managers choose target leverage ratios to be near industry averages. For example, Billingsley et al. (1994) examined the simultaneous issuances of debt and equity, which appear to be motivated by a desire to have firm target leverage ratios in close proximity to industry leverage averages. Also, Claggett (1991) investigated the proposition that there may be a conver-

gence of the pecking order theory with optimal capital structure theory. The author found a convergence toward industry leverage means, but gave a *caveat* that one should not take a simplistic view. There are definitely differences in the nature of any convergence internationally (e.g., Antoniou 2002). Roberts (2002) modeled the leverage target as having firm-specific, time-varying factors. Hovakimian et al. (2001) also reported that firms move toward a target leverage ratio and that targets are more important when the firm does a repurchase than when the firm issues securities. Hovakimian (2002) reexamined the convergence to a target leverage ratio with a more differentiated sample. He found that equity activity has a weak relation to the target capital structure and debt reductions have the most significant association with target leverage ratios. Even when a target leverage ratio is assumed, the timing of issuance is potentially influenced by macroeconomic conditions. Korajczyk and Levy (2002) indicated that firms who are not financially constrained will time the market, whereas firms who are financially constrained will have to accept market prices when they are in need.

International evidence by de Miguel and Pindado (2001) indicates that Spanish firms have lower transactions costs than U.S. firms principally because Spanish firms have more private investment in the companies. The authors investigate a target capital structure adjustment model in which debt is a function of non-debt tax shields, financial distress costs, and investment. They find that debt has an inverse relation with non-debt tax shields and financial distress costs, but debt has a direct relation with investment. In another analysis of Spanish data, Giner and Reverte (2001) utilized the Ohlson (1995) framework and found evidence that markets value a target capital structure over the long term. The authors also report that some of their results are consistent with signaling theory.

Research literature (e.g., Maksimovic and Zechner 1991; Williams 1995; Fries et al. 1997) indicates that an industry equilibrium model does explain firm leverage ratios. In particular, Fries et al. argued that an industry's output price elasticity affects the demand for debt. Thus, firms within an industry will move over time toward an optimal capital structure trade-off between debt and agency cost. In general, however, the industry membership effect may not have a strong impact on leverage decisions. Bradley et al. (1984) found that industry dummy variables add only an additional 10 percent explanatory power to a model of company-specific variables describing firm leverage. In a working paper, Almazan and Molina (2001) examined intraindustry characteristics in finer detail with respect to their impact on firm capital structures. They investigated the dispersion and find greater dispersion in industries that have a more unique product, weaker corporate governance

conditions, easily transferable assets, and industries that are highly concentrated.

To investigate the issue in more depth, Mackay and Phillips (2001) addressed the impact of industry effects on individual firm leverage with univariate and multivariate analyses. They built on the previous industrial equilibrium work (i.e., Maksimovic and Zechner 1991; Williams 1995; Fries et al. 1997). Here, we focus only on the simultaneous equation investigation. The authors use the general method of moments to address the simultaneity effect. All of their variables are computed as first differences so as to minimize firm fixed effects. Their general method of moment results (their Table V) are shown in Table 8.3,

TABLE 8.3 Industry Effects on Firm Leverage

	Ordinary Least Squares			*General Method of Moments*		
	Leverage	*K/L*	*Risk*	*Leverage*	*K/L*	*Risk*
Leverage		0.025	0.017		0.232	0.153
		(5.56)[c]	(8.19)[c]		(5.57)[c]	(3.56)[c]
Capital/Labor	0.046		0.003	0.729		-0.739
	(5.55)[c]		(1.09)	(4.27)[c]		(-9.82)[c]
Risk	0.141	0.018		0.481	-0.877	
	(7.89)[c]	(1.37)		(3.22)[c]	(18.6)[c]	
Profitability	-0.057	0.021	-0.021	-0.096	0.146	0.134
	(-16.03)[c]	(7.76)[c]	(-17.56)[c]	(-1.25)	(3.27)[c]	(3.05)[c]
$(\text{Profitability})^2$	0.013	-0.021	0.014	0.293	-0.236	-0.200
	(4.23)[c]	(-9.61)[c]	(14.07)	(4.67)[c]	(-7.42)[c]	(-6.13)[c]
Size [log(assets)]	0.062	0.028	-0.012	0.483	-0.128	-0.082
	(26.52)[c]	(16.10)[c]	(-14.68)[c]	(7.86)[c]	(-3.20)[c]	(-2.03)[c]
Diversification	0.015	-0.002	0.003	0.057	-0.002	0.043
	(2.37)	(-0.03)	(1.00)	(0.77)	(0.034)	(1.19)
Tobin's Q	-0.005	-0.002	-0.001	0.098	-0.042	-0.033
	(-6.15)[c]	(-2.63)[c]	(-1.93)[a]	(5.90)[c]	(-4.55)[c]	(-3.54)[a]
Natural Hedge	-0.015	-0.135	-0.001	-0.137	0.106	-0.077
	(-3.75)[c]	(-47.77)[c]	(-0.39)	(-2.12)[c]	(-2.52)[c]	(-2.25)
$(\text{Natural Hedge})^2$	0.032	-0.003	-0.001	0.200	0.106	0.107
	(4.88)[c]	(-0.53)	(-0.51)	(2.58)[c]	(2.52)[b]	(2.56)[c]
Intra-quintile Change	0.171	0.147	0.162	0.120	0.026	0.025
	(19.30)[c]	(13.67)[c]	(18.17)[c]	(6.67)[c]	(1.81)[a]	(1.34)
Extra-quintile Change	-0.069	0.089	-0.102	0.076	0.026	-0.034
	(-3.42)[c]	(3.82)[c]	(-4.97)[c]	(1.71)[a]	(1.18)	(-0.08)
Adj. R Square	0.058	0.105	0.046	NA	NA	NA
Degrees of Freedom	26,747	26,747	26,747	26,747	26,747	26,747
Wald test	1673[c]	3156[c]	1327[c]	197[c]	407[c]	115[c]
J-statistic Hansen	NA	NA	NA	82[c]	21[b]	78[c]

[a] Significant at the .1 level.
[b] Significant at the .05 level.
[c] Significant at the .01 level.

where:

Leverage	= total debt divided by total assets,
Capital/Labor	= net plant and equipment per employee,
Risk	= standard deviation of operating cash flow divided by sales,
Profitability	= operating cash flow divided by sales,
Size	= log of total assets,
Diversification	= Herfindahl index of output for each four-digit SIC industry,
Tobin's Q	= market value of assets divided by book value of assets,
Natural Hedge	= 1 – absolute value[capital/labor(firm) – capital/labor (industry)],
Intra-quintile change	= mean change in the dependent variable for firm's industry-year quintile, and
Extra-quintile change	= mean change in the dependent variable outside firm's industry-year quintile.

One of the key results of interest to capital structure decisions is the relation between leverage and firm volatility. Recall that Carleton and Silberman (1977) found a negative relation of the variance of returns on assets with leverage. Here, MacKay and Phillips (2001) reported that the relation between profitability squared is positive and significant. This sign seems contradictory at first glance. However, profitability is cash flow divided by sales, which is always going to be less than 1, and MacKay and Phillips defined all variables as first differences. The square of a number less than one will always create a number even smaller than the original fraction. Most important, the profitability square is larger for higher differences of profitability, which means than the variation (volatility as defined by MacKay and Phillips) will increase as the leverage differences also increase. We can infer that the firms with lower profitability variations will have more stable leverage ratios.

IMPLICATIONS

In contrast to previous chapters, it is difficult, if not impossible, to construct simple examples of simultaneous equation systems. However, a basic principle of modeling firm behavior holds that each equation should make economic sense in its own right. Thus, the key

issue becomes to ask the right question in the first place. Then, the next step is to build a suitable theoretical design that will answer the question.

Although it may be possible to present the concepts of agency theory abstractly as equations, the practical examination of these equations may be another matter. For example, if a manager is shirking work, then how does the investigator estimate the cost to the firm? When costs are not observable by accounting data, how can they be employed in empirical analyses? Perhaps market values reflect these losses, but the errors-in-variables problems are likely to make the measurement problematical. Thus, the analyst must identify variables of interest to management and other stakeholders in terms of probable cause and effect on the research question. Then, interactions between the variables should be considered and variables placed in separate equations as appropriate.

SUMMARY

What do we know from the analysis of capital structure with simultaneous equations? We know greater detail about firm behavior and that interactions exist between key attributes of capital structure decision making. For example, the marginal tax rate does mitigate agency relation between managerial ownership and debt. It is obvious that single equation analysis can lead to opposite conclusions about cause and effect. Thus, simultaneous equations are necessary in certain situations where variables are going to interact and where variables might interact with regression equation residuals.

Simultaneous equations are on one level a means to estimate the capital structure factors. On this level, we are only talking about better statistical information and no paradigm shift in capital structure knowledge. On another level, simultaneous equations can give the means to model the firm as a nexus of contracts that could cause a capital structure paradigm shift. "Could" is the key word, because at this point we are simply looking at an avenue of research that might make a paradigm shift. Time will tell if it does.

NOTES

1. The results also indicate a negative relation between debt and business risk that is consistent with bankruptcy cost arguments advanced in Chapter 6 of this book.

2. Claggett (1991) also theorized that pecking order and optimal capital structures have convergence.

REFERENCES

Almazan, A., and C. Molina. 2001. "Intra-Industry Capital Structure Dispersion: How Do Capital Structures Differ among Competitors?" University of Texas at Austin working paper.

Antoniou, A., Y. Guney, and K. Paudyal. 2002. "Determinants of Corporate Capital Structure: Evidence from European Countries," University of Durham working paper.

Arditti, F. 1967. "Risk and the Required Rate of Return on Equity." *Journal of Finance* 22 (March): 19–36.

Baker, S. 1973. "Risk, Leverage and Profitability: An Industry Analysis." *Review of Economics and Statistics* 55 (November): 503–7.

Bathala, C., K. Moon, and R. Rao. 1994. "Managerial Ownership, Debt Policy and the Impact of Institutional Holdings: An Agency Theory Perspective." *Financial Management* 23 (Autumn): 38–50.

Billingsley, R., D. Smith, and R. Lamy. 1994. "Simultaneous Debt and Equity Issues and Capital Structure Targets." *Journal of Financial Research* 17 (Winter): 495–516.

Bradley, M., G. Jarrell, and H. Kim. 1984. "On the Existence of an Optimal Financial Structure." *Journal of Finance* 39: 857–78.

Brigham, E., and J. Houston. 2000. *Fundamentals of Financial Management*. Fort Worth: Harcourt College Publishers.

Calegari, M. 2000. "The Effect of Tax Accounting Rules on Capital Structure and Discretionary Accruals." *Journal of Accounting & Economics* 30 (August): 1–32.

Carleton, W., and I. Silberman. 1977. "Joint Determination of Rate of Return and Capital Structure: An Econometric Analysis." *Journal of Finance* 32 (June): 811–21.

Chauvin, K., and M. Hirshey. 1996. "Ownership and Capital Structure." *Advances in Financial Economics* 2: 25–46.

Choi, J. 1988. "Debt Financing and the Cost of Capital in the Neoclassical Investment Model." *American Economist* 32 (Spring): 19–23.

Claggett, E. 1991. "Capital Structure: Convergent and Pecking Order Evidence." *Review of Financial Economics* 1 (Fall): 35–48.

Crutchley, C., and R. Hansen. 1989. "A Test of Agency Theory Managerial Ownership, Corporate Leverage, and Corporate Dividends." *Financial Management* 18 (Winter): 36–46.

DeAngelo, H., and R. Masulis, 1980. "Leverage and Dividend Irrelevancy under Corporate and Personal Taxation." *Journal of Finance* 35 (May): 453–64.

de Miguel, A., and J. Pindado. 2001. "Determinants of Capital Structure: New Evidence from Spanish Panel Data." *Journal of Corporate Finance* 7: 77–99.

Dasgupta, S., and K. Sengupta. 2002. "Financial Constraints, Investment and Capital Structure: Implications from a Multi-Period Model." Hong Kong University working paper.

Dotan, A., and A. Ravid. 1985. "On the Interaction of Real and Financial Decisions of the Firm under Uncertainty." *Journal of Finance* 40 (June): 501–17.

Figlewski, S., and X. Wang. 2000. "Is the 'Leverage Effect' a Leverage Effect?" NYU Stern School of Business working paper.

Fries, S., M. Miller, and W. Parraudin. 1997. "Debt in Industry Equilibrium." *Review of Financial Studies* 10: 39–67.

Gale, B. 1972. "Market Share and Rate of Return." *Review of Economics and Statistics* 54 (November): 412–23.

Giner, B., and C. Reverte. 2001. "Valuation Implications of Capital Structure: A Contextual Approach." *European Accounting Review* 10: 291–314.

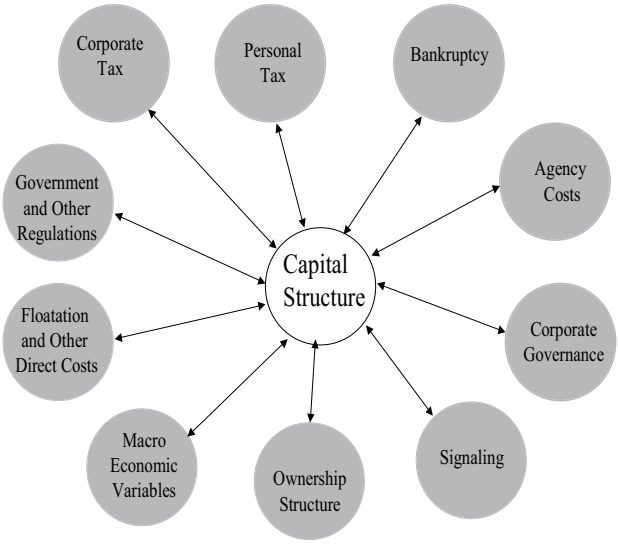
Gujarati, D. 1995. *Basic Econometrics*. New York: McGraw-Hill.

Hall, M., and L. Weiss. 1967. "Firm Size and Profitability." *Review of Economics and Statistics* 49 (August): 319–31.
Hite, G. 1997. "Leverage, Output Effects, and the M-M Theorems." *Journal of Financial Economics* 4: 177–202.
Hovakimian, A. 2002. "The Role of Target Leverage in Security Issues and Repurchases." Baruch working paper.
Hovakimian, A., T. Opler, and S. Titman. 2001. "The Debt-Equity Choice." *Journal of Financial and Quantitative Analysis* 36: 1–25.
Jensen, G., D. Solberg and T. Zorn. "Simultaneous Determination of Insider Ownership, Debt and Dividend Policy." *Journal of Financial and Quantitative Analysis* 27 (June): 247–63.
Jensen, M. C., and W. Meckling. 1976. "The Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure." *Journal of Financial Economics* 3: 305–60.
Kennedy, P. 1998. *A Guide to Econometrics*. 4th ed. Cambridge: MIT Press.
Koch, P., and C. Shenoy. 1999. "The Information Content of Dividend and Capital Structure Policies." *Financial Management* 28 (Winter): 16–35.
Korajczyk, R., and A. Levy. "Capital Structure Choice: Macroeconomic Conditions and Financial Constraints." Northwestern University working paper.
Kovenock, D., and G. Phillips. 1997. "Capital Structure and Product Market Behavior: An Examination of Plant Exit and Investment Decisions." *Review of Financial Studies* 10: 767–803.
Lev, B. 1969. "Industry Averages as Targets for Financial Ratios." *Journal of Accounting Research* 7 (Autumn): 290–99.
MacKay, P., and G. Phillips. 2001. "Is There an Optimal Industry Financial Structure?" Southern Methodist University working paper.
Maksimovic, V., and J. Zechner. 1991. "Debt, Agency Costs, and Industry Equilibrium." *Journal of Finance* 46: 1619–43.
Mamaysky, H. 2002. "A Model for Pricing Stocks and Bonds with Default Risk." Yale ICF working paper No. 02-13.
Nerlove, M. 1968. "Factors Affecting Differences among Rates of Return on Investments in Individual Common Stocks." *Review of Economics and Statistics* 50 (August): 312–31.
Ohlson, J. 1995. "Earnings, Book Values and Dividends in Equity Valuation." *Contemporary Accounting Research* 11: 661–87.
Petty, J., A. Keown, D. Scott, and J. Martin. 1993. *Basic Financial Management*. Englewood Cliffs, N.J.: Prentice Hall.
Prezas, A. 1988. "Interactions of the Firm's Real and Financial Decisions." *Applied Economics* 20 (April): 551–60.
Roberts, M. 2002. "The Dynamics of Capital Structure: An Empirical Analysis of a Partially Observable System." Duke University working paper.
Seetharaman, A., Z. Swanson, and B. Srinidhi. 2001. "Analytical and Empirical Evidence of the Impact of Tax Rates on the Trade-Off between Debt and Managerial Ownership." *Journal of Accounting Auditing & Finance* 16 (Summer): 249–72.
Stenbacka, R., and M. Tombak. 2002. "Investment, Capital Structure, and Complementarities between Debt and New Equity." *Management Science* 48 (February): 257–72.
Swanson, Z. 1998. "How the Market Views Leverage Data from Financial Statements," in Cheng-Few Lee (Ed.). *Advances in Quantitative Analysis of Finance and Accounting* 6: 55–71.
Williams, J. 1995. "Financial and Industrial Structure with Agency." *Review of Financial Studies* 8: 431–74.

9

Executive Survey Interview Information

Central Tenet: The current practice of capital structure decision making has considerable variation.



INTRODUCTION

The previous chapters examined capital structure decision making from a theoretical point of view. Results of empirical investigations of certain hypotheses were presented. The implications of these theories for practitioners were specified within the chapters to the extent that the implications are identifiable. This chapter looks at capital structure decision making explicitly from the point of view of the practitioner. We report on four major articles that surveyed executive thinking on capital structure matters. Surveys conducted by Graham and Harvey 2001, Kamath 1997, Pinegar and Wilbricht 1989, and Scott and Johnson 1982 basically ask two questions. First, what do practitioners think of the theoretical hypotheses? Second, how do practitioners make their capital structure decisions? Most of these surveys had been conducted before the tumultuous changes that occurred at the turn of the century. For reference purposes, a set of questions from these surveys are included in Appendix 4.

SURVEY LITERATURE

Although there has been considerable research into the behaviors of firms utilizing financing, little research into executive capital structure decision making has been conducted, for several reasons. First, no theoretical models exist modeling cognitive behavior, in contrast to the auditing literature, where many models have been developed. For example, to what extent does "fixation" on past information influence current capital structure decision making? Second, students are often used as surrogates of practitioners to facilitate experiments. However, no particular evidence exists that seasoned chief financial officers will think the same as students. While surveys have limitations (e.g., non-respondent bias), at least they give a window into executive thinking on capital structure. Four major articles that surveyed executive thinking on capital structure matters are discussed next.

Scott and Johnson (1982)

Scott and Johnson (1982) stated that a motivation for their executive survey was a focus on asset management. They specifically excluded issues about liabilities from their analysis. They sent surveys to Fortune 1000 company chief financial officers (CFOs) in 1979 and obtained a 21.2 percent response rate, which although not particularly high, is probably greater than could be obtained today due to litigation issues and executive time pressures. The authors did not deal with non-respondent bias, because in part they said that they could not afford to send a second mailing.[1]

The questions examined by Scott and Johnson (1982) focus on management's identification of a specific target capital structure and on the CFO's method of defining firm leverage. Their survey results indicated that a vast majority (89 percent) of managements use some measure of leverage in making a capital structure decision. The executives in the survey reported that their thinking was most influenced by their own internal staff and fellow managers. Investment bankers were ranked the next most important group affecting firm capital structure decisions. Although research described in Chapter 8 indicates that industry averages affect leverage levels, the executives in 1979 were not particularly influenced by this numerical factor, ranking it third in importance.

The definition of leverage is a controversial issue that is discussed in Chapter 1. In the Scott and Johnson (1982) survey, approximately 80 percent of the respondents defined leverage in terms of both balance sheet and income statement items. The survey respondents selected the long-term debt-to-total capitalization ratio as a leverage measure according to a composite score derived by the authors. There was considerable variation in the response to the question: "How is financial leverage measured?" as is evidenced by Table 9.1 (Scott and Johnson's Exhibit 3). Times-interest earned was actually the most frequently chosen metric. It is interesting that the practitioners selected book values by 92 percent over market values as measures for leverage. Bowman (1980) found a high correlation between book and market value of debt,

TABLE 9.1 How Financial Leverage Is Measured: Question 3

		Ranking Not Given				
			Rank			Composite
Ratio	Percent of Firms Using	(Number of Firms)	1	2	3	Ranking Statistic
Debt	37%	133	4%	7%	11%	8.43
Long-term debt to total capitalization	76	50	46%	13%	13%	4.05
Common equity	29	150	2	3%	6%	9.14
Long-term debt	32	144	3%	4%	8%	8.94
Long-term debt to net worth	56	93	21%	21%	8%	6.19
Times-interest-earned	69	66	6%	34%	26%	5.37
Times-interest and preferred dividend coverage	32	144	0%	4%	12%	9.06
Cash flow coverage	41	126	2%	10%	12%	8.20
Other	27	155	16%	4%	4%	8.72
Total			100%	100%	100%	

and management should easily be able to get the book value of debt from their accounting data. However, later research (Swanson 1998) indicated that market values are more commonly used by investors. These contrasting results may be indicative of an agency conflict that should be the subject of future research.

Scott and Johnson's (1982) findings clearly show that the CFOs who responded to the survey believe that there is a single optimal capital mix for their firms. For example, 92 percent of the respondents believed that there was a "proper" debt number for the balance sheet. An even higher percentage of respondents (97 percent) thought that too much debt could trigger bankruptcy. These CFOs appear to have held the belief that the firm has an optimal debt capacity that is necessary for maintaining a favorable bond debt rating.

Pinegar and Wilbricht (1989)

Pinegar and Wilbricht (1989) conducted a survey in 1989 that differed from that of Scott and Johnson (1982) in one key respect. Pinegar and Wilbricht focused on the belief of executives in alternative capital structure theories. Specifically, they compared the "static trade-off" versus the "pecking order" theories versus a category that the authors defined as "other models." They defined the "static trade-off" theory as the proposition that an optimal capital structure exists that would maximize firm value. Pinegar and Wilbricht included the Miller and Rock (1985) signaling model in the "other models" category.

Pinegar and Wilbrich (1989) surveyed chief financial officers of the Fortune 500 firms for 1986. They obtained a response of 35 percent. One reason that the response exceeded that of Scott and Johnson (1982) is that the survey contained only nine questions. There is no indication that the authors tried to address non-respondent bias. The authors gave a descriptive picture (their Exhibit 2) of the thinking of the executives in their survey with respect to capital structure theory issues, which is replicated in Table 9.2.

Next, we summarize several key results. A very interesting finding is that the respondents consider the forecasted cash flow of a new project to be the most important factor in the financing. Pinegar and Wilbricht (1989) found that the majority of CFOs prefer the pecking order theory. In particular, 85 percent of the respondents would choose internal financing from retained earnings for any new project. The next choice is straight debt. As rankings moved down the list, common stock was preferred to preferred stock, which is contrary to the authors' interpretation of the pecking order theory. The authors concluded that financing and investment are not separable because executives weight highly the asset characteristics that are to be financed.

TABLE 9.2 Relative Importance of Capital Structure Model Inputs and/or Assumptions in Governing Financing Decisions of Major U.S. Industrial Firms

	Percentage of Responses within Each Rank						
Inputs/Assumptions by Order of Importance	*Unimportant*	*2*	*3*	*4*	*Important*	*Not Ranked*	*Mean*[a]
1. Projected cash flow from asset to be financed	1.7	1.1	9.7	29.5	58.0	0.0	4.41
2. Avoiding dilution of common shareholders' claims	2.8	6.3	18.2	39.8	33.0	0.0	3.94
3. Risk of asset to be financed	2.8	6.3	20.5	36.9	33.0	0.6	3.91
4. Restrictive covenants on senior securities	9.1	9.7	18.7	35.2	27.3	0.0	3.62
5. Avoiding mispricings of securities to be issued	3.4	10.8	27.3	39.8	18.7	0.0	3.60
6. Corporate tax rate	4.0	9.7	29.5	42.6	13.1	1.1	3.52
7. Voting control	17.6	10.8	21.0	31.2	19.3	0.0	3.24
8. Depreciation and other non-debt tax shields	8.5	17.6	40.9	24.4	7.4	1.1	3.05
9. Correcting mispricing of outstanding securities	14.8	27.8	36.4	14.2	5.1	1.7	2.66
10. Personal tax rates of debt and equity holders	31.2	34.1	25.6	8.0	1.1	0.0	2.14
11. Bankruptcy costs	69.3	13.1	6.8	4.0	4.5	2.3	1.58

[a]Means are calculated by assigning scores of 1 through 5 for rankings from "unimportant" to "important," respectively, and by multiplying each score by the fraction of responses within each rank. A score of 0 is assigned when a source is not ranked.

The conclusion that managers linked the assets to the financing suggests that the firm would also endeavor to signal to investors the quality of the projects to be financed. However, the survey results indicated that managers do not feel that the market is incorrectly pricing the firm's securities. If the firm's securities are appropriately priced, there is no advantage for management to incur the costs of such signaling. Thus, management will probably not make an effort to signal a firm's status unless it is dissatisfied with current security pricing. The aforementioned high rankings of asset characteristics to be financed may simply reflect management's predominant focus on financial planning. Pinegar and Wilbricht (1989) concluded that financial executives do not consider capital structure theory when they make financing decisions.

Kamath (1997)

The third in the group of survey studies was conducted by Kamath (1997). The author examined a sample of New York Stock Exchange

(NYSE) firms. The author's findings have a number of similarities to those of Pinegar and Wilbricht (1989), as he uses most of the same questions. The author also reported some similar findings to a previous study by Pruitt and Gitman (1991). Some new analyses seek to determine underlying factors. In particular, Kamath's study asked the question: What reasons do executives think are driving the firm's current capital structure? Table 9.3 (Kamath's Table 6) reports the executive reasoning for a firm's capital structure. The highest-ranked factor for a firm's leverage is past profits.

Graham and Harvey (2001)

Graham and Harvey (2001) conducted a survey on a broad range of corporate finance issues including capital structure. Their survey comprises a list of 100 questions, which is considerably larger than the other three works discussed previously. They also polled a much larger sample of 4,440 firms. The authors collected information on firm-specific characteristics used to see if business factors drive capital structure decisions and also addressed capital budgeting and cost of capital issues. Their response rate of 9 percent is much lower than the prior works. They did check for non-respondent bias and concluded that despite its small size, their sample was representative of the firms to which the surveyed was sent.

A central issue in this book is whether or not an optimal capital structure exists. Graham and Harvey (2001) surveyed this issue to see what practitioners think. One expression of the optimal capital structure proposition is the trade-off theory. In this theory, firms trade off the tax advantage of debt versus the debt disadvantages and non-debt tax

TABLE 9.3 Responses to the Inquiry: In Your Opinion, the Debt Ratio of Your Firm Depends on …

	Percentage of Responses within Each Rank						
	Disagree				*Agree*	*Not*	
Statement	*1*	*2*	*3*	*4*	*5*	*Ranked*	*Mean*[a]
1. Past Profits	12.0	13.4	20.4	38.0	13.4	2.8	3.19
2. Average debt ratio in your industry	13.4	19.7	27.5	23.2	14.1	2.1	2.99
3. Past growth	15.5	19.7	21.1	26.8	14.1	2.8	2.93
4. Degree of diversification achieved by your firm	21.1	24.0	26.1	21.8	4.2	2.8	2.56
5. Past dividend payout	24.7	21.8	25.4	20.4	4.9	2.8	2.51

[a]Means are calculated by assigning scores of 1 through 5 for rankings from "unimportant" to "important," respectively, and by multiplying each score by the fraction of responses within each rank. A score of 0 is assigned when a source is not ranked.

shields. Personal tax rates of investors theoretically are also a component of the trade-off theory. The executives in the sample do rate taxes as a relatively important factor in their thinking. Chief financial officer responses from larger companies are more concerned with tax effects. On the other hand, the practitioners do not rate as important the costs of bankruptcy (a theoretical disadvantage of debt). Neither do the executives state that investor personal taxes are important to capital structure decisions. Agency costs were also not a significant issue to the executives. Thus, the tax advantage side of the trade-off theory is considered important in capital structure decisions, but little weight is given to the disadvantages of debt versus equity (see Table 9.4, which is their Table 6).

Another manifestation of the trade-off theory is the choice of a target-debt ratio. The vast majority of executives in Graham and Harvey's (2001) sample indicate that they have a target-debt ratio, but only 10 percent indicated that they adhere strictly to a target. In selecting the target-debt ratio, executives responded that they pay little attention to the debt levels present in their industry. Thus, there is some indirect evidence that executives do subscribe to an optimal capital structure theory. On the other hand, executives expressed preferences for external financing only when they did not have enough internal resources. Also, executives indicated that they were not likely to issue securities when they felt the market undervalued their firm. These responses are consistent with the pecking order hypothesis. The third major theory for capital structure policy is signaling. The authors find little support among executives for signaling. Among the other explanations for capital structure policy, there is little evidence for agency problems from substituting risky assets for indicated assets in financing and no particular support for the under-investment problem.

Graham and Harvey (2001) surveyed U.S. firms, and U.S. executive attitudes are probably influenced by cultural and institutional factors. In a working paper, Bancel and Mittoo (2002) surveyed executives in 17 European countries. At this writing, they have made no direct comparisons with Graham and Harvey, but they have expressed the intention to do so. They do report that the European executives rank credit rating, financial flexibility, and taxes as important factors affecting the debt in capital structure. The European managers are concerned about share dilution of equity positions. They also rate highly interest rate and share price as important factors affecting the issuance of debt and equity.

IMPLICATIONS

The survey results cited in this chapter indicate that executives rely largely on heuristics (informal rules of thumb) for making decisions

TABLE 9.4 Survey Responses to the Question: What factors affect how you choose the appropriate amount of debt for your firm?[i]

	% import.		Size		P/E		Leverage	
	or very	Mean	Small	Large	Growth	Non-G	Low	High
(g) Financial flexibility (we restrict debt so we have enough internal funds to pursue new projects when they come along)	59.38	2.59	2.54	2.65	2.61	2.75	2.61	2.60
(d) Our credit rating (as assigned by rating agencies)	57.10	2.46	1.92	3.14[a]	2.89	2.81	2.29	2.64[b]
(b) The volatility of our earnings and cash flows	48.08	2.32	2.29	2.36	2.41	2.25	2.25	2.32
(a) The tax advantage of interest deductibility	44.85	2.07	1.77	2.44[a]	2.36	2.27	1.99	2.26[b]
(e) The transactions costs and fees for issuing debt	33.52	1.95	2.07	1.81[b]	1.98	1.80	1.94	1.87
(c) The debt levels of other firms in our industry	23.40	1.49	1.29	1.77[a]	1.72	1.52	1.36	1.70[a]
(b) The potential costs of bankruptcy, near-bankruptcy, or financial distress	21.35	1.24	1.36	1.10[b]	1.29	1.02[c]	1.16	1.37[b]
(i) We limit debt so our customers/suppliers are not worried about our firm going out of business	18.72	1.24	1.20	1.30	1.43	1.00[a]	1.34	1.20
(n) We restrict our borrowing so that profits from new/future projects can be captured fully by shareholders and do not have to be paid out as interest to debt holders	12.57	1.01	1.16	0.80[a]	1.09	0.69[a]	1.18	0.83[a]
(j) We try to have enough debt that we are not an attractive takeover target	4.75	0.73	0.57	0.91[a]	0.95	0.86	0.62	0.90[a]
(f) The personal tax cost our investors face when they receive interest income	4.79	0.68	0.59	0.72[c]	0.53	0.80[b]	0.68	0.63
(k) If we issue debt our competitors know that we are very unlikely to reduce our output	2.25	0.40	0.41	0.37	0.48	0.32[c]	0.33	0.47[b]
(m) To ensure that upper management works hard and efficiently, we issue sufficient debt to make sure that a large portion of our cash flow is committed to interest payments	1.69	0.33	0.33	0.32	0.32	0.28	0.22	0.49[a]
(l) A high debt ratio helps us bargain for concessions from our employees	0.00	0.16	0.16	0.15	0.18	0.13	0.13	0.19[c]

[i]Respondents are asked to rate on a scale of 0 (not important) to 4 (very important). [a, b, c] denote a significant difference at the 1%, 5%, and 10% levels, respectively. Questions (a) through (n) are ordered by the degree of importance given them by survey repondents, as shown in column 1.

Invest. Grade		*Pay dividends*		*Industry*		*Mgt. Ownership*	
Yes	*No*	*Yes*	*No*	*Man*	*Others*	*Low*	*High*
2.71	2.59	2.73	2.40[a]	2.67	2.52	2.68	2.41[b]
3.36	3.11[b]	2.76	2.04[a]	2.52	2.39	2.81	1.99[a]
2.11	2.44[b]	2.33	2.28	2.35	2.31	2.32	2.41
2.32	2.54	2.35	1.65[a]	2.30	1.79[a]	2.27	1.89[a]
1.85	2.06	1.91	2.02	1.89	1.95	1.88	2.02
1.80	1.71	1.63	1.34[b]	1.38	1.66[b]	1.57	1.37[c]
0.99	1.40[b]	1.27	1.21	1.31	1.22	1.30	1.33
1.23	1.14	1.19	1.30	1.21	1.40[c]	1.17	1.45[b]
0.77	0.85	0.95	1.06	1.08	0.97	0.78	1.30[a]
0.84	0.96	0.76	0.66	0.83	0.66[c]	0.85	0.74
0.87	0.51[a]	0.71	0.55[c]	0.65	0.63	0.65	0.72
0.38	0.51	0.38	0.41	0.46	0.36	0.37	0.52[b]
0.28	0.38	0.32	0.34	0.40	0.26[b]	0.33	0.35
0.14	0.17	0.13	0.19[c]	0.18	0.15	0.17	0.18

concerning capital structure of their firms. The executives seem to tailor their capital structure decisions to firm-specific characteristics. For example, the executives surveyed in the Graham and Harvey (2001) study say that financial flexibility and credit ratings are important in their capital structure decisions.

SUMMARY

This chapter reviews a set of studies that surveyed executives to see to what extent their thinking agrees with various aspects of the capital structure paradigm. Firm executives rank the theories discussed in the earlier chapters of this book fairly high. In every study, executives expressed the position that a leverage ratio does impact on their capital structure decision making. However, few executives actively manage their debt ratio. Their thinking appears to be more closely aligned with the pecking order proposition than with other capital structure theories.

NOTE

1. Note, nobody today would even start a survey without planning some effective means of addressing non-respondent bias because current journal reviewers would very likely reject the article.

REFERENCES

Bancel, F., and U. Mittoo. 2002. "The Determinants of Capital Structure Choice: A Survey of European Firms." European Financial Management Association, London Meeting.

Bowman, J. 1980. "The Importance of a Market Value Measurement of Debt in Assessing Leverage." *Journal of Accounting Research* 18 (Spring): 242–54.

Graham, J., and C. Harvey. 2001. "The Theory and Practice of Corporate Finance: Evidence from the Field." *Journal of Financial Economics* 60: 187–243.

Kamath, R. 1997. "Long-Term Financing Decisions: Views and Practices of Financial Managers of NYSE Firms." *Financial Review* 32 (May): 331–56.

Miller, M., and K. Rock. 1985. "Dividend Policy under Asymmetric Information." *Journal of Finance* (September): 1031–51.

Pinegar, M., and L. Wilbricht. 1989. "What Managers Think of Capital Structure Theory: A Survey." *Financial Management* 18 (Winter): 82–91.

Pruitt, S., and L. Gitman. 1991. "The Interactions between the Investment, Financing, and Dividend Decisions of Major U.S Firms." *Financial Review* 26 (August): 409–30.

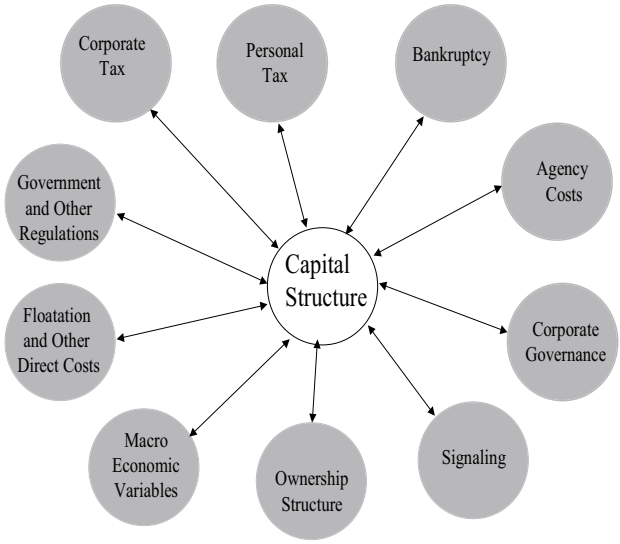
Scott, D., and D. Johnson. 1982. "Financing Policies and Practices in Large Corporations." *Financial Management* 11 (Summer): 51–59.

Swanson, Z. 1998. "How the Market Views Leverage Data from Financial Statements," in Cheng-Few Lee (Ed.). *Advances in Quantitative Analysis of Finance and Accounting* 6: 55–71.

10

Current State of Research Frontier and Opportunities

Central Tenet: The current state of research still leaves many questions unanswered.



INTRODUCTION

This chapter examines the total picture of the capital structure paradigm from two perspectives: an analysis of the current research frontier and an analysis of some unanswered questions in the current frontier that may be exploited or further researched. The next section follows the same outline organization as the previous chapters so that an interested reader can investigate any critical issues further in the relevant chapter in the event of unanswered questions. We categorize the research frontier in both theoretical and empirical terms. In each aspect of the paradigm development, we formulate research directions and articulate empirical hypotheses.

RESEARCH FRONTIER SECTORS

Chapter 2

> Central Tenet: Under MM (1958) assumptions including no taxes, the debt/equity decision is irrelevant.

Chapter 2: Theoretical Analyses. Assuming the MM (1958) restrictive assumptions concerning perfect markets are correct, the theoretical consequence of capital structure irrelevance is unassailable. Modigliani and Miller developed the following three propositions:

1. A firm's market value is irrelevant with respect to its capital structure for a given risk class.
2. The cost of a firm's equity capital is equal to the return of an all-equity firm plus the debt-to-equity ratio multiplied by the spread between the debt interest rate and the rate of return for the all-equity firm.
3. Each firm has a cut-off return that serves as the floor for all projects.

The Modigliani and Miller (1958) article is the foundation of the capital structure paradigm. Their homemade leverage arbitrage argument for the three propositions is both simple and powerful. The expansion of the assumptions to include the perfect market framework assumptions results in the same capital structure irrelevance conclusion. Researchers intensely analyzed the set of perfect market assumptions from a theoretical viewpoint on capital structure. The prospect of any theoretical breakthrough from continued analysis of the perfect market assumptions is about nil. Furthermore, the MM (1963) inclusion of income tax into the analysis is treated as a given omission. Thus,

theoretical research should look in general elsewhere for new opportunities, as discussed later in this chapter.

Chapter 2: Theory Research Propositions/Direction. In general, the capital structure paradigm foundation is complete and research has shifted beyond this level. There are some opportunities to extend MM (1958) work in dynamic intertemporal frameworks. Proposition 3 implies an independence between investment and financing. The implication of investment and financing independence is counterintuitive and fundamentally controversial. The controversy enhances the possibility of developing new theoretical frameworks for further analysis.

Chapter 2: Empirical Analyses. If capital structure is irrelevant to firm value, then the following hypothesis should hold.

2.1 Ha: The debt-equity ratio should not be associated with firm value.

As one considers the imperfections in the real world, the difficulty of finding perfect market conditions to analyze capital structure irrelevancy is very low. Furthermore, whenever a hypothesis is stated in the negative, it is becomes difficult to prove statistically. In almost all statistical test designs, comparisons between the null and tails of a normal distribution determine the acceptance or rejection of the null. The empirical hypothesis here presumes something not to happen, which raises the possibility of a false acceptance at the typically high confidence level of .05. Evidence supporting original MM (1958) propositions is scant and inconclusive, although many researchers have attempted tests of the propositions. However, there is little likelihood that any empirical investigation to test the original propositions is worthy of the time if no one has been able to develop a good test since its formulation over 40 years ago.

2.2 Ha: Firm investment and financing are independent.

This hypothesis may be regarded as an MM assumption, and it is always good to check assumptions. There are probably many opportunities to check the investment and financing assumption, but no definitive empirical answer has yet been found.

Chapter 2: Empirical Research Propositions/Direction. For the most part, the capital structure paradigm foundation is complete, and empirical research has shifted beyond this level. The separation between investment and financing remains an issue for further study. Even though the investment and financing issue may not be tested directly, any capital

structure empirical research should be aware of the potential interaction between investment and financing that might otherwise confound results.

Over time researchers have added increasing levels of complexity to the original MM (1958) paradigm. As we look back at the discussions about the definition of MM (1958) firm value, we note that growth was one of the key issues of contention. The MM (1958) piece was written in a world where firm cash flows were much more stable than those of firms near the turn of the century. The specification of growth option value has been an area of theoretical interest. It might be a useful exercise to include growth options, including those derived from real option formulations, in the capital structure paradigm at an elemental level.

Chapter 3

Central Tenet: With corporate taxes and no personal taxes, the optimum debt level shifts to 100 percent.

Chapter 3: Theoretical Analyses. MM (1963) added one market imperfection to their 1958 model. The introduction of corporate taxes changes the conclusion of capital structure irrelevance to an outcome that firms should add as much debt as possible to their capital structure—a corner solution. As their previous analysis is only modified by taxes, it should not be surprising that the theoretical model has also stood the test of time as far as the set of market assumptions goes. Corporate taxes have a significant impact on a firm's bottom line and by direct inference on its valuation in the marketplace. Thus, corporate taxes definitely belong in the capital structure paradigm. However, by itself, there is not much that can be improved on theoretically to the corporate tax inclusion in the theoretical capital structure paradigm. Various researchers have extended MM (1963) and examined the theoretical implications of corporate taxation. The classic line of theoretical research on financing and investment is leasing, because capital leases are deemed by generally accepted accounting principles to be simultaneously a purchase and a loan. The interaction of taxation and inflation is another general area of concern that generates theoretical research interest.

Chapter 3: Theory Research Propositions/Direction. Corporate taxes are an accepted part of the theoretical capital structure paradigm, and research has shifted to corporate income tax applications, including changes such as the most recent tax law. Opportunities for further research also exist because of the confusion occasioned by hybrid secu-

rities, including those that are combinations of debt and equity, having characteristics of both. The Treasury's attempt to police the distinction between debt and equity, and its impact on capital structure, provides yet another fertile area for future research. In summation, the general theoretical principles are well known, but individual microeconomic situations could benefit from specific theoretical models. As was the case in Chapter 2, researchers should look elsewhere to make significant contributions to the theoretical research frontier.

Chapter 3: Empirical Analyses. The articulation of hypotheses of corporate taxes is difficult because the tax rate may confound the amount of the investment. The following hypotheses are restricted to the aforementioned situations, *ceteris paribus*.

3.1 Ha: Higher marginal corporate tax rates will increase firm value for a given amount of leverage.

Or

3.2 Ha: If marginal corporate tax rates increase, then the tax advantage of debt should increase.

The inclusion of corporate taxes has empirical support, as per Chapter 3, in its effect on leverage and firm value. However, Berens and Cuny (1995) identified a measurement problem for this type of research. They note that earnings numbers generally drive firm value. On the other hand, interest payments are in many cases fixed, and even if they are variable, the elasticity effect for the degree of financial leverage is relatively small. Debt ratios may imperfectly measure the value of the firm's debt in its capital structure when evaluating trade-off theory. Certainly, this issue needs to be considered for longitudinal study research designs.

3.3 Ha: The linkage between investment and financing is affected by corporate taxes.

In a study on leasing, Graham (1998) provided clear empirical evidence that a firm's marginal tax rate does affect its capital structure position. Certainly, every time a new tax law is enacted, there is reason to review this issue theoretically, and everyone should be knowledgeable about the theoretical impact of the current tax law. The Tax and Revenue Act of 1986 (TRA86) is one of the most heavily examined laws because it profoundly changed the income tax rates. The tax laws often include specific language that reflects public policy.

For example, the investment tax credit impacts new investments in fixed assets. The investment tax credit affects capital structure differently depending on the linkage between investment and financing. Conversely, tax laws might change the linkage between investment and financing. For example, Alltizer and Swanson (1998) showed a cause-effect of TRA86 tax provisions on oil and gas industry exploration investments that will very likely affect the level of financing and financing mix of these firms.

According to a working paper by Mills and Newberry (2002), foreign-controlled U.S. firms shift their debt financing so as to take advantage of national differences in tax regimes. Globalization places new challenges on the capital structure paradigm. Increased multinational firm activity will make it increasingly difficult to ascertain evidence regarding capital structure. Alternatively, researchers may have opportunities to differentiate hypotheses and make the economic models more representative of firms in real business conditions.

Chapter 3: Empirical Research Propositions/Direction. Empirical studies on the capital structure paradigm should definitely include relevant corporate tax variables. Research shifted to specific tax law applications because construction of an unambiguous general research design including taxes, investment, and financing is exceptionally difficult. The modeling difficulty leads to Graham's (1998) suggestion that it might be worthwhile to document directly capital leasing's income tax treatment. Simultaneous equation modeling of the entire firm or portfolio stratified by variable of interest might be the best research design for investigating the corporate income tax effects on capital structure.

Chapter 4

> Central Tenet: With corporate and personal taxes, the optimum debt level shifts to one of the two extremes—either 0 or 100 percent—but non-debt tax shields can move it to an interior optimum point.

Chapter 4: Theoretical Analyses. Two important theoretical developments build on the previously discussed tax factor. They have potentially conflicting capital structure paradigm conclusions. In the first development, Miller (1977) included personal taxes on debt and stock income in the capital structure paradigm. The author concluded that the inclusion of personal taxes leads to three theoretical outcomes depending on the value of the various tax rates: (1) firms should be debt free, (2) firms should carry the maximum debt possible, and (3) some interior optimum solution exists, with firms carrying a debt level between none and the maximum debt condition. Miller applied a general

equilibrium supply and demand analysis and concluded that firm capital structure should be irrelevant in the context of the entire economy.

Several other authors have investigated theoretical aspects of the Miller (1977) equilibrium including issues about unequal access between individuals and corporations in the credit markets. Any unequal access impacts on an economy-wide equilibrium. For that matter, so does inflation. Just as the assumption about independence between financing and investment is a key part of the original MM framework, the "grossing up" of returns in the Miller (1977) equilibrium is an essential mechanism for its existence. A possible missing piece of this discussion may be in the question: How do intertemporal changes impact any Miller equilibrium? Is there any adjustment process of the Miller equilibrium as is theorized in the individual firm/industry target capital structure line of research? How does interindustry risk impact on Miller's equilibrium? These are open questions about this theory that might provide insight about events such as the dot-com bubble burst at the turn of the century.

The second major theoretical analysis addresses the incorporation of tax issues such as the non-debt tax shields of depreciation and investment tax credit in the capital structure paradigm. In their seminal work, DeAngelo and Masulis (1980) argued that a trade-off occurs between the tax advantages of debt and non-debt tax shields. The theoretical consequence is an interior optimum in which firms employ less than the maximum debt that firms otherwise acquire. Two articles (Talmor et al. 1985; Zechner and Swoboda 1986) have challenged the distinction between principal and interest payments in the DeAngelo and Masulis analysis, which reduces the power of their argument.

Numerous articles have incorporated personal as well as corporate taxes in capital structure models of firm value. They employ a variety of techniques, including option pricing theory. Most of them, but not all, conclude that an interior point generates the optimal capital structure position. Some research indicates that linkage between investment and financing is affected by the difference between the tax rates of the lessor and the lessee. Because decisions should be made on an after-tax basis, this conclusion is reasonably straightforward.

Scholes and Wolfson (1992) made a fundamental change to the substance of the capital structure paradigm with respect to the impact of tax. They developed three themes that need to be present in any discussion of taxes: the decision should consider (1) all parties to the issue, (2) all relevant taxes, and (3) all applicable costs. This framework is necessary for anyone to assess any current treatment of taxes in capital structure analyses.

Chapter 4: Theory Research Propositions/Direction. The Scholes and Wolfson (1992) comprehensive framework covers the criteria for assessing new works on the research frontier. In particular, there is little doubt that personal taxes are a factor in the investor clientele aspect of the capital structure paradigm. The theoretical development on the clientele effect on capital structure appears complete, but theoretical models designs of recent research rarely incorporate the feature. For example, research could investigate the effects of management ownership of stock and their personal tax rates on debt and the trade-off between debt and equity. The basic proposition is that as management stock ownership increases, debt becomes less attractive. Thus, the before-tax rate of return must be high enough to offset this disadvantage. The trade-off theory between taxes and non-debt tax shields appears to have reached a theoretical plateau. Some improved formulation of the DeAngelo and Masulis (1980) model seems possible with respect to observable variables.

Chapter 4: Empirical Analyses. The empirical evidence that personal taxes have an impact on firm capital structures is limited. Part of the reason is a lack of data. The Miller (1977) equilibrium is a general equilibrium of capital markets, and the applicable personal tax rates would have to be inferred statistically. However, the use of one estimate to calculate another estimate is a recipe for statistical problems. Alternatively, researchers need to know the personal tax rates of the firm's equity holders; once again, this information is not publicly available. The goal of empirically testing the Miller (1977) equilibrium is attractive, but the data challenges are daunting.

4.1 Ha: The inclusion of personal taxes in a capital structure decision matters.

There is evidence for and against the value of non-debt tax shields. For example, Kemsley and Nissim (2002) gave evidence that a debt-tax shield exists and that there is a personal tax disadvantage to it.

4.2 Ha: There is a trade-off between taxes and non-debt tax shields.

Chapter 4: Empirical Research Propositions/Direction. The empirical evidential matter on taxes is unresolved. Because of the difficulty observing non-debt tax shield and personal tax effects, this aspect of the capital structure paradigm empirical research frontier is still subject to debate. The inclusion of Scholes and Wolfson's (1992) implicit taxes makes empirical work more interesting and more challenging.

Chapter 5

Central Tenet: With bankruptcy cost and taxes, the optimal debt-to-equity ratio will be at an interior point, not at an extreme point.

Chapter 5: Theoretical Analyses. The theoretical principle that firm distress costs will increase the cost of debt as a firm adds debt beyond some point after which the probability of bankruptcy increases is a likely proposition. However, identifying a bankruptcy variable from observable firm data has proven to be a challenging task. A number of articles (e.g., Scott 1976) have created stylized models of bankruptcy costs. Many of them are multiperiod models because bankruptcy can be projected to occur only at some point in the future. Obviously, if a firm is in bankruptcy at the current time, then the value of the firm's capital structure depends on the liquidation value of the assets. However, if bankruptcy's occurrence is uncertain, then a stochastic estimation of discounted values is generally necessary.

Option pricing theory is one means of interjecting stochastic default probabilities into the capital structure and bankruptcy cost process. Building on Hsia's (1981) foundation and utilizing options pricing theory is one of the most promising avenues for addressing firm distress costs within the capital structure paradigm. The proper role of financial distress's cost in the capital structure paradigm appears be a gap in the theoretical research frontier that researchers have been trying to fill. In particular, see Duffie and Singleton (1999) for a good exposition on the use of option pricing theory in bankruptcy cost analysis. Also, the view that the firm should be modeled in dynamic terms as opposed to a static model is a probable trend. For example, Dasgupta and Sengupta (2002) created a multiperiod model of capital structure where profitability and leverage are positively related.

Recently developed firm valuation models reflect today's economic realties of corporate leverage and risk. Firm value models that are built do reflect the economic realities. At the turn of the century, the prospect of increased change within a firm's capital structure appears to be more likely than not. Goldstein et al. (2001) provided an example of a dynamic capital structure model based on option pricing theory. Ericsson and Reneby (forthcoming) offer an approach to complex capital structures by considering securities as a set of fundamental building-block modules. Their modeling technique is a potential avenue to bridge the gap between the real world of various straight and hybrid securities and the theoretical literature.

One aspect of bankruptcy procedures that has been lightly addressed is the role of investor groups with respect to bankruptcy recoveries and

resultant capital structure. Adler (1997) discussed multicredit bankruptcy situations with regard to the continuance of firms.

Chapter 5: Theory Research Propositions/Direction. In a nutshell, researchers should try to generate a model of bankruptcy cost with inputs that are observable to calculate—a task that is easier said than done. With the recent substantial progress in options development, as used in financial engineering, it is conceivable that an easy-to-implement stochastic default model for capital structure values will be constructed in the not too distant future. Leland (1998) offered another direction in addressing default risk—to simultaneously consider agency theory ramifications as well. Leland formulates an option-pricing model approach that aims to incorporate agency theory considerations. The idea of synthesizing default issues and agency theory factors is appealing if an overall model of firm behavior is to be created.

An alternative theoretical avenue is to construct trigger points that might prompt more intense analysis of a firm's capital structure situation. There is an ongoing debate (e.g., Dichev 1998) of a capital structure research frontier issue that can be filled by answering the question: How does financial distress relate to firm value?

Chapter 5: Empirical Analyses. Every once in a while, academics find an issue in which economic significance of the statistics becomes a key factor in whether or not studies contribute to the research frontier. Bankruptcy cost is one of those areas. In fact most of the early research has concentrated on identifying what the bankruptcy costs are from a direct and indirect point of view. Studies would then compare the bankruptcy costs with firm market value to determine whether they had economic significance. Practitioners certainly recognize the price of default through credit rating downgrades and intuitive investigations of experts. While there are some conflicting findings, the preponderance of evidence indicates that bankruptcy costs do matter and belong in the capital structure paradigm.

5.1 Ha: The bankruptcy costs are significant with respect to firm value.

The question then becomes, when are the bankruptcy costs significant to a particular firm? There is no answer to this question, and it is an open research issue both empirically and theoretically. Certainly, practitioners make judgment calls on this issue every single working day.

In terms of bankruptcy costs, there are a number of specific variables that firms determine and other variables over which firms have no control. A comprehensive list is not available, but it might be interesting to develop a theoretical framework to define a complete set of variables

that relate to bankruptcy costs. Higher leverage associates with higher bankruptcy costs, and the cost of risky debt increases with the degree of financial leverage after the optimum debt level.

5.2 Ha: Higher leverage associates with higher bankruptcy costs.

5.3 Ha: Higher leverage associates with higher risky-debt costs.

Size is one firm factor that many researchers, including Antoniou et al. (2002), agree does positively associate with leverage across the globe. Size is a useful control variable, but it also may represent any number of other effects.

5.4 Ha: Size positively associates with leverage.

The degree of association between debt maturity and leverage is an open question. Some research has found a negative association, while other research has found a positive association. Because size and risk relate, the answer might help clarify the impact of risky debt on firm capital structure.

5.5 Ha: Debt maturity associates positively or negatively with firm size.

With the incorporation of risk into the capital structure paradigm, the linkage between investment and financing becomes more pronounced. In particular, the earnings volatility of specific assets appears to drive financing rates.

5.6 Ha: Risky debt rates associate directly with the risk characteristics of firm assets that are financed.

Chapter 5: Empirical Research Propositions/Direction. This line of research is going to be moving toward default probability empirical definitions verifiable with real data. Researchers might try to model what practitioners think with an expert system, neural net, or other artificial intelligence program and verify the results with empirical data. One difficult open question is which bankruptcy model is best. Hillegeist et al. (2002) compare the Altman (1968) Z score and the Ohlson (1980) O score with an options pricing theory model. Their results indicate that the Options Pricing Theory (OPT) model gives the superior performance. Not only are there statistical problems comparing past events, but the question is also an issue of how future conditions might affect bankruptcy. For example, when will we see a

replication of the turn-of-century dot-coms that went bust? Bankruptcies are probably a function of firm-specific and industry-wide factors.

Chapter 6

> Central Tenet: With agency costs, bankruptcy costs, and taxes, the relationships become more complicated and the proportion of equity in the optimal capital structure increases.

Chapter 6: Theoretical Analyses. A central feature of the modern corporation is the separation of ownership and control. Many investors in the marketplace supply the capital in necessary amounts to fund investments that could never be financed by one individual. Professional managers supply the expertise necessary to run complex organizations. Two problems occurring with the separation of ownership and control are discussed in Chapter 6: (1) the inability to observe management effort and (2) an information asymmetry between owners and managers. A different type of theoretical model is needed to address these human behavior problems than the pure financial models described in the previous chapters. Jensen and Meckling (1976) advanced what is probably the best known theoretical agency theory model. In their view, the firm is a nexus of contracts among its stakeholders: shareholders, managers, creditors, and employees. The relation between managers and stockholders and the relationship between the stockholders and the holders of corporate debt are generally viewed as the key "contracts" in the nexus. Each contract has agency costs from bonding, monitoring, and residual loss. The objective of firm capital structure policy is to minimize the agency costs so as to maximize firm value. There should be a Pareto optimality between all stakeholders, which sounds fine until one tries to articulate this principle in theory and practice.

Studies have developed agency theory models in words and mathematical terms. For example, see Appendix 2. As of the writing of this book, empirical studies of the agency theory suffer from the problem that what researchers are attempting to model is not observable and/or the information asymmetry. Managerial shirking or consumption of unwarranted perquisites is not observable, while information asymmetry is not present in a verifiable market price. One focus of agency theory research is the development of compensation, debt, and other contracts that minimize agency cost. For example, many construe debt's interest costs and repayment provisions as a mechanism to force managers to generate cash to pay interest and not use it for perquisites. Great expenditures of research effort have been made to evaluate the incentives (e.g., stock options) for management with respect to its ability to maximize firm value. The most researched agency conflict

between stockholders and bondholders centers around the asset substitution question of stockholders switching to more risky projects than the bondholders anticipated.

Chapter 6: Theory Research Propositions/Direction. The agency theory part of the capital structure paradigm is still subject to debate many years after the seminal work by Jensen and Meckling (1976). Modeling human behavior is a complex task, and there will probably always be room for improvement. For example, Parrino and Weisbach (1999) introduced evidence that agency conflicts between stockholders and bondholders exist in individual investment projects. Perhaps some means of agglomerating the lines of business in a firm may be necessary to get a better estimate of firm total agency costs. The basic characteristics of firm assets, including life, type, and cash flow profile, have implications for agency theory analysis according to the theoretical framework of Vilasuso and Minkler (2001). They created a dynamic model that incorporates asset specificity and agency costs. The authors then used their theoretical model to make predictions about firm capital structure policy.

The character of the agents involved in the firm processes is also important. Johnson (1998) found that firms that have bank debt have significantly higher leverage than firms that do not have bank debt. The monitoring during loan negotiation and subsequent loan monitoring processes are likely factors in more reliable, and apparently higher, leverage decisions. Bank credit negotiation and monitoring vary among banks. In general, banks have become more concentrated through mergers over time that may give the surviving bank institutions more power.

These results suggest that an assessment of the agents involved in the capital structure decision might provide greater insight. Any improved perspective must be welcomed because the explanatory power of practically all capital structure analyses is quite low, with generally less than 50 percent of the variance explained. Also, Johnson suggested that researchers should investigate the underlying theoretical reasons for his results. The point can be generalized with respect to the capital structure components of common stock, preferred stock, and debt. Furthermore, Carey et al. (1998) suggested that the mixture of both the financing public and private have a relation with other aspects of the firm including investments in assets.

It is not clear that the agency theory problem can be adequately represented using observable variables, but such a theoretical advancement would improve the capital structure research frontier. In any event, the theoretical work here must make a major leap forward to appreciably change the current research frontier.

The practice of corporate finance is continually innovating new securities (Finnerty and Emery 2002). For example, instruments exist such as preferred equity redemption cumulative stock/mandatory conversion premium dividend preferred stock, which is a preferred stock paying a higher dividend for conversion rights with a capped value that must be redeemed within three years from issuance. Finnerty and Emmery (2002) categorized 80 types of instruments into debt, common equity, preferred stock, and convertible securities. This multitude of attributes might help fine-tune contracts to minimize agency costs within the broader context of the firm. The inclusion of these financial instrument innovations into the research designs is going to be a major undertaking. A one-type-fits-all theoretical security model is probably not appropriate to describe capital structure policy of larger firms, although smaller firms might be defined in simpler terms. One interesting type of analysis might be a comparison of firms by size and type of instruments to determine the effects on firm capital structure.

One area of continuing interest is the impact of stock prices on capital structure policy. In Chapter 9, executives indicated that security prices do influence their decisions to make new bond or stock issues. Baker and Wurgler (2002) confirmed this proposition empirically, but we do not yet have a theoretical model to explain firm behavior with respect to security prices. There appears to be some opportunity here.

Chapter 6: Empirical Analyses. In general, researchers should look for better means to model agency costs. The theoretical problem of unobservable variables carries over to empirical analyses. The following propositions were analyzed by Swanson (1995) with mathematical proxies for agency costs, and some evidence is present that they have significance. However, there is great room for improvement in the empirical analysis of this aspect of the capital structure paradigm.

6.1 Ha: Firm value inversely associates with the agency cost of equity *ceteris paribus* with respect to the agency cost of debt.

6.2 Ha: Firm value inversely associates with the agency cost of debt *ceteris paribus* with respect to the agency cost of equity.

Empirical evidence indicates that incentive plans do not fully resolve the agency conflict between shareholders and managers. The evidence is also inconclusive on whether capital structure resolves the stakeholder conflict. Thus, there is a research opportunity here.

6.3 Ha: Debt should be negatively associated with incentive compensation.

6.4 Ha: Leverage, takeover threats, and management incentive schemes substitute for each other.

The results of Kim et al. (1977) support the following hypothesis. The need to revisit this hypothesis appears minimal in terms of the research frontier.

6.5 Ha: Because of asset substitution, stock repurchases with debt should increase the stock price and reduce the bond price.

The following hypotheses appear to hold according to Smith and Warner (1979). The logic of this finding means the incentive to do further analysis will have to be fairly specific with respect to the research frontier. Begley and Feltham (1999) is a rare example of this type of work.

6.6 Ha: Debt covenants reduce the risk from future projects, dividend payments, and other actions that transfer wealth from debtholders to stockholders.

6.7 Ha: High debt firms have greater earnings management, and this management behavior exploits the defects in the contracting technology.

A number of authors, including Seetharaman et al. (2001), address the relationship between managerial ownership and debt. Their findings indicate that a negative relation holds. The intertemporal examination of changes in firm characteristics appears to offer an opportunity to better resolve agency questions. For example, Rimbey (1998) reported that a time-series variable is useful in providing better explanations of the management and creditor agency analysis.

6.7 Ha: There should be an inverse relation between debt and managerial ownership.

Baker and Wurgler (2002) presented empirical evidence that firms use measures like the market-to-book ratio to time security issuances and thus affect the corporate capital structure.

6.8 Ha: Firm capital structure is a consequence of a firm's trying to time the market on security issuances.

Garvey and Hanka (2002) posed the theoretical argument that potential increases in financial distress reduce debt, but the greater threat of takeover encourages management to add debt to the firm capital structure. They presented evidence that new state anti-takeover laws are

consistent with lower firm debt. As every businessperson knows, government regulations are pervasive. The extent of the impact of government regulation on capital structure is a good question for additional study.

6.9 Ha: Government regulations that enhance management's position reduce debt.

During the course of analyzing the impact of agency costs on capital structure, several hypotheses were generated that are open at the present time. They are:

6.10 Ha: There should be a positive relation between leverage and external block holder ownership.

6.11 Ha: Firms with high investment opportunity set (IOS) have low debt.

6.12 Ha: For a given debt level, firms with high IOS have more short-term and less long-term debt.

6.13 Ha: High IOS firms are likely to have more call provisions and convertibility features than low IOS firms.

6.14 Ha: Older firms with more managerial reputation will have more lax debt covenant terms for the same debt level.

Chapter 6: Empirical Research Propositions/Direction. The capital structure paradigm is not uniquely determined with respect to agency issues, and further analyses are necessary to resolve inconclusive gaps in the empirical research frontier. Note that several of the aforementioned hypotheses are open questions, and the list is hardly complete. The typical firm's method of selecting its mixture of debt and equity is theoretically unresolved. How a firm chooses its mixture of debt borrowing is an unsettled issue theoretically, which also affects the nature of the empirical evidence being collected. For example, information asymmetries and agency costs appear to impact a firm's use of bank debt (Johnson 1998). A working paper by Cantillo (2002) also examines alternative choices of financing with respective agency issues of verification. A generally accepted corporate finance concept introduced by Jensen (1986) is that free cash flow alters management's behavior. The investment community now monitors free cash flow, and as a consequence it probably does affect management's actions. However, the mapping of cause and effect of Jensen's free cash flow problem is not clear. Do we have a linear relation, or is there some set of threshold

triggers that affect management actions? The concept is reasonably clear, but the implementation effect in practice is once again not that clear.

One trend in management incentives appears to be the use of options that are sometimes revised in midstream. This increased complexity makes it more difficult to assess the nature of agency costs with respect to capital structure policy for investors and researchers. Debt covenants are another area where the contractual language has an impact on capital structure. Begley and Feltham (1999) suggest that researchers might investigate the managerial ownership percentage as it relates to debt covenants. All aspects of agency debt and equity costs should be viewed as a system of equations, and particular attention should be given to which variables are endogenous and which are exogenous. It seems that the extent of the agency cost effect needs further theoretical resolution to make more cogent empirical analyses.

Chapter 7

> Central Tenet: With signaling, agency costs, bankruptcy costs, and taxes, the relationships become contingent on the full set of firm characteristics.

Chapter 7: Theoretical Analyses. Signaling is based on the proposition that information asymmetry exists between the firm and the security investors. There are numerous ways that a firm can engage in signaling. Chapter 7 discusses three examples of information asymmetry with respect to a firm's capital structure and the implied consequences. First, Myers and Majluf (1984) identify asymmetric information conditions where financing a new project by new stock issue is to the detriment of current shareholders. The consequence is that the firm tends to underinvest in its opportunities. They develop the pecking order theory for financing new projects. Second, there is a differentiation between the signal that a firm sends when it issues equity and that when it issues debt (Ross 1977; Miller and Rock 1985). There is the consequential implication that issuing debt signals high firm quality and issuing equity signals lower quality. Third, Leland and Pyle (1977) hypothesize that the better managers will select the maximum amount of debt that increases the risk of firm but still within the managers' private knowledge of expected cash flow. The managers of weaker firms cannot follow suit because of the elevated risk of bankruptcy.

Chapter 7: Theory Research Propositions/Direction. Klein et al. (2002) reviewed the literature with respect to capital structure and information

asymmetry and concluded that more theoretical knowledge is necessary to make an informed judgment. In a working paper Heider (2001) presented a grand theory that subsumes Myers and Majluf's (1984) pecking order theory and Stiglitz and Weiss's (1981) credit rationing theory. Baker and Wurgler (2002) presented evidence that managers may time the issuance of their securities to maximize market benefits to the firm. It seems that some synthesis of signaling and market timing propositions is appropriate for an integrated picture of firm capital structure policy. Without a doubt more theoretical work will occur on this line of research.

Chapter 7: Empirical Analyses. By its very nature, signaling is a dynamic activity, which means that event studies should be the preferred means of empirical analysis. The explicit identification of the event, the construction of an appropriate time frame, and the exclusion of extraneous factors are key parts of a successful signaling study. The evidence on signaling in general and the pecking order theory in particular is mixed.

7.1 Ha: Signaling corporate activity is significant.

7.2 Ha: There is a priority to firm financing choices.

Chapter 7: Empirical Research Propositions/Direction. The capital structure paradigm with respect to signaling is not completely resolved. In fact, there is controversy as to whether capital structure decisions should focus on the debt-equity mix or on the internal-external financing mix. There is also debate about the relation between earnings and leverage. We do not have a complete understanding of when the pecking order is deployed and when the decisions are made mostly on the debt-equity mix. Shyam-Sundar and Myers (1999) found evidence consistent with the pecking order hypothesis. Chirinko and Singha (2000) criticized Shyam-Sundar and Myers on the grounds that their research design generates misleading conclusions. On the other hand, a 2001 working paper of Frank and Goyal compares the pecking order theory with the static trade-off theory. The authors do not find evidence consistent with the pecking order hypothesis. They report a significant mean reversion of leverage. Another working paper by Sarkar (2000) also concludes that the static trade-off theory is better supported. Sarkar's study uses a mean-reverting earnings method to conduct his analysis, which appears to be an appropriate research design.

Part of the problem in developing a method for testing the signaling model is the difficulty in phrasing the alternative hypotheses into two distinct measurable statements in a research design. The pecking order

hypothesis is one possible theory where firms have a definite priority of financing choices. The static trade-off theory is another alternative hypothesis where the advantages of debt are weighed against the prospects of bankruptcy and the use of non-debt tax shields. However, a third possibility remains that capital structure is irrelevant as per the original MM (1958) proposition and the Miller (1977) equilibrium. There is the prospect that firms time the market (Baker and Wurgler 2002), which may confound a collection of event studies made over times of market swings. Shyam and Myers (1999) also found a power problem with previous empirical research on the static trade-off capital structure model.

Chapter 8

> Central Tenet: The firm is a nexus of contracts. Capital structure decisions are made simultaneously with other decisions that can be solved by simultaneous equations to compute maximum firm value.

Chapter 8: Theoretical Analyses. Most of the simultaneous equation modeling has been to address specific empirical research problems. A notable exception is Stenbacka and Tombak (2002), who investigate equity shareholders' value maximization in simultaneous set equations for new project funding with alternatives of debt, new equity, and retained earnings. Essentially, they evaluate the pecking order theory with simultaneous equations. There is an appeal to the idea of organizing a system of equations to represent the key attributes of capital structure decision making. Such a framework would truly represent the concept of a nexus of contracts for the firm (Jensen and Meckling 1976). As described in previous chapters, however, many of the variables of interest are not directly observable. Moreover, it is far from clear that we have identified all the variables in capital structure decision making and, even if we have, the relative importance of the variables to be used in the simultaneous equation system.

Chapter 8: Theory Research Propositions/Direction. The research frontier has the potential for a major paradigm shift if a complete set of equations can be identified for the firm's nexus of contracts that also represents value to investors in the marketplace. In addition to the firm's specific contracts, there may be a research opportunity to include the impact of industry factors. That is to say, the impact of competitor contagion factors may affect the target leverage in an industry or the dispersion of leverage around an industry target mean. Titman (2002) suggested that in the future capital structure research should consider the impact of different countries' institutional factors. Simultaneous

equation systems might provide the ability to investigate multinational firms with securities issued in multiple jurisdictions.

Chapter 8: Empirical Analyses. Simultaneous equation estimation has a whole new round of empirical issues in addition to the theoretical concerns of proper specification. If the theory is completely specified, then the question of whether a variable is endogenous or exogenous is settled. However, if the research work is approaching a specific hypothesis, then the identification (or misidentification) of variables can have a significant effect on the conclusions. After one has resolved the variable identification problem, there is still the question of which technique should be used (e.g., second-stage least squares, third-stage least squares) or whether instrumental variables should be used. Ultimately, the empirical issues center on the following hypothesis:

8.1 Ha: The simultaneous equation solution of capital structure decisions is statistically better than single equation designs.

Chapter 8: Empirical Research Propositions/Direction. This part of the capital structure paradigm frontier is where the data will speak for itself. The most obvious indications of the superiority of a simultaneous equation approach occur when all of the regression coefficients have the proper sign with significance, whereas single equation results do not have the same significance or consistent signs. The use of simultaneous equation estimations will require careful application due to staged types of statistical procedures. Econometrics is more of an art than a science. Sensitivity analysis probably will be necessary to improve simultaneous equation results because the nature of capital structure relations may be contextual to specific firm samples that indicate industry effects.

Chapter 9

Central Tenet: The current practice of capital structure decision making has considerable variation.

Chapter 9: Practitioner Analysis. Ultimately, the practitioners are the ones who make the capital structure decisions. We do not know whether the academic theoretical and empirical research points the right way to the practitioners (prescriptive) or simply describes what the practitioners are already doing (descriptive). We assume it is a little bit of both.

The survey research asks the same questions as archival statistical research. The framing of the questions is important, and it is difficult to get a good response rate along with some reasonable assurance that

non-respondent bias is not a problem. The survey results indicate that managers pay attention to security prices when considering whether to issue securities, and there is some evidence that executives follow a pecking order approach. The question of whether executives think that some optimal capital structure policy or some optimal capital structure exists is not clear. Thus, from time to time, it is appropriate to survey practitioner thinking, especially after massive economic disturbances like the corporate governance crises of Enron and Worldcom. Some propositions worth assessing include:

9.1 Ha: Has practitioner capital structure decision making changed as a result of economic shocks?

9.2 Ha: Large and small company capital structure policies and funding concerns are different.

9.3 Ha: There are differences among countries in regard to executive priorities for capital structure.

For European firms, Bancel and Mittoo (2002) repeated the Graham and Harvey (2001) survey approach. There is an opportunity to survey Asian executives on capital structure and then get a worldwide perspective on executive preferences toward capital structure. Singh and Hodder (2000) provided some evidence of underlying factors that affect capital structure such as taxes and financial flexibility. The authors found that firms have higher leverage in countries with higher taxes. They also indicate that opportunities exist to take advantage of financial flexibility when multinational companies are doing business in numerous countries that have varying tax regulations.

It might be interesting to carry this analysis one step further and correlate underlying sociological/institutional factors by country for effects on business executives' capital structure choices. In particular, the financial executives in developing countries may hold different attitudes than their counterparts in developed countries. While there is some evidence (Booth et al. 2001) that developing countries have similar capital structures to developed countries, the firm variables have a relatively low effect on the structures. The reason for the low cause and effect may be due to institutional factors and management preferences.

Chapter 9: Empirical Research Propositions/Direction. Given that this survey area of research probably needs to done periodically, it is important that the surveyors remember that repeated mailings are necessary because non-respondent bias in particular is a serious potential flaw. Some researchers are experimenting with surveys over the World

Wide Web. Perhaps a capital structure survey could be conducted over the Web in a way that would reduce non-respondent bias. Also, the Internet is an interesting avenue to examine companies other than the Fortune 1000 with respect to financing alternatives and capital structure policy.

Another important relationship that seems to have been neglected is the interaction between the capital structure decisions and the accounting systems. It is known that different countries use different accounting systems. For example, Germany and Japan use accounting systems that have greater focus on legal compliance than on fair and transparent disclosure. The United States and Great Britain have accounting systems that are much more focused on fair and free disclosure. International accounting scholars have used capital structure in different countries as the main factor in explaining the differences in accounting systems. They claim that the high debt content of firms in countries such as Germany and Japan requires an accounting model that minimizes risk rather than one that provides full disclosure to the equity investor. Perhaps the question can be reversed: Accounting systems that have evolved over many centuries in different countries have led to different capital structures. There is scant research on this relationship. It provides another fertile area for future research.

SUMMARY

From its arbitrage theory beginnings, the capital structure paradigm has definitely developed theoretically to include taxes, bankruptcy costs, agency problems, and signaling. The field has not resolved empirical resolution of agency problems and signaling. In particular, there is some question of the strength of signaling of capital structure changes on firm value. Specification for the set of capital structure simultaneous equations is a gap in the current research frontier. For example, Zingales (2000) suggested that the firm that incorporates organizational capital can better explain capital structure by postulating that the firm is a nexus not only of explicit contracts but also of implicit contracts (e.g., firm reputational capital from excellent personnel policies). The value chain has become an important model of corporate planning, but this feature has yet to be integrated into capital structure decision making. An emerging issue is the definition of the capital structure within behavioral finance thinking.

REFERENCES

Adler, B. 1977. "A Theory of Corporate Bankruptcy." *New York University Law Review* 72 (May): 343–82.

Alltizer, R., and Z. Swanson. 1998. "An Empirical Examination of the Effect of Taxes on New Oil and Gas Development." *Oil & Gas Energy Quarterly* 47 (December): 267–78.

Altman, E. 1968. "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy." *Journal of Finance* 23: 580–609.

Antoniou, A., Y. Guney, and K. Paudyal. 2002. "Determinants of Corporate Capital Structure: Evidence from European Countries." University of Durham working paper.

Baker, M., and J. Wurgler. 2002. "Market Timing and Capital Structure." *Journal of Finance* 57 (February): 1–32.

Bancel, F., and U. Mittoo. 2002. "The Determinants of Capital Structure Choice: A Survey of European Firms." European Financial Management Association, London Meeting.

Begley, J., and G. A. Feltham. 1999. "An Empirical Examination of the Relation between Debt Contracts and Management Incentives." *Journal of Accounting and Economics* 27 (April): 229–59.

Berens, J., and C. Cuny. 1995. "The Capital Structure Puzzle Revisited." *Review of Financial Studies* 8 (Winter): 1185–208.

Booth, L., V. Aivazian, A. Demirguc-Kunt, and V. Maksimovic. 2001. "Capital Structures in Developing Countries." *Journal of Finance* 56 (February): 87–130.

Cantillo, M. 2002. "A Theory of Corporate Capital Structure and Investment." University of California at Berkeley working paper.

Carey, M., M. Post, and S. Sharpe. 1998. "Does Corporate Lending by Banks and Financing Companies Differ? Evidence on Specialization in Private Debt Contracting." *Journal of Finance* 53 (June): 845–78.

Chirinko, R., and A. Singha. 2000. "Testing Static Tradeoff against Pecking Order Models of Capital Structure: A Critical Comment." *Journal of Financial Economics* 58 (December): 417–25.

Dasgupta, S., and K. Sengupta. 2002. "Financial Constraints, Investment and Capital Structure: Implications from a Multi-Period Model." Hong Kong University working paper.

DeAngelo, H., and R. Masulis. 1980. "Leverage and Dividend Irrelevancy under Corporate and Personal Taxation." *Journal of Finance* 35 (May): 453–64.

Dichev, I. 1998. "Is the Risk of Bankruptcy a Systematic Risk?" *Journal of Finance* 53 (June): 1131–48.

Duffie, D., and K. Singleton. 1999. "Modeling Term Structures of Defaultable Bonds." *Review of Financial Studies* 12: 687–720.

Ericsson, J., and J. Reneby. Forthcoming. "A Framework for Valuing Corporate Securities." *Applied Mathematical Finance.*

Finnerty, J., and D. Emmery. 2002. "Corporate Securities Innovation: An Update." *Journal of Applied Finance* 12 (Spring/Summer): 21–47.

Frank, M., and V. Goyal. 2001. "Testing the Pecking Order Theory of Capital Structure." American Finance Association, New Orleans meeting.

Garvey, G., and G. Hanka. 2002. "The Management of Corporate Capital Structure: Theory and Evidence." Claremont Graduate University working paper.

Goldstein, R., N. Ju, and H. Leland. 2001. "An EBIT-Based Model of Dynamic Capital Structure." *Journal of Business* 74 (October): 483–512

Graham, J. 1998. "Debt, Leases, Taxes and the Endogeneity of Corporate Tax Status." *Journal of Finance* 53 (February): 131–62.

Graham, J., and C. Harvey. 2001. "The Theory and Practice of Corporate Finance: Evidence from the Field." *Journal of Financial Economics* 60: 187–243.

Heider, F. 2001. "Signalling with Debt and Equity: A Unifying Approach and Its Implications for the Pecking-Order Hypothesis and Competitive Credit Rationing." Université Catholique de Louvain working paper.
Hillegeist, S., E. Keating, D. Cram, and K. Lundstedt. 2002. "Assessing the Probability of Bankruptcy." Northwestern University working paper.
Hsia, C. 1981. "Coherence of the Modern Theories of Finance." *Financial Review* 16 (Winter): 27–42.
Jensen, M. C., and W. Meckling. 1976. "The Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure." *Journal of Financial Economics* 3: 305–60.
Jensen, M. 1986. "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers." *American Economic Review* 76: 323–29.
Johnson, S., "The Effect of Bank Debt on Optimal Capital Structure," *Financial Management*, 27 (Spring): 47–56.
Kemsley, D., and D. Nissim. 2002. "Valuation of the Debt-Tax Shield." *Journal of Finance* 57: 2045–73.
Kim, E., J. McConnell, and P. Greenwood. 1977. "Capital Structure Re-arrangements and Me-first Rules in an Efficient Market." *Journal of Finance* 32: 789–810.
Klein, L., T. O'Brien, and S. Peters. 2002. "Debt vs. Equity and Asymmetric Information: A Review." *Financial Review* 37(3): 317–50.
Leland, H., and D. Pyle. 1977. "Information Asymmetries, Financial Structure and Financial Intermediation" *Journal of Finance* 32: 371–88.
Leland, H. 1998. "Agency Costs, Risk Management and Capital Structure." *Journal of Finance* 53 (August): 1213–43.
Miller, M. 1977. "Debt and Taxes." *Journal of Finance* 32 (May): 261–75.
Miller, M., and K. Rock. 1985. "Dividend Policy under Asymmetric Information." *Journal of Finance* 40: 1031–51.
Mills, L., and K. Newberry. 2002. "Do Worldwide Tax Incentives Affect the Income Reporting and Capital Structure of Foreign-Controlled U.S. Corporations?" University of Arizona working paper.
Modigliani, F., and M. Miller. 1958. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* 48 (June): 261–97.
Modigliani, F., and M. Miller. 1963. "Corporate Income Taxes and the Cost of Capital." *American Economic Review* 53 (June): 433–43.
Myers, S., and N. Majluf. 1984. "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have." *Journal of Financial Economics* 13 (June): 187–221.
Ohlson, J. 1980. "Financial Ratios and the Probabilistic Prediction of Bankruptcy." *Journal of Accounting Research* 19: 109–31.
Parrino, R., and M. Weisbach. 1999. "Measuring Investment Distortions Arising from Stockholder-Bondholder Conflicts." *Journal of Financial Economics* 53 (July): 3–42.
Rimbey, J. 1998. "The Impact of Ownership Structure on Corporate Debt Policy: A Time-Series Cross-Sectional Analysis." *Financial Review* 33 (August): 85–98.
Ross, S. 1977. "The Determination of Financial Structure: The Incentive Signaling Approach." *Bell Journal of Economics* 8: 23–40.
Sarkar, S. 2002. "The Trade-Off Model with Mean Reverting Earnings: Theory and Empirical Tests." Southern Methodist University working paper.
Scholes, M., and M. Wolfson. 1992. *Taxes and Business Strategy: A Planning Approach.* Englewood Cliffs, N.J.: Prentice Hall.

Scott, J. 1976. "A Theory of Optimal Capital Structure." *Bell Journal of Economics* 7 (Spring): 33–54.
Shyam-Sunder, L., and S. Myers. 1999. "Testing Static Tradeoff against Pecking Order Models of Capital Structure." *Journal of Financial Economics* 51 (February): 219–44.
Singh, K., and J. Hodder. 2000. "Multinational Capital Structures and Financial Flexibility." *Journal of International Money and Finance* 19 (December) 853–84.
Smith, C., and J. Warner. 1979. "On Financial Contracting: An Analysis of Bond Covenants." *Journal of Financial Economics* 7: 117–61.
Stenbacka, R., and M. Tombak. 2002. "Investment, Capital Structure, and Complementarities between Debt and New Equity." *Management Science* 48 (February): 257–72.
Stiglitz, J., and A. Weiss. 1981. "Credit Rationing in Markets with Imperfect Information." *American Economic Review* 71: 393–410.
Swanson, Z. 1995. "Leverage Information for Stocks during a 'Deleveraging' Period." *Journal of Accounting Finance Research* 1 (Spring): 12–22.
Talmor, E., R. Haugen, and A. Barnea. 1985. "The Value of the Tax Subsidy on Risky Debt." *Journal of Business* 58 (April): 191–202.
Titman, S. 2002. "The Modigliani and Miller Theorem and the Integration of Financial Markets." *Financial Management* 31 (Spring): 101–15.
Vilasuso, J., and A. Minkler. 2001. "Agency Costs, Asset Specificity, and the Capital Structure of the Firm." *Journal of Economic Behavior & Organization* 44: 55–69.
Zechner, J., and P. Swoboda. 1986. "The Critical Implicit Tax Rate and Capital Structure." *Journal of Banking & Finance* 10 (October): 327–41.
Zingales, L. 2000. "In Search of New Foundations." *Journal of Finance* 55 (August): 1623–54.

11

Summary and Conclusions

Central Tenet: The major capital structure decision factors are known, but the complexity remains largely unresolved.

SUMMARY

We have endeavored to give the reader a perspective on the firm's capital structure paradigm. This aspect of business touches on a broad range of issues. After examining these diverse areas, we hope that you will agree with our initial proposition that an organized approach is essential for understanding capital structure levels and decisions. For most firms, the capital structure decision is a strategic long-term decision, not an everyday activity. This is why firms engage specialists to issue securities or seek financial institutions who have expertise as investors. While it is true that the basic business concept is the key attribute of success or failure, if a business is not sufficiently/appropriately financed, then the enterprise will not succeed.

For the academic researcher, we hope that the book provides a means of reflection and a reference source for future projects. The basic foundations of the paradigm are well grounded, and because the capital

structure issues change with economic circumstances, it is likely that no "right" answer will ever emerge. We have shown that the research frontier has a number of opportunities. Thus, any effort expended in this field is likely to have an eventual publication payoff.

The current capital structure paradigm has evolved as a consequence of the Industrial Revolution, which started the need for massive amounts of capital and required the separation of the investor and professional manager. During the latter part of the twentieth century, the ascendance of the information age and the shift to a service economy changed financial markets and the way that we do business. Human behavior is becoming more important in the financing decision process. The human element is much more difficult to model and measure than simple financial numbers like the bottom line. Thus, the next paradigm shift in capital structure decision making is likely to be difficult and profound.

The capital structure paradigm is also changing as a result of shifts in the underlying firm economics. This process is gradual, and business is continually adapting to improvements in the management of the value chain. In addition to opportunities discussed in Chapter 10 about the current state of the research frontier, we must move forward to address the ways that businesses will finance firm projects. The capital structure paradigm will continue to develop for the foreseeable future, which means an unending stream of interesting projects for everyone involved to work on. Good luck to you!

Appendix 1

Does the Spread between the Cost of Debt and Equity Provide Incremental Information to Earnings-Returns Relations?

Zane Swanson
and
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INTRODUCTION

If a firm's stock price reflects all available information, unexpected new information about the firm or its environment should have an impact on that price. Included among the information reflected in a stock's price is the cost of equity capital reported in the financial statements. We develop an analytical model that relates unexpected changes in the cost of equity capital to unexpected market returns. When Modigliani and Miller's (1963) definition of the cost of equity capital is incorporated in the aforementioned relation, a resultant theoretical model indicates that a firm's leverage, the spread between its cost of debt and its discount rate as an all-equity firm, and changes in these two factors should be associated with unexpected stock market returns. We examine empirically the incremental information value of spread and leverage variables with two research designs: (1) a comparison of portfolio means and (2) a regression analysis. The results corroborate each other.

The spread variable has a significant association with stock market returns. There is a also a significant interaction effect of spread with leverage. In addition to showing the incremental information value of spread and leverage variables, the study provides a conceptual explanation for several authors' results with regard to financial statement information content (e.g., Dhaliwal et al. 1991; Jeter and Chaney 1992; Kim et al. 1992). The remainder of the study is organized as follows. The next step is the model development. Then, empirical procedures are discussed. Results are presented and analyzed. Finally, conclusions are given.

MODEL DEVELOPMENT

All research builds on prior work. In this model development, the technique of formulating a link between unexpected stock returns and unexpected financial statement information is the key paradigm. There are numerous examples in the literature (e.g., Ball and Brown 1968; Collins and Kothari 1989; Ohlson 1995) of relating earnings information with stock market returns. Readers who are interested in extensive discussions of this line of research are referred to the aforementioned references. Here, the study utilizes the accounting cost of capital as a fundamental variable to explain stock market returns. The accounting cost of capital is decomposed into earnings and capital structure variables (which will be investigated for incremental information value). The theoretical approach is based on a difference equation formulation, as is much of the prior literature. The current cost of capital analysis does implicitly include the "clean surplus" approach because the denominator of the cost of equity is a function of firm book value (i.e., funds retained in the firm after dividend payments). However, the current analysis differs from prior works' paradigm in the incorporation of debt capital structure factors.

In addition to the ability to detail the effect in theoretical terms of the two major sources of financing (equity and debt) on equity shareholders' evaluations with this study's approach, there are empirical implications for market research because regression models are mis-specified when variables are omitted. This research suggests that mis-specification might occur under circumstances when (large) changes in leverage and spread are present. Thus, this empirical specification issue provides another motivation for the study to analyze the nature of financial statement information's impact on stock market returns incorporating spread and leverage variables.

Three assumptions are necessary to link together the accounting cost of equity capital and stock market returns:

Assumption 1: There is a fundamental relationship between the real asset market and the stock market.

Assumption 2: The real asset market and the stock market are both perfect markets and arbitrage between them is not possible.[1]

Assumption 3: The cost of equity follows a first-order autoregressive process.

The analysis is grounded on the presumption of a fundamental relationship between the "real" asset market and the "financial" asset market. If financial statements faithfully represent performance in the productive asset market, there should be an association between unexpected financial statement information and unexpected stock market returns. Given that returns signify performance in the stock market, if financial statements faithfully represent performance in the real asset market, then it follows from the first two assumptions that any unexpected change in the cost of equity as reflected in the financial statements should result in a concomitant unexpected market return. Focusing on unexpected differences is consistent with the view that market changes result from new (i.e., unexpected) information in the financial statements.

Equation (1) is a simple linear expression for a relationship between "real asset" and financial markets. This approach implies any other information factor is incorporated in the error term, and could be modified to adding another such factor as Ohlson (1995) did. Here, equation (1) is treated as the key expression and will be expanded in an orderly development. For those readers who want to cross-reference this approach to the typical earnings/return paradigm, equations (6) and (12) are the detailed expansions in terms of income and book value, and they will be discussed later.

$$U[R_{(t-1,t)}] = \alpha + \lambda U[\Delta K_{s(t-t_s)}] + \varepsilon \tag{1}$$

where:

α	=	the model intercept,
λ	=	the coefficient of association between market return and the accounting cost of equity capital,
$\Delta K_{s(t,t-1)}$	=	the change in accounting cost of equity capital[1] for firm i from time t – 1 to t,
$R_{(t,t-1)}$	=	the market return for firm i during time period (t,t-1),

$U[\bullet]$ = the usual unexpected operator (e.g., the unexpected return on stock for firm i, during period t, $U[R_{(t,t-1)}]$, equals $R_{(t,t-1)} - E[R_{(t,t-1)}]$), and

ε = the error term.

By virtue of the definition of $U[\bullet]$, an equivalent formulation of equation (1) is:

$$U[R_{(t-1,t)}] = \alpha + \lambda[\Delta K_{s_{(t-1,t)}} - E[\Delta K_{s_{(t-1,t)}}]] + \varepsilon \tag{1a}$$

But, where K_{s_t}represents the accounting cost of equity capital at time t:

$$\Delta K_{s_{(t-1,t)}} = K_{s_{(t)}} - K_{s_{(t-1)}}$$

and:

$$\boldsymbol{E[\Delta K_{s(t,t-1)}] = E[K_{s(t)}] - K_{s(t-1)}}$$

Therefore:

$$U[R_{(t-1,t)}] = \alpha + \lambda(K_{s_{(t)}} - E[K_{s_{(t)}}]) + \varepsilon \tag{1b}$$

Having thus expressed the relationship between unexpected returns and the accounting cost of equity capital, we next invoke our third assumption to specify the expected value for equity cost of capital. The third assumption is that the cost of equity capital follows a first-order autoregressive process. This autoregressive assumption is often applied to financial variables because researchers typically postulate or find persistence in firm behavior (Foster 1977). In the current setting, our expectation for the cost of equity in period t is assumed to be (see Makridakis et al. 1983):

$$E[K_{s_t}] = \mu + \varphi(K_{s_{t-1}} - \mu) + \varepsilon \tag{2}$$

where:

μ = the overall mean,

φ = the autoregressive coefficient, and

ε = an error term.

Substituting equation (2) into equation (1a) results in the following:

$$U[\ R_{(t,t-1)}\ ] = \alpha + \lambda\ (K_{s\ t} - \mu - \varphi\ (K_{s\ t-1} - \mu) - e) + \varepsilon \tag{3}$$

Expanding and rearranging to isolate the constants and error terms gives:

$$U[\ R_{(t,t\text{-}1)}\ ] = (\alpha - \lambda\mu + \lambda\varphi\mu) + \lambda K_{s\,t} - \lambda\varphi\ K_{s\,t\text{-}1} + (\lambda\ e + \varepsilon) \tag{4}$$

Combining the constants (α, $\lambda\mu$, and $\lambda\varphi\mu$) into a new constant, α', and rewriting the error term ($\lambda e + \varepsilon$) more simply as ε', reduces (4) to:

$$U[R_{(t-1,t)}] = \alpha' + \lambda K_{s_t} - \lambda\varphi K_{s_{t-1}} + \varepsilon' \tag{4a}$$

Adding and subtracting $\lambda\varphi K_s$ of time period t and rearranging the terms slightly has the following result:

$$U[R_{(t-1,t)}] = \alpha' + \lambda\varphi K_{s_t} - \lambda\varphi K_{s_{t-1}} + \lambda K_{s_t} - \lambda\varphi K_{s_t} + \varepsilon' \tag{5}$$

Factoring reduces this equation to:

$$U[R_{(t-1,t)}] = \alpha' + \lambda\varphi(K_{s_t} - K_{s_{t-1}}) + \lambda K_{s_t}(1 - \varphi) + \varepsilon' \tag{5a}$$

Note that the second term, $\lambda\varphi(K_{s_t} - K_{s_{t-1}})$, is a difference term analogous to Ali and Zarowin's (1992) concept of "permanent" earnings. Similarly, the third term, $\lambda K_{s_t}(1 - \varphi)$, bears a strong resemblance to their concept of transitory earnings (1992).

Modigliani and Miller (1963) defined the cost of equity, K_{s_t}, in terms of a firm's basic leverage ratio target for the current period. Equation (6) below expresses their definition. (See Copeland and Weston [1988] for a fully detailed development of this equation.)

$$K_{s_t} = \rho_t + (T_c)(\rho_t - K_{d_t})(\frac{\Delta B}{\Delta S})_t \tag{6}$$

where:

ρ_t	=	the discount rate for an all-equity firm at time t,
T_c	=	a tax adjustment factor (equal to one minus the corporate tax rate at time t),
K_{d_t}	=	the corporate debt rate at time t, and
$(\frac{\Delta B}{\Delta S})_t$	=	the marginal change in the leverage ratio of debt to stock investment at time t.

Substituting the right-hand expression for K_{s_t} in equation (5a) results in the following:

$$U[R_{(t-1,t)}] = \alpha' + \lambda\varphi((\rho_t + (T_c)(\rho_t - K_{d_t})(\frac{\Delta B}{\Delta S})_t) - (\rho_{t-1} + (T_c)(\rho_{t-1} - K_{d_{t-1}})(\frac{\Delta B}{\Delta S})_{t-1})) + \lambda(1-\varphi)(\rho_t + (T_c)(\rho_t - K_{d_t})(\frac{\Delta B}{\Delta S})_t) + \varepsilon' \quad (7)$$

After rearranging equation (7) so as to collect terms, the result is:

$$U[R_{(t-1,t)}] = \alpha' + \lambda\varphi(\rho_t - \rho_{t-1}) + \lambda(1-\varphi)\rho_t + \lambda\varphi T_c(((\rho_t - K_{d_t})(\frac{\Delta B}{\Delta S})_t) - (\rho_{t-1} - K_{d_{t-1}})(\frac{\Delta B}{\Delta S})_{t-1}) + \lambda(1-\varphi)((T_c)(\rho_t - K_{d_t})(\frac{\Delta B}{\Delta S})_t) + \varepsilon \quad (8)$$

In equation (8), the expression $(\rho_t - K_{d_t})$ is the spread between the firm's discount rate as an all-equity firm and its debt rate at time t. To simplify subsequent analysis , we will let Ψ_t represent this spread expression. We also assume that the tax rate is constant and that complex treatments (e.g., carryforwards) are not present. Robichek et al. (1973) made a similar assumption in their analysis of the effect of leverage on the cost of equity capital of utilities. We may then rewrite equation (8) as follows:

$$U[R_{(t-1,t)}] = \alpha' + \lambda\varphi(\rho_t - \rho_{t-1}) + \lambda(1-\varphi)\rho_t + \lambda\varphi T_c(((\Psi_t)(\frac{\Delta B}{\Delta S})_t) - (\Psi_{t-1})(\frac{\Delta B}{\Delta S})_{t-1}) + \lambda(1-\varphi)((T_c)(\Psi_t)(\frac{\Delta B}{\Delta S})_t) + \varepsilon \quad (9)$$

This formulation shows that stock market returns are expressed in firm-specific variables. By the way of comparison with prior research, the return on equity variable ρ has features of prior research where net income is in the numerator but the denominator (deflator) has common stockholders' equity (which also follows from prior research of the "clean surplus" principle). The variable ρ differs from prior research in its income effect because it is adjusted for leverage (See equation (12) later in the text for empirical details). In the current work, leverage (i.e., capital structure debt vs. equity features) effects are in the relation of accounting data with stock market returns. This theoretical analysis has similarities to other accounting/stock market models (e.g., by its implicit assumption of the "clean surplus of Ohlson (1995)" in the cost of equity variable). However, the current study's approach is different

from prior works because the incorporation of Modigliani and Miller's (1963) analysis of the relationship of spread and leverage to the cost of capital provides a more explicit/complete description of the association between financial accounting information and stock market behavior than is given by a basic earnings/return relation.

As a limitation, this leverage treatment also appears to demand an additional assumption that firm and investor interests are aligned; hence the interpretation of the leverage variable is the same for both the firm and the stock market. The need for this assumption is perhaps arguable given that corporate shares are largely held in institutional portfolios that have the ability to diversify. On the firm side of the issue, the vast majority of executives are also given stock options, which mitigates any alignment problem.

SPECIAL CASES

In this section we examine characteristics of the model expressed in equation (9). The section considers three special situations: (1) firms with no debt, (2) firms with debt and no target leverage change, and (3) firms with debt and a target leverage change. The reason for this analysis is that we want to consider the model with respect to conventional wisdom as it is exhibited in the marketplace and to set the stage for an empirical investigation.

The first case (1) we examine is the firm with no debt. With zero debt, all terms containing some form of $(\frac{\Delta B}{\Delta S})$ equal zero and equation (9) reduces to:

$$U[R_{(t-1,t)}] = \alpha' + \lambda\varphi(\rho_t - \rho_{t-1}) + \lambda(1-\varphi)\rho_t + \varepsilon' \tag{10}$$

Equation (10) has the format of the familiar earnings-return relation that has appeared prominently in previous literature (e.g., Ali and Zarowin 1992). In the current study, the coefficients $\lambda\varphi$ and $\lambda(1-\varphi)$ represent, respectively, responses to permanent and transitory shocks on the rate of return for an all-equity firm (See equation (12) later in the study for empirical details).

Having examined the case of a firm with no debt, we next turn to the case (2) of a firm with debt but no change in its target leverage. When target leverage remains constant from t – 1 to t, $(\frac{\Delta B}{\Delta S})_t = (\frac{\Delta B}{\Delta S})_{t-1}$ and equation (9) reduces to equation (11).

$$\begin{aligned} U[R_{(t-1,t)}] = {} & \alpha' + \lambda\varphi(\rho_t - \rho_{t-1}) + \lambda(1-\varphi)\rho_t \\ & + \lambda\varphi T_c(\frac{\Delta B}{\Delta S})_t(\Psi_t - \Psi_{t-1}) + \lambda(1-\varphi)T_c\Psi_t(\frac{\Delta B}{\Delta S})_t + \varepsilon \end{aligned} \tag{11}$$

The fourth term on the right-hand side of equation (11) predicts that a change in the spread should have an associated effect on the unexpected return. Furthermore, the model predicts that this effect should be permanent. Also, the fifth term predicts a transitory effect due to the level of the current period spread and leverage interaction.

Equation (11) simplifies to:

$$U[R_{(t-1,t)}] = a' + \lambda\varphi(\rho_t - \rho_{t-1}) + \lambda(1-\varphi)\rho_t + \lambda T_c(\frac{\Delta B}{\Delta S})_t(\Psi_t - \varphi\Psi_{t-1}) + \varepsilon \tag{11a}$$

Also, if the spread between the equity and debt markets does not change from t – 1 to t, equation (11b) is the result.

$$U[R_{(t-1,t)}] = a' + \lambda\varphi(\rho_t - \rho_{t-1}) + \lambda(1-\varphi)\rho_t + \lambda T_c(\frac{\Delta B}{\Delta S})_t\Psi_t(1-\varphi) + \varepsilon \tag{11b}$$

This last equation is consistent with the finding of Clinebell et al. (1991), that this spread follows a random walk. Equation (11b) implies unexpected positive returns associate positively with leverage and spread.

The final case (3) that we consider is that of a firm with both debt and a change in its target leverage. These conditions require the full model of the aforementioned equation (9). In this model, both permanent and transitory effects result from an unexpected change in our spread variable. The permanent effect reflects the impact of a permanent change in leverage.

Both Dhaliwal et al. (1991) and Jeter and Chaney (1992) reported empirical evidence that increases in leverage have an inverse effect on the earnings response coefficient. The authors reason that the market's discount rate increases as firms increase leverage. To the extent that increases in leverage among individual firms reduce the spread between their all-equity return and their cost of debt, the model expressed in equation (9) is also an explanation of these authors' results. Along similar lines, Kim et al. (1992) found an association between changes in leverage and cumulative abnormal returns. Furthermore, these authors noted that the direction of the association seems to depend on the amount of leverage a firm has relative to its optimal level. This finding is also consistent with our analysis. Unexpected changes in the spread between the return on an all-equity firm and the cost of debt translate into unexpected returns. By definition, however, a firm's optimal leverage is the amount that maximizes the (positive) spread between its all-equity return and its cost of debt. Hence, as the firm's leverage approaches its optimal level, increases in leverage should increase the

spread, resulting in increased returns. As the firm's leverage departs from the optimal level, however, increases in leverage may actually reduce the spread, thereby dampening returns. This illustrates how empirical analyses into the effects of leverage may need to control for equity-debt spreads and that the influence of changing equity-debt spreads on stockholder returns may be a fruitful topic for future research.

EMPIRICAL ANALYSIS

General Design

The model(s) discussed here offers a framework to investigate the association between the "financial" and "real" asset markets. The theoretical model is original to this article, and therefore no previous empirical analysis has been performed on the model. We focus here on the spread variable because it should be a key issue in the tradeoff between debt and equity financing. The research design first analyzes the relation of spread to the stock market with univariate portfolios and then examines association using multivariate regressions. The study's approach also permits the theoretical model's validity to be tested by two types of techniques: measurements of information value (or content) and tests of investment strategies that capitalize on theoretical model features. Thus, the study examines the empirical model validity in two respects that will or will not corroborate each other.

The study's univariate portfolio analyses examine the theoretical model from the perspective of this question: Do accounting reports present information that investors are not pricing (i.e., does spread have explanatory power)? The current study examines portfolios with the intent of establishing the groundwork for investment strategies that would use the spread as a metric to choose portfolios. The theoretical modeling suggests that (1) leverage, (2) the spread between a firm's discount rate as an all-equity firm and its debt rate, and the interaction between (1) and (2) relate to stock market returns. Accordingly, accounting measures of spread and leverage variables are the treatment variables in the empirical analysis. The portfolio metric is the unexpected stock market return, defined as the cumulative abnormal residual (CAR). Of the two independent variables, the spread variable in particular has received almost no attention in the literature. Previous research on the spread variable (Clinebell et al. 1991) has been limited to its time series characteristics.

In general, our model predicts that the leverage, the spread, and a leverage-spread interaction should be associated with changes in CAR. To examine spread (leverage) effects, we used the following portfolio methodological approach. First, we divided the sample into quartiles

such that the first quartile contains the observations with the lowest leverage (most negative spread) and the fourth quartile contains the observations with the highest leverage (most positive spread). We then calculated the mean CAR for each quartile and compared the quartile means according to an ANOVA using the Duncan means test.

To examine the leverage-spread interaction, we adopted two approaches. Our first approach was similar to the method used to examine individual effects; that is, we divided the sample into quartiles such that the first quartile contains the observations for which the product of leverage and spread was the most negative and the fourth quartile contains the observations for which that product was most positive. We then calculated the mean CAR for each quartile and compared the quartile means according to an ANOVA using the Duncan means test.

In a second, more detailed examination of the leverage-spread interaction, we first divided the sample into leverage quartiles (first quartile low, fourth quartile high) and then divided each leverage quartile into subgroup quartiles according to spread (first subgroup quartile low, fourth subgroup quartile high). In this manner, we were able to examine the spread variable's effect while holding leverage relatively constant. For each of the leverage quartiles, we calculated the mean CAR for each spread subgroup and compared the subgroup means according to an ANOVA using the Duncan means test. We also performed MANOVA tests of the overall association between the spread variable and CAR.

A reiteration of the study's research question for the multivariate regression analysis is: To what extent does accounting data associate with the stock market returns or prices? There is a well-established line of research that has addressed this issue in the form of association studies (e.g., Collins and Kothari 1989; Ali and Zarowin 1992; Collins et al. 1999). In the current association study approach, regression analyses examine equations (11) and (11b) for both the industrial and non-industrial samples. The analysis objective is to test the model empirical coefficients' significance versus the proposition that the model variables have no effect. And if the model's coefficients are significant, then an evidential argument can be advanced that the theoretical model has empirical validity. As with any regression employing firm-year observations, there is a concern of cross-sectional dependency where the independent and dependent variables move together, but may not have a causal relation. Therefore, regressions are also run that have indicator variables for all of the years except one. (A regression cannot be perfectly defined.)

Research Variables

Accounting measures of a firm's leverage and the spread between its discount rate as an all-equity firm and its debt rate are independent

variables in our empirical analysis.[3] Compustat provided the annual data for their computation. Note that income IBE is income from operations before one-time charges (Compustat item IB). Variables are defined as follows with the final expression giving their operational definition in Compustat mnemonics:

$$\text{Leverage (LEV 1)} = \frac{\text{Total Debt}}{\text{Total Debt} + \text{Common Stockholder's Equity}} = \frac{DLC + DLTT}{(DLC + DLTT) + CEQ} \text{ and}$$

$$\text{Spread (SPRD1)} = \text{Discount Rate as an All-Equity Firm (RO1)} - \text{Debt Rate (DRAT1)}$$

$$\text{RO1} = \frac{(1 - \text{Leverage}) - (\text{Income} + [\text{Interest Expense} \times (1 - \text{Tax Rate})])}{\text{Common Stockholders' Equity}} = \frac{(1 - \text{LEV1}) \times (\text{IBE} + (\text{XINT})(1 - \frac{\text{TXT}}{\text{TXT} + \text{IBE}}))}{\text{CEQ}} \text{ and}$$

where:

$$\text{DRAT 1} = \frac{\text{Interest Expense}}{\text{Short-Term Notes} + \text{Long-Term Debt}} = \frac{\text{XINT}}{\text{DLC} + \text{DLTT}}.$$

The tax effect of interest expense is approximated by

$$TXT \times \left(\frac{DLC + DLTT}{DLC + DLTT + CEQ}\right). \tag{12}$$

Sample Data

This study has elected to examine annual data in order to be comparable with other stock market/financial statement information association studies (e.g., Ali and Zarowin 1992). There is a limit to what can reasonably be placed in one manuscript, which means that other research will have the opportunity to examine shorter time periods using this model and/or focus on event studies that affect leverage or the spread. The sampling covers the period 1990 to 1998. The analysis examines an industrial sample with SIC codes from 2000 through 3999 and a non-industrial sample of all other firms with requisite data. The reasoning for the sample categorizations is that industrial firms typically have leverage tied to operating income characteristics (i.e., stable and linked to physical products) that are different from non-industrial firms' income characteristics (i.e., service based or linked to commodities and financial markets). Industrial firms typically involve signifi-

cant investments in fixed assets (physical equipment) and are thus consistent with the study's theoretical focus on the relationship between the real asset market and the financial asset (stock) market. To see whether leverage/spread effects are universal, an analysis is also made of a non-industrial sample.

Firm-year observations must have all data for equation (11) variables available for that year as well as CRSP data to compute CAR. Only firms with positive debt are included in the analyses as this study is examining leverage. Also, firms with negative equity are excluded because a negative return on equity when the firm has positive earnings does not make sense in the study's general theoretical framework. These basic data availability criteria resulted in 20,789 firm-year data points.

The dependent variable is the unexpected stock market return, defined as the cumulative abnormal residual (CAR). CRSP was the source of the stock market returns to compute CAR. The estimation period is 60 months through the first quarter of the observation year. The CAR measurement period (of one year consistent with the aforementioned annual approach) includes the last nine months of the observation year and three months after the balance sheet date. The reasoning for the measurement period can be traced to Collins and Kothari (1989), who show that the three months after the observation year-end maximize earnings value relevance. Or, as Easton et al. (1992) pointed out, the procedure assures that the market reflects the financial statement information. Observations whose CAR was less than –1 or greater than 1 were eliminated because the study focuses on routine behavior (no greater than 100 percent absolute change) (see the example of Kerstein and Kim 1995). In addition, any observation with an effective accounting debt rate greater than 50 percent was dropped because an actual rate of that magnitude is unlikely to be reflective of routine operations or firm conditions (i.e., these firms would quickly go bankrupt).

The final industrial sample includes 10,400 firm-year observations, and the non-industrial sample has 5,330 observations. A two-digit SIC code categorization indicates that no industry accounted for more than 14 percent of the final industrial sample and 17 percent of the non-industrial sample. One spread change was more than 20 standard deviations from the mean and was eliminated. Table 1 summarizes the samples' selection effects.

Descriptive data concerning leverage and spread are of particular interest because they may be limiting conditions that suggest the use of one or more of the theoretical equations and consequent testing purposes. The mean annual changes in leverage and spread in the industrial sample (0.00348 and –0.00569, respectively) are not significantly different from zero ($\alpha = 0.1$). Also, distributions of these changes are highly peaked (kurtosis: 7.2 and 125.8). The non-industrial sample

TABLE 1 Sample Selection Effects

	Observations Remaining in Sample	
Criterion	*Industrial*	*Non-Industrial*
Compustat and CRSP data availability	20789	20789
Debt rate greater than .50	20171	20171
CAR between –1 and +1	19011	19011
SIC code between 2000 and 4899	10410	
SIC code between 5000 and 7999		5331
Spread change greater than 20 standard deviations	10410	5330

Sample selection characteristics and numbers by criteria.

exhibits similar behavior to the industrial sample. The mean change 0.0032 for leverage is not significantly (α = .05) different from zero, but the mean spread change –0.0011 can not be rejected from the null of zero (α = .1). Once again, the distributions are highly peaked (kurtosis: 6.0 for leverage changes and 93.3 for spread changes). Note, a casual analysis of the relatively tight distribution of spread changes near zero suggests a consistency with Clinebell et al.'s (1991) finding that the spread follows a random walk.

As these distributions are not skewed, these variables can be used without transformations in regression analyses. However, because the changes in spread are so small for most of our observations, we focus on the form of our model expressed in equation (11b) for portfolio analyses. This information of (11b) assumes that target leverage and the spread between the discount rate for an all-equity firm and the firm's debt rate are constant from the prior year to the observation year. Adopting that version simplified the analysis by allowing us to concentrate on the transitory impact of the current year's leverage and spread.

Next, Table 2 has a descriptive statistics overview of the industrial sample for purposes of checking outliers. Panel A reports the sample means, standard deviations, maxima, and minima for the data. There is no evidence of large or unusual sample points that would have outlier effects on the analysis. Panel B reports a correlation matrix of the variables. There is no apparent indication of any multicollinearity problem because the correlation between independent variables is relatively low (less than .6). In any event, multicollinearity was examined using the variance inflation factor (VIF) in all regressions, and not one variable exhibited a VIF greater than the commonly accepted threshold of ten. Consequently, these VIFs are not reported and multicollinearity does not appear to be a regression problem. The non-industrial sample exhibited similar characteristics and therefore those sample data are not shown.

TABLE 2 Simple Statistics

Panel A: Industrial Sample Statistics (N = 9803)

Variable	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
CAR	-.0465	.3846	-.9999	.9999
RO1D	-.0031	.2152	-3.8987	6.4067
RO1	.0784	.2001	-5.0405	1.1514
LEV1	.3498	.2159	.0006	.9999
SPRD1	-.0266	.2423	-5.0932	1.1045
SCHG	-.0068	.2275	-3.8651	5.1594

Panel B: Non-industrial Sample Statistics (N = 8372)

Variable	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
CAR	-0.0445	0.3815	-0.9999	0.9997
RO1D	-0.0004	0.3575	-4.8851	25.8676
RO1	0.0723	0.1694	-4.3714	1.4471
LEV1	0.4058	0.2358	0.0000	0.9988
SPRD1	-0.0257	0.1876	-4.6226	1.2091
SCHG	-0.0027	0.2079	-4.4264	5.1758

Panel C: Pearson Correlation Coefficients and P Statistics Inustrial Sample (N = 9803)

	CAR	*RO1D*	*RO1*	*LEV1*	*SPRD1*
RO1D	.0219#				
RO1	-.0481*	*.4168**			
LEV1	-.0235#	*-.0317**	*-.0494**		
SPRD1	.0868*	*.1000**	*.5237**	*-.0345**	
SCHG	.1459*	*-.2494**	*-.3226**	*-.0345**	*.5758**

Panel D: Pearson Correlation Coefficients and P Statistics Non-industrial Sample (N = 8372)

	CAR	*RO1D*	*RO1*	*LEV1*	*SPRD1*
RO1D	-.0009				
RO1	.0269#	.2609*			
LEV1	-.0230#	.0139	-.0494*		
SPRD1	.1317*	.0693*	.3815*	-.0244#	
SCHG	.1418*	-.1491*	-.4836*	-.0329*	.5427*

Descriptive statistics and simple correlations between variables (*= .01 significance and # = .05 significance). Variable descriptions are as follows:

CAR = Cumulative Abnormal Residual,

LEV1 = Total Debt ÷ (Total Debt + Stockholder's Equity) = (DLC + DLTT) ÷ (DLC + DLTT + CEQ)

$$(\text{RO1} = \frac{((1 - \text{LEV1} - (\text{Income Before Extraordinary Items} + \text{Interest} + (\text{Taxes} - \text{LEV1}))}{\text{Stockholders' Equity}}$$

$$= \frac{(1 - \text{LEV1}) \times (\text{IBE} + \text{XINT} + (\text{TXT} \times \text{LEV1}))}{\text{CEQ}},$$

$\text{RO1D} = \text{RO1}_t - \text{RO1}_{t-1}$

DRAT1 = Interest ÷ Total Debt = XINT ÷ (DLC + DLTT)

SPRD1 = RO1 • DRAT1

$\text{SCHG} = \text{SPRD1sub}t - \text{SPRD1}_{t-1}$

Univariate Portfolio Analyses

Industrial Sample. Panels A and B of Table 3 show the individual association between spread and leverage with CAR for the industrial sample. Panel A categorizes the sample according to leverage quartiles. Consistent with both Dhaliwal et al. (1991) and Jeter and Chaney (1992), this panel reflects an inverse association between leverage and unexpected returns. All (of six possible) pairwise comparisons of CAR are in order ($a < .02$, where a represents the probability of obtaining the results by chance), but the quartiles are not different from each other at the .05 level according to an ANOVA analysis using the Duncan means test.

Panel B of Table 3 categorizes the sample into quartiles according to the spread between the equity return, ρ, and the debt rate. Except for the fourth quartile's position, this panel reflects a direct association between the spread and CAR that is consistent with the study's theoretical model. The first quartile mean differs from all of the others at the .05 level according to an ANOVA using the Duncan test.

Panel C of Table 3 examines the interaction between the leverage and spread variables. Panel C of Table 3 categorizes the sample into quar-

TABLE 3 Industrial Sample Analysis of CAR by Leverage Quartile and by Spread Quartile

Panel A: Leverage Quartiles

Quartile	N	Mean CAR	Standard Deviation	Minimum CAR	Maximum CAR	T- Statistic	Duncan Grouping
1	2602	-.0388	.3872	-.9999	.9851	-5.12	A
2	2603	-.0425	.3740	-.9913	.9999	-5.81	A
3	2604	-.0506	.3608	-.9953	.9818	-7.16	A
4	2605	-.0529	.3969	-.9995	.9876	-6.80	A

Panel B: Spread Quartiles

Quartile	N	Mean CAR	Standard Deviation	Minimum CAR	Maximum CAR	T- Statistic	Duncan Grouping
1	2602	-.1162	.4260	-.9999	.9848	-13.92	B
2	2603	-.0312	.3887	-.9995	.9964	-4.093	A
3	2602	-.0103	.3461	-.9976	.9756	-1.519	A
4	2603	-.0271	.3443	-.9871	.9999	-4.029	A

Panel C: Leverage × Spread Quartiles

Quartile	N	Mean CAR	Standard Deviation	Minimum CAR	Maximum CAR	T- Statistic	Duncan Grouping
1	2602	-.1227	.4239	-.9999	.9849	-14.77	B
2	2603	-.0253	.3837	-.9976	.9964	-3.36	A
3	2602	-.0216	.3565	-.9953	.9876	-3.09	A
4	2603	-.0153	.3404	-.9871	.9999	-2.30	A

Cumulative abnormal returns (CAR) decomposed by quartile according to spread, leverage and spread*leverage.

tiles according to the product of each observation's leverage and spread (i.e., LEV1 × SPRD1). This panel reflects a direct association between CAR and the product of leverage and spread. The first quartile mean differs from the other three quartile means at the .05 level according to an ANOVA using the Duncan test. Furthermore, all six possible pairwise comparisons of CAR are in order ($\alpha < .02$).

In Table 4A, the industrial sample is first divided into quartiles according to the leverage variable and then each leverage quartile is divided into subgroup quartiles according to spread. In three of the four quartiles, the first quartile subgroup has a significantly lower mean

TABLE 4A Industrial Sample Analysis of CAR by Spread within Leverage Quartile

Quartile	*N*	*Mean CAR*	*Standard Deviation*	*Minimum CAR*	*Maximum CAR*	*T-Statistic/ Duncan*
Leverage Quartile 1 Spread Subgroup						
1	650	-.0836	0.4291	-.9999	.9848	-4.96/ B
2	651	-.0223	0.3944	-.9813	.9837	-1.44/A
3	650	-.0034	0.3544	-.9976	.9851	-0.25/A
4	651	-.0461	0.3628	-.9811	.9753	-3.24/A B
Leverage Quartile 2 Spread Subgroup						
1	650	-.0995	.4270	-.9913	.9776	-5.94/ B
2	651	-.0206	.3711	-.9776	.9964	-1.42/A
3	650	-.0448	.3428	-.9819	.9738	-3.33/A
4	651	-.0055	.3431	-.9871	.9999	-.41/A
Leverage Quartile 3 Spread Subgroup						
1	650	-.1231	.4049	-.9932	.9025	-7.75/B
2	651	-.0390	.3729	-.9952	.9818	-2.67/A
3	650	-.0064	.3185	-.9741	.9554	-0.51/A
4	651	-.3410	.3304	-.9806	.9798	-2.63/A
Leverage Quartile 4 Spread Subgroup						
1	650	-.1465	.4498	-.9798	.9712	-8.30/ C
2	651	-.0507	.3898	-.9995	.9637	-3.32/ B
3	650	-.0147	.3795	-.9343	.9876	-.99/A B
4	651	.0002	.3458	-.9801	.9701	02/A

Comparison of CAR by spread within leverage quartiles of industrial subsample.

CAR than the other quartile subgroups according to a Duncan test in an ANOVA analysis at the .05 level. Here, the Duncan analysis in each leverage quartile generally shows no such differences in the spread quartiles of Table 4B for leverage. For the industrial subsample, the dominant component in a leverage/spread interaction is the spread.

Non-Industrial Sample. Results for the non-industrial sample are highly consistent with the results for the industrial sample. Panels A and B of Table 5 show the individual association between each of the independent variables and CAR for the extended sample. Panel A

TABLE 4B Industrial Sample Analysis of CAR by Leverage within Spread Quartile

Quartile	*N*	*Mean CAR*	*Standard Deviation*	*Minimum CAR*	*Maximum CAR*	*T-Statistic/ Duncan*
Leverage Quartile 1 Spread Subgroup						
1	650	-.0648	.4216	-.9817	.9576	-3.92 / A
2	651	-.1172	.4262	-.9999	.9849	-7.01 / B
3	650	-.1307	.4099	-.9932	.9598	-8.13 / B
4	651	-.1523	.4419	-.9747	.9712	-8.79 / B
Leverage Quartile 2 Spread Subgroup						
1	650	-.0011	.3860	-.9871	.9851	-.072 / A
2	651	-.0414	.3920	-.9776	.9964	-2.69 / A B
3	650	-.0487	.3838	-.9995	.9818	-3.24 / B
4	651	-.0357	.3918	-.9692	.9876	-2.32 / A B
Leverage Quartile 3 Spread Subgroup						
1	650	-.0103	.3451	-.9976	.9756	-.76 / A
2	651	-.0247	.3478	-.9819	.9397	-1.82 / A
3	650	-.0090	.3258	-.9741	.9554	-.71 / A
4	651	-.0029	.3649	-.9115	.9701	-.20/ A
Leverage Quartile 4 Spread Subgroup						
1	650	-.0447	.3638	-.9812	.9532	-3.13 / A
2	651	-.0177	.3455	-.9871	.9999	-1.30 / A
3	650	-.0338	.3356	-.9762	.9664	-2.57 / A
4	651	.0126	.3315	-.9807	.9798	.97 / A

Comparison of CAR by leverage within spread quartiles of industrial subsample.

categorizes the sample according to leverage quartiles and does not indicate a strong relation with CAR. Panel B of Table 5 categorizes the sample into quartiles according to the spread between the equity return, ρ, and the debt rate. Again as was the case with Panel B in Table 3, this panel reflects a direct association between the spread and CAR. The first quartile mean differs from all others at the .05 level according to an ANOVA using the Duncan test. Furthermore, all six possible pairwise comparisons of CAR are in order ($\alpha < .02$).

Panel C of Table 5 as well as Tables 6A and 6B examine the interaction between the leverage and spread variables in the non-industrial subsample. Panel C of Table 5 categorizes the sample into quartiles according to the product of each observation's leverage and spread (i.e., LEV1 × SPRD1). This panel reflects a direct association between CAR and the product of leverage and spread. The first quartile mean differs from the others at the .05 level according to an ANOVA using the Duncan test. All six possible pairwise comparisons of CAR are in order ($\alpha < .02$).

Table 6A also examines the interaction between the leverage and spread variables. In this table, the non-industrial sample is first divided

TABLE 5 Non-Industrial Sample Analysis of CAR by Leverage Quartile and by Spread Quartile

Panel A: Leverage Quartiles

Quartile	N	Mean CAR	Standard Deviation	Minimum CAR	Maximum CAR	T-Statistic	Duncan Grouping
1	1332	-.0116	.3735	-.9999	.9983	-1.14	A
2	1333	-.0450	.3521	-.9884	.9560	-4.67	B
3	1332	-.0308	.3794	-.9985	.9830	-2.96	A B
4	1333	-.0518	.4015	-.9995	.9996	-4.71	B

Panel B: Spread Quartiles

Quartile	N	Mean CAR	Standard Deviation	Minimum CAR	Maximum CAR	T-Statistic	Duncan Grouping
1	1332	-.1086	.4514	-.9999	.9886	-8.78	B
2	1333	-.0222	.3532	-.9891	.9983	-2.30	A
3	1332	-.0109	.3404	-.9985	.9996	-1.16	A
4	1333	.0024	.3430	-.9999	.9917	.25	A

Panel C: Leverage × Spread Quartiles

Quartile	N	Mean CAR	Standard Deviation	Minimum CAR	Maximum CAR	T-Statistic	Duncan Grouping
1	1332	-.1050	.4534	-.9999	.9866	-8.45	B
2	1333	-.0154	.3580	-.9867	.9983	-1.57	A
3	1332	-.0239	.3267	-.9999	.9917	-2.67	A
4	1333	.0050	.3495	-.9985	.9997	.52	A

Cumulative abnormal returns (CAR) decomposed by quartile according to spread, leverage, and spread × leverage.

into quartiles according to the leverage variable and then each leverage quartile is divided into subgroup quartiles according to spread. Consistent with Tables 3, 4, 5A, and 5B, Table 6A provides evidence that CAR is directly associated with spread. In all four quartiles, the first quartile subgroup has a lower mean CAR than the other three quartile subgroups. According to a Duncan test in an ANOVA analysis, the difference is significant at the .05 level. However, Table 6B does not indicate that leverage is different within spread quartiles.

The implications of the portfolio analysis is that an investment strategy could make money by selling short a portfolio made up of the first

TABLE 6A Non-Industrial Sample Analysis of CAR by Spread within Leverage Quartiles

Quartile	*N*	*Mean CAR*	*Standard Deviation*	*Minimum CAR*	*Maximum CAR*	*T-Statistic/ Duncan*
Leverage Quartile 1 Spread Subgroup						
1	333	-.0795	.4508	-.9999	.9886	-3.22/B
2	333	-.0079	.3400	-.9654	.9983	-.43/A
3	333	.0286	.3286	-.9500	.8988	1.58/A
4	333	.0123	.3544	-.9999	.9917	.63/A
Leverage Quartile 2 Spread Subgroup						
1	333	-.0795	.4432	-.9884	.9560	-3.27/ B
2	333	-.0497	.3219	-.9880	.9539	-2.82/A B
3	333	-.0301	.2965	-.9246	.8693	-1.85/A B
4	333	-.0209	.3272	-.9580	.8822	-1.16/A
Leverage Quartile 3 Spread Subgroup						
1	333	-.1268	.4673	-.9985	.9830	-4.95/B
2	333	-.0278	.3473	-.8715	.9489	-1.46/A
3	333	-.0030	.3277	-.9985	.9814	-.17/A
4	333	.0285	.3418	-.8953	.9576	1.52/A C
Leverage Quartile 4 Spread Subgroup						
1	333	-.1603	.4560	-.9995	.9460	-6.41/B
2	333	-.0196	.3930	-.9891	.9866	-.91/A
3	333	-.0251	.3301	-.9781	.9726	-1.39/A
4	334	-.0025	.3987	-.9150	.9996	-.12/A

Comparison of CAR by spread within leverage quartiles of non-industrial subsample.

TABLE 6B Non-Industrial Sample Analysis of CAR by Leverage within Spread Quartiles

Quartile	*N*	*Mean CAR*	*Standard Deviation*	*Minimum CAR*	*Maximum CAR*	*T-Statistic/ Duncan*
Leverage Quartile 1 Spread Subgroup						
1	333	-.0701	.4339	-.9820	.9886	-2.95/A
2	333	-.0697	.4406	-.9999	.9560	-2.89/A
3	333	-.1367	.4570	-.9985	.9830	-5.46/AB
4	333	-.1580	.4681	-.9995	.9824	-6.16/ B
Leverage Quartile 2 Spread Subgroup						
1	333	-.0060	.3521	-.9654	.9983	-.31/A
2	333	-.0284	.3469	-.9867	.9539	-1.49/A
3	333	-.0127	.3400	-.9722	.9106	-.68/A
4	334	-.0416	.3735	-.9891	.9866	-2.04/A
Leverage Quartile 3 Spread Subgroup						
1	333	-.0006	.3294	-.9880	.8988	.03/A
2	333	-.0414	.3136	-.9985	.9631	-2.41/A
3	333	.0003	.3322	-.9275	.9814	.02/A
4	333	-.0017	.3823	-.9781	.9996	-.08/A
Leverage Quartile 4 Spread Subgroup						
1	333	.0222	.3488	-.9999	.9917	1.16/A
2	333	-.0125	.3359	-.9902	.9134	-.68/A
3	334	-.0027	.3578	-.9580	.9576	-.15/A
4	334	.0023	.3461	-.8953	.9808	.21/A

Comparison of CAR by leverage within spread quartiles of non-industrial subsample.

quartile spread subgroup for any given quartile of leverage. Further research needs to be undertaken to examine the predictive characteristics of a spread-based portfolio strategy.

Multivariate Regression Analyses

As per the previous research design discussion, the basic empirical regression equation is:

$$\text{CAR} = \text{Intercept} + \beta_1\,\text{RO1D} + \beta_2\,\text{RO1} + \beta_3\,\text{LEV*SCHG} + \beta_4\,\text{LEV*SPRD1} + \text{error} \qquad (13)$$

where:

CAR = Cumulative Abnormal Residual,
LEV1 = Total Debt ÷ (Total Debt + Stockholders' Equity)
= (DLC + DLTT) ÷ (DLC + DLTT + CEQ),
RO1 =

$$\frac{((1 - \text{LEV1}) - (\text{Income before Extraordinary Items} + \text{Interest} + (\text{Taxes} - \text{LEV1}))}{\text{Stockholders' Equity}}$$

$$= \frac{(1 - \text{LEV1}) \times (\text{IBE} + \text{XINT} + (\text{TXT} \times \text{LEV1}))}{\text{CEQ}},$$

$\text{RO1D} = \text{RO1}_t - \text{RO1}_{t-1}$
DRAT1 = Interest ÷ Total Debt = XINT ÷ (DLC + DLTT)
SPRD1 = RO1 • DRAT1
$\text{SCHG} = \text{SPRD1}_t - \text{SPRD1}_{t-1}$

The regression results are shown in Tables 7 and 8. For the industrial sample, the model coefficients are significant. Signs are positive as

TABLE 7 Regression Analysis on Industrial Sample (10,410 Observations)

Variables	*Equation (11)*	*Equation (11)*	*Equation (11b)*	*Equation (11b)*
Intercept	-0.035*	-0.038*	-0.025*	-0.028#
Y91		0.120*		0.119*
Y92		0.033#		0.032#
Y93		0.112*		0.110*
Y94		0.027&		0.025
Y95		-0.058*		-0.061*
Y96		-0.022		-0.025
Y97		-0.007		-0.010
Y98		-0.159*		-0.162*
RO1D	0.101*	0.108*	0.093*	0.101*
RO1	-0.114*	-0.134*	-0.221*	-0.219*
LEV*SCHG	0.340*	0.272*		
LEV*SPRD1	0.106	0.198*	0.393*	0.428*
Adj. R Square	0.017	0.058	0.015	0.057
F Test	45.04*	54.67*	53.02*	58.32*

Cross-sectional regression of CAR for theoretical model of variables specified below. * = .01 significance; # = .05 significance and & = .1 significance. Variables are as stated previously in Table 2, except that Yxx equals 1 in the year xx and 0 otherwise.

CAR = Cumulative Abnormal Residual,
LEV1 = Total Debt ÷ (Total Debt + Stockholders' Equity) = (DLC + DLTT) ÷ (DLC + DLTT + CEQ)

$$\text{RO1} = \frac{((1-\text{LEV1}) - (\text{Income before Extraordinary Items} + \text{Interest} + (\text{Taxes}-\text{LEV1}))}{\text{Stockholders' Equity}}$$

$$= \frac{(1-\text{LEV1}) \times (\text{IBE}+\text{XINT}\,(\text{TXT}\times\text{LEV1}))}{\text{CEQ}},$$

TABLE 8 Regression Analysis on Non-Industrial Sample (5,330 Observations)

Variables	*Equation (11)*	*Equation (11)*	*Equation (11b)*	*Equation (11b)*
Intercept	-0.025*	-0.059*	-0.123#	-0.047*
Y91		0.081*		0.119*
Y92		0.119*		0.144*
Y93		0.115*		0.141*
Y94		0.059*		0.055#
Y95		-0.033		-0.036&
Y96		-0.003		-0.005
Y97		-0.008		-0.011
Y98		-0.073*		-0. 078*
RO1D	0.013	0.016	0.008	0.013
RO1	-0.074	-0.117#	-0.213*	-0.218*
LEV*SCHG	0.436*	0.317*		
LEV*SPRD1	0.346*	0.498*	0.692*	0.752*
Adj. R Square	0.019	0.058	0.018	0.057
F Test	27.39*	28.29*	32.68*	30.26*

Cross-sectional regression of CAR for theoretical model of variables specified below. * = .01 significance; # = .05 significance and & = .1 significance. Variables are as stated previously in Table 2, except that Yxx equals 1 in the year xx and 0 otherwise.

CAR = Cumulative Abnormal Residual,

LEV1 = Total Debt ÷ (Total Debt + Stockholders' Equity) = (DLC + DLTT) ÷ (DLC + DLTT + CEQ)

$$\text{RO1} = \frac{((1-\text{LEV1}) - (\text{Income before Extraordinary Items} + \text{Interest} + (\text{Taxes} - \text{LEV1}))}{\text{Stockholders' Equity}}$$

$$= \frac{(1 - \text{LEV1}) \times (\text{IBE} + \text{XINT}\,(\text{TXT} \times \text{LEV1}))}{\text{CEQ}}$$

the model predicts for normal parameter values except for RO1 (the level's variable of the return on capital of the hypothesized all-equity firm), which is negative and an anomaly for the model. The reason that RO1 is negative may stem from firm characteristics not captured in the theoretical model. Perhaps firms with increasingly higher RO1 may be more easily evaluated by investors where net income is easily determined by analysts. The use of the yearly indicators does not change the basic results and therefore the findings are robust with respect to cross-sectional dependency concerns. In the non-industrial sample, only the leverage and spread variables are significant in each equation. Returns on equity may be more difficult to assess when the revenues are driven by factors like interest rates and demands for services. In both subsamples, the spread variable provides incremental information to earnings data. Generally, the empirical regression statistics are significant, which indicates that the current study's model

is viable, but one anomalous coefficient contrary sign result is present. The reason for the current period return on equity contrary sign may be the empirical difficulty of identifying the return of an all-equity return, or the results may be indicative of adaptive firm behavior relative to the difference of the current and prior period return on equity. In any event this issue is a potential opportunity for further research.

The results of Tables 9 and 10 show the incremental value of spread information beyond the standard relation of CAR with earnings differences (UX = [earnings per share$_t$ – earnings per share$_{t-1}$]/price$_{t-1}$) and earnings levels (ELEV = earnings per share$_t$/price$_{t-1}$). The spread variables have significant t-statistics (α = .01), which indicates that spread has incremental information value beyond earnings in all cases.

TABLE 9 Incremental Information Regression Analysis on Industrial Sample (10,410 Observations)

Variables	*Standard*	*With Leverage* Spread Change*	*With Leverage* Spread*	*With Both Interactions*
Intercept	-0.050*	-0.049*	-0.042*	-0.046*
Y91	0.114*	0.118*	0.116*	0.117*
Y92	0.030&	0.030&	0.029&	0.030&
Y93	0.112*	0.110*	0.109*	0.110*
Y94	0.031#	0.028&	0.027&	0.027&
Y95	-0.053*	-0.055*	-0.059*	-0.057*
Y96	-0.018	-0.018	-0.022	-0.020
Y97	-0.002	-0.005	-0.009	-0.007
Y98	-0.155*	-0.156*	-0.158*	-0.158*
UX	0.079*	0.086*	0.085*	0.086*
ELEV	-0.135*	-0.106*	-0.175*	-0.130*
LEV*SCHG		0.417*		0.306*
LEV*SPRD1			0.356*	0.141*
Adj. R Square	0.045	0.059	0.056	0.059
F Test	50.37*	59.91*	57.29*	55.66*

Cross-sectional regression of CAR for theoretical model of variables specified below. * = .01 significance; # = .05 significance and & = .1 significance. Variables are as stated previously in Table 2, except that Yxx equals 1 in the year xx and 0 otherwise.

CAR = Cumulative Abnormal Residual,

LEV1 = Total Debt ÷ (Total Debt + Stockholders' Equity) = (DLC + DLTT) ÷ (DLC + DLTT + CEQ)

$$RO1 = \frac{((1-LEV1) - (\text{Income before Extraordinary Items} + \text{Interest} + (\text{Taxes} - LEV1))}{\text{Stockholders' Equity}}$$

$$= \frac{(1 - LEV1) \times (IBE + XINT\,(TXT \times LEV1))}{CEQ}$$

TABLE 10 Incremental Information Regression Analysis on Non-Industrial Sample (5,330 Observations)

Variables	*Standard*	*With Leverage* Spread Change*	*With Leverage* Spread*	*With Both Interactions*
Intercept	-0.079*	-0.076*	-0.056*	-0.070*
Y91	0.119*	0.120*	0.119*	0.120*
Y92	0.149*	0.146*	0.143*	0.143*
Y93	0.145*	0.144*	0.142*	0.142*
Y94	0.069&	0.065*	0.059*	0.061*
Y95	-0.027	-0.026	-0.034	-0.030
Y96	-0.006	-0.003	-0.003	-0.001
Y97	-0.001	-0.003	-0.011	-0.009
Y98	-0.059*	-0.064*	-0.073*	-0.070*
UX	0.044*	0.046*	0.049*	0.048*
ELEV	-0.050*	-0.028#	-0.070*	-0.047*
LEV*SCHG		0.684*		0.461*
LEV*SPRD1			0.629*	0.359*
Adj. R Square	0.040	0.058	0.056	0.061
F Test	23.29*	30.67*	29.67*	29.67*

Cross-sectional regression of CAR for theoretical model of variables specified below. * = .01 significance; # = .05 significance and & = .1 significance. Variables are as stated previously in Table 2, except that Yxx equals 1 in the year xx and 0 otherwise.

CAR = Cumulative Abnormal Residual,

LEV1 = Total Debt ÷ (Total Debt + Stockholders' Equity) = (DLC + DLTT) ÷ (DLC + DLTT + CEQ)

$$RO1 = \frac{((1 - LEV1) - (\text{Income before Extraordinary Items} + \text{Interest} + (\text{Taxes} - LEV1))}{\text{Stockholders' Equity}}$$

$$= \frac{(1 - LEV1) \times (IBE + XINT\,(TXT \times LEV1))}{CEQ}$$

SUMMARY AND CONCLUSIONS

This study shows theoretically and empirically that the spread between the cost of equity and debt has incremental value to earnings information to explain stock returns. The study's theoretical model postulates that stockholder returns relate to a firm's accounting cost of equity capital. Then, the model incorporates leverage and the spread between the cost of equity and debt as additional explanatory variables to accounting income data.

One of the interesting findings of this study is that spread and leverage interactions matter in the association with CARs even though change in spread and change in leverage both have relatively small means with very highly peaked distributions. Therefore, the study presents additional evidence that accounting capital structure data

matters from annual reports and not just in event studies around major capital structure changes. Thus, these findings suggest that further empirical analyses of this association and of the interaction between the spread and leverage may be useful.

One potential opportunity of this theory is the possibility of creating empirical research designs that more accurately reflect firm behavior. The study also lays the groundwork for investment strategy research based on the theoretical model. Portfolios that are chosen using a spread metric have significantly different cumulative abnormal residuals. Thus, a portfolio analysis and regression analysis are presented that mutually support the value of the theoretical model, which is developed in the study. A limitation of this study is that the analysis assumes firm debt to be risk free when, in fact, such debt has risk. Therefore, future theoretical work incorporating the effects of risky debt might also be useful.

NOTES

Data can be obtained from sources identified in the article. The authors will respond to questions of clarification.

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1. If prices in both the real asset and stock markets fully reflect available information and if investors in each have perfect information about their investment options, arbitrage should not be possible. To the extent that investors have less than perfect information, arbitrage is, of course, possible. An overriding restriction is market liquidity to conduct trades.
2. The accounting cost of equity utilized in this study is Modigliani and Miller's (1963) definition, which is shown here in equation (6).
3. Here, accounting measures (based on past costs) provide proxies for the current expected cost of capital. Further research may want to explore this issue.

REFERENCES

Ali, A., and P. Zarowin. 1992. "The Role of Earnings Levels in Annual Earnings-Returns Studies." *Journal of Accounting Research* 30(2): 286–96.

Ball, R., and P. Brown. 1968. "An Empirical Evaluation of Accounting Income Numbers." *Journal of Accounting Research* 6(2) (Supplement): 159–77.

Clinebell, J., D. Kahl, and J. Stevens. 1991. "Spreads between Total Rates of Return on Stocks and Bonds: Is There Information for Asset Allocation?" *Akron Business and Economic Review* 22(2): 184–93.

Collins, D., and S. Kothari. 1989. "An Analysis of the Intertemporal and Cross-Sectional Determinants of Earnings Response Coefficients." *Journal of Accounting and Economics* 11(2/3): 143–82.

Collins, D., M. Pincus, and H. Xie. 1999. "Equity Valuation and Negative Earnings: The Role of Book Value of Equity." *Accounting Review* 74(1): 29–62.

Copeland, T., and F. Weston. 1988. *Financial Theory Corporate Policy*, 3d ed. Reading, MA: Addison-Wesley Publishing Company.

Dhaliwal, D., K. Lee, and N. Gargher. 1991. "The Association between Unexpected Earnings and Abnormal Security Returns in the Presence of Financial Leverage." *Contemporary Accounting Research* 8 (Fall): 20–41.

Easton, P., T. Harris, and J. Ohlson. 1992. "Aggregate Accounting Earnings Can Explain Most of Security Returns: The Case of Long Return Intervals." *Journal of Accounting & Economics* 15 (June/September): 119–42.

Foster, G. 1977. "Quarterly Accounting Data: Time-Series Properties and Predictive Ability Results." *Accounting Review* 52 (January): 1–21.

Jeter, D., and P. Chaney. 1992. "An Empirical Investigation of Factors Affecting the Earnings Association Coefficient." *Journal of Business, Finance & Accounting* 19(6): 839–64.

Kerstein, J., and S. Kim. 1995. "The Incremental Information Content of Capital Expenditures." *Accounting Review* 70(3): 513–26.

Kim, I., K. Chen, and J. Nance. 1992. "Information Content of Financial Leverage: An Empirical Study." *Journal of Business Finance & Accounting* 19 (January): 133–52.

Makradakris, S., S. Wheelwright, and V. McGee. 1983. *Forecasting: Methods.* New York: John Wiley & Sons.

Modigiliani, F., and M. Miller. 1963. "Corporate Income Taxes and the Cost of Capital." *American Economic Review* 53(3): 433–43.

Ohlson, J. 1995. "Earnings, Book Values, and Dividends in Security Valuation." *Contemporary Accounting Research* 28(2): 661–87.

Robichek, A., R. Higgins, and M. Kinsman. 1973. "The Effect of Leverage on the Cost of Equity Capital of Electric Utility Firms." *Journal of Finance* 28 (May): 353–67.

Appendix 2

Analytical Agency Model of Debt/Equity Tradeoff

In this appendix, we develop an analytical agency model of the tradeoff between the debt level and the managerial ownership share of the firm's equity. The external shareholders are represented as the principal, and the managers are represented as the agent. The external shareholders, through the board of directors, decide on the extent of stock ownership by managers. We also assume that they have sufficient control of the firm to effectively determine the debt-equity financing decision. The notations are described in section 2 of the text. Some additional notations that are introduced for the purpose of this appendix are defined as and when they are introduced.

Principal's investment = υI where I is the total investment in the firm.

Debt-holding share of the total investment = βI and Management Share = $(1-\beta-\upsilon)$I. The part of equity owned by the external shareholder is given by $\frac{v}{1-\beta} = k_5$ and the part of equity owned by the manager is given by $\frac{1-v-\beta}{1-\beta} = 1-k_5 = w$. We want to show that, in equilibrium, $\delta w/\delta\beta$ is negative (managerial ownership and debt are substitutes) and that this negative relationship becomes less intensive when the mar-

ginal tax rate t increases, i.e., $\delta^2 w/\delta\beta\delta t$ is positive. We assume that the personal tax rates for the principal and agent are the same and that the output from the firm is taxed immediately.

PRINCIPAL'S PROBLEM

$$\underset{\beta,\upsilon}{Max}\ \frac{\upsilon}{1-\beta}(1-t)[x_1 + P_a(x_2 - x_1) - z\beta I + \beta I(\alpha + \gamma\beta) - y] - k_2(1-\beta-\upsilon)I$$

where x_1, x_2 are the low and high possible EBITs that are realized with probabilities $1 - P_a$ and P_a, respectively.

$\frac{\upsilon}{1-\beta}$ = Principal's share of output

$P_a = P(x_2 \mid a) = 1 - a \qquad P_a^I > 0$ and $P_a^{II} < 0$

y = Non-pecuniary consumption

k_2 = Cost of outside capital that increases with managers getting more control of the firm

α and γ are the parameters of the incremental expected output that the principal receives because of the disciplining effect of debt

MANAGER'S PROBLEM, GIVEN β AND υ

$$\underset{\hat{a},\hat{y}}{Max}\ \frac{1-\beta-\upsilon}{1-\beta}(1-t)[x_1 + P_{\hat{a}}(x_2 - x_1) - z\beta I + \beta I(\alpha + \gamma\beta) - \hat{y}] + k_3 \ln\hat{y} - \hat{a}^2$$

where $k_3 \ln\hat{y}$ is the utility from perquisites, and $\hat{a}^2$ is disutility from effort.

SOLVING MANAGER'S PROBLEM

$$\frac{1-\beta-\upsilon}{1-\beta}(1-t)\left[e^{-a}(x_2 - x_1)\right] - 2a = 0$$

$$\text{or } g(a) = ae^a = \frac{(1-\beta-\upsilon)(1-t)(x_2 - x_1)}{2(1-\beta)}$$

Differentiating with respect to y, we get

$$\text{y: } \frac{1-\beta-\upsilon}{1-\beta}(1-t) = \frac{k_3}{y} \qquad \text{or y} = \frac{k_3(1-\beta)}{(1-t)(1-\beta-\upsilon)}$$

COMPUTING $P_{a\beta}$ AND $P_{a\upsilon}$

$$P_{a\upsilon} = \frac{\delta P_a}{\delta \upsilon} = \frac{\frac{dP_a}{da} \cdot \frac{\delta g}{\delta \upsilon}}{\frac{dg}{da}} \qquad \text{where } \frac{dP_a}{da} = e^{-a},\ \frac{dg}{da} = (1+a)e^{a}$$

Therefore, $P_{a\upsilon} = -\dfrac{(1-t)(x_2 - x_{1)}}{2(1-\beta)e^{2a}(1+a)}$

$$P_{a\beta} = \frac{\delta P_a}{\delta \beta} = \frac{\frac{dP_a}{da} \cdot \frac{\delta g}{\delta \beta}}{\frac{dy}{da}}$$

$$\frac{\delta g}{\delta \beta} = \frac{(1-\beta)[-(1-t)(x_2 - x_1)] + (1-\beta-\upsilon)(1-t)(x_2 - x_1)}{2(1-\beta)^2} = \frac{(1-t)[-\upsilon(x_2 - x_1)]}{2(1-\beta)^2}$$

Therefore, $P_{a\beta} = \dfrac{-\upsilon(1-t)(x_2 - x_1)}{2(1-\beta)^2(1+a)e^{2a}}$

SOLVING PRINCIPAL'S PROBLEM

$$\underset{\beta,\upsilon}{MAX}\ \frac{\upsilon}{1-\beta}(1-t)[x_1 + P_a(x_2 - x_1) - z\beta I + \beta I(\alpha + \gamma\beta) - y] - k_2(1-\beta-\upsilon)I$$

First order condition with respect to υ:

$$\frac{1-t}{1-\beta}[x_1 - P_a(x_2 - x_1) - z\beta I + \beta I(\alpha + \gamma\beta)] + \frac{\upsilon(1-t)}{1-\beta}P_{a\upsilon}(x_2 - x_1) - \frac{k_3}{(1-\beta-\upsilon)}$$
$$- \frac{k_3\upsilon}{(1-\beta-\upsilon)^2} + k_2 I$$

Simplification leads to

$$\frac{1-t}{1-\beta}\left[x_1 + (1-e^{-a})(x_2 - x_1) - z\beta I + \beta I(\alpha + \gamma\beta) - \frac{\upsilon(1-t)(x_2 - x_1)^2}{2(1-\beta)e^{2a}(1+a)}\right]$$
$$- \frac{k_3(1-\beta)}{(1-\beta-\upsilon)^2} + k_2 I = 0$$

First order condition with respect to β:

$$\frac{\upsilon(1-t)}{(1-\beta)^2}[x_1 + P_a(x_2 - x_1) - z\beta I + \beta I(\alpha+\gamma\beta)] +$$
$$\frac{\upsilon(1-t)}{(1-\beta)}[P_{a\beta}(x_2 - x_1) + I(\alpha - z + 2\gamma\beta)] - \frac{\upsilon k_3}{(1-\beta-\upsilon)^2} + k_2 I = 0$$

Substituting for P_a, $P_{a\beta}$, simplifying and letting

$A = x_1 + (1 - e^{-a})(x_2 - x_1) - z\beta I + \beta I(a + \gamma\beta)$; $B = (x_2 - x_1)$; $C = 2e^{2a}(1 + a)$;

$$k_5 = \frac{\upsilon}{1 - \beta}; \; w = 1 - k_5;$$

we get $(1 - w)(1 - t)(a - z + 2\gamma\beta) + k_2 w = 0$ *Note that* $(a - z + 2\gamma\beta) < 0$

(Note that if the expression in the parenthesis is not negative, this will lead to an extreme solution with 100% debt financing.)

Differentiating this equilibrium condition with respect to β, we get

$\frac{dw}{d\beta} = \frac{2(1 - w)(1 - t)}{(1 - t)(a - z + 2\gamma\beta) - k_2} < 0$ because the denominator is negative and the numerator is positive. This shows the negative relationship between w and β.

Further differentiating $dw/d\beta$ with respect to t, we get

$$\frac{d^2w}{d\beta dt} = \frac{2(1 - w)k_2}{[(1 - t)(a - z + 2\gamma\beta) - k_2]^2} > 0$$

This shows that the negative value of $dw/d\beta$ becomes less negative as the marginal tax rate t increases.

REFERENCE

Seetharam, A., Z. Swanson, and B. Srinidhi. 2001. "Analytical and Empirical Evidence of the Impact of Tax Rates on the Trade-off between Debt and Managerial Ownership." *Journal of Accounting Auditing & Finance* 16 (Summer): 249–72.

Appendix 3

Leverage Information for Stocks during a "Deleveraging" Period

Zane Swanson

ABSTRACT

Lower interest rates and a recession caused the "deleveraging" of U.S. firms during the late 1980s and early 1990s. This period of significant change presents an opportunity to examine capital structure agency theory propositions. For that purpose, this study has a development of a capital structure model for firm value. The firm value model is a perpetuity of earnings divided by a discount rate. The discount rate is hypothesized to be a function of debt and equity agency costs. The agency debt cost is proposed to be *directly* proportional to leverage. The agency equity cost is proposed to be *inversely* proportional to leverage. The empirical regression findings are as predicted by the model. Earnings have a positive association with the market. The agency cost measures have negative associations with the market, but not under all earnings conditions.

INTRODUCTION

Business Week (1994) cites a survey showing that from the late eighties to the present time firms have sought to reduce the amount of leverage. Kahn (1992) categorizes several reasons for this trend (e.g., the decline in interest rates caused firms to refinance). If the firm is viewed as a nexus of contracts (Jensen and Meckling 1976), then leverage is a key variable in the tradeoff of equity and debt as firm inputs. Management will endeavor to lower the weighted average cost of capital in order to maximize firm value. Even if firms did not refinance during this period, investors compared them in the stock market against firms that did. This deleveraging period offers the most useful opportunity in recent times to analyze firm leverage phenomena.

With the increased focus on leverage by investors, the leverage information should have more pronounced effects on security returns. To test this supposition, the study has a development of a model of firm value that depends on leverage. Consequently, this model presents further research opportunities because leverage is a relevant factor for the prediction and feedback of cash flow information (Ravid and Sarig 1991), and this study also contributes a useful research formulation for investment valuation purposes. The model gives a basis for hypotheses and a regression equation to measure the association of security returns and leverage. The regression does have overall significance (α = .05). The individual independent variable associations with returns are in the predicted directions and are significant (α = .05), particularly when earnings are classified as transitory.

The study's next section develops a leverage information content theoretical model that shows how leverage relates to security returns. The third section has the hypotheses and covers the empirical procedures used to test the hypotheses. Findings are in the fourth section and the final section contains conclusions.

CAPITAL STRUCTURE FRAMEWORK

The specification of firm value from its capital structure is a heavily researched finance topic (Harris and Raviv 1991). Harris and Raviv (1991) generalize five categories of determinants of capital structure (e.g., agency costs). This paper focuses on the agency approach because of its general applicability to all firms during the late 80's and early 90's. Agency conflicts will affect investors' perceptions of debt and equity costs, and consequently, agency costs impact on the rate that investors use to discount the firm's future cash flows. Thus, agency costs affect investors' determination of firm value from the firm financial statements. If agency costs are manifested in a leverage effect, then a conceptual chain exists in which firm value is a function of leverage. The

next several paragraphs present a development of a symbolic formulation of this proposition.

Given the objective of developing a model of firm value that is a function of leverage, some steps are necessary to minimize the potential complexity of the problem. This development uses simplifying assumptions which are:

1) Taxes are zero,

2) There is a simple capital structure of only debt and equity,

3) The firm has perpetual life,

4) The firm has a fixed size, and

5) Perfect market conditions exist.

Under these assumptions, firm value (V) is a perpetuity as per equation [1]. Net income (NI) is presumed to be always the same because firm size is fixed.

$$V = NI/R \tag{1}$$

where:

V = firm market value,

NI = net income available to common shareholders, and

R = discount rate.

Jensen and Meckling (JM) (1976) originated an agency theory framework applicable to a firm's cost of capital. This paper's development will use part of their agency cost theory in the depiction of the discount rate R. JM's agency model does require the presence of an owner-manager, but this restriction is not onerous because the vast majority of firms do have some long-term equity compensation plan. JM use agency theory logic to propose that the mix of debt and equity in the capital structure affects the firm's cost of capital. Following their lead, this paper offers relation [2] that describes the discount rate as a function of the agency cost of debt and equity. This relation represents a fundamental connection that investors are presumed to make between investors' demanded return and their risk of management taking advantage of them by imposing agency costs.

$$R = f(Cost\{D\},Cost\{E\}) \tag{2}$$

where:

Cost{D} = agency debt cost, and

Cost{E} = agency equity cost.

The next step is to relate agency costs of debt and equity to firm leverage. For this purpose, a basic proposition is that the agency debt cost is directly proportional to the debt fraction of the total capital structure. Equation [3] is a formulation of the proposition. The logic for the proposition is JM's assertion that debt rates will rise as debt becomes a higher fraction of the capital structure, because of an increase in monitoring cost and the propensity of the managers to reallocate wealth to themselves.

$$\text{Cost}\{D\} = \lambda_d \, [D/(D+E)] \tag{3}$$

where:

λ_d = a proportionality factor for the debt rate,

D = firm debt, and

E = firm equity.

A second basic proposition is that equity rates (and consequent equity cost) are inversely proportional to the debt fraction of the total capital structure. Equation (4) is a formulation of this proposition. JM hypothesize that the equity agency costs increase as the equity financed portion of the firm increases, because management has more incentive to exploit the outside owners.

$$\text{Cost}\{E\} = \lambda_e \, [1/(D/(D+E))] \tag{4}$$

where:

Cost{E} = equity cost, and

λ_e = a proportionality factor for the equity rate.

The relation of leverage and rates is not going to be linear as per the following diagram from Jensen and Meckling (1976).

The ideas of equations [1], [2], [3] and [4] are summarized in equation [5] which is a model of firm value in terms of earnings, the agency cost of debt and the agency cost of equity.

$$V = \frac{NI}{\lambda_d [D/(D+E)] + \lambda_e \left[\frac{1}{D/(D+E)}\right]} \tag{5}$$

HYPOTHESES AND EMPIRICAL DESIGN

Equation [5] provides three testable hypotheses. The first hypothesis is a model validation proposition that earnings has a positive association with firm value. Kormendi and Lipe (1987) and many others have shown significant empirical validation of the earnings response coefficient (ERC) model. The second hypothesis proposes that the cost of debt proxy will have a negative association with firm value. The third hypothesis advances the position that the cost of equity proxy will have a negative association with firm value. The expected outcome is a rejection of the null of each hypothesis according to the previous discussion. The hypotheses are:

H1a: A positive association exists between earnings and firm value.

H2a: A negative association exists between a proxy for debt cost and firm value.

H3a: A negative association exists between a proxy for equity cost and firm value.

The next step is the formulation of a regression equation to test the hypotheses. To simplify notation, leverage L_t will describe $D_t/(D_t + E_t)$. Thus, a statement of equation [5] will be that V_t is a function $f\{NI_t, \lambda_d L_t, \lambda_e(1/L_t)\}$. There are two important aspects of empirical testing relations between firm value and firm specific variables which are: (1) firm stock market values are investors' cumulative expectations, and (2) earnings and leverage data are point estimates. The consequence of these two aspects is an empirical formulation that regresses security returns with earnings differences, debt proxy cost differences and equity proxy cost differences. The earnings difference variable is divided by the prior period's price to alleviate the heteroskedasticity size problem (Christie 1987).

The relation of leverage and rates is not going to be linear as per the following diagram from Jensen and Meckling (1976). See Figure 1. Therefore, a transform of the leverage factor data is taken. The square root of the leverage factor is used because it is simple.

The resultant regression equation is:

$$CAR_t = \alpha + \gamma_1 UX_t + \gamma_2 \Delta DEBT_t + \gamma_3 \Delta EQUITY_t + \varepsilon_t \qquad (6)$$

where:

CAR_t = Cumulative abnormal residual of the sum of $R_t - (a_i + b_i \times RM_t)$ in the event year period,

R_t = return of firm i at month t,

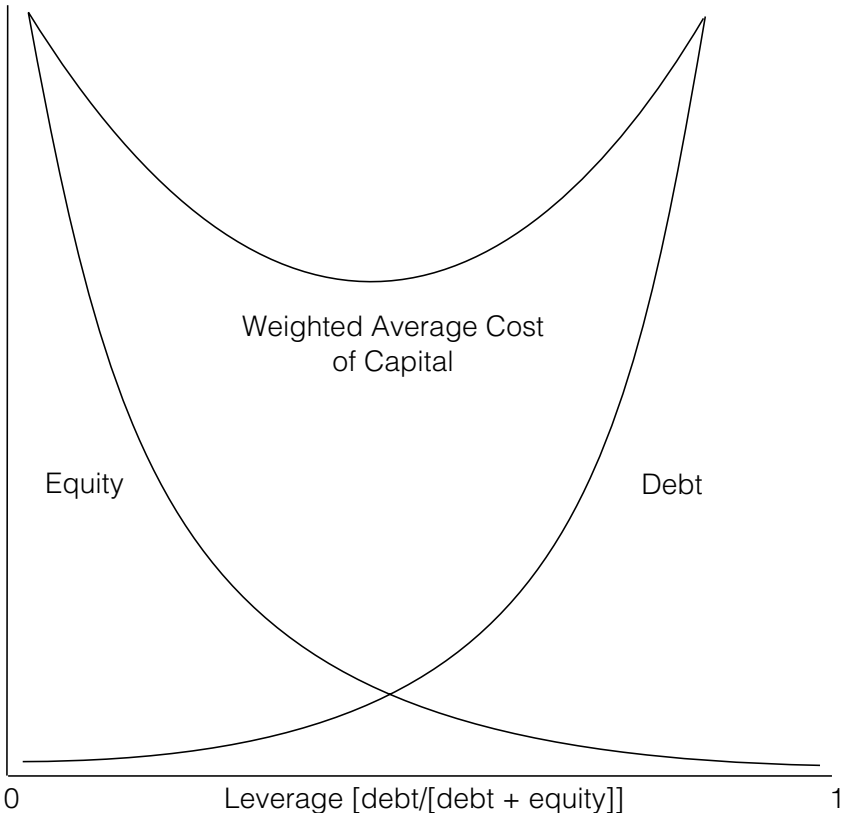


Figure 1 Jensen and Meckling agency cost relation with rates.

a_i,b_i = market model coefficients
RM_t = return of the market at month t,
$UX_t = [EPS_{i,t} - EPS_{i,t-1}]/P_{i,t-1}$,
EPS_t = earnings per share at time t,
P_{t-1} = stock price at time t–1,
$\Delta DEBT_t = DEBT_t - DEBT_{t-1}$,
$DEBT_t = \{D/(D + E)\}^{1/2}$ at time t,
$\Delta EQUITY_t = EQUITY_t - EQUITY_{t-1}$,
$EQUITY_t = \{1/[D/(D + E)]\}^{1/2}$ at time t,
ε_t = error term at time t, and
α, γ_1, γ_2, γ_3 = regression coefficients.

Predicated on the idea that prices lead earnings, Kothari (1992) argues that the earnings process for returns should be expressed as current earnings, as opposed to the difference model he scribed in equation [6]. Therefore, the empirical analysis includes a "levels" empirical formulation according to equation (7) which is:

$$CAR_t = \alpha + \gamma_1 \, ELEVEL_t + \gamma_2 \, DEBT_t + \gamma_3 \, EQUITY_t + \varepsilon_t \qquad (7)$$

where

$ELEVEL = [EPS_t]/P_{t-1}$.

The accrual character of earnings information significantly affects the earnings-return relation (Ali and Zarowin 1992). Investors have concerns about earnings manipulations. In the current study, the leverage analysis is based on an agency cost premise and therefore it is relevant to differentiate firms according to transitory or permanent earnings conditions. This study includes two appropriate subsample analyses. In the spirit of Ou and Penman (1989), the sample is divided into subsamples of permanent and transitory earnings observations. After ranking observations by (EPS_{t-1}/P_{t-1}), the bottom quartile and the top quartile are classified as transitory firms. The middle two quartiles then represent the permanent firms. This categorization creates two equal-sized subsamples for comparison. The results described in the previous discussion should hold for each subsample.

Up to this point, the theoretical development has utilized a leverage ratio using accounting information based on a perfect markets assumption. For the validity of this position, Feltham and Ohlson (1994) argue that firm financial activities concern assets and liabilities which have relatively perfect markets. Thus, they say that book values and market values should coincide for these accounts. However, an argument can be made that investors may regard a firm's stock market value as a better measure than the accounting equity in this situation. Also, the findings of Mulford (1985) on leverage issues influenced the decision concerning the research analysis to include a hybrid ratio which has market equity instead of accounting equity. Therefore, all of the aforementioned analyses are repeated with a hybrid leverage ratio of (long-term debt) divided by (long-term debt + market value of equity).

The data is extracted from Compustat using years 1988 through 1990. The analysis uses annual data, because the focus in this paper is on long-term firm attributes. The study uses only industrial stocks of SIC 2000 up to SIC 4000 to assure a sample of similar underlying characteristics. Each Compustat data point has valid: current and prior period earnings before extraordinary items, current and prior period long-term debt, current and prior period equity, and the stock price at the prior

period balance sheet date. A computer procedure further screened the valid Compustat data so that corresponding CRSP (NYSE and AMEX exchanges only) security monthly return information is present. Monthly returns of the five years preceding the event year are used to estimate the market model parameters. CAR is the sum of market model abnormal returns in each month of the announcement year.

EMPIRICAL RESULTS

Descriptive Statistics

Table I provides a summary of the sample data and no large outlier appears present. A frequency analysis was made according to two-digit SIC industry codes. No SIC category has an extremely large proportion, the largest being no greater than thirteen percent

Simple correlation information is presented in Table II. A purpose of this table is to show the extent to which independent variables relate to each other (i.e., the apparent multicollinearity). The debt and equity

TABLE I Descriptive Statistics

Variable	*Mean*	*Std Deviation*
CAR_t	–.03430	.33462
$ELEVEL_t$	.05542	.13110
$ADEBT_t$	.54375	.18578
$AEQUITY_t$	2.44256	3.15745
$HDEBT_t$	.48371	.20426
$HEQUITY_t$	3.24432	6.79467
UX_t	.00755	.16119
$\Delta ADEBT_t$	.00791	.09363
$\Delta AEQUITY_t$	.05435	2.65488
$\Delta HDEBT_t$	.01335	.10036
$\Delta HEQUITY_t$	–.06097	5.38487

The variables are defined as follows:
$ADEBT_t = \{debt_A/(debt_A + equity_A)\}^{1/2}$,
$AEQUITY_t = \{1/[debt_A/(debt_A + equity_A)]\}^{1/2}$,
$HDEBT_t = \{debt_A/(debt_A + equity_M)\}^{1/2}$,
$HEQUITY_t = \{1/[debt_A/(debt_A + equity_M)]\}^{1/2}$,
$debt_A$ = long-term debt from accounting data at time t,
$equity_A$ = equity from accounting data at time t,
$equity_M$ = equity from market data at time t,
$\Delta ADEBT_t = ADEBT_t - ADEBT_{t-1}$,
$\Delta AEQUITY_t = AEQUITY_t - AEQUITY_{t-1}$,
$\Delta HDEBT_t = HDEBT_t - HDEBT_{t-1}$, and
$\Delta HEQUITY_t = HEQUITY_t - HEQUITY_{t-1}$.

TABLE II Correlation Analysis
Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 822

	Panel A "Levels" Variables				
	CAR_t	$ELEVEL_t$	$ADEBT_t$	$AEQUITY_t$	$HDEBT_t$
$ELEVEL_t$	.280**				
$ADEBT_t$	-.044	-.133**			
$AEQUITY_t$	-.050	-.028	-.560**		
$HDEBT_t$	-.149**	-.220**	.871**	-.476**	
$HEQUITY_t$	-.003	.006	-.437**	.918**	-.411**

	Panel B "Differences" Variables				
	CAR_t	UX_t	$\Delta ADEBT_t$	$\Delta AEQUITY_t$	$\Delta HDEBT_t$
Ux_t	.215**				
$\Delta ADEBT_t$	-.055	-.158**			
$\Delta AEQUITY_1$	-.057	.034	-.449**		
$\Delta HDEBT_t$	-.418**	-.167**	.791**	-.335**	
$\Delta HEQUITY_t$	.028	.001	-.289**	.888**	-.208**

* = .05 significance, ** = .01 significance

variables do have correlations greater than .5. Therefore, all regressions had variance inflation factor tests. None of the variance inflation factors were greater than ten (a rule of thumb for multicollinearity problems (Kennedy 1986)). This evidential matter is in Table III.

Hypotheses Findings

The earnings response coefficient γ_1 is always positive and significant (α = .01) in Table III, which is as predicted. As a validity check, the coefficient γ_1 in the permanent earnings subsample is higher than the coefficient γ_1 in the transitory earnings subsample. These findings concur with Ali and Zarowin (1992). Thus, the results reject the null of Hypothesis One and this conclusion is consistent with prior literature. All t tests are one-tailed because the hypotheses have direction predictions.

For the accounting ratio data in panel A of Table III, the cost of debt and equity proxies are never significant (α = .05) under permanent earnings conditions. Also, the cost of debt proxy is not significant (α = .05) in the subsample with the "levels" model. In all other cases, the sign is the predicted negative for both the proxy for debt agency cost and equity agency cost, and the coefficients are significant (α = .05). When earnings conditions are transitory, investors appear to utilize agency

TABLE III

Panel A: Regressions for Accounting Ratio Data						
	Differences Equation[6]			*Levels Equation [7]*		
Coeff.	*All*	*Permanent*	*Transitory*	*All*	*Permanent*	*Transitory*
α	-.035	-.039	-.029	-.011	-.215	.097
	(-3.06)**	(-3.00)**	(-1.54)	(-.23)	(-2.72)**	(1.11)
γ_1	.432	.774	.397	.696	2.474	.668
	(6.04)**	(3.57)**	(4.56)**	(8.00)**	(3.29)**	(6.54)**
	[1.03]	[1.00]	[1.05]	[1.03]	[1.01]	[1.05]
γ_2	-.228	-.209	-.486	-.081	-.031	-.181
	(-1.66)*	(-1.27)	(-2.08)*	(-1.09)	(-.37)	(-1.42)
	[1.29]	[1.13]	[1.65]	[1.51]	[1.47]	[1.51]
γ_3	-.012	-.003	-.035	-.007	.004	-.023
	(-2.43)**	(-.60)	(-3.30)**	(-1.65)*	(.94)	(-3.00)**
	[1.25]	[1.13]	[1.59]	[1.48]	[1.47]	[1.48]
F	15.415**	4.853**	11.901**	24.273**	4.401**	20.302**
R^2	.0535	.0345	.0806	.0817	.0314	.1302
R^2_{adj}	.0500	.0274	.0739	.0784	.0243	.1238
Obs	822	411	411	822	411	411

Panel B: Regressions for Hybrid Ratio Data						
	Differences Equation[6]			*Levels Equation [7]*		
Coeff.	*All*	*Permanent*	*Transitory*	*All*	*Permanent*	*Transitory*
α	-.019	-.020	-.019	.028	-.165	.170
	(-1.78)	(-1.60)	(-1.14)	(.77)	(-2.37)**	(2.54)**
γ_1	.306	.578	.254	.653	2.373	.616
	(4.65)**	(2.82)**	(3.22)**	(7.44)**	(3.17)**	(5.99)**
	[1.03]	[1.02]	[1.05]	[1.06]	[1.01]	[1.09]
γ_2	-1.351	-1.137	-1.69	-.186	-.130	-.357
	(-12.48)**	(-7.63)**	(-9.81)**	(-3.02)**	(-1.75)*	(-3.35)**
	[1.08]	[1.04]	[1.38]	[1.28]	[1.22]	[1.28]
γ_3	-.004	-.002	-.028	-.003	.002	-.011
	(-1.77)*	(-.92)	(-3.30)**	(-1.39)	(.97)	(-3.13)**
	[1.05]	[1.03]	[1.33]	[1.21]	[1.21]	[1.20]
F	67.941**	24.322**	43.204**	26.573**	5.946**	22.459**
R^2	.1995	.1520	.2415	.0888	.0420	.1420
R^2_{adj}	.1965	.1458	.2359	.0855	.0349	.1357
Obs	822	411	411	822	411	411

(t-statistics) * = .05 significance, ** = .01 significance, [variance inflation factors]

cost considerations to value stock investments. On the other hand, these findings suggest that agency cost considerations are not part of the paradigm that investors use when they evaluate firm value if the earnings are permanent in nature.

With respect to the hybrid ratio data in panel B of Table III, the cost of debt coefficient γ_2 is always negative and significant (α = .05). The cost of equity proxy is significant (α = .01) and negative for transitory

earnings conditions. However, the cost of equity proxy is not significant (α = .05) for permanent earnings conditions. When the agency cost proxy variables have significant coefficients, the sign is in the predicted negative direction

The importance of the cost of debt and equity information is affected by whether or not the accrual character of earnings is permanent or transitory. The evidence indicates the nulls of the second and third hypotheses are rejected under transitory earnings conditions, but not under permanent earnings conditions.

CONCLUSIONS

During a period when firms were reducing debt, a valuation model shows that the effects of debt cost and equity cost are important to investors, but the effects tended to be significant under transitory earnings conditions. The results confirm the validity of the paper's valuation model. Earnings always has a positive association with CAR that is significant (α = .01). When the debt and equity proxy cost variables are significant, they have a negative association with CAR, which is in the predicted direction.

The major purpose of this study is to examine whether agency debt costs and equity costs are important to investors during a time of important leverage changes. Investors do appear to consider agency cost factors when earnings are transitory but not when earnings are permanent. An obvious observation is that investors want more information for valuation purposes when earnings appears transitory in nature. It appears that investors are suspicious of management's financial statement information if there is any indication of earnings manipulation or other temporary earnings condition.

Opportunities for further research appear to exist for the investigation of the value of balance sheet information for investors. Further studies could address other causes for the lack of significant findings for the debt and equity cost variables under permanent earnings conditions. Another prospective research direction could follow the idea that the income statement and balance sheet reports are a complete system that investors use to assess a stock's market value. Incorporating a capital structure theory perspective with earnings analysis gives a potentially powerful approach to the identification of firm value.

REFERENCES

Ali, Ashiq, and Paul Zarowin. 1992. "The Role of Earnings Levels in Annual Earnings-Returns Studies." *Journal of Accounting Research*: 286–96.

Business Week. 1994. "The Big Picture." *Business Week* (June 13): 8.
Christie, Andrew. 1987. "On Cross-Sectional Analysis in Accounting Research." *Journal of Accounting and Economics*: 231–58.
Feltham, Gerald, and James Ohlson. 1994. "Valuation and Clean Surplus Accounting for Operating and Financial Activities." *Contemporary Accounting Review*. forthcoming.
Harris, Milton, and Arthur Raviv. 1991. "The Theory of Capital Structure." *Journal of Finance*: 297–355.
Jensen, Michael, and William Meckling. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." *Journal of Financial Economics*: 305–60.
Kahn, Sharon. 1992. "Deleveraging: America Fights Its Debt Habit." *Management Review*: 10–15.
Kennedy, Peter. 1986. *A Guide to Econometrics*. Cambridge, MA: MIT Press.
Kormendi, Roger, and Robert Lipe. 1987. "Earnings Innovations, Earnings Persistence and Stock Returns." *Journal of Business*: 323–45.
Kothari, S. 1992. "Price-earnings Regressions in the Presence of Prices Leading Earnings: Earnings Level versus Change Specifications and Alternative Deflators." *Journal of Accounting & Economics*: 173–202.
Mulford, Charles. 1985. "The Importance of a Market Value Measurement of Debt in Leverage Ratios: Replication and Extensions." *Journal of Accounting Research*: 897–906.
Ou, Jane, and Stephen Penman. 1989. "Accounting Measurement, Price-Earnings Ratio, and the Information Content of Security Prices." *Journal of Accounting Research*: 111–52.
Ravid, Abraham, and Oded Sarig. 1991. "Financial Signalling to Cash Outflows." *Journal of Financial and Quantitative Analysis*: 165–80.

Appendix 4

Interview Questions

Questions 1 through 14 are from Scott and Johnson (1982).

1. In making financing decisions, does your firm use some measure of financial leverage (e.g., a debt-to-equity ratio or times-interest-earned ratio) as a constraint on the mix of debt and common equity funds employed? (Please check below.)
   Yes_____ No_____
2. Who is most important (influential) to you in setting your firm's target financial structure ratios? (Indicate the most important with a 1, next most important with a 2, etc.) Check NA if not influential at all.
   _____Our own management and staff of analysts
   _____Investment bankers
   _____Commercial bankers
   _____Trade creditors (suppliers)
   _____Outside security analysts
   _____Comparison with ratios of industry competitors
   _____Other (Please specify_____)

3. How does your firm measure the degree of financial leverage used? Please rank the following financial leverage measures in order of their importance in your firm's financing decision procedures. (Indicate the most important with a 1, next most important with a 2, etc.)
   _____a. Total liabilities divided by total assets (the debt ratio)
   _____b. Long-term debt divided by total debt plus net worth (the long-term debt-to-total capitalization ratio)
   _____c. Common equity divided by total assets (the common equity ratio)
   _____d. Long-term debt divided by total assets (the long-term debt ratio)
   _____e. Long-term debt divided by net worth (the long-term debt to net worth ratio)
   _____f. Earnings before interest and taxes divided by total interest expense (the times-interest-earned ratio)
   _____g. Earnings before interest and taxes divided by interest expense plus the before-tax equivalent of preferred dividend payments (the times-interest and preferred dividend coverage ratio)
   _____h. Earnings before interest and taxes plus rent expense (i.e., lease payments) plus depreciation expense divided by interest expense plus the before-tax equivalent of preferred dividend payments plus rent expense (i.e., lease payments) (the cash-flow coverage ratio)
   _____i. Other (Please identify_____)
4. If your firm leases equipment, does your calculation of the various financial leverage measures recognize (allow for) the fixed lease payment as a financing charge similar to interest expense? (Please check below.)
   Yes_____ No_____
5. If your firm computes and use a debt-to-equity ratio in financing decisions, how is it calculated? By using: (Please check below.)
   _____1. Book values (that is values for debt and equity components that appear on the balance sheet)
   _____2. Market values (that is the current values for the debt equity components obtainable in the marketplace)
6. Does your firm believe that there is a functional relationship between capital costs and the amount of debt that a firm utilizes in its financial structure? (Please check below.)
   Yes_____ No_____
7. Does your firm believe that the use of a "proper" amount of debt in the capitalization (as opposed to none, or too much) will result

in a lower overall cost of capital to the corporation? (Please check below.)
Yes_____ No_____

8. Is the concept of an industry norm (standard debt ratios for similar lines of business as your own) ever used by your firm in arriving at a financing decision? (Please check below.)
Yes_____ No_____
9. Does your firm believe that the use of an excessive amount of debt will eventually result in an increase in the yield (cost) of debt faced by your company? (Please check below.)
Yes_____ No_____
10. Does your firm believe that the use of an excess amount of debt will eventually result in the market price of your common stock being adversely affected? (Please check below.)
Yes_____ No_____
11. What is the target proportion of long-term debt in your firm's capital structure (i.e., as a percent of all long-term sources of financial capital)? (Please fill in below.)
_____ percent
12. Does your firm believe that there is some maximum amount of debt financing that should not be surpassed? (i.e., do you subscribe to the concept of a corporate debt capacity?) (Please check below.)
Yes_____ No_____
13. If your response to question 12 was "yes," how is debt capacity defined? (Please tell us in a sentence or two below).

_____

_____

14. Does the financial theory concept of "systematic risk" as typically measured by what are called "beta coefficients" ever affect your financial structure policy? (Please check below.)
Yes_____ No_____

Questions 15 through 20 are from Pinegar and Wilbricht (1989) and Klamath (1997).

15. In raising new funds, your firm
    a. _____ Seeks to maintain a target capital structure by using approximately constant proportions of several types of long-term capital simultaneously.
    b. _____ Follows a hierarchy in which the most advantageous sources of funds are exhausted before other sources are used.

16. Rank the following sources of long-term funds in order of preference for financing new investments
(1 = first choice, 6 = last choice).
a. _____ Internal equity (retained earnings)
b. _____ External common equity
c. _____ Straight debt
d. _____ Convertible debt
e. _____ Straight preferred stock
f. _____ Convertible preferred stock
17. Please indicate the relative importance of the following considerations in governing your firm's financing decisions.
On a scale of 1 to 5, where 1 = Important and 5 = Unimportant.)
a. _____ Maximizing prices of publicly traded securities
b. _____ Maintaining financial flexibility
c. _____ Ensuring long-term survivability of the firm
d. _____ Maintaining financial independence
e. _____ Maintaining comparability with firms in the industry
f. _____ Maintaining a high debt rating
g. _____ Maintaining a predictable source of funds
18. Approximately what percent of the time would you estimate that your firm's outstanding securities are priced fairly by the market?
a. _____ More than 80 percent of the time
b. _____ Between 50 and 80 percent of the time
c. _____ Less than 50 percent of the time.
19. Given an attractive new growth opportunity that could not be taken without departing from your target capital structure of financing hierarchy, cutting the dividend, or selling off other assets, what action is your firm most likely to take?
(Check the item.)
a. _____ Forego the growth opportunity
b. _____ Deviate from the target capital structure or financing hierarchy
c. _____ Cut the dividend
d. _____ Sell off other assets
20. Indicate the relative importance of the following factors in governing your firm's financing decisions.
(On a scale of 1 to 5, where 1 = Important and 5 = Unimportant)
a. _____ The corporate tax rate
b. _____ Personal tax rates of your debt and equity holders
c. _____ The level of depreciation and other non-debt tax shields
d. _____ Costs of bankruptcy (potential financial distress)
e. _____ Voting control
f. _____ Restrictive covenants of senior securities

g.____ Projected cash flow or earnings from the assets to be financed
h.____ Riskiness of the assets to be financed
i. ____ Avoiding dilution of common shareholders' claims
j. ____ Avoiding mispricing of securities to be issued
k.____ Correcting mispricing of outstanding securities

21. In your opinion, the debt-to-equity ratio of your firm depends on: (On a scale of 1 to 5, where 1 = Important and 5 = Unimportant)
a.____ Past profits
b.____ Average debt-to-equity ratio in your industry
c. ____ Past growth
d.____ Degree of diversification achieved by your firm
e. ____ Past dividend payout

REFERENCES

Kamath, R. 1997. "Long-Term Financing Decisions: Views and Practices of Financial Managers of NYSE Firms." *Financial Review* 32 (May): 331–56.

Pinegar, M., and L. Wilbricht. 1989. "What Managers Think of Capital Structure Theory: A Survey." *Financial Management* 18 (Winter): 82–91.

Scott, D., and D. Johnson. 1982. "Financing Policies and Practices in Large Corporations." *Financial Management* 11 (Summer): 51–59.

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