

SAVING CORPORATIONS FROM THEMSELVES?

IMPOSING LIMITS ON CORPORATE DEBT

A REPORT BY NATHAN ASSOCIATES INC.

FOR THE IRVING ZUCKERMAN TRUST



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ARLINGTON, VIRGINIA

Contents

| | |
|---|----|
| Preface | i |
| Executive Summary | 1 |
| 1. Introduction | 3 |
| 2. Background | 5 |
| Early Theory Predicts Debt Levels Vary Randomly | 6 |
| With Less Restrictive Assumptions Early Theory Predicts Capital Structures Consist Entirely of Debt | 6 |
| Trade-off Theory Predicts Debt Levels Vary Systematically | 6 |
| Debt Provides Incentive for Greater Efficiency and Profit | 7 |
| Relevant Propositions | 8 |
| 3. Methods | 9 |
| Comparing Industry Debt Levels | 9 |
| Comparing Healthy and Financially Distressed Corporations..... | 12 |
| Considering a Specific Rule..... | 13 |
| 4. Data | 15 |
| 5. Results | 20 |
| Debt Levels Vary Across Industries | 20 |
| Debt Levels Vary Systematically..... | 20 |
| Little Evidence of Significant Differences in the Distributions of Debt Levels of Healthy Corporations and Corporations in Financial Distress..... | 21 |
| Implications for a Debt-Limiting Rule | 22 |
| Benefit-Cost Ratio of Rule Does Not Justify Debt Limits | 24 |
| Eliminating Tax Code Biases Favoring Debt Is an Alternative to Limiting Debt Levels..... | 25 |
| References | 26 |
| Appendix A. Industry Characteristics | |
| Appendix B. Unemployment and Gross Domestic Product (GDP) | |
| Appendix C. ANOVA Regression Results | |
| Appendix D. OLS Regression Results | |
| Appendix E. Impact of Debt Limits on Weighted Average Cost of Capital | |

ILLUSTRATIONS

Tables

| | |
|---|----|
| Table 3-1. Industry Definitions | 10 |
| Table 4-1. Corporations in Database by Industry, 1977-2001 | 16 |
| Table 4-2. Corporations in Database by Year, 1977-2001 | 16 |
| Table 4-3. Industries of Highest and Lowest Values of Factors Affecting Debt, 2001 | 17 |
| Table 4-4. Industry Characteristics, 2001 | 17 |
| Table 4-5. Corporations in Financial Distress by Reason for Delisting, 1977-2001 | 18 |
| Table 4-6. Healthy Corporations and Those in Financial Distress by Industry, 1977-2001 | 18 |
| Table 4-7. Healthy Corporations and Those in Financial Distress by Year, 1977-2001 | 19 |
| Table 5-1. Debt Levels by Industry, 1977-2001 | 21 |
| Table 5-2. Debt Levels of Healthy and Financially Distressed Corporations by Industry | 22 |
| Table 5-3. Debt Levels of Healthy and Financially Distressed Corporations by Year | 23 |
| Table 5-4. Reach of a Hypothetical Rule | 25 |

Figures

| | |
|--|---|
| Figure 1-1. Primary Functions of a Business Corporation | 5 |
|--|---|

Preface

Major funding for this study was provided by the Irving Zuckerman Trust. The study was undertaken as the result of a bequest by Mr. Zuckerman, a civil servant and close friend of Robert R. Nathan. In his will, Mr. Zuckerman requested that Nathan Associates Inc. conduct a study of the feasibility of a law limiting the extent to which non-financial corporations could rely on debt to finance their investment activities. He suggested that the law might require companies to reduce their debt ratios “possibly and eventually down to fifty percent (50%).” As a man who was influenced by his experience of the Great Depression, Mr. Zuckerman’s hope was expressed in his stated purpose for limiting debt, “... to increase the flow of taxes to governments to help deal with deficits and to reduce vulnerability during slumps ...”

Nathan Associates Inc. is fully responsible for the study. Robert J. Damuth, Vice President, authored the paper. Ramji Tamara, Ph.D., led the econometric analysis. The statistical analysis was led by John Ramirez.

We gratefully acknowledge the contributions of Michael T. Maloney, Professor of Economics, Clemson University; David A. Walker, Professor and John A. Largay Scholar and Director, Capital Markets Research Center, Georgetown University; and Peter Wagner, Executor of Mr. Zuckerman’s estate and former Senior Economist at the Federal Reserve Board and Economist at the U.S. Department of Commerce.

Executive Summary

In its financing function, a corporation raises funds (capital) from investors and lenders by issuing equity (stocks) or debt (bonds) or both. Equity carries no binding promise of repayment. Instead, it gives equity holders claim to a share of profits, without promising that profits will be earned. Debt carries a promise by the corporation to repay lenders the loan amount plus a certain amount in interest over a specified term. The promise to lenders is binding regardless of the performance of the corporation.

Fifty years of development in the theory of corporate finance has led to general acceptance of several propositions regarding the choice between equity and debt and, hence, the amount of debt in the capital structures of corporations. First, debt levels¹ are likely to vary by industry and the unique conditions and circumstances of a corporation. Second, corporations choose to use debt when the benefits of debt outweigh the costs of debt. Third, the benefits of debt derive from the discipline it imposes on managers, plus the tax savings that it affords. And fourth, the costs of debt are the legal, accounting, and business costs associated with restructuring or liquidating as a result of failing to honor promises to lenders, a failing that has greater probability of occurring as debt levels increase.

These propositions suggest that debt levels vary systematically and are in some sense optimal. By striking a balance between the benefits and costs of debt, a corporation protects itself against debt levels that are too high.

Nevertheless, during and after recessions it is not unusual to hear calls for limiting the amount of debt held by corporations. Such calls are founded on the belief that “high levels” of debt cause corporate failures.

In this paper we analyze the economic feasibility of imposing limits on debt levels by answering two questions: (1) To the extent that we can quantify the benefits and costs of limiting debt levels, are the benefits greater than the costs and (2) Recognizing that we cannot quantify all of the benefits and costs, is imposing limits on debt levels a practical way of reducing the likelihood and costs of financial distress?

To answer the first question, we consider the impact of a hypothetical debt-limiting rule on a sample of non-financial corporations from 1977 to 2001. Under the rule, each industry has its own debt level limit. For any given industry, the limit is the average debt level of the industry’s corporations that faced financial distress sometime between 1977 and 2001.

The rule adversely affects healthy corporations that must reduce their debt levels. Requiring these corporations to lower their debt levels increases their after-tax cost of raising capital. As a result, some investments made without the rule are not made with the rule and economic growth slows. The higher cost of capital, lower rate of investment, and slower economic growth are all costs of the debt-limiting rule.

On the other hand, lowering debt levels lowers the likelihood of financial distress. Therefore, the benefits of a debt-limiting rule are the costs of financial distress avoided as a result of the rule.

If our rule had been in effect from 1977 to 2001, it would have interfered with the financing decisions of 3,693 corporations that never experienced financial distress and 899 corporations that experienced distress, 116 of which filed for bankruptcy. More than one-third (38 percent) of all healthy corporations would have been directly and adversely affected by the rule.

¹ Debt levels measure the relative amount of debt in capital structures. In this study, debt levels are defined to be long-term debt divided by total assets.

Considering only the benefits and costs we can quantify, the rule's benefit-cost ratio is 0.03. If the rule had prevented all 116 bankruptcies, \$701 million of legal and administrative costs of filing for bankruptcy would have been avoided. At the same time, the weighted average after-tax cost of capital at healthy corporations required to lower their debt levels would have increased from 7.48 percent to 8.06 percent, an increase equivalent to \$23 billion. Although the cost of equity at these firms falls from 11.85 percent to 10.62 percent as debt levels and, concomitantly, the likelihood of financial distress decline, the substitution of equity for less costly debt (the after-tax cost of debt is 3.72 percent) raises the total cost of equity and debt capital.

Given that the debt levels of healthy and distressed corporations are similar, this finding is not surprising. Our analysis reveals a statistically significant difference in the average debt levels of healthy and distressed corporations in only 2 of 21 industries. Moreover, in one of these two industries, healthy corporations have higher debt levels than distressed corporations. Over time, we find a statistically significant difference in only 5 of 25 years, and in two of those five years, healthy corporations are more highly leveraged than distressed corporations. Only in 1982, 1999, and 2000 were corporations that experienced financial distress more highly leveraged than healthy ones. In other words, high levels of debt financing are found in healthy, as well as unhealthy, corporations.

To answer the second question of whether setting debt limits is practical, we analyze debt financing decisions at non-financial corporations to determine whether they are based on financial conditions unique to a corporation and its industry. If they are, setting debt limits would be impractical. Doing so would require as many limits as there are corporations, and the limits would have to change as the financial fundamentals of the corporation changed.

Although there is little evidence of differences in debt levels of healthy and distressed corporations, there is abundant evidence of industry differences in debt levels. Across 21 industries, debt levels range from 13 percent to 44 percent, with a median value of 26 percent.

Debt levels vary systematically from industry to industry. Nearly half of the industry variation is jointly explained by differences in the uniqueness of an industry; the volatility of industry earnings; whether industry earnings are cyclical; industry growth opportunities; the degree to which industry assets are tangible, separable, and of value when sold separately; and the degree to which industry assets are intangible and unassignable as collateral for debt. Industries with higher uniqueness ratios, more volatile earnings, cyclical sales, and intangible assets have lower debt levels. Industries with assets that are separable and of value when sold separately have higher debt levels.

The findings of this study support the propositions of corporate finance theory and do not offer strong support for limiting the amount of debt in the capital structures of non-financial corporations. As stated by Princeton University economist and member of the Board of Governors of the U.S. Federal Reserve System, Ben Bernanke (1989), "Given the importance of improving the performance of U.S. corporations in a competitive international marketplace, it would probably be a severe mistake for the government simply to ... limit leverage."

However, our study does measure benefits from lower debt levels, suggesting that an alternative to legislating debt level limits might be economically feasible. The most likely alternative is tax reform.

Corporate income taxes are levied against the income that goes to equity holders but not against the income that goes to creditors. Interest payments are treated as a deductible item from corporate income. As a result, corporations can lower their income taxes by increasing their debt.

Eliminating this bias in the tax code, which favors the use of debt over equity, might be an effective and economically feasible alternative to legislating debt limits.

1. Introduction

A record number of large corporate bankruptcies accompanied the economic recession of 2001. The loudest corporate collapse was Enron in late 2001, but it was only one of 39 filings of more than \$1 billion in liabilities and 171 filings of more than \$100 million in liabilities (Altman and Arman 2002). Chapter 11 liabilities totaled \$230 billion in 2001. Although the number of large corporate bankruptcy filings declined to 122 in 2002, the total Chapter 11 liabilities of these corporations increased to \$337 billion (Altman and Bana 2003).

The confluence of these negative events raises questions about whether corporations rely too heavily on debt (are too highly leveraged), and if so, whether government intervention is necessary to discourage, if not limit, the use of debt to avoid deep recessions. Such questions are not new. They were addressed in 1938 by the Committee on Debt Adjustment of the Twentieth Century Fund, which investigated the “[m]any different, and not altogether consistent, arguments [that] have been advanced to show that the debts of corporations are a factor in bringing on and accentuating depressions” (Hart 1938). They were addressed again following the recession and merger activity of the 1980s (Kaufman 1986; Bernanke and Campbell 1988; Taggart 1990). Most recently, William A. Niskanen, Chairman of the Cato Institute, weighed in with a paper offering his preliminary opinion on the major policy lessons of the collapse of Enron (Niskanen 2002). The consensus that arises from this literature is that biases in the U.S. tax code that favor debt should be removed.

In this paper, we consider whether government intervention in the form of legislating limits on the amount of debt used by non-financial corporations is feasible (i.e., would the benefits of legislation outweigh the costs). Although feasibility has political, technological, and economic dimensions, we are concerned primarily with the economic dimension.

The evidence from 1977 through 2001 supports three major findings:

- The relative amount of debt in the capital structures of non-financial corporations varies significantly from industry to industry.
- Differences in the use of debt across industries can be explained by economic factors, including asset characteristics, earnings, and cash flows of an industry, as well as expectations of future general economic conditions.
- On average, the relative amount of debt in the capital structures of corporations in financial distress is not significantly different from the amount in the capital structures of healthy corporations.

On the basis of these findings, we conclude that

- Corporate managers make decisions about debt systematically. To impose a rule limiting the amount of debt in the capital structure of a corporation would be to second-guess the informed decisions of corporate managers.
- High levels of debt do not in and of themselves cause corporate failure. Numerous corporations operate successfully with debt levels that are higher than the debt levels of corporations experiencing financial distress or failure. Hence, imposing a debt ceiling would affect healthy as well as unhealthy corporations.
- Considering only (1) the higher cost of capital at healthy corporations that would have been required to lower their leverage rates if debt limits had been in effect between 1977 and 2001 and (2) the administrative and legal costs of bankruptcy filings that might have been avoided if debt limits had been in effect, the benefit-cost ratio of limiting debt does not justify doing so.

In our opinion, debt-limiting legislation would reduce the probability of financial distress for some corporations, but it would have harsh effects for others, restricting their financing options and eroding profitability. Furthermore, given that debt levels within an industry and across years are dispersed, it would be difficult to stipulate a simple rule that could be implemented efficiently and effectively.

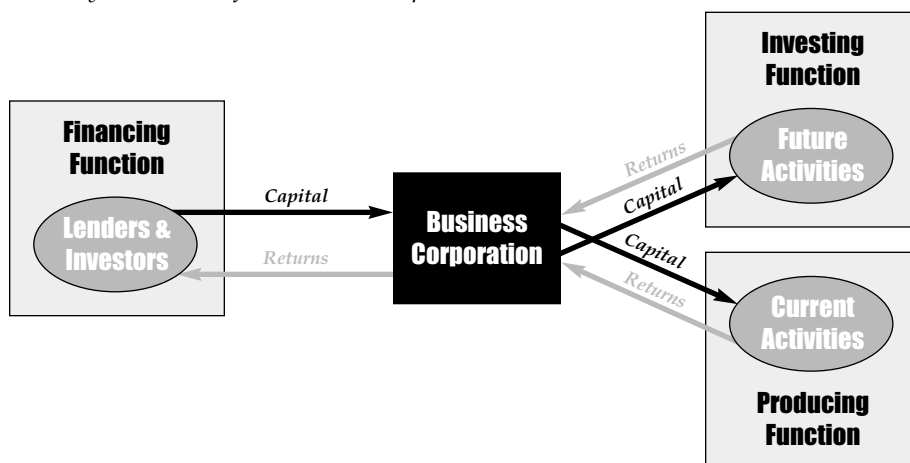
If debt levels are believed to be too high, a more appropriate measure than limiting debt outright would be to remove incentives in the tax code that encourage the use of debt and, by doing so, increase the likelihood of financial distress.

This paper proceeds as follows. Section 2 discusses the basic economics of corporate finance. It also introduces the reader to the major theoretical developments relevant to our study. Section 3 presents our methodology, which includes investigating and testing for differences in the use of debt across industries, identifying factors that might explain the use of debt and testing the explanatory power of these factors using a regression model, and, finally, comparing the debt levels of healthy corporations to those of failed corporations within an industry and in a given year. Section 4 describes the data and their sources. Section 5 presents our findings and conclusions.

2. Background

A business corporation engages in three basic functions: financing, investing, and producing (Figure 1-1). The purpose of the financing function is to raise funds (capital) from lenders and investors. The investing and producing functions allocate these funds to the corporation's future and current activities, respectively, which generate returns that can be retained by the corporation or distributed to lenders and investors.

FIGURE 1-1
Primary Functions of a Business Corporation



In its financing function, a corporation raises funds from lenders and investors by issuing debt (bonds) or equity (stocks) or both.² Debt carries a promise by the corporation to repay lenders the loan amount plus a certain amount in interest over a specified term. The promise is binding regardless of the performance of the corporation. Equity carries no binding promise of repayment. Instead, the issuance of an equity share in the corporation is an offer to share ownership. Ownership carries with it the opportunity to participate in business decisions affecting the firm, as well as opportunities to share profits and losses.

A perceived need to impose limits on corporations' debt levels is based, at least implicitly, on the following assumptions:

- Every corporation has an optimal level of debt.
- Suboptimal levels—primarily those that exceed the optimal—harm the corporation and, in turn, the economy.
- Legislation that would prevent corporations from borrowing beyond a certain level will leave corporations less susceptible to financial distress and benefit the economy.

In this section we are concerned with what the theory of corporate finance has to say about the first of these assumptions. Without an optimal level, there can be no suboptimal levels. Without an optimal level, the "certain" level that leaves corporations more or less susceptible to financial distress is unclear.

² In addition to bonds and stocks, modern corporations can raise capital using hybrids such as convertible bonds and warrants, as well as derivatives, leases, and trade credit.

Although the literature is certainly more extensive than the body of work summarized here, our purpose in this section is to establish the theoretical underpinnings of three general propositions: (1) there is no single “optimal” debt level, but instead numerous optimal levels; (2) debt levels vary systematically across industries based on the unique characteristics of corporations constituting an industry; and (3) costs and benefits of debt finance are weighed against each other when choosing a debt level.

Early Theory Predicts Debt Levels Vary Randomly

The theory of modern corporate finance began with a proof that the choice of debt versus equity, under restrictive assumptions, including no taxes and no bankruptcy costs, does not affect the value of a corporation (Modigliani and Miller 1958). Initially, the cost of debt might be lower than the cost of equity, but because debt obligations must be met first, increasing debt adds risk to the equity of the corporation and, hence, increases the cost of equity. The corporation’s total cost of capital cannot be reduced (and profits increased) by using debt. Profits are increased only by the current and future activities of the producing and investing functions, respectively.

If, as the initial theory suggests, financing decisions do not matter, we would see debt levels distributed randomly across companies and industries, but we don’t. Some industries, such as utilities, rely more heavily on debt. Others, such as pharmaceuticals, rely more heavily on equity. Hence, the initial theory was not predictive.

With Less Restrictive Assumptions Early Theory Predicts Capital Structures Consist Entirely of Debt

Relaxing the restrictive assumptions underlying the initial theory led to quite different conclusions. By including the U.S. corporate income tax it was demonstrated that capital structures should consist entirely or nearly entirely of debt (Modigliani and Miller 1963). Dividends paid to equity holders are included in taxable corporate income, but interest payments to debt holders are not. In other words, corporations can shield income from taxation by using debt instead of equity. Doing so reduces taxes and increases profits. Inclusion of the U.S. individual income tax reduces but does not eliminate the advantage of debt (Miller 1977; Brealey and Myers 2000, 500–509 for numerical examples). Still, the predictive power of the theory was weak. Capital structures of corporations do not consist entirely or nearly entirely of debt.

Trade-off Theory Predicts Debt Levels Vary Systematically

Next came the proposition that debt will increase if its benefit exceeds its cost. The trade-off theory predicts that debt is determined by balancing the tax benefits of debt against the increased likelihood of financial distress as debt increases.

Financial distress occurs when a corporation fails to honor or has difficulty honoring its debt (i.e., its promises to lenders). In the extreme, financial distress leads to bankruptcy, which occurs when a decline in the value of the corporation’s assets triggers a default by the corporation’s owners.³

³ Debt does not cause bankruptcy. The decline in asset value triggers a bankruptcy, and this decline has no necessary connection to the capital structure of the failed business (Brealey and Myers 2000, 512).

Bankruptcy is a legal mechanism for allowing lenders to take over the corporation from its original owners. The direct costs of bankruptcy are the legal and administrative costs of filing. A study of 31 bankruptcies between 1980 and 1986 found the legal and administrative costs to be 3 percent of total book assets and 20 percent of the market value of equity in the year prior to bankruptcy (Brealey and Myers 2000, 513; Weiss, 1990).

Agency costs can arise from conflicts of interest between lenders and owners (or managers acting on behalf of owners) during financial distress (Jensen and Meckling 1976). For example, consider the situation of a leveraged corporation whose market value of total assets is less than the face value of its debt—a clear indicator of financial distress (Brealey and Myers 2000, 516–520). The debt does not mature for a year, and cash flows are adequate to survive until then. Under these circumstances, owners have every incentive to gamble on a high-risk, high-payoff project. If the gamble succeeds and the market value of the firm increases enough to cover the face value of the outstanding debt due next year, the corporation avoids bankruptcy. If the gamble fails, the corporation fails, but the corporation was likely to fail anyway so the owners are no worse off. In effect, the owners gamble with the money of the lenders. The gambling behavior adds high-risk assets to the balance sheet of the corporation, thereby lowering the value of the corporation.

The trade-off theory suggests that debt levels will remain within a “safe” range and provides insight into why debt levels vary. For any given level of debt, the probability of financial distress will be affected by financial conditions unique to a corporation, industry characteristics, and general economic conditions. For example, at a given level of debt a corporation with stable instead of erratic cash flows is less likely to experience financial distress. As a result, its marginal cost of debt is lower and we expect it to be more highly leveraged than businesses with erratic cash flows. Other characteristics that might affect the likelihood of experiencing financial distress, and, hence, leverage, include the size of a corporation, its age, and the nature of its assets, among others.

Debt Encourages Efficiency and Profit

Having considered the cost of debt more completely, one last question remains: Are there additional benefits of debt? Jensen and Meckling (1976) answered this question by again considering potential conflicts of interest among a corporation’s lenders, owners, and managers acting on behalf of owners. They demonstrate that debt can create incentives to make profit-maximizing decisions that would not otherwise be made. A simple example illustrates the idea (Bernanke 1989).

Suppose that an entrepreneur hopes to start a new business, but to do so, he needs to obtain a sum of money from someone else. Because no one is prepared to offer the sum as an outright gift, he must induce someone to offer the sum with promises. He could promise a share of any future profits and a say in how the business is operated, while not promising that profits will be earned (equity finance). Or he could promise to make regular payments in fixed amounts until the sum, plus some interest percentage of that sum, is repaid regardless of whether the business succeeds or fails (debt finance).

Now consider what happens when, halfway through the first year, the new business is so successful that its income allows the entrepreneur to meet the fiscal responsibility of either financing option. After only six months, the income is great enough to compensate him for the value of his time (salary) while leaving profit to be shared with stockholders. Alternatively, the income is great enough to pay his salary and make the first debt service payment to creditors.

Whether debt or equity was used to finance the business will affect what the business owner does in the remaining six months. With equity financing he will not be able to keep the full amount of any additional profit earned during the second half of the year. The additional profit will have to be shared. But with debt financing, he will be able to keep all additional profits. With debt financing, he has greater incentive to continue working during the second half of the year.

If we assume that the business generates enough income during the second half of the year to compensate the owner for his time, keeping the business running is the right thing to do, and the incen-

tive to do the right thing is greater using debt instead of equity. In the debt financing option, profits are higher, more is produced, and the business grows faster.

Relevant Propositions

From this brief summary of development in the theory of corporate finance, the following propositions are evident:

- Optimal debt levels are likely to vary by industry and with the unique conditions of each corporation.
- An optimal debt level for a corporation is where the costs and benefits of debt are in balance.
- The costs of debt are the legal, accounting, and business costs associated with restructuring or liquidation in the event of financial distress.
- The benefits of debt come from the discipline that it imposes on managers, plus the tax savings that it affords.
- Because debt levels vary across corporations on the basis of the costs and benefits of debt, as the likelihood of facing financial distress increases, debt levels decline.

We examine the validity of these propositions by analyzing debt levels at non-financial corporations from 1977 through 2001.

3. Methods

In this study a corporation's debt level is its long-term debt scaled by its total assets. Long-term debt includes all obligations repayable more than one year from their date of issue, including notes and accounts payable due after one year, interest accrued on the debt, Chapter 11 bankruptcy terms, the current portion of long-term debt included in current liabilities, deferred compensation, and subsidiary preferred stock included in minority interest.

To determine whether a debt limit is feasible, we first compare historical debt levels from 1977 through 2001 to determine whether leveraging decisions are made systematically as predicted by theory. Next we compare debt levels of healthy corporations and of corporations in financial distress to determine whether corporations in financial distress are more leveraged than healthy corporations. Finally, we propose a basis for a debt-limiting rule, specify industry-specific debt level limits, determine the reach of the rule, and estimate its quantifiable costs and benefits.

Comparing Industry Debt Levels

LOOKING FOR DIFFERENCES

We begin with calculations of debt levels in each of 21 industries defined on the basis of the North American Industrial Classification System (NAICS) (Table 3-1). The debt level of each industry is a weighted average across all years and all corporations in the industry.

Next we estimate average debt levels in each industry. An analysis of variance regression (ANOVA) of annual industry average debt levels on industry NAICS classification generates estimates of the mean value of each industry's debt level across all years.

We test for statistical significance in differences between estimated debt levels across industries in two ways. First, we arbitrarily choose a reference industry (other services, except public administration) and use a t-test to determine whether the differences between the reference industry's estimated debt level and each of the remaining 20 industries' estimated debt levels are statistically significant. In addition, we compare each industry to all others one at a time to determine the uniqueness of an industry's debt level. A Tukey test (Tamhane and Dunlop 2000, 469) is used to find statistically significant differences between all possible pairs of industry debt levels.

EXPLAINING DIFFERENCES

Several factors are correlated with debt levels. The consensus opinion is that debt levels "increase with fixed assets, nondebt tax shields, investment opportunities, and firm size and decrease with volatility, advertising expenditure, the probability of bankruptcy, profitability and uniqueness of the product" (Harris and Raviv 1991, 335). Here we consider these factors using five industry characteristics: industry uniqueness, volatility of industry earnings, whether earnings are cyclical, the earnings potential of an industry, and the nature of the industry's assets.

Uniqueness

Following Titman and Wessels (1988), we hypothesize that industries offering unique products or services have higher risk of failure and are likely to be less leveraged. The higher risk of failure

TABLE 3-1
Industry Definitions

| NAICS | Industry Description |
|-------|--|
| 11 | Agriculture, forestry, fishing, and hunting |
| 21 | Mining |
| 22 | Utilities |
| 23 | Construction |
| 31 | Manufacturing, essentials |
| 32 | Manufacturing, inputs |
| 33 | Manufacturing, durables |
| 42 | Wholesale trade |
| 44 | Retail trade, non-discretionary |
| 45 | Retail trade, discretionary |
| 48 | Transportation and warehousing, passengers and packages |
| 49 | Transportation and warehousing, postal service and couriers |
| 51 | Information |
| 53 | Real estate and rental and leasing |
| 54 | Professional, scientific, and technical services |
| 56 | Administrative and support and waste management and remediation services |
| 61 | Education services |
| 62 | Health care and social assistance |
| 71 | Arts, entertainment, and recreation |
| 72 | Accommodation and food services |
| 81 | Other services, except public administration |

stems from two sources. First, uniqueness depends on innovation and innovation depends on research and development (R&D) spending, the outcome of which is highly uncertain and often long in coming. Second, because unique products and services are often new, market acceptance is uncertain, requiring significant selling, general, and administrative (SG&A) expenses. This suggests that industry uniqueness can be measured by R&D and SG&A expenses scaled by total assets, and that industries with higher uniqueness ratios will have lower debt levels.

Earnings Volatility

We expect industries with more volatile earnings to have lower debt levels. This is likely to be true for at least two reasons. First, when earnings are highly volatile, forecasting future earnings accurately is difficult. Lenders will demand a premium to compensate for the uncertainty over future earnings, driving up the cost of debt (DeAngelo and Masulis 1980). Second, for any given debt level, as the volatility of cash flows increases, the probability of a default increases. In other words, the likelihood of financial distress and cost of debt increase with increasing earnings volatility. Building on Bradley, Jarrell, and Kim (1984), we measure industry volatility by the three-year moving standard deviation of the percentage change in annual industry earnings before interest and taxes scaled by total assets.

Cyclical

Another characteristic of an industry's earnings stream – whether earnings are cyclical – is likely to be correlated with debt levels. As is the case for industries with more volatile earnings, we expect industries with cyclical earnings to have lower debt levels. If earnings are cyclical, they decline when general economic activity declines. At any given debt level, when the economy declines the likelihood of financial distress is higher in an industry with cyclical earnings. The cost of debt is higher, and debt levels, according to the trade-off theory, are lower. We identify industries with cyclical earnings by regressing industry sales on economy-wide sales from 1977 through 2001. If the

economy-wide sales coefficient is statistically significantly different from zero at the 5 percent level of significance, we consider the industry to have cyclical earnings.

Earnings Potential

Industry growth opportunities (earnings potential) and industry debt levels are also expected to be negatively correlated, although previous empirical results are mixed. From the perspectives of Jensen and Meckling (1976), Galai and Masulis (1976), and Myers (1977), agency costs are higher in industries with greater growth opportunities. Hence, debt levels are likely to be lower. Jensen (1986) agrees, noting that in an industry with greater growth opportunities, there is less need for the discipline of debt payments. In the empirical literature, Titman and Wessels (1988) find a negative correlation between growth opportunities and debt levels; Rajan and Zingales (1995) find a positive correlation.

We use two measures of industry growth opportunities. The first measure is the industry's ratio of market value to book value of equity. According to simple cash flow valuation models, this measure indicates future earnings potential. Our second measure is the industry's earnings before interest and taxes scaled by total assets, an indicator of current earnings potential.

Nature of Assets

The nature of an industry's assets will affect its debt level, although the direction of effect could be positive or negative. Tangible assets that are separable and of value when sold separately can be tied to specific allotments of debt. Thus secured, the debt is less costly. The trade-off theory predicts higher debt levels in industries with assets of this nature. Industries with intangible assets, however, might have higher or lower debt levels. When assets are intangible and not a source of collateral, the cost of debt is higher, and, according to the trade-off theory, debt levels are lower. But Grossman and Hart (1982) demonstrate how agency costs can lead to higher debt levels even when the assets of the industry are intangible. Higher debt levels are used to guard against overconsumption of perquisites.

We examine both of these possible outcomes by considering two measures of the nature of an industry's assets. One, which indicates tangible assets that are separable and of value when sold separately, is the industry's net total property, plant, and equipment scaled by its total assets. The other, which indicates intangible assets that cannot be used as collateral, is the industry's sum of cash, total receivables, and inventories scaled by its gross total property, plant, and equipment.

To test our expectations, we specify the following linear equation and estimate it using ordinary least squares regression:

$$\begin{aligned}
 \text{Debt level} = & a_0 + a_1 \begin{bmatrix} \text{Uniqueness} \\ (-) \end{bmatrix} + a_2 \begin{bmatrix} \text{Earnings} \\ \text{volatility} \\ (-) \end{bmatrix} + a_3 \begin{bmatrix} \text{Cyclical} \\ \text{earnings} \\ (-) \end{bmatrix} + a_4 \begin{bmatrix} \text{Future} \\ \text{earnings} \\ \text{potential} \\ (-) \end{bmatrix} \\
 & + a_5 \begin{bmatrix} \text{Current} \\ \text{earnings} \\ \text{potential} \\ (-) \end{bmatrix} + a_6 \begin{bmatrix} \text{Asset} \\ \text{tangibility \& } \\ \text{separability} \\ (+) \end{bmatrix} + a_7 \begin{bmatrix} \text{Asset} \\ \text{intangibility} \\ (-) \text{ or } (+) \end{bmatrix}
 \end{aligned}$$

The "+" or "-" under each factor indicates whether we expect changes in the debt level and the factor to be in the same or opposite direction.

Comparing Healthy and Financially Distressed Corporations

Are the debt levels of healthy corporations significantly different from those of corporations experiencing financial distress? Answering this question requires a basis for identifying corporations in financial distress, examining the debt levels of healthy and distressed corporations, and determining the statistical significance of any observed differences.

IDENTIFYING CORPORATIONS IN FINANCIAL DISTRESS

We identify corporations in financial distress on the basis of two criteria. First, the corporation had to be delisted from its stock exchange for reasons indicative of financial distress. Second, the corporation had to no longer be reporting financial data.

Delisting from a stock exchange can occur for several reasons, not all of which indicate financial distress. For example, a corporation can be delisted if its name changes, whether ownership changes or not. This delisting does not indicate financial distress. But if a corporation fails to meet the exchange's financial guidelines for continued listing, or if its share price falls below a level deemed acceptable by the exchange, delisting would be indicative of financial distress. Of all reasons reported for a delisting, we considered nine indicative of distress:

- Bankruptcy, declared insolvent
- Company request, liquidation
- Delinquent in filing, non-payment of fees
- Failure to meet exception or equity requirements
- Failure to meet exchange's financial guidelines for continued listing
- Insufficient (or non-compliance with rules of) float or assets
- Insufficient number of shareholders
- Price fell below acceptable level
- Protection of investors and the public interest

A corporation delisted for reasons indicative of financial distress might not be in distress. To verify financial distress, we compared the last year for which the corporation reported its financial data to the year of its delisting. If the last year was either three or fewer years before or after delisting, the corporation was deemed to be in distress at the time of delisting.

EXAMINING DEBT LEVELS OF HEALTHY AND FINANCIALLY DISTRESSED CORPORATIONS

We create two mutually exclusive datasets. One consists of corporations that never experienced financial distress between 1977 and 2001. The other consists of corporations that experienced financial distress sometime during the period.

For each dataset we calculate three-year backward-moving averages⁴ of debt levels by year across industries and by industry across years. A moving average is used to avoid the bias of unusually high debt levels during the year of delisting. Loss in the value of total assets, not an increase in long-term debt, is more likely to account for these high levels. By including data for the two years preceding and the year of delisting, we obtain a truer picture of the debt level of a corporation in financial distress.

The mutual exclusivity of the datasets ensures that the average debt level of the group of healthy corporations does not include debts and assets of corporations that eventually, and perhaps as soon

⁴ For example, the 1983 average is calculated as the sum of long-term debt in 1981, 1982, and 1983 divided by the sum of total assets in 1981, 1982, and 1983.

as within one year, experienced financial distress. For example, if the datasets were not mutually exclusive, the average debt level of the group of “healthy” firms in, say, 1984, could have included debts and assets of corporations that were delisted and in financial distress in 1985 or 1986.

We examine the distribution of debt levels among the group of healthy corporations to identify and delete extreme values before calculating the final mean value for the group. Rates greater than the initial group mean plus three standard deviations are deleted. No observations are deleted from the group of financially distressed corporations.

We assemble the final data for each group into relative frequency distributions by year and by industry.⁵ Pictures of the distributions are developed to examine and find patterns in and differences between the debt levels of healthy and distressed corporations. Similar distributions or higher debt levels among the healthy group indicate that debt alone has little to do with financial distress and that limits might cause as much harm as good.

TESTING FOR SIGNIFICANCE OF OBSERVED DIFFERENCES

We perform a difference of means test (Beals 1972, 195–199) to determine whether any differences between the average debt levels of healthy and financially distressed corporations are statistically significant. Tests are conducted for each year across all industries and for each industry across all years.

Considering a Specific Rule

In the final step of our analysis, we identify a basis for a hypothetical debt-limiting rule, specify debt level limits, examine the reach of the rule so specified, and estimate the quantifiable costs and benefits of the rule if it had been in effect from 1977 to 2001.

Presumably, the objective of any debt-limiting rule is to reduce financial distress brought on by high debt levels. Therefore, the basis of our rule is found in our analysis of debt levels of corporations that experienced distress sometime between 1977 and 2001.

Debt limits specified by the rule are industry-specific and do not vary over time. For a given industry, the limit is set at the average debt level of the industry’s corporations that experienced financial distress. No corporation within the industry is allowed to have a debt level in excess of the industry’s limit.

The rule directly affects all—healthy as well as distressed—corporations with debt levels in excess of the allowed limits. However, corporations in distress with debt levels at or under the allowed limits are not affected directly by the rule.

COSTS OF THE RULE

The rule adversely affects healthy corporations that must reduce their debt levels to the limit allowed. With lower debt levels, the weighted average cost of capital is higher, investment is lower, and growth is slower. In addition, with lower debt levels, profit maximizing incentives are reduced, further lowering profits and investment and slowing growth.

The quantifiable cost of the rule is its impact on the weighted average cost of capital at healthy corporations required to lower their debt levels. As they shed debt, the risk premium demanded by equity investors declines and the cost of equity falls. However, the decline in the cost of equity is not enough to offset the after-tax cost advantage of debt. Requiring healthy corporations to substitute higher cost equity for lower cost debt raises their weighted average cost of debt and equity capital.

⁵ We construct 92 distributions. For each group (healthy and distressed corporations), we construct distributions for each of 25 years (1977 and 2001) and each of 21 industries.

BENEFITS OF THE RULE

There are direct and indirect benefits of the rule. A corporation experiencing distress with a debt level exceeding the allowed limit benefits directly when its distress is avoided with a debt level not exceeding the limit. A corporation with a debt level at or under the limit but nonetheless experiencing financial distress benefits indirectly when its distress is caused by the failure of corporations with debt levels in excess of the allowed limits. Whether direct or indirect, the benefit consists of the avoided costs of financial distress, including bankruptcy and agency costs.

The quantifiable benefits of the rule are the costs of bankruptcies avoided directly as a result of the rule. They consist of the legal and administrative costs of filing for bankruptcy.

Although the amount of debt held by creditors that is unrecovered in bankruptcies is a cost that would be avoided (a benefit) if the bankruptcy were avoided by limiting debt levels, the amounts of unrecovered debt vary significantly and have not been quantified and included here. However, we do examine the potential impact on the benefit-cost ratio of including these avoided costs as a benefit of the debt-limiting rule by assuming none of the outstanding debt is recovered.

4. Data

Our database is constructed from corporate financial data reported in Standard & Poor's COMPUSTAT (North America) database. COMPUSTAT contains annual income statements and balance sheets of publicly traded corporations.

Our database includes annual observations from 1977 through 2001 on more than 3,000 active non-financial corporations each year.⁶ In total, 13,406 non-financial corporations are reported in our database (see Tables 4-1 and 4-2 for corporations by industry and year, respectively).

Annual values of industry characteristics that we hypothesize to explain industry variation in debt levels are calculated from our database. Industries with the highest and lowest values in 2001 for each factor, except cyclicalities,⁷ are identified in Table 4-3. The 2001 values of each factor, including cyclicalities, for each industry are presented in Table 4-4. Appendix A contains annual values for all years. For reference, Appendix B contains annual unemployment rates and gross domestic product of the U.S. economy during the period.

Delistings, which are the starting point of our analysis of leverage among healthy and unhealthy corporations, are reported by the Center for Research in Security Prices at the University of Chicago. Ninety-six codes are reported, nine of which we considered indicative of financial distress. Between 1977 and 2001, nearly 3,000 non-financial corporations in our database were delisted for these nine reasons.

We have complete data for 2,257 corporations confirmed to have experienced financial distress sometime between 1977 and 2001. Corporations delisted for reasons considered indicative of distress were confirmed to be in distress by noting the final year for which their financial data were reported. If the final year was either three years before or three years after their year of delisting, they were counted among the group of corporations in financial distress (see Table 4-5 for corporations in financial distress by reason for delisting and Tables 4-6 and 4-7 for corporations by industry and year, respectively, for the healthy and distressed groups). If we could not confirm the distress of a corporation delisted because of a reason indicating distress, it was excluded from the healthy and the distressed groups.

The returns on debt and equity that are used to calculate the weighted average cost of capital with and without the debt-limiting rule are reported in *Stocks, Bonds, Bills, and Inflation: 2003 Yearbook*, a publication of Ibbotson Associates. For the cost of debt, we use 6.2 percent, the arithmetic mean of annual total returns on long-term corporate bonds from 1926 to 2002 (Ibbotson Associates 2003, 33). Using a 40 percent corporate income tax rate, the after-tax cost of debt is 3.72 percent.

⁶ Because of the time that elapses between the initial reporting of financial data and its availability as a complete and accurate database stored on magnetic media, 2001 is the most recent year for which we have all data necessary for our analysis. Annual observations for 2002 will not be available until the end of 2003.

⁷ Industries cannot be ranked by cyclicalities. They either are or are not cyclical. Furthermore, whether an industry is cyclical does not change from year to year.

TABLE 4-1
Corporations in Database by Industry (1977 – 2001)

| Industry | All Corporations | Share of Total (%) |
|--|------------------|--------------------|
| Accommodation and food services | 360 | 2.7 |
| Administrative and support and waste management and remediation services | 349 | 2.6 |
| Agriculture, forestry, fishing, and hunting | 72 | 0.5 |
| Arts, entertainment, and recreation | 154 | 1.1 |
| Construction | 244 | 1.8 |
| Education services | 43 | 0.3 |
| Health care and social assistance | 348 | 2.6 |
| Information | 1,740 | 13.0 |
| Manufacturing, durables | 3,725 | 27.8 |
| Manufacturing, essentials | 656 | 4.9 |
| Manufacturing, inputs | 1,411 | 10.5 |
| Mining | 948 | 7.1 |
| Other services, except public administration | 97 | 0.7 |
| Professional, scientific, and technical services | 763 | 5.7 |
| Real estate and rental and leasing | 456 | 3.4 |
| Retail trade, discretionary | 361 | 2.7 |
| Retail trade, non-discretionary | 448 | 3.3 |
| Transportation and warehousing, passengers and packages | 380 | 2.8 |
| Transportation and warehousing, postal service and couriers | 18 | 0.1 |
| Utilities | 158 | 1.2 |
| Wholesale trade | 675 | 5.0 |
| Total | 13,406 | 100.0 |

Source: Nathan Associates Inc. from COMPUSTAT data.

TABLE 4-2
Corporations in Database by Year (1977 – 2001)

| Year | All Corporations | Year | All Corporations |
|------|------------------|------|------------------|
| 1977 | 3,781 | 1990 | 4,623 |
| 1978 | 3,893 | 1991 | 4,640 |
| 1979 | 4,071 | 1992 | 4,851 |
| 1980 | 4,308 | 1993 | 5,038 |
| 1981 | 4,403 | 1994 | 5,184 |
| 1982 | 4,634 | 1995 | 5,376 |
| 1983 | 4,798 | 1996 | 4,126 |
| 1984 | 4,790 | 1997 | 4,925 |
| 1985 | 5,047 | 1998 | 5,279 |
| 1986 | 5,205 | 1999 | 4,959 |
| 1987 | 5,148 | 2000 | 3,789 |
| 1988 | 4,907 | 2001 | 3,323 |
| 1989 | 4,697 | | |

Source: Nathan Associates Inc. from COMPUSTAT data.

TABLE 4-3*Industries of Highest and Lowest Values for Factors Affecting Debt (2001)*

| Factor | Industry with | |
|------------------------------------|---------------------------------|---|
| | Highest value | Lowest value |
| Uniqueness | Information | Transportation and warehousing, passengers and packages |
| Earnings volatility | Education services | Accommodation and food services |
| Future earnings potential | Retail trade, non-discretionary | Construction |
| Current earnings potential | Mining | Transportation and warehousing, postal service and couriers |
| Asset tangibility and separability | Mining | Professional, scientific, and technical services |
| Asset intangibility | Construction | Transportation and warehousing, postal service and couriers |

TABLE 4-4*Industry Characteristics (2001)*

| Industry | Uniqueness | Earnings Volatility | Cyclical Earnings (1 = Yes) | Future Earnings Potential | Current Earnings Potential | Asset Tangibility & Separability | Asset Intangibility |
|--|------------|---------------------|-----------------------------|---------------------------|----------------------------|----------------------------------|---------------------|
| Agriculture, forestry, fishing, and hunting | 0.218 | 0.498 | 0 | 2.263 | 0.048 | 0.320 | 0.833 |
| Mining | 0.022 | 0.619 | 1 | 1.999 | 0.087 | 0.707 | 0.115 |
| Utilities | NA | 0.468 | 1 | 1.077 | 0.042 | 0.534 | 0.180 |
| Construction | 0.008 | 0.188 | 0 | 0.476 | 0.024 | 0.179 | 2.881 |
| Manufacturing, essentials | 0.187 | 0.253 | 1 | 1.395 | 0.047 | 0.248 | 0.476 |
| Manufacturing, inputs | 0.187 | 0.287 | 0 | 1.955 | 0.073 | 0.395 | 0.389 |
| Manufacturing, durables | 0.228 | 0.351 | 1 | 2.800 | 0.033 | 0.225 | 0.881 |
| Wholesale trade | 0.013 | 0.412 | 1 | 1.440 | 0.048 | 0.248 | 1.398 |
| Retail trade, non-discretionary | 0.083 | 0.383 | 1 | 5.310 | 0.059 | 0.341 | 0.565 |
| Retail trade, discretionary | 0.012 | 0.386 | 1 | 2.900 | 0.055 | 0.269 | 0.971 |
| Transportation and warehousing, passengers and packages | 0.000 | 0.180 | 0 | 0.510 | 0.022 | 0.655 | 0.140 |
| Transportation and warehousing, postal service and couriers | 0.001 | 0.569 | 1 | 1.388 | 0.000 | 0.419 | 0.045 |
| Information | 0.234 | 0.301 | 1 | 3.079 | 0.025 | 0.283 | 0.235 |
| Real estate and rental and leasing | 0.009 | 0.218 | 1 | 0.642 | 0.037 | 0.510 | 0.090 |
| Professional, scientific, and technical services | 0.215 | 0.492 | 1 | 3.229 | 0.024 | 0.119 | 1.214 |
| Administrative, support and waste management, and remediation services | 0.086 | 0.131 | 1 | 2.886 | 0.046 | 0.215 | 0.245 |
| Education services | 0.038 | 1.032 | 1 | 4.373 | 0.062 | 0.205 | 0.379 |
| Health care and social assistance | 0.010 | 0.043 | 1 | 2.092 | 0.047 | 0.239 | 0.372 |
| Arts, entertainment, and recreation | 0.036 | 0.836 | 0 | 2.440 | 0.075 | 0.623 | 0.081 |
| Accommodation and food services | 0.002 | 0.017 | 0 | 1.966 | 0.084 | 0.616 | 0.160 |
| Other services (except public administration) | 0.024 | 0.390 | 0 | 1.212 | 0.071 | 0.172 | 0.425 |

Note: NA = not available.

Source: Nathan Associates Inc. See Appendix A for all years.

TABLE 4-5*Corporations in Financial Distress by Reason for Delisting (1977 – 2001)*

| Reason for Delisting | Corporations in Financial Distress^a | Share of Total (%) |
|---|---|---------------------------|
| Bankruptcy, declared insolvent | 238 | 10.5 |
| Company request, liquidation | 9 | 0.4 |
| Delinquent in filing, non-payment of fees | 448 | 19.8 |
| Failure to meet exception or equity requirements | 85 | 3.8 |
| Failure to meet exchange's financial guidelines for continued listing | 246 | 10.9 |
| Insufficient (or non-compliance with rules of) float or assets | 298 | 13.2 |
| Insufficient number of shareholders | 588 | 26.1 |
| Price fell below acceptable level | 299 | 13.2 |
| Protection of investors and the public interest | 46 | 2.0 |
| Total | 2,257 | 100.0 |

^a In distress in at least one year from 1977 through 2001.

Source: Nathan Associates Inc. from COMPUSTAT and CRSP data.

TABLE 4-6*Healthy Corporations and Corporations in Financial Distress by Industry (1977 – 2001)*

| Industry | Healthy Corporations | Corporations in Financial Distress^a | Total^b | Distressed Share of Total (%) |
|--|-----------------------------|---|--------------------------|--------------------------------------|
| Accommodation and food services | 277 | 64 | 341 | 18.8 |
| Administrative and support and waste management and remediation services | 242 | 68 | 310 | 21.9 |
| Agriculture, forestry, fishing, and hunting | 51 | 14 | 65 | 21.5 |
| Arts, entertainment, and recreation | 104 | 33 | 137 | 24.1 |
| Construction | 154 | 63 | 217 | 29.0 |
| Education services | 23 | 10 | 33 | 30.3 |
| Health care and social assistance | 241 | 91 | 332 | 27.4 |
| Information | 1,278 | 222 | 1,500 | 14.8 |
| Manufacturing, durables | 2,715 | 609 | 3,324 | 18.3 |
| Manufacturing, essentials | 509 | 109 | 618 | 17.6 |
| Manufacturing, inputs | 1,074 | 185 | 1,259 | 14.7 |
| Mining | 624 | 148 | 772 | 19.2 |
| Other services, except public administration | 68 | 22 | 90 | 24.4 |
| Professional, scientific, and technical services | 525 | 132 | 657 | 20.1 |
| Real estate and rental and leasing | 305 | 79 | 384 | 20.6 |
| Retail trade, discretionary | 240 | 92 | 332 | 27.7 |
| Retail trade, non-discretionary | 320 | 94 | 414 | 22.7 |
| Transportation and warehousing, passengers and packages | 303 | 65 | 368 | 17.7 |
| Transportation and warehousing, postal service and couriers | 14 | 3 | 17 | 17.6 |
| Utilities | 147 | 4 | 151 | 2.6 |
| Wholesale trade | 462 | 150 | 612 | 24.5 |
| Total | 9,676 | 2,257 | 11,933 | 18.9 |

^a In distress in at least one year from 1977 through 2001.

^b Totals do not match previously presented totals. Some corporations were missing data required for this part of the analysis. Hence, they are not included in the totals presented here. Also, some corporations that were delisted for reasons indicative of distress continued to have data reported. They were not included in either the healthy or distressed group and, hence, are not reported here.

Source: Nathan Associates Inc. from COMPUSTAT and CRSP data.

TABLE 4-7*Healthy Corporations and Corporations in Financial Distress by Year (1977–2001)*

| Year^a | Healthy Corporations | Corporations in Financial Distress^b | Total^c | Distressed Share of Total (%) |
|-------------------------|-----------------------------|---|--------------------------|--------------------------------------|
| 1977 | 2,872 | 1 | 2,873 | 0.0 |
| 1978 | 2,961 | 2 | 2,963 | 0.1 |
| 1979 | 3,087 | 4 | 3,091 | 0.1 |
| 1980 | 3,189 | 10 | 3,199 | 0.3 |
| 1981 | 3,147 | 7 | 3,154 | 0.2 |
| 1982 | 3,221 | 20 | 3,241 | 0.6 |
| 1983 | 3,199 | 30 | 3,229 | 0.9 |
| 1984 | 3,153 | 56 | 3,209 | 1.7 |
| 1985 | 3,202 | 97 | 3,299 | 2.9 |
| 1986 | 3,187 | 149 | 3,336 | 4.5 |
| 1987 | 3,127 | 78 | 3,205 | 2.4 |
| 1988 | 2,938 | 122 | 3,060 | 4.0 |
| 1989 | 2,779 | 103 | 2,882 | 3.6 |
| 1990 | 2,724 | 126 | 2,850 | 4.4 |
| 1991 | 2,775 | 129 | 2,904 | 4.4 |
| 1992 | 2,887 | 131 | 3,018 | 4.3 |
| 1993 | 2,947 | 59 | 3,006 | 2.0 |
| 1994 | 3,090 | 80 | 3,170 | 2.5 |
| 1995 | 3,192 | 93 | 3,285 | 2.8 |
| 1996 | 2,465 | 85 | 2,550 | 3.3 |
| 1997 | 2,846 | 120 | 2,966 | 4.0 |
| 1998 | 3,087 | 210 | 3,297 | 6.4 |
| 1999 | 3,006 | 199 | 3,205 | 6.2 |
| 2000 | 2,296 | 163 | 2,459 | 6.6 |
| 2001 | 2,024 | 183 | 2,207 | 8.3 |

^a Year of delisting.^b In distress in at least one year from 1977 through 2001.^c Totals do not match previously presented totals. Some corporations were missing data required for this part of the analysis. Hence, they are not included in the totals presented here. Also, some corporations that were delisted for reasons indicative of distress continued to have data reported. They were not included in either the healthy or distressed group and, hence, are not reported here.

Source: Nathan Associates Inc. from COMPUSTAT and CRSP data.

The cost of equity consists of a risk-free return plus a premium demanded by holders of equity to compensate them for their risks of holding equity. For the risk-free return we use 5.8 percent, the arithmetic mean of annual total returns on long-term government bonds from 1926 to 2002 (Ibbotson Associates 2003, 33).

The equity premium is measured by the percentage difference between the risk-free rate and a market rate adjusted by market risk. Without the debt-limiting rule, we assume that the risk of holding the equity of our sample of healthy corporations affected by the rule is no different from the risk of holding equity of all other corporations. Hence, no adjustment is made for market risk. The equity premium is 6.05 percent, based on the 5.8 percent risk-free return and a 12.2 percent average annual total return on large company stocks (Ibbotson Associates 2003, 33).

With the rule, debt levels of the healthy companies affected by the rule are lower, their likelihood of financial distress is lower, and the risk of holding their equity is lower than the risk of holding the equity of all other corporations. In this case an adjustment is made for market risk. A smaller equity premium is demanded. The decline is determined by the extent to which the healthy corporations are required to substitute equity for debt.

5. Results

Debt Levels Vary Across Industries

Our analysis of historical industry debt levels reveals wide variation and statistically significant differences (Table 5-1). Industry debt levels vary from 13 percent to 44 percent, with a median value of 26 percent. Industry alone “explains” 82.8 percent of the variation in annual debt levels from 1977 through 2001 (see Appendix C for all results of the ANOVA regression). All but the utilities industry have debt levels that are statistically significantly different from the level of the industry of “other services, except public administration.” Moreover, results of our Tukey test reveal that debt levels in some industries are significantly different from most other industries. For example, the debt level of the utility industry is statistically significantly different from the debt levels of 18 of the other 20 industries.

Debt Levels Vary Systematically

Debt levels vary systematically across industries. The factors we hypothesized to be correlated with debt levels jointly explain 45.7 percent of the variation in debt levels across industries (see Appendix D for all results of the regression model). The estimated equation is⁸

$$\begin{aligned}
 \text{Debt level} = & 0.36109 - 0.57266 \left[\begin{array}{c} \text{Uniqueness} \\ (0.02877) \quad (0.05061) \end{array} \right] - 0.0606 \left[\begin{array}{c} \text{Earnings} \\ \text{volatility} \\ (0.0143) \end{array} \right] - 0.06368 \left[\begin{array}{c} \text{Cyclical} \\ \text{earnings} \\ (0.00804) \end{array} \right] + 0.00350 \left[\begin{array}{c} \text{Future} \\ \text{earnings} \\ \text{potential} \\ (0.00417) \end{array} \right] \\
 & - 0.14266 \left[\begin{array}{c} \text{Current} \\ \text{earnings} \\ \text{potential} \\ (0.14421) \end{array} \right] + 0.08493 \left[\begin{array}{c} \text{Asset} \\ \text{tangibility \&} \\ \text{separability} \\ (0.03896) \end{array} \right] - 0.04421 \left[\begin{array}{c} \text{Asset} \\ \text{intangibility} \\ (0.01258) \end{array} \right]
 \end{aligned}$$

Coefficients for industry uniqueness, earnings volatility, cyclical earnings, and asset tangibility are statistically significantly different from zero and of the expected sign. As theory predicts, debt levels are lower in industries with more unique products and services, more volatile earnings, and earnings that decline when general economic activity declines. Industries in which tangible assets are a greater share of total assets have higher debt levels. In these industries, the ability to tie assets to specific allotments of debt lowers the cost of debt, which, according to the trade-off theory, increases debt.

The coefficient of asset intangibility is statistically significantly different from zero and found to have a negative impact on debt levels. In other words, as predicted by the trade-off theory, industries with larger proportions of intangible assets that cannot be used as collateral have higher costs of debt and lower debt levels. Recognizing that our measure of asset intangibility includes cash, this finding does not support the proposition that agency costs lead to higher debt levels in industries with excess cash.

Differences in industry growth opportunities as measured by future and current earnings potential are not statistically significant factors in explaining the variation in industry debt levels. However,

⁸ Below each estimated coefficient is its standard error.

TABLE 5-1*Debt Levels by Industry (1977 – 2001)*

| Industry Description | Calculated Average | ANOVA Estimated Average | Calculated <i>t</i> -Statistic ^a | Statistically Different from Reference Industry ^b | Industries with Significantly Different Debt Levels ^b |
|--|--------------------|-------------------------|---|--|--|
| Accommodation and food services | 0.44 | 0.42 | 4.36 | Yes | 17 |
| Arts, entertainment, and recreation | 0.43 | 0.42 | 3.61 | Yes | 17 |
| Real estate and rental and leasing | 0.42 | 0.42 | 4.34 | Yes | 17 |
| Health care and social assistance | 0.38 | 0.40 | 3.35 | Yes | 16 |
| Utilities | 0.35 | 0.35 | 0.77 | No | 18 |
| Other services, except public administration | 0.34 | 0.33 | 17.59 | – | 17 |
| Information | 0.29 | 0.29 | -2.00 | Yes | 14 |
| Retail trade, non-discretionary | 0.28 | 0.27 | -2.92 | Yes | 12 |
| Transportation and warehousing, passengers and packages | 0.28 | 0.28 | -2.21 | Yes | 13 |
| Administrative and support and waste management and remediation services | 0.26 | 0.24 | -4.07 | Yes | 9 |
| Retail trade, discretionary | 0.26 | 0.26 | -3.40 | Yes | 12 |
| Wholesale trade | 0.26 | 0.26 | -3.75 | Yes | 12 |
| Construction | 0.24 | 0.24 | -4.19 | Yes | 10 |
| Manufacturing, essentials | 0.22 | 0.22 | -5.73 | Yes | 10 |
| Mining | 0.21 | 0.22 | -5.52 | Yes | 10 |
| Agriculture, forestry, fishing, and hunting | 0.20 | 0.20 | -4.57 | Yes | 12 |
| Manufacturing, inputs | 0.19 | 0.19 | -7.13 | Yes | 12 |
| Professional, scientific, and technical services | 0.16 | 0.17 | -8.11 | Yes | 13 |
| Manufacturing, durables | 0.15 | 0.16 | -9.15 | Yes | 15 |
| Transportation and warehousing, postal service and couriers | 0.13 | 0.20 | -2.72 | Yes | 12 |
| Education services | 0.13 | 0.14 | -5.43 | Yes | 18 |

^a For all but the reference industry, which is "other services, except public administration," the *t*-statistic tests for the significance of the difference between the ANOVA estimated averages of the industry identified in the row and the reference industry. For the reference industry, the *t*-statistic tests for whether the ANOVA estimated average is significantly different from zero.

^b Statistically significant at the 5 percent level.

Source: Nathan Associates Inc.

we do find that the future earnings potential of an industry is positively related to debt levels, contrary to the theoretical prediction but supporting the empirical findings of Rajan and Zingales (1995). With respect to current earnings potential and debt levels, we find a negative correlation. As theory predicts, industries with greater growth opportunities, as measured here by current earnings potential, have higher agency costs of debt and less need for the discipline of debt payments.

Debt Level Distribution Similar in Healthy and Distressed Corporations

Turning next to the results of our analysis of debt levels at healthy corporations and corporations in financial distress, we find little difference between the two groups. In only 2 of the 21 industries we examined is there a statistically significant difference between the average debt level of healthy corporations and the average debt level of corporations in financial distress (Table 5-2). Moreover, in one of these two industries (health care and social assistance), the group of healthy corporations has a higher debt level than the group of distressed corporations. Only in the mining industry do we find that distressed corporations are more highly leveraged than healthy corporations and that the difference is statistically significant.

In only 5 of the 25 years of our period of analysis do we find a statistically significant difference in debt levels of healthy and distressed corporations (Table 5-3). In two of those years (1987 and 1990),

healthy corporations are more highly leveraged than distressed corporations. Only in 1982, 1999, and 2000 are leverage rates of distressed corporations statistically significantly higher than leverage rates of healthy corporations.

Implications for a Debt-limiting Rule

Our findings reveal the difficulty of designing an effective debt-limiting rule. Given that the purpose of limiting debt is to reduce the incidence and cost of financial distress, an effective rule must reach corporations likely to experience distress in the absence of the rule, while not interfering with corporations that are healthy and unlikely to experience distress in the absence of the rule.

Consider the simplest of rules, one that imposes a single debt limit on all corporations. To avoid interfering with the financing decisions at healthy corporations, the limit is determined from an analysis of debt levels at corporations that experienced financial distress. But, given that debt levels among healthy and unhealthy corporations are similar, we know this rule will necessarily reach and adversely affect healthy corporations.

To reduce the number of healthy corporations affected by the simplest rule, we complicate the rule by recognizing that debt levels vary across industries. Hence, the rule now has as many limits as

TABLE 5-2

Debt Levels of Healthy and Financially Distressed Corporations by Industry (1977 – 2001)

| Industry | Average Debt Level | | Difference ^a | Calculated <i>t</i> -Statistic ^b | Statistical Significance |
|--|----------------------|------------------------------------|-------------------------|---|--------------------------|
| | Healthy Corporations | Corporations in Financial Distress | | | |
| | (1) | (2) | (3) = (1) - (2) | (4) | (5) |
| Accommodation and food services | 0.358 | 0.329 | 0.029 | 0.9624 | No |
| Administrative and support and waste management and remediation services | 0.213 | 0.209 | 0.004 | 0.1668 | No |
| Agriculture, forestry, fishing, and hunting | 0.211 | 0.190 | 0.021 | 0.6221 | No |
| Arts, entertainment, and recreation | 0.338 | 0.260 | 0.078 | 1.9132 | No |
| Construction | 0.256 | 0.264 | -0.008 | -0.3067 | No |
| Education services | 0.148 | 0.149 | -0.001 | -0.0213 | No |
| Health care and social assistance | 0.311 | 0.241 | 0.070 | 3.3528 | Yes |
| Information | 0.277 | 0.243 | 0.034 | 1.7092 | No |
| Manufacturing, durables | 0.191 | 0.209 | -0.018 | -1.7808 | No |
| Manufacturing, essentials | 0.236 | 0.225 | 0.011 | 0.6448 | No |
| Manufacturing, inputs | 0.222 | 0.229 | -0.007 | -0.3238 | No |
| Mining | 0.245 | 0.335 | -0.090 | -2.5733 | Yes |
| Other services, except public administration | 0.266 | 0.230 | 0.036 | 0.6756 | No |
| Professional, scientific, and technical services | 0.185 | 0.196 | -0.011 | -0.3018 | No |
| Real estate and rental and leasing | 0.370 | 0.331 | 0.039 | 1.2705 | No |
| Retail trade, discretionary | 0.236 | 0.195 | 0.041 | 1.8062 | No |
| Retail trade, non-discretionary | 0.255 | 0.231 | 0.024 | 1.2804 | No |
| Transportation and warehousing, passengers and packages | 0.294 | 0.335 | -0.040 | -1.4799 | No |
| Transportation and warehousing, postal service and couriers | 0.302 | 0.657 | -0.355 | -2.1114 | No |
| Utilities | 0.331 | 0.344 | -0.013 | -0.0949 | No |
| Wholesale trade | 0.212 | 0.214 | -0.002 | -0.1276 | No |

Note: Items might not subtract to equal differences because of rounding.

^a A positive difference means healthy corporations were more leveraged than corporations in financial distress.

^b We use the *t*-statistic to test for the significance of differences between the averages of debt levels of healthy and distressed corporations. Test results are valid at the 5 percent level of significance.

Source: Nathan Associates Inc.

TABLE 5-3*Debt Levels of Healthy and Financially Distressed Corporations by Year (1977 – 2001)*

| Year | Average Debt Level | | Difference ^a | Calculated t-Statistic ^b | Statistical Significance |
|------|-------------------------|--|-------------------------|--|-----------------------------|
| | Healthy Corporations | Corporations in Financial Distress | | | |
| | (1) | (2) | (3) = (1) - (2) | (4) | (5) |
| 1977 | 0.245 | 0.197 | 0.048 | na | na |
| 1978 | 0.241 | 0.307 | -0.066 | -0.2194 | No |
| 1979 | 0.242 | 0.184 | 0.057 | 0.7696 | No |
| 1980 | 0.237 | 0.253 | -0.016 | -0.3393 | No |
| 1981 | 0.232 | 0.204 | 0.028 | 0.3780 | No |
| 1982 | 0.233 | 0.323 | -0.089 | -2.4669 | Yes |
| 1983 | 0.221 | 0.250 | -0.029 | -0.8026 | No |
| 1984 | 0.219 | 0.217 | 0.002 | 0.0700 | No |
| 1985 | 0.227 | 0.240 | -0.013 | -0.4589 | No |
| 1986 | 0.241 | 0.248 | -0.008 | -0.4183 | No |
| 1987 | 0.241 | 0.200 | 0.041 | 2.1431 | Yes |
| 1988 | 0.246 | 0.215 | 0.031 | 1.6139 | No |
| 1989 | 0.257 | 0.246 | 0.012 | 0.5867 | No |
| 1990 | 0.255 | 0.196 | 0.059 | 3.1720 | Yes |
| 1991 | 0.252 | 0.234 | 0.018 | 0.9608 | No |
| 1992 | 0.241 | 0.231 | 0.009 | 0.3839 | No |
| 1993 | 0.236 | 0.210 | 0.026 | 0.8226 | No |
| 1994 | 0.226 | 0.257 | -0.031 | -0.6280 | No |
| 1995 | 0.249 | 0.234 | 0.016 | 0.5047 | No |
| 1996 | 0.213 | 0.201 | 0.013 | 0.6045 | No |
| 1997 | 0.222 | 0.215 | 0.007 | 0.2852 | No |
| 1998 | 0.262 | 0.253 | 0.008 | 0.2184 | No |
| 1999 | 0.226 | 0.265 | -0.039 | -2.0696 | Yes |
| 2000 | 0.231 | 0.307 | -0.076 | -2.9938 | Yes |
| 2001 | 0.226 | 0.220 | 0.007 | 0.3187 | No |

Notes: In 1977 there was only one corporation in financial distress. Hence, the t-statistic is not available (na). Items might not subtract to equal differences because of rounding.

^a A positive difference means healthy corporations were more leveraged than corporations in financial distress.

^b We use the t-statistic to test for the significance of differences between the averages of debt levels of healthy and distressed corporations. Test results are valid at the 5 percent level of significance.

Source: Nathan Associates Inc.

there are industries. Again, the limit in each industry is determined on the basis of debt levels of the industry's corporations that experienced financial distress.

Further reducing the number of healthy corporations affected by the rule requires complications that render the rule impractical. Recognizing that debt levels vary across industries on the basis of unique and changing financial fundamentals of corporations constituting industries, the most effective rule has nearly as many limits as there are corporations and the limits vary over time.

The design of our hypothetical debt-limiting rule trades effectiveness for practicality. The rule specifies debt level limits that vary by industry and remain constant over time. An industry's limit is set equal to the average debt level among the industry's corporations that experienced financial distress sometime between 1977 and 2002.

If our debt-limiting rule had been in effect from 1977 to 2001, it would have interfered with the financing decisions of 3,693 corporations that never experienced financial distress and 899 corporations that experienced distress, 116 of which filed for bankruptcy (Table 5-4). The number of healthy businesses that would have been adversely affected by the rule is more than four times the number of distressed businesses that might have benefited directly from the rule.

Benefit-Cost Ratio of Rule Does Not Justify Debt Limits

Limiting debt levels lowers the likelihood of financial distress. Consequently, the benefits of the rule are the costs of financial distress avoided as a result of the rule. Distress is avoided by corporations that were in distress and had debt levels in excess of the rule. It is also avoided by corporations with debt levels below the limits of the rule but in distress because of the failure of corporations with debt levels in excess of the rule.

But healthy corporations that must reduce their debt levels to the limit allowed by the rule are adversely affected. The after-tax cost of raising capital at these corporations is higher with the rule, and as a result, investment declines and economic growth slows.

Considering only the quantifiable benefits and costs, the rule's benefit-cost ratio is 0.03. If all 116 bankruptcies of corporations with debt levels in excess of the limits of the rule had been prevented by the rule, \$701 million of legal and administrative costs of filing for bankruptcy would have been avoided.^{9,10,11} However, the weighted average after-tax cost of capital at healthy corporations affected by the rule would have been 7.75 percent higher than it was without the rule, an increase equivalent to \$23 billion.

Requiring healthy corporations to reduce their debt levels raises their weighted average cost of capital from 7.48 percent to 8.06 percent (see Appendix E). Although the cost of equity at these firms falls from 11.85 percent to 10.62 percent as debt levels and, concomitantly, the likelihood of financial distress decline, the substitution of equity for less costly debt (the after-tax cost of debt is 3.72 percent) raises the total cost of equity and debt capital.¹²

The benefit-cost ratio of our rule does not include unquantifiable costs and benefits of limiting debt levels. Unquantifiable costs are the reduced investment and slower economic growth resulting from the higher cost of capital and agency costs of lower debt levels at healthy corporations affected by the rule. Unquantifiable benefits are the unrecovered debt of corporations whose bankruptcies are avoided with debt limits, the costs of financial distress that does not end in bankruptcy but is avoided by lower debt levels, as well as the costs of financial distress avoided by the rule indirectly.

Nevertheless, the benefit-cost ratio of our rule does not justify limiting the amount of debt in the capital structures of non-financial corporations. As stated by Princeton University economist and member of the Board of Governors of the U.S. Federal Reserve System, Ben Bernanke (1989), "Given the importance of improving the performance of U.S. corporations in a competitive international marketplace, it would probably be a severe mistake for the government simply to ... limit leverage."

⁹ Lawrence Weiss (1990) found that the average administrative and legal costs of filing for bankruptcy at 31 firms that filed between 1980 and 1986 was approximately 3 percent of the book value of total assets in the year before filing. \$701 million is 3 percent of the book value of assets at the 116 corporations that presumably would have avoided bankruptcy if our rule had been in effect.

¹⁰ The long-term debt of the 116 corporations that filed for bankruptcy was approximately \$5.6 billion. If one were to assume that none of this outstanding debt were recovered, the benefit of our debt-limiting rule would total \$6.3 billion instead of \$701 million. The benefit-cost ratio would increase to 0.27 (\$6.3 billion divided by \$23.0 billion).

¹¹ Although corporate income tax revenue would be affected by debt limits, taxes are transfers from corporations to the federal government and not a cost or benefit of the debt-limiting rule. Estimating the net effect of debt limits on corporate tax revenue is beyond the scope of this study. However, we do know that less debt would result in less corporate income shielded from taxation and additional tax revenue. But the adverse consequences of debt limits would result in less corporate income and less tax revenue.

¹² By coincidence, the rule reduces the aggregate debt-equity ratio of all healthy firms adversely affected to a rate nearly equaling the ratio suggested by Mr. Zuckerman. Without the rule the debt-equity ratio is 1.16. With the rule, the ratio falls to 0.59. In his will Mr. Zuckerman suggested that legislation might require companies to reduce their debt ratios "possibly and eventually down to fifty percent (50%)."

TABLE 5-4*Reach of a Hypothetical Rule*

| Industry | Total Healthy Corporations | Total Corporations in Financial Distress | Debt Level Limit ^a | Affected Corporations ^b | | | |
|--|----------------------------|--|-------------------------------|------------------------------------|-------------------------------------|------------------------------------|--|
| | | | | Healthy Corporations | Share of Industry Healthy Total (%) | Corporations in Financial Distress | Share of Industry Distressed Total (%) |
| Accommodation and food services | 277 | 64 | 0.329 | 144 | 52.0 | 26 | 40.6 |
| Administrative and support and waste management and remediation services | 242 | 68 | 0.209 | 109 | 45.0 | 30 | 44.1 |
| Agriculture, forestry, fishing, and hunting | 51 | 14 | 0.190 | 25 | 49.0 | 6 | 42.9 |
| Arts, entertainment, and recreation | 104 | 33 | 0.260 | 67 | 64.4 | 11 | 33.3 |
| Construction | 154 | 63 | 0.264 | 62 | 40.3 | 30 | 47.6 |
| Education services | 23 | 10 | 0.149 | 11 | 47.8 | 4 | 40.0 |
| Health care and social assistance | 241 | 91 | 0.241 | 136 | 56.4 | 42 | 46.2 |
| Information | 1,278 | 222 | 0.243 | 493 | 38.6 | 82 | 36.9 |
| Manufacturing, durables | 2,715 | 609 | 0.209 | 953 | 35.1 | 237 | 38.9 |
| Manufacturing, essentials | 509 | 109 | 0.225 | 219 | 43.0 | 50 | 45.9 |
| Manufacturing, inputs | 1,074 | 185 | 0.229 | 407 | 37.9 | 70 | 37.8 |
| Mining | 624 | 148 | 0.335 | 150 | 24.0 | 55 | 37.2 |
| Other services, except public administration | 68 | 22 | 0.230 | 30 | 44.1 | 9 | 40.9 |
| Professional, scientific, and technical services | 525 | 132 | 0.196 | 120 | 22.9 | 42 | 31.8 |
| Real estate and rental and leasing | 305 | 79 | 0.331 | 145 | 47.5 | 31 | 39.2 |
| Retail trade, discretionary | 240 | 92 | 0.195 | 118 | 49.2 | 38 | 41.3 |
| Retail trade, non-discretionary | 320 | 94 | 0.231 | 149 | 46.6 | 42 | 44.7 |
| Transportation and warehousing, passengers and packages | 303 | 65 | 0.335 | 128 | 42.2 | 29 | 44.6 |
| Transportation and warehousing, postal service and couriers | 14 | 3 | 0.657 | 1 | 7.1 | 2 | 66.7 |
| Utilities | 147 | 4 | 0.344 | 48 | 32.7 | 2 | 50.0 |
| Wholesale trade | 462 | 150 | 0.214 | 178 | 38.5 | 61 | 40.7 |
| Total | 9,676 | 2,257 | — | 3,693 | 38.2 | 899 | 39.8 |

^a Limit is the average debt level of corporations in financial distress (see column 2 in Table 5-2).

^b Affected populations are corporations with debt levels above the limit. Their use of debt would have been constrained by the rule.

Source: Nathan Associates Inc.

Eliminating Tax Code Biases Favoring Debt Is an Alternative to Limiting Debt Levels

However, our evidence reveals benefits from lower debt levels, suggesting that an alternative to legislating debt level limits might be economically feasible. The most likely alternative is tax reform. Corporate income taxes are levied against the income that goes to equity holders but not against the income that goes to lenders. Dividend payments are not a deductible item from corporate income, but interest payments are. As a result, corporations can lower their income taxes by increasing their debt. Eliminating this bias in the tax code might be a practical, effective, and feasible alternative to legislating debt limits; however, a cost-benefit analysis of revising the corporate tax code is outside the scope of our research.

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Appendix A

Industry Characteristics

TABLE A-1
Industry Uniqueness (1977 – 2001)

| Industry | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Agriculture, forestry, fishing, and hunting | 0.086 | 0.079 | 0.113 | 0.108 | 0.114 | 0.134 | 0.144 | 0.222 | 0.130 | 0.139 | 0.093 | 0.112 | 0.116 | 0.349 | 0.344 | 0.353 | 0.351 | 0.347 | 0.335 | 0.390 | 0.324 | 0.374 | 0.139 | 0.235 | 0.218 |
| Mining | 0.069 | 0.083 | 0.079 | 0.063 | 0.069 | 0.075 | 0.076 | 0.068 | 0.074 | 0.082 | 0.079 | 0.072 | 0.065 | 0.056 | 0.065 | 0.064 | 0.062 | 0.057 | 0.052 | 0.043 | 0.042 | 0.038 | 0.023 | 0.029 | 0.022 |
| Utilities | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 | 0.004 | 0.003 | 0.004 | 0.003 | 0.003 | 0.003 | 0.001 | 0.001 | 0.000 | 0.000 | na | na |
| Construction | 0.022 | 0.021 | 0.016 | 0.012 | 0.012 | 0.014 | 0.006 | 0.006 | 0.005 | 0.010 | 0.009 | 0.011 | 0.013 | 0.013 | 0.006 | 0.017 | 0.020 | 0.020 | 0.015 | 0.002 | 0.008 | 0.008 | 0.011 | 0.009 | 0.008 |
| Manufacturing, essentials | 0.111 | 0.112 | 0.108 | 0.101 | 0.107 | 0.089 | 0.094 | 0.117 | 0.113 | 0.115 | 0.108 | 0.099 | 0.165 | 0.177 | 0.184 | 0.196 | 0.174 | 0.178 | 0.168 | 0.035 | 0.187 | 0.171 | 0.188 | 0.193 | 0.187 |
| Manufacturing, inputs | 0.098 | 0.098 | 0.096 | 0.103 | 0.105 | 0.114 | 0.117 | 0.121 | 0.125 | 0.162 | 0.144 | 0.141 | 0.141 | 0.142 | 0.155 | 0.165 | 0.186 | 0.175 | 0.166 | 0.152 | 0.163 | 0.207 | 0.156 | 0.128 | 0.187 |
| Manufacturing, durables | 0.127 | 0.128 | 0.128 | 0.140 | 0.141 | 0.163 | 0.163 | 0.160 | 0.162 | 0.166 | 0.171 | 0.163 | 0.155 | 0.169 | 0.186 | 0.182 | 0.181 | 0.172 | 0.172 | 0.172 | 0.166 | 0.183 | 0.195 | 0.199 | 0.228 |
| Wholesale trade | 0.028 | 0.027 | 0.025 | 0.019 | 0.020 | 0.018 | 0.017 | 0.012 | 0.012 | 0.013 | 0.010 | 0.010 | 0.022 | 0.022 | 0.025 | 0.024 | 0.023 | 0.024 | 0.017 | 0.008 | 0.010 | 0.008 | 0.005 | 0.011 | 0.013 |
| Retail trade, non-discretionary | 0.072 | 0.066 | 0.053 | 0.028 | 0.026 | 0.026 | 0.026 | 0.034 | 0.032 | 0.028 | 0.029 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.022 | 0.021 | 0.017 | 0.026 | na | 0.000 | 0.014 | 0.021 | 0.083 |
| Retail trade, discretionary | 0.031 | 0.034 | 0.031 | 0.022 | 0.024 | 0.019 | 0.017 | 0.019 | 0.020 | 0.013 | 0.014 | 0.018 | 0.025 | 0.019 | 0.018 | 0.013 | 0.019 | 0.010 | 0.010 | 0.011 | 0.003 | 0.007 | 0.032 | 0.034 | 0.012 |
| Transportation and warehousing, passengers and packages | 0.007 | 0.005 | 0.005 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.002 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | na | na | na | na | 0.000 |
| Transportation and warehousing, postal service and couriers | na | na | na | na | na | na | na | 0.000 | 0.000 | na | na | na | na | 0.016 | 0.021 | 0.021 | 0.021 | 0.006 | 0.001 | 0.001 | na | na | na | na | 0.001 |
| Information | 0.015 | 0.015 | 0.017 | 0.015 | 0.012 | 0.013 | 0.016 | 0.012 | 0.025 | 0.026 | 0.031 | 0.057 | 0.074 | 0.079 | 0.087 | 0.088 | 0.081 | 0.086 | 0.102 | 0.096 | 0.107 | 0.123 | 0.131 | 0.184 | 0.234 |
| Real estate and rental & leasing | 0.044 | 0.037 | 0.033 | 0.032 | 0.022 | 0.024 | 0.026 | 0.022 | 0.015 | 0.012 | 0.010 | 0.010 | 0.005 | 0.004 | 0.004 | 0.006 | 0.037 | 0.011 | 0.019 | 0.024 | 0.021 | 0.008 | 0.008 | 0.008 | 0.009 |
| Professional, scientific, and technical services | 0.166 | 0.163 | 0.183 | 0.175 | 0.200 | 0.208 | 0.213 | 0.237 | 0.232 | 0.182 | 0.211 | 0.212 | 0.199 | 0.195 | 0.198 | 0.315 | 0.292 | 0.298 | 0.181 | 0.154 | 0.236 | 0.218 | 0.182 | 0.189 | 0.215 |
| Administrative, support and waste management, and remediation services | 0.115 | 0.121 | 0.127 | 0.106 | 0.096 | 0.099 | 0.077 | 0.076 | 0.050 | 0.048 | 0.036 | 0.025 | 0.024 | 0.018 | 0.026 | 0.025 | 0.023 | 0.025 | 0.026 | 0.025 | 0.004 | 0.011 | 0.021 | 0.049 | 0.086 |
| Education services | 0.258 | 0.248 | 0.275 | 0.227 | 0.203 | na | na | na | 0.004 | 0.004 | 0.003 | 0.170 | 0.152 | 0.134 | 0.145 | 0.192 | 0.197 | 0.130 | 0.121 | 0.127 | na | 0.005 | 0.022 | 0.032 | 0.038 |
| Health care and social assistance | 0.036 | 0.027 | 0.026 | 0.020 | 0.019 | 0.015 | 0.006 | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 | 0.005 | 0.006 | 0.006 | 0.007 | 0.010 | 0.008 | 0.008 | 0.008 | na | 0.003 | 0.003 | 0.005 | 0.010 |
| Arts, entertainment, and recreation | 0.060 | 0.052 | 0.052 | 0.049 | 0.031 | 0.033 | 0.043 | 0.050 | 0.041 | 0.049 | 0.066 | 0.062 | 0.076 | 0.101 | 0.003 | 0.001 | 0.011 | 0.003 | 0.004 | 0.009 | 0.016 | 0.036 | 0.046 | 0.050 | 0.036 |
| Accommodation & food services | 0.009 | 0.011 | 0.012 | 0.006 | 0.007 | 0.008 | 0.014 | 0.013 | 0.010 | 0.009 | 0.007 | 0.008 | 0.010 | 0.007 | 0.009 | 0.011 | 0.011 | 0.010 | 0.011 | 0.007 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 |
| Other services (except public administration) | 0.100 | 0.097 | 0.099 | 0.092 | 0.089 | 0.096 | 0.092 | 0.067 | 0.049 | 0.071 | 0.085 | 0.089 | 0.080 | 0.087 | 0.092 | 0.096 | 0.068 | 0.070 | 0.067 | 0.051 | 0.050 | 0.045 | 0.051 | 0.058 | 0.024 |

Note: na = not available.

Source: Nathian Associates Inc.

TABLE A-2
Industry Earnings Volatility (1977 – 2001)

| Industry | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Agriculture, forestry, fishing, and hunting | na | na | na | 0.158 | 0.320 | 0.647 | 0.648 | 0.261 | 0.138 | 0.126 | 0.109 | 0.233 | 0.233 | 0.270 | 0.434 | 0.422 | 0.327 | 0.252 | 0.257 | 0.218 | 0.665 | 0.665 | 0.245 | 0.235 | 0.498 |
| Mining | na | na | na | 0.218 | 0.234 | 0.207 | 0.099 | 0.203 | 0.173 | 0.228 | 0.329 | 0.304 | 0.156 | 0.170 | 0.312 | 0.171 | 0.170 | 0.658 | 0.611 | 0.562 | 0.197 | 0.571 | 1.049 | 1.059 | 0.619 |
| Utilities | na | na | na | 0.037 | 0.043 | 0.028 | 0.030 | 0.049 | 0.069 | 0.033 | 0.018 | 0.060 | 0.078 | 0.101 | 0.022 | 0.009 | 0.122 | 0.195 | 0.194 | 0.099 | 0.133 | 0.218 | 0.318 | 0.495 | 0.468 |
| Construction | na | na | na | 0.086 | 0.149 | 0.127 | 0.087 | 0.035 | 0.061 | 0.078 | 0.346 | 0.309 | 0.362 | 0.179 | 0.105 | 0.319 | 0.324 | 0.465 | 0.452 | 0.496 | 0.399 | 0.282 | 0.246 | 0.280 | 0.188 |
| Manufacturing, essentials | na | na | na | 0.009 | 0.019 | 0.049 | 0.055 | 0.052 | 0.081 | 0.093 | 0.134 | 0.216 | 0.216 | 0.176 | 0.070 | 0.092 | 0.065 | 0.126 | 0.068 | 0.360 | 1.078 | 1.126 | 0.909 | 0.293 | 0.253 |
| Manufacturing, inputs | na | na | na | 0.122 | 0.168 | 0.091 | 0.082 | 0.104 | 0.089 | 0.115 | 0.192 | 0.184 | 0.092 | 0.055 | 0.157 | 0.148 | 0.136 | 0.112 | 0.129 | 0.079 | 0.129 | 0.179 | 0.346 | 0.355 | 0.287 |
| Manufacturing, durables | na | na | na | 0.105 | 0.117 | 0.132 | 0.195 | 0.230 | 0.181 | 0.181 | 0.103 | 0.125 | 0.088 | 0.235 | 0.148 | 0.124 | 0.298 | 0.270 | 0.216 | 0.203 | 0.190 | 0.190 | 0.100 | 0.059 | 0.351 |
| Wholesale trade | na | na | na | 0.074 | 0.070 | 0.065 | 0.054 | 0.056 | 0.101 | 0.101 | 0.062 | 0.093 | 0.087 | 0.141 | 0.266 | 0.270 | 0.215 | 0.086 | 0.085 | 0.198 | 0.254 | 0.283 | 0.197 | 0.384 | 0.412 |
| Retail trade, non-discretionary | na | na | na | 0.041 | 0.038 | 0.042 | 0.085 | 0.095 | 0.089 | 0.025 | 0.064 | 0.050 | 0.048 | 0.128 | 0.087 | 0.028 | 0.033 | 0.039 | 0.019 | 0.029 | 0.072 | 0.077 | 0.298 | 0.221 | 0.383 |
| Retail trade, discretionary | na | na | na | 0.171 | 0.180 | 0.173 | 0.214 | 0.228 | 0.285 | 0.088 | 0.030 | 0.122 | 0.143 | 0.139 | 0.202 | 0.159 | 0.326 | 0.303 | 0.185 | 0.150 | 0.255 | 0.302 | 0.270 | 0.146 | 0.386 |
| Transportation and warehousing, passengers and packages | na | na | na | 0.026 | 0.045 | 0.130 | 0.090 | 0.177 | 0.254 | 0.282 | 0.372 | 0.320 | 0.246 | 0.237 | 0.150 | 0.715 | 0.647 | 0.335 | 0.234 | 0.253 | 0.201 | 0.245 | 0.183 | 0.049 | 0.180 |
| Transportation and warehousing, postal service and couriers | na | na | na | 0.290 | 0.292 | 0.213 | 0.131 | 0.108 | 0.062 | 0.233 | 0.237 | 0.229 | 0.181 | 0.138 | 0.244 | 0.716 | 0.703 | 0.902 | 2.592 | 2.633 | 2.374 | 0.144 | 0.160 | 0.472 | 0.569 |
| Information | na | na | na | 0.042 | 0.062 | 0.075 | 0.170 | 0.322 | 0.323 | 0.222 | 0.105 | 0.099 | 0.047 | 0.056 | 0.051 | 0.111 | 0.206 | 0.369 | 0.381 | 0.323 | 0.029 | 0.086 | 0.082 | 0.302 | 0.301 |
| Real estate and rental & leasing | na | na | na | 0.111 | 0.092 | 0.094 | 0.296 | 0.331 | 0.318 | 0.166 | 0.084 | 0.134 | 0.190 | 0.185 | 0.148 | 0.169 | 0.236 | 0.277 | 0.016 | 0.084 | 0.087 | 0.125 | 0.172 | 0.169 | 0.218 |
| Professional, scientific, and technical services | na | na | na | 0.109 | 0.102 | 0.135 | 0.048 | 0.032 | 0.049 | 0.048 | 0.044 | 0.037 | 0.030 | 0.173 | 0.139 | 0.493 | 0.728 | 0.787 | 0.120 | 0.532 | 0.564 | 0.217 | 0.185 | 0.220 | 0.492 |
| Administrative, support and waste management, and remediation services | na | na | na | 0.084 | 0.095 | 0.070 | 0.059 | 0.231 | 0.213 | 0.085 | 0.123 | 0.119 | 0.089 | 0.102 | 0.122 | 0.179 | 0.226 | 0.340 | 0.346 | 0.325 | 0.078 | 0.320 | 0.281 | 0.249 | 0.131 |
| Education services | na | na | na | 0.189 | 0.192 | 0.148 | 0.070 | 0.057 | 0.030 | 0.183 | 0.189 | 0.333 | 0.382 | 0.393 | 0.277 | 0.153 | 0.142 | 0.183 | 0.210 | 0.093 | 0.304 | 0.211 | 0.133 | 0.430 | 1.032 |
| Health care and social assistance | na | na | na | 0.032 | 0.052 | 0.061 | 0.068 | 0.056 | 0.090 | 0.256 | 0.280 | 0.309 | 0.158 | 0.240 | 0.243 | 0.160 | 0.126 | 0.142 | 0.047 | 0.089 | 0.159 | 0.170 | 0.153 | 0.017 | 0.043 |
| Arts, entertainment, and recreation | na | na | na | 0.239 | 0.103 | 0.108 | 0.157 | 0.168 | 0.228 | 0.120 | 0.112 | 0.061 | 0.020 | 0.282 | 0.306 | 0.486 | 0.270 | 0.268 | 0.206 | 0.445 | 0.725 | 0.787 | 0.744 | 0.880 | 0.836 |
| Accommodation & food services | na | na | na | 0.057 | 0.111 | 0.104 | 0.122 | 0.122 | 0.129 | 0.041 | 0.193 | 0.185 | 0.240 | 0.155 | 0.194 | 0.061 | 0.195 | 0.258 | 0.248 | 0.093 | 0.050 | 0.010 | 0.115 | 0.127 | 0.017 |
| Other services (except public administration) | na | na | na | 0.075 | 0.261 | 0.220 | 0.225 | 0.024 | 0.295 | 0.280 | 0.298 | 0.093 | 0.185 | 0.198 | 0.203 | 0.061 | 0.203 | 0.226 | 0.447 | 1.112 | 1.155 | 1.073 | 0.334 | 0.309 | 0.390 |

Note: na = not available.

Source: Nathian Associates Inc.

TABLE A-3
Industry Future Earnings Potential (1977 – 2001)

| Industry | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Agriculture, forestry, fishing, and hunting | 0.607 | 0.669 | 1.046 | 1.554 | 1.284 | 1.273 | 1.708 | 1.972 | 1.162 | 1.572 | 1.067 | 1.258 | 1.400 | 1.137 | 1.931 | 2.035 | 2.436 | 2.045 | 3.511 | 3.681 | 5.725 | 4.513 | 1.351 | 1.909 | 2.263 |
| Mining | 1.220 | 1.100 | 1.777 | 2.576 | 1.710 | 1.282 | 1.159 | 1.018 | 0.625 | 0.791 | 0.914 | 0.893 | 1.187 | 0.887 | 0.897 | 0.773 | 0.918 | 0.737 | 0.870 | 1.687 | 0.857 | 0.368 | 0.529 | 0.897 | 1.999 |
| Utilities | 0.779 | 0.674 | 0.638 | 0.638 | 0.646 | 0.741 | 0.742 | 0.771 | 0.924 | 1.064 | 0.879 | 0.960 | 1.234 | 1.153 | 1.360 | 1.340 | 1.433 | 1.185 | 1.282 | 1.276 | 1.461 | 1.055 | 1.690 | 1.432 | 1.077 |
| Construction | 0.674 | 0.648 | 0.795 | 0.975 | 0.721 | 0.942 | 0.654 | 0.547 | 0.628 | 0.581 | 0.568 | 0.668 | 0.730 | 0.529 | 0.724 | 0.960 | 1.527 | 0.847 | 0.863 | 1.167 | 1.410 | 0.990 | 0.699 | 0.790 | 0.476 |
| Manufacturing, essentials | 0.803 | 0.717 | 0.715 | 0.688 | 0.738 | 0.738 | 0.895 | 0.814 | 0.835 | 0.781 | 0.733 | 0.855 | 0.924 | 0.681 | 1.003 | 1.378 | 1.712 | 1.161 | 1.867 | 1.472 | 2.273 | 3.192 | 2.335 | 2.395 | 1.395 |
| Manufacturing, inputs | 0.841 | 0.826 | 1.021 | 1.260 | 0.902 | 0.775 | 0.935 | 0.865 | 1.078 | 1.371 | 1.169 | 1.245 | 1.416 | 1.248 | 1.653 | 1.526 | 1.473 | 1.487 | 1.858 | 2.158 | 2.573 | 3.063 | 3.222 | 2.850 | 1.955 |
| Manufacturing, durables | 0.468 | 0.481 | 0.561 | 0.812 | 0.702 | 0.791 | 0.994 | 0.766 | 0.798 | 0.833 | 0.823 | 0.804 | 0.855 | 0.655 | 0.904 | 1.147 | 1.362 | 1.246 | 1.575 | 2.067 | 2.033 | 2.643 | 4.726 | 3.458 | 2.800 |
| Wholesale trade | 0.799 | 0.784 | 1.001 | 1.150 | 0.940 | 0.868 | 1.066 | 0.928 | 1.076 | 1.227 | 0.970 | 1.138 | 1.427 | 1.066 | 1.123 | 1.030 | 1.271 | 1.321 | 1.301 | 1.692 | 1.554 | 1.382 | 1.336 | 0.878 | 1.440 |
| Retail trade, non-discretionary | 1.142 | 1.183 | 1.055 | 1.045 | 1.044 | 1.463 | 1.808 | 1.542 | 1.968 | 1.974 | 1.981 | 2.558 | 2.626 | 1.609 | 1.832 | 1.817 | 2.125 | 2.098 | 2.292 | 2.248 | 2.466 | 2.030 | 3.283 | 2.077 | 5.310 |
| Retail trade, discretionary | 0.489 | 0.431 | 0.472 | 0.515 | 0.500 | 0.791 | 0.914 | 0.793 | 1.114 | 1.172 | 0.806 | 1.176 | 1.292 | 1.132 | 1.936 | 1.970 | 2.189 | 1.428 | 1.659 | 1.828 | 2.156 | 3.119 | 3.349 | 1.439 | 2.900 |
| Transportation and warehousing, passengers and packages | 0.630 | 0.529 | 0.701 | 0.948 | 0.673 | 0.561 | 0.617 | 0.532 | 0.608 | 0.485 | 0.444 | 0.430 | 0.821 | 0.281 | 0.775 | 0.801 | 1.106 | 1.002 | 1.139 | 0.878 | 0.819 | 0.602 | 0.463 | 0.468 | 0.510 |
| Transportation and warehousing, postal service and couriers | 1.881 | 1.839 | 1.780 | 2.101 | 2.573 | 2.820 | 2.796 | 1.904 | 2.403 | 2.456 | 1.615 | 1.731 | 1.722 | 1.100 | 1.486 | 1.620 | 1.700 | 1.386 | 1.810 | 2.029 | 0.457 | 0.310 | 0.192 | 2.158 | 1.388 |
| Information | 0.495 | 0.485 | 0.526 | 0.535 | 0.527 | 0.387 | 0.406 | 0.510 | 0.984 | 1.077 | 1.147 | 1.240 | 1.663 | 1.299 | 1.589 | 1.792 | 2.497 | 2.254 | 3.179 | 2.641 | 2.890 | 3.730 | 6.871 | 1.760 | 3.079 |
| Real estate and rental & leasing | 0.496 | 0.543 | 0.677 | 1.001 | 0.953 | 0.783 | 0.962 | 0.859 | 0.860 | 0.830 | 0.965 | 0.967 | 1.082 | 1.004 | 0.882 | 0.980 | 1.540 | 0.957 | 1.330 | 1.459 | 1.434 | 0.813 | 0.990 | 0.827 | 0.642 |
| Professional, scientific, and technical services | 1.685 | 1.587 | 1.721 | 2.371 | 2.009 | 2.190 | 2.754 | 2.105 | 2.361 | 1.870 | 1.927 | 1.670 | 1.733 | 1.434 | 1.978 | 0.938 | 1.040 | 1.091 | 3.778 | 3.517 | 3.771 | 2.836 | 6.738 | 3.237 | 3.229 |
| Administrative, support and waste management, and remediation services | 0.960 | 1.034 | 1.286 | 1.846 | 1.893 | 2.666 | 2.105 | 2.169 | 2.983 | 3.382 | 3.440 | 3.273 | 4.055 | 3.334 | 3.405 | 3.123 | 2.493 | 2.370 | 2.617 | 3.254 | 3.512 | 2.512 | 4.400 | 1.896 | 2.886 |
| Education services | 1.955 | 2.122 | 3.104 | 4.542 | 4.707 | 3.292 | 3.694 | 3.260 | 3.303 | 2.905 | 3.467 | 2.883 | 2.446 | 2.038 | 2.462 | 2.035 | 1.488 | 1.719 | 2.852 | 5.350 | 5.372 | 4.146 | 2.666 | 4.345 | 4.373 |
| Health care and social assistance | 1.272 | 1.631 | 2.036 | 3.161 | 2.536 | 3.087 | 2.502 | 2.352 | 2.268 | 1.747 | 1.550 | 1.608 | 1.897 | 1.910 | 2.829 | 2.554 | 2.556 | 2.638 | 2.982 | 2.463 | 2.116 | 1.491 | 1.173 | 1.889 | 2.092 |
| Arts, entertainment, and recreation | 1.266 | 2.080 | 2.370 | 1.566 | 1.303 | 1.228 | 1.617 | 1.238 | 1.403 | 1.300 | 1.163 | 1.376 | 1.239 | 0.809 | 0.985 | 1.335 | 2.781 | 2.023 | 2.102 | 2.375 | 2.140 | 2.377 | 1.881 | 1.711 | 2.440 |
| Accommodation & food services | 0.798 | 0.825 | 0.902 | 0.938 | 0.938 | 1.342 | 1.736 | 1.469 | 1.551 | 1.573 | 1.225 | 1.377 | 1.434 | 0.990 | 2.143 | 2.398 | 2.818 | 1.261 | 2.257 | 2.262 | 1.815 | 1.687 | 1.278 | 1.710 | 1.966 |
| Other services (except public administration) | 0.595 | 0.588 | 0.583 | 0.659 | 0.515 | 0.834 | 0.860 | 0.879 | 1.364 | 1.331 | 1.063 | 1.355 | 1.164 | 1.062 | 1.592 | 1.821 | 2.426 | 1.816 | 2.094 | 2.404 | 2.186 | 2.288 | 1.445 | 0.794 | 1.212 |

Note: *na = not available.*

Source: *Nathian Associates Inc.*

TABLE A-4
Industry Current Earnings Potential (1977 – 2001)

| Industry | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Agriculture, forestry, fishing, and hunting | 0.039 | 0.043 | 0.050 | 0.069 | 0.127 | 0.073 | 0.079 | 0.082 | 0.058 | 0.059 | 0.047 | 0.059 | 0.054 | 0.047 | 0.073 | 0.080 | 0.077 | 0.107 | 0.160 | 0.301 | 0.103 | 0.095 | 0.048 | 0.038 | 0.048 |
| Mining | 0.081 | 0.073 | 0.094 | 0.108 | 0.095 | 0.070 | 0.066 | 0.075 | 0.056 | 0.043 | 0.058 | 0.059 | 0.075 | 0.067 | 0.041 | 0.040 | 0.033 | 0.054 | 0.066 | 0.073 | 0.085 | 0.028 | 0.070 | 0.090 | 0.087 |
| Utilities | 0.072 | 0.071 | 0.072 | 0.077 | 0.083 | 0.086 | 0.088 | 0.086 | 0.083 | 0.076 | 0.076 | 0.064 | 0.061 | 0.064 | 0.062 | 0.065 | 0.051 | 0.059 | 0.059 | 0.060 | 0.049 | 0.059 | 0.086 | 0.046 | 0.042 |
| Construction | 0.060 | 0.072 | 0.078 | 0.081 | 0.063 | 0.054 | 0.050 | 0.049 | 0.041 | 0.034 | 0.046 | 0.047 | 0.036 | 0.030 | 0.026 | 0.040 | 0.059 | 0.038 | 0.030 | 0.047 | 0.043 | 0.064 | 0.055 | 0.050 | 0.024 |
| Manufacturing, essentials | 0.081 | 0.084 | 0.091 | 0.092 | 0.097 | 0.091 | 0.091 | 0.091 | 0.079 | 0.085 | 0.096 | 0.071 | 0.078 | 0.078 | 0.072 | 0.059 | 0.058 | 0.058 | 0.062 | 0.025 | 0.066 | 0.047 | 0.059 | 0.043 | 0.047 |
| Manufacturing, inputs | 0.075 | 0.079 | 0.092 | 0.098 | 0.093 | 0.072 | 0.073 | 0.080 | 0.067 | 0.064 | 0.074 | 0.086 | 0.084 | 0.080 | 0.060 | 0.060 | 0.057 | 0.064 | 0.077 | 0.077 | 0.072 | 0.054 | 0.073 | 0.082 | 0.073 |
| Manufacturing, durables | 0.082 | 0.080 | 0.083 | 0.068 | 0.072 | 0.060 | 0.068 | 0.080 | 0.070 | 0.062 | 0.065 | 0.074 | 0.071 | 0.048 | 0.037 | 0.032 | 0.044 | 0.060 | 0.061 | 0.075 | 0.063 | 0.066 | 0.064 | 0.070 | 0.033 |
| Wholesale trade | 0.061 | 0.061 | 0.070 | 0.077 | 0.079 | 0.075 | 0.065 | 0.065 | 0.053 | 0.050 | 0.043 | 0.048 | 0.047 | 0.056 | 0.041 | 0.040 | 0.045 | 0.039 | 0.039 | 0.051 | 0.040 | 0.035 | 0.041 | 0.060 | 0.048 |
| Retail trade, non-discretionary | 0.077 | 0.083 | 0.085 | 0.081 | 0.084 | 0.075 | 0.079 | 0.079 | 0.077 | 0.070 | 0.058 | 0.048 | 0.045 | 0.048 | 0.050 | 0.051 | 0.052 | 0.048 | 0.045 | 0.047 | 0.041 | 0.039 | 0.059 | 0.073 | 0.059 |
| Retail trade, discretionary | 0.077 | 0.084 | 0.090 | 0.063 | 0.066 | 0.064 | 0.088 | 0.086 | 0.068 | 0.057 | 0.045 | 0.061 | 0.050 | 0.047 | 0.056 | 0.075 | 0.047 | 0.049 | 0.043 | 0.050 | 0.042 | 0.041 | 0.041 | 0.034 | 0.055 |
| Transportation and warehousing, passengers and packages | 0.069 | 0.074 | 0.077 | 0.080 | 0.077 | 0.066 | 0.060 | 0.071 | 0.052 | 0.034 | 0.046 | 0.054 | 0.047 | 0.031 | 0.018 | 0.031 | 0.032 | 0.049 | 0.047 | 0.062 | 0.074 | 0.061 | 0.049 | 0.042 | 0.022 |
| Transportation and warehousing, postal service and couriers | 0.073 | 0.083 | 0.129 | 0.087 | 0.102 | 0.105 | 0.100 | 0.084 | 0.070 | 0.067 | 0.058 | 0.050 | 0.058 | 0.054 | 0.030 | 0.064 | 0.058 | 0.011 | 0.075 | 0.064 | 0.062 | 0.046 | 0.047 | 0.005 | 0.000 |
| Information | 0.075 | 0.078 | 0.081 | 0.079 | 0.086 | 0.081 | 0.058 | 0.079 | 0.073 | 0.077 | 0.074 | 0.078 | 0.067 | 0.064 | 0.060 | 0.065 | 0.046 | 0.070 | 0.064 | 0.055 | 0.053 | 0.056 | 0.050 | 0.024 | 0.025 |
| Real estate and rental & leasing | 0.059 | 0.071 | 0.078 | 0.078 | 0.091 | 0.102 | 0.058 | 0.082 | 0.073 | 0.061 | 0.063 | 0.055 | 0.069 | 0.071 | 0.066 | 0.040 | 0.044 | 0.054 | 0.059 | 0.060 | 0.061 | 0.046 | 0.050 | 0.049 | 0.037 |
| Professional, scientific, and technical services | 0.094 | 0.090 | 0.084 | 0.094 | 0.094 | 0.080 | 0.073 | 0.070 | 0.078 | 0.064 | 0.060 | 0.056 | 0.051 | 0.063 | 0.061 | 0.013 | 0.016 | 0.036 | 0.064 | 0.043 | 0.026 | 0.029 | 0.037 | 0.051 | 0.024 |
| Administrative, support and waste management, and remediation services | 0.066 | 0.078 | 0.089 | 0.086 | 0.083 | 0.076 | 0.063 | 0.079 | 0.082 | 0.103 | 0.089 | 0.097 | 0.084 | 0.083 | 0.062 | 0.071 | 0.051 | 0.066 | 0.058 | 0.038 | 0.041 | 0.057 | 0.053 | 0.055 | 0.046 |
| Education services | 0.114 | 0.116 | 0.093 | 0.118 | 0.104 | 0.100 | 0.103 | 0.103 | 0.103 | 0.075 | 0.075 | 0.102 | 0.057 | 0.065 | 0.060 | 0.060 | 0.043 | 0.055 | 0.066 | 0.068 | 0.038 | 0.031 | 0.016 | 0.023 | 0.062 |
| Health care and social assistance | 0.082 | 0.082 | 0.094 | 0.097 | 0.096 | 0.107 | 0.103 | 0.106 | 0.095 | 0.053 | 0.046 | 0.062 | 0.050 | 0.063 | 0.048 | 0.066 | 0.063 | 0.060 | 0.053 | 0.057 | 0.038 | 0.041 | 0.040 | 0.042 | 0.047 |
| Arts, entertainment, and recreation | 0.089 | 0.114 | 0.112 | 0.110 | 0.084 | 0.086 | 0.062 | 0.049 | 0.079 | 0.058 | 0.039 | 0.059 | 0.061 | 0.029 | 0.032 | 0.040 | 0.044 | 0.045 | 0.083 | 0.037 | 0.076 | 0.051 | 0.031 | 0.081 | 0.075 |
| Accommodation & food services | 0.078 | 0.080 | 0.071 | 0.077 | 0.085 | 0.077 | 0.080 | 0.077 | 0.072 | 0.062 | 0.075 | 0.071 | 0.052 | 0.053 | 0.058 | 0.054 | 0.069 | 0.060 | 0.063 | 0.059 | 0.056 | 0.054 | 0.061 | 0.073 | 0.084 |
| Other services (except public administration) | 0.061 | 0.061 | 0.071 | 0.070 | 0.043 | 0.048 | 0.042 | 0.037 | 0.052 | 0.054 | 0.050 | 0.053 | 0.070 | 0.064 | 0.046 | 0.053 | 0.072 | 0.060 | 0.021 | 0.059 | 0.040 | 0.024 | 0.029 | 0.031 | 0.071 |

Note: na = not available.

Source: Nathan Associates Inc.

TABLE A-5
Industry Asset Separability (1977 – 2001)

| Industry | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Agriculture, forestry, fishing, and hunting | 0.649 | 0.606 | 0.629 | 0.546 | 0.531 | 0.530 | 0.513 | 0.299 | 0.446 | 0.513 | 0.510 | 0.521 | 0.504 | 0.389 | 0.513 | 0.487 | 0.499 | 0.504 | 0.509 | 0.497 | 0.389 | 0.360 | 0.392 | 0.331 | 0.320 |
| Mining | 0.616 | 0.630 | 0.645 | 0.648 | 0.686 | 0.720 | 0.679 | 0.658 | 0.646 | 0.672 | 0.666 | 0.680 | 0.668 | 0.635 | 0.649 | 0.644 | 0.640 | 0.685 | 0.684 | 0.715 | 0.642 | 0.627 | 0.603 | 0.530 | 0.707 |
| Utilities | 0.852 | 0.853 | 0.837 | 0.821 | 0.823 | 0.824 | 0.798 | 0.795 | 0.811 | 0.817 | 0.809 | 0.795 | 0.748 | 0.737 | 0.729 | 0.712 | 0.674 | 0.663 | 0.665 | 0.663 | 0.667 | 0.665 | 0.627 | 0.418 | 0.534 |
| Construction | 0.242 | 0.243 | 0.245 | 0.253 | 0.270 | 0.200 | 0.373 | 0.352 | 0.332 | 0.289 | 0.294 | 0.157 | 0.250 | 0.294 | 0.330 | 0.172 | 0.158 | 0.181 | 0.180 | 0.146 | 0.167 | 0.139 | 0.142 | 0.159 | 0.179 |
| Manufacturing, essentials | 0.310 | 0.314 | 0.313 | 0.320 | 0.340 | 0.342 | 0.334 | 0.319 | 0.324 | 0.306 | 0.301 | 0.296 | 0.287 | 0.287 | 0.296 | 0.299 | 0.313 | 0.322 | 0.316 | 0.252 | 0.284 | 0.267 | 0.267 | 0.221 | 0.248 |
| Manufacturing, inputs | 0.506 | 0.514 | 0.507 | 0.513 | 0.543 | 0.574 | 0.573 | 0.576 | 0.579 | 0.563 | 0.554 | 0.544 | 0.544 | 0.547 | 0.562 | 0.557 | 0.535 | 0.515 | 0.500 | 0.519 | 0.509 | 0.477 | 0.461 | 0.412 | 0.395 |
| Manufacturing, durables | 0.312 | 0.310 | 0.321 | 0.339 | 0.360 | 0.377 | 0.355 | 0.339 | 0.336 | 0.328 | 0.304 | 0.276 | 0.277 | 0.289 | 0.298 | 0.287 | 0.277 | 0.278 | 0.282 | 0.282 | 0.283 | 0.276 | 0.255 | 0.221 | 0.225 |
| Wholesale trade | 0.296 | 0.296 | 0.305 | 0.312 | 0.356 | 0.381 | 0.359 | 0.364 | 0.342 | 0.307 | 0.288 | 0.260 | 0.235 | 0.238 | 0.248 | 0.228 | 0.230 | 0.219 | 0.225 | 0.345 | 0.242 | 0.234 | 0.227 | 0.284 | 0.248 |
| Retail trade, non-discretionary | 0.313 | 0.363 | 0.384 | 0.401 | 0.408 | 0.404 | 0.392 | 0.412 | 0.418 | 0.395 | 0.406 | 0.356 | 0.359 | 0.349 | 0.362 | 0.366 | 0.375 | 0.379 | 0.380 | 0.403 | 0.376 | 0.387 | 0.363 | 0.385 | 0.341 |
| Retail trade, discretionary | 0.386 | 0.435 | 0.455 | 0.468 | 0.466 | 0.446 | 0.415 | 0.382 | 0.367 | 0.328 | 0.290 | 0.387 | 0.383 | 0.383 | 0.394 | 0.399 | 0.362 | 0.362 | 0.349 | 0.352 | 0.253 | 0.251 | 0.226 | 0.240 | 0.269 |
| Transportation and warehousing, passengers and packages | 0.735 | 0.726 | 0.718 | 0.709 | 0.701 | 0.701 | 0.708 | 0.698 | 0.703 | 0.700 | 0.693 | 0.669 | 0.634 | 0.633 | 0.662 | 0.690 | 0.686 | 0.685 | 0.677 | 0.689 | 0.673 | 0.685 | 0.691 | 0.722 | 0.655 |
| Transportation and warehousing, postal service and couriers | 0.434 | 0.419 | 0.440 | 0.433 | 0.470 | 0.479 | 0.532 | 0.600 | 0.582 | 0.646 | 0.622 | 0.607 | 0.628 | 0.582 | 0.563 | 0.539 | 0.546 | 0.387 | 0.384 | 0.354 | 0.399 | 0.413 | 0.442 | 0.456 | 0.419 |
| Information | 0.802 | 0.794 | 0.785 | 0.783 | 0.497 | 0.823 | 0.809 | 0.766 | 0.749 | 0.711 | 0.680 | 0.649 | 0.608 | 0.586 | 0.590 | 0.589 | 0.562 | 0.543 | 0.471 | 0.430 | 0.436 | 0.411 | 0.341 | 0.226 | 0.283 |
| Real estate and rental & leasing | 0.537 | 0.568 | 0.605 | 0.608 | 0.618 | 0.621 | 0.586 | 0.542 | 0.503 | 0.498 | 0.474 | 0.498 | 0.598 | 0.660 | 0.670 | 0.601 | 0.594 | 0.614 | 0.587 | 0.637 | 0.608 | 0.655 | 0.650 | 0.644 | 0.510 |
| Professional, scientific, and technical services | 0.263 | 0.277 | 0.273 | 0.291 | 0.246 | 0.240 | 0.227 | 0.211 | 0.195 | 0.208 | 0.222 | 0.208 | 0.200 | 0.202 | 0.200 | 0.232 | 0.231 | 0.230 | 0.149 | 0.163 | 0.220 | 0.200 | 0.161 | 0.106 | 0.119 |
| Administrative, support and waste management, and remediation services | 0.412 | 0.419 | 0.412 | 0.421 | 0.416 | 0.433 | 0.507 | 0.418 | 0.407 | 0.388 | 0.431 | 0.414 | 0.368 | 0.411 | 0.431 | 0.486 | 0.458 | 0.449 | 0.461 | 0.450 | 0.403 | 0.253 | 0.205 | 0.181 | 0.215 |
| Education services | 0.464 | 0.492 | 0.395 | 0.469 | 0.440 | 0.410 | 0.429 | 0.438 | 0.400 | 0.406 | 0.398 | 0.358 | 0.290 | 0.299 | 0.314 | 0.318 | 0.312 | 0.300 | 0.299 | 0.117 | 0.140 | 0.167 | 0.180 | 0.182 | 0.205 |
| Health care and social assistance | 0.628 | 0.631 | 0.627 | 0.628 | 0.647 | 0.660 | 0.638 | 0.617 | 0.594 | 0.573 | 0.481 | 0.443 | 0.484 | 0.479 | 0.463 | 0.457 | 0.435 | 0.433 | 0.363 | 0.331 | 0.285 | 0.258 | 0.281 | 0.265 | 0.239 |
| Arts, entertainment, and recreation | 0.603 | 0.568 | 0.589 | 0.636 | 0.677 | 0.673 | 0.638 | 0.606 | 0.603 | 0.640 | 0.693 | 0.632 | 0.671 | 0.625 | 0.635 | 0.639 | 0.627 | 0.639 | 0.674 | 0.664 | 0.664 | 0.642 | 0.531 | 0.577 | 0.623 |
| Accommodation & food services | 0.555 | 0.571 | 0.571 | 0.600 | 0.605 | 0.608 | 0.548 | 0.520 | 0.542 | 0.563 | 0.570 | 0.586 | 0.576 | 0.552 | 0.634 | 0.635 | 0.695 | 0.666 | 0.603 | 0.588 | 0.663 | 0.643 | 0.659 | 0.604 | 0.616 |
| Other services (except public administration) | 0.269 | 0.300 | 0.316 | 0.303 | 0.286 | 0.321 | 0.313 | 0.329 | 0.328 | 0.296 | 0.304 | 0.219 | 0.252 | 0.304 | 0.308 | 0.320 | 0.295 | 0.334 | 0.352 | 0.338 | 0.220 | 0.208 | 0.228 | 0.216 | 0.172 |

Note: *na* = not available.

Source: Nathian Associates Inc.

TABLE A-6
Industry Asset Intangibility (1977 – 2001)

| Industry | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Agriculture, forestry, fishing, and hunting | 0.226 | 0.229 | 0.244 | 0.321 | 0.347 | 0.358 | 0.424 | 0.541 | 0.494 | 0.591 | 0.537 | 0.518 | 0.546 | 0.611 | 0.448 | 0.504 | 0.499 | 0.480 | 0.469 | 0.515 | 0.683 | 0.693 | 0.683 | 0.780 | 0.833 |
| Mining | 0.299 | 0.284 | 0.276 | 0.268 | 0.228 | 0.193 | 0.168 | 0.165 | 0.146 | 0.119 | 0.122 | 0.114 | 0.117 | 0.135 | 0.125 | 0.119 | 0.122 | 0.110 | 0.109 | 0.122 | 0.121 | 0.136 | 0.156 | 0.198 | 0.115 |
| Utilities | 0.092 | 0.088 | 0.102 | 0.119 | 0.114 | 0.111 | 0.113 | 0.116 | 0.105 | 0.096 | 0.092 | 0.093 | 0.101 | 0.101 | 0.095 | 0.093 | 0.093 | 0.092 | 0.095 | 0.092 | 0.090 | 0.112 | 0.159 | 0.149 | 0.180 |
| Construction | 1.281 | 1.373 | 1.429 | 1.441 | 1.372 | 1.831 | 0.727 | 0.686 | 0.738 | 0.901 | 0.981 | 2.689 | 1.856 | 1.471 | 1.254 | 2.494 | 2.729 | 1.825 | 1.841 | 2.916 | 2.038 | 2.069 | 2.621 | 2.858 | 2.881 |
| Manufacturing, essentials | 1.032 | 1.015 | 1.027 | 1.005 | 0.958 | 1.025 | 1.039 | 1.070 | 1.009 | 1.083 | 1.111 | 1.048 | 0.784 | 0.789 | 0.722 | 0.720 | 0.646 | 0.682 | 0.717 | 0.761 | 0.711 | 0.791 | 0.717 | 0.665 | 0.476 |
| Manufacturing, inputs | 0.463 | 0.454 | 0.483 | 0.469 | 0.419 | 0.370 | 0.359 | 0.345 | 0.330 | 0.332 | 0.357 | 0.331 | 0.319 | 0.343 | 0.314 | 0.301 | 0.304 | 0.325 | 0.331 | 0.295 | 0.273 | 0.289 | 0.341 | 0.377 | 0.389 |
| Manufacturing, durables | 0.903 | 0.932 | 0.903 | 0.845 | 0.773 | 0.687 | 0.745 | 0.793 | 0.773 | 0.782 | 0.848 | 1.209 | 1.211 | 1.140 | 0.973 | 0.925 | 0.889 | 0.901 | 0.954 | 1.071 | 0.950 | 0.739 | 0.784 | 1.008 | 0.881 |
| Wholesale trade | 1.086 | 1.087 | 1.055 | 1.001 | 0.826 | 0.716 | 0.815 | 0.788 | 0.840 | 0.888 | 0.940 | 1.157 | 1.343 | 1.311 | 1.191 | 1.267 | 1.256 | 1.383 | 1.324 | 0.821 | 1.243 | 1.241 | 1.409 | 1.097 | 1.398 |
| Retail trade, non-discretionary | 1.159 | 0.947 | 0.885 | 0.815 | 0.778 | 0.789 | 0.817 | 0.792 | 0.754 | 0.794 | 0.743 | 0.780 | 0.747 | 0.762 | 0.697 | 0.628 | 0.588 | 0.575 | 0.536 | 0.588 | 0.564 | 0.545 | 0.565 | 0.480 | 0.565 |
| Retail trade, discretionary | 0.853 | 0.728 | 0.672 | 0.636 | 0.634 | 0.650 | 0.726 | 0.778 | 0.844 | 0.822 | 0.916 | 0.759 | 0.798 | 0.811 | 0.701 | 0.702 | 0.760 | 0.755 | 0.731 | 0.715 | 1.196 | 1.125 | 1.250 | 1.189 | 0.971 |
| Transportation and warehousing, passengers and packages | 0.168 | 0.173 | 0.187 | 0.202 | 0.211 | 0.194 | 0.182 | 0.190 | 0.184 | 0.175 | 0.170 | 0.173 | 0.178 | 0.145 | 0.144 | 0.139 | 0.136 | 0.141 | 0.145 | 0.145 | 0.151 | 0.141 | 0.129 | 0.117 | 0.140 |
| Transportation and warehousing, postal service and couriers | 0.630 | 0.690 | 0.652 | 0.764 | 0.582 | 0.576 | 0.522 | 0.238 | 0.278 | 0.162 | 0.169 | 0.180 | 0.162 | 0.196 | 0.181 | 0.191 | 0.195 | 0.135 | 0.132 | 0.060 | 0.094 | 0.090 | 0.075 | 0.355 | 0.045 |
| Information | 0.135 | 0.142 | 0.148 | 0.144 | 0.147 | 0.105 | 0.116 | 0.149 | 0.131 | 0.126 | 0.125 | 0.119 | 0.128 | 0.132 | 0.127 | 0.123 | 0.124 | 0.134 | 0.154 | 0.129 | 0.121 | 0.157 | 0.222 | 0.230 | 0.235 |
| Real estate and rental & leasing | 0.141 | 0.124 | 0.121 | 0.115 | 0.119 | 0.105 | 0.120 | 0.147 | 0.147 | 0.153 | 0.147 | 0.186 | 0.154 | 0.127 | 0.107 | 0.112 | 0.111 | 0.105 | 0.104 | 0.115 | 0.248 | 0.112 | 0.126 | 0.117 | 0.090 |
| Professional, scientific, and technical services | 0.985 | 0.962 | 0.984 | 0.916 | 1.058 | 1.022 | 1.038 | 1.110 | 1.102 | 1.133 | 1.204 | 1.228 | 1.368 | 1.302 | 1.133 | 0.851 | 0.790 | 0.773 | 1.151 | 0.816 | 0.884 | 0.910 | 0.961 | 1.408 | 1.214 |
| Administrative, support and waste management, and remediation services | 0.422 | 0.506 | 0.533 | 0.508 | 0.537 | 0.478 | 0.332 | 0.448 | 0.377 | 0.482 | 0.459 | 0.447 | 0.441 | 0.341 | 0.305 | 0.267 | 0.263 | 0.245 | 0.242 | 0.263 | 0.257 | 0.501 | 0.518 | 0.422 | 0.245 |
| Education services | 0.639 | 0.582 | 0.866 | 0.650 | 0.727 | 0.746 | 0.255 | 0.278 | 0.322 | 0.291 | 0.376 | 0.399 | 0.366 | 0.378 | 0.303 | 0.596 | 0.487 | 0.525 | 0.599 | 1.604 | 1.326 | 0.809 | 0.496 | 0.657 | 0.379 |
| Health care and social assistance | 0.306 | 0.305 | 0.303 | 0.312 | 0.271 | 0.249 | 0.252 | 0.267 | 0.273 | 0.237 | 0.297 | 0.359 | 0.349 | 0.302 | 0.353 | 0.256 | 0.283 | 0.262 | 0.319 | 0.420 | 0.291 | 0.335 | 0.320 | 0.361 | 0.372 |
| Arts, entertainment, and recreation | 0.228 | 0.291 | 0.300 | 0.251 | 0.216 | 0.203 | 0.223 | 0.258 | 0.199 | 0.165 | 0.149 | 0.182 | 0.181 | 0.161 | 0.145 | 0.091 | 0.154 | 0.139 | 0.178 | 0.174 | 0.093 | 0.124 | 0.171 | 0.105 | 0.081 |
| Accommodation & food services | 0.296 | 0.277 | 0.270 | 0.241 | 0.239 | 0.230 | 0.250 | 0.257 | 0.273 | 0.250 | 0.228 | 0.203 | 0.208 | 0.243 | 0.153 | 0.154 | 0.147 | 0.145 | 0.164 | 0.172 | 0.127 | 0.157 | 0.151 | 0.171 | 0.160 |
| Other services (except public administration) | 0.980 | 0.937 | 0.920 | 0.949 | 1.035 | 0.794 | 0.804 | 0.803 | 0.844 | 0.969 | 0.919 | 1.199 | 0.967 | 0.728 | 0.698 | 0.622 | 0.598 | 0.301 | 0.296 | 0.331 | 0.329 | 0.344 | 0.298 | 0.502 | 0.425 |

Note: na = not available.

Source: Nathan Associates Inc.

Appendix B

Unemployment and Gross Domestic Product (GDP)

TABLE B-1

Unemployment Rate and GDP (1977 – 2001)

| Year | Unemployment Rate (%) | GDP (Current \$Billion) | GDP (Constant 1996 \$Billion) |
|-------------|------------------------------|--------------------------------|--------------------------------------|
| 1977 | 7.1 | 2,031.4 | 4,511.8 |
| 1978 | 6.1 | 2,295.9 | 4,760.6 |
| 1979 | 5.8 | 2,566.4 | 4,912.1 |
| 1980 | 7.1 | 2,795.6 | 4,900.9 |
| 1981 | 7.6 | 3,131.3 | 5,021.0 |
| 1982 | 9.7 | 3,259.2 | 4,919.3 |
| 1983 | 9.6 | 3,534.9 | 5,132.3 |
| 1984 | 7.5 | 3,932.7 | 5,505.2 |
| 1985 | 7.2 | 4,213.0 | 5,717.1 |
| 1986 | 7.0 | 4,452.9 | 5,912.4 |
| 1987 | 6.2 | 4,742.5 | 6,113.3 |
| 1988 | 5.5 | 5,108.3 | 6,368.4 |
| 1989 | 5.3 | 5,489.1 | 6,591.8 |
| 1990 | 5.6 | 5,803.2 | 6,707.9 |
| 1991 | 6.8 | 5,986.2 | 6,676.4 |
| 1992 | 7.5 | 6,318.9 | 6,880.0 |
| 1993 | 6.9 | 6,642.3 | 7,062.6 |
| 1994 | 6.1 | 7,054.3 | 7,347.7 |
| 1995 | 5.6 | 7,400.5 | 7,543.8 |
| 1996 | 5.4 | 7,813.2 | 7,813.2 |
| 1997 | 4.9 | 8,318.4 | 8,159.5 |
| 1998 | 4.5 | 8,781.5 | 8,508.9 |
| 1999 | 4.2 | 8,274.3 | 8,859.0 |
| 2000 | 4.0 | 9,824.6 | 9,191.4 |
| 2001 | 4.8 | 10,082.2 | 9,214.5 |

Source: Economic Report of the President, 2003. Washington.

Appendix C

ANOVA Regression Results

Using SAS GLM Procedure for Debt Levels Weighted by Number of Firms

TABLE C-1

Overall Results

| Source | Degrees of Freedom | Sum of Squares | Mean Square | F-Value | Pr > F |
|-----------------|--------------------|----------------|-------------|---------|----------|
| Model | 20 | 1,812.968087 | 90.648404 | 121.22 | < 0.0001 |
| Error | 504 | 376.901438 | 0.747820 | | |
| Corrected total | 524 | 2,189.869524 | | | |

TABLE C-2

Fit Statistics

| R-Square | Coefficient of Variation | Root Mean Squared Error | Dependent Variable Mean |
|----------|--------------------------|-------------------------|-------------------------|
| 0.827889 | 369.842288 | 0.864766 | 0.233820 |

TABLE C-3

Parameter Estimates

| Parameter | Estimate | Standard of Error | t-Value | Pr > t |
|------------------------------|-----------|-------------------|---------|----------|
| Intercept (NAICS code 81) | 0.331228 | 0.018835 | 17.59 | < 0.0001 |
| NAICS code 11 | -0.131713 | 0.028792 | -4.57 | < 0.0001 |
| NAICS code 21 | -0.109009 | 0.019760 | -5.52 | < 0.0001 |
| NAICS code 22 | 0.018525 | 0.023972 | 0.77 | 0.4400 |
| NAICS code 23 | -0.092988 | 0.022209 | -4.19 | < 0.0001 |
| NAICS code 31 | -0.115517 | 0.020175 | -5.73 | < 0.0001 |
| NAICS code 32 | -0.138814 | 0.019480 | -7.13 | < 0.0001 |
| NAICS code 33 | -0.174573 | 0.019078 | -9.15 | < 0.0001 |
| NAICS code 42 | -0.075345 | 0.020112 | -3.75 | 0.0002 |
| NAICS code 44 | -0.060376 | 0.020693 | -2.92 | 0.0037 |
| NAICS code 45 | -0.072475 | 0.021339 | -3.40 | 0.0007 |
| NAICS code 48 | -0.046446 | 0.021035 | -2.21 | 0.0277 |
| NAICS code 49 | -0.131429 | 0.048302 | -2.72 | 0.0067 |
| NAICS code 51 | -0.039039 | 0.019482 | -2.00 | 0.0456 |
| NAICS code 53 | 0.089890 | 0.020717 | 4.34 | < 0.0001 |
| NAICS code 54 | -0.163440 | 0.020145 | -8.11 | < 0.0001 |
| NAICS code 56 | -0.087051 | 0.021380 | -4.07 | < 0.0001 |
| NAICS code 61 | -0.192054 | 0.035360 | -5.43 | < 0.0001 |
| NAICS code 62 | 0.071149 | 0.021212 | 3.35 | 0.0009 |
| NAICS code 71 | 0.086597 | 0.023965 | 3.61 | 0.0003 |
| NAICS code 72 | 0.092340 | 0.021172 | 4.36 | < 0.0001 |

Appendix D

OLS Regression Results

Using SAS REG Procedure for Debt Levels

TABLE D-1

Analysis of Variance

| Source | Degrees of Freedom | Sum of Squares | Mean Square | F-Value | Pr > F |
|-----------------|--------------------|----------------|-------------|---------|----------|
| Model | 7 | 2.068400 | 0.295490 | 53.69 | < 0.0001 |
| Error | 431 | 2.372170 | 0.005500 | | |
| Corrected total | 438 | 4.440570 | | | |

TABLE D-2

Fit Statistics

| Root Mean Squared Error | Dependent Mean | Coefficient of Variation | R-Square | Adjusted R-Square |
|-------------------------|----------------|--------------------------|----------|-------------------|
| 0.07419 | 0.27325 | 27.15008 | 0.4658 | 0.4571 |

TABLE D-3

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t-Value | Pr > t |
|------------------------------------|--------------------|----------------|---------|----------|
| Intercept | 0.361090 | 0.028770 | 12.55 | < 0.0001 |
| Industry uniqueness | -0.572660 | 0.050610 | -11.32 | < 0.0001 |
| Earnings volatility | -0.060600 | 0.014300 | -4.24 | < 0.0001 |
| Cyclical earnings | -0.063680 | 0.008040 | -7.92 | < 0.0001 |
| Future earnings potential | 0.003500 | 0.004170 | 0.84 | 0.4020 |
| Current earnings potential | -0.142660 | 0.174210 | -0.82 | 0.4133 |
| Asset tangibility and separability | 0.084930 | 0.038960 | 2.18 | 0.0298 |
| Asset intangibility | -0.044210 | 0.012580 | -3.51 | 0.0005 |

Appendix E

Impact of Debt Limits on Weighted Average Cost of Capital

EQUATION E-1

Calculating Weighted Average Cost of Capital (WACC) Without and With the Rule

$$WACC = \text{After-tax cost of debt} \times \left(\frac{\text{Debt}}{\text{Debt} + \text{Equity}} \right) + \left(\text{Risk-free rate of return} + \beta^* \times \text{Equity premium} \right) \times \left(\frac{\text{Equity}}{\text{Debt} + \text{Equity}} \right)$$

$$WACC_{\text{Without rule}} = 3.72\% \times \left(0.538 \right) + \left(5.80\% + 1.0 \times 6.05\% \right) \times \left(0.462 \right)$$

$$= 7.48\%$$

$$WACC_{\text{With rule}} = 3.72\% \times \left(0.370 \right) + \left(5.80\% + 0.796 \times 6.05\% \right) \times \left(0.630 \right)$$

$$= 8.06\%$$

* Note: β is market risk. The market risk of equity in companies with no debt will be less than the market risk of equity in companies with debt. The relationship is:

$$\beta_{\text{With debt}} = \beta_{\text{Without debt}} \times \left(1 + (1 - \text{Tax rate}) \times \frac{\text{Debt}}{\text{Equity}} \right)$$

Assuming that the risk of equity in our sample of healthy corporations is no different from the risk of equity in all corporations, $\beta_{\text{With debt}} = 1.0$. Solve for $\beta_{\text{Without debt}}$ as follows:

$$\beta_{\text{Without debt}} = 1.0 / \left(1 + (1 - \text{Tax rate}) \times \frac{\text{Debt}}{\text{Equity}} \right)$$

$$= 1.0 / \left(1 + (1 - 0.4) \times 1.1646 \right)$$

$$= 0.5887$$

With the debt limiting rule, debt declines (debt-equity ratio falls from 1.1646 to 0.5870) and the likelihood of financial distress in our sample of healthy corporations declines. The new β is:

$$\beta_{\text{With debt}} = 0.5887 \times \left(1 + (1 - 0.4) \times 0.5870 \right)$$

$$= 0.7960$$