Are Firms Really Under-levered?

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"You can't underestimate how many of America's greatest minds are being devoted to what economist would all say is totally useless economic activity."
- Peter Cobb, former Deputy Chief of Staff of the Joint Committee on Taxation

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ABSTRACT

In a recent paper, Graham (2000) finds that firms, on average, are under-levered and could increase firm value by increasing debt levels. This paper compares Graham's measure of under-leverage -- called kink -- to the difference between tax expense and taxes paid (tax spread) as a proxy for firms' use of (unobservable) non-debt tax shields, to show that firms may not need as much debt tax shields as suggested by kink. We find a significant and positive relation between kink and the tax spread, inferring that firms are finding alternatives to debt to reduce taxable income. We also find statistically significant determinants of the tax spread using accounting proxies for tax shelter activities. Tax spread is then used as a replacement for previous proxies of non-debt tax shields in extant empirical capital structure models and provides results consistent with capital structure theory. Although our results using tax spread our statistically robust, the economic significance of these results is much less in explaining the under-leverage puzzle.

I. Introduction

A long-held argument exists that U.S. corporations do not use as much debt as would be predicted by the rational use of the interest tax deduction offered by the Internal Revenue Service tax code. This argument goes back as far as Modigliani and Miller (1963) when they "corrected" their seminal capital structure theory to include corporate taxes. More recently, Graham (2000) offers an empirical measure of the underutilization of debt by corporations and calls this measure the kink (defined as the maximum amount of interest deductions a firm could charge before any decline in the marginal tax benefit of debt relative to the actual interest charge the firm incurred given its current debt). Graham's results and other recent research (see Graham (2003) for a summary) support the notion that highly profitable, low-default probability, and high marginal-tax rate firms are no more likely to use debt than other types of firms, suggesting tax benefits may be of secondary importance.

The first purpose of this study is to reexamine the under-leverage result obtained by Graham (2000) in light of non-debt tax shelters available to corporations in recent years. DeAngelo and Masulis (1980) were one of the first to point to the importance of non-debt tax substitutes, primarily depreciation and tax credits, for capital structure relevance. There is evidence, primarily in the accounting literature, that U.S. corporations have been taking a host of other (newer) non-debt tax shields (for examples, see Desai (2003), Mills, Newberry, and Trautman (2002), Manzon and Plesko (2001), and Bankman (1999)). This study examines a proxy for these tax shields – the difference between tax expense and taxes actually paid – and relates this to Graham's kink variable to see if this measure can explain the under-leverage result. In other words, the tax benefits of DEBT may be of secondary importance, but tax benefits in general may still be of primary importance.

During the mid to late 1990's, tax sheltering products were responsible for an estimated $250-300 billion per year of reduced corporate income tax revenues. These tax shelters were often promoted by large accounting firms despite evolving regulation according to Charles Rossotti of the IRS Oversight Board[1]. For example, Graham, Lang, and Shackelford (2004) examine one nondebt tax shield, the exercise of executive/employee stock options, and find these tax shelters can explain some, but not all, of the kink. Tax shelters can create a spread between the publicly reported book income tax and the income tax privately reported to the IRS – what we refer to as the "tax spread" in this paper. Are firms really leaving money on the table by not fully capitalizing the tax benefits of debt, or are firms acting optimally by exploiting these other tax sheltering activities?

We find a significant and positive relation between the tax spread and Graham's measure for debt conservatism, the kink. This suggests that firms may not be acting sub-optimally in respect to the debt tax shield. Through permanent deferrals, accounting discretion, and opaque tax shelters, firms that appear under-levered may be simply overstating book income relative to taxable income.

The second purpose of this paper is to explore the determinants of the tax spread. Direct measures for taxable income and activities that create a book-tax income spread are not available. We use estimates for tax sheltering defined by Manzon and Plesko (2001) to explain how firms create a book-tax income spread. These proxies are able to explain a significant portion of the variability in the tax spread.

[1] PBS documentary, "Frontline: Tax Me if You Can?" interview was given September 25, 2002.

The third purpose of this paper is to examine the effectiveness of the tax spread variable as a proxy for non-debt tax shields (NDTS), a variable that is used in various capital structure empirical studies. Using firm-year data from 1987-1999, we re-estimate three cross-sectional regression analyses of capital structure models that have appeared in the literature in the past 20 years. Bradley, Jarrell and Kim (1984) use cross-sectional firm specific data to test for the existence of an optimal capital structure. Their proxy for NDTS does not show up statistically significant with the predicted sign. We substitute tax spread as a proxy for that NDTS into their empirical test and find a significant and negative relation, indicating that NDTS does act as a substitute for debt. We also add tax spread to the regression models of Graham, Lemmon, and Schallheim (1998) and Frank and Goyal (2004) and find an analogous result, that is, the tax spread is negatively and significantly related to debt in the presence of a host of capital structure control variables.

This paper is organized as follows. Section II discusses previous capital structure literature and the measures used for taxes and non-debt tax shields. Section III introduces the tax spread measure and describes our dataset and summary statistics. Section IV presents the results of the relation between kink and the tax spread. Section V shows the results regarding the determinants of tax spread. In Section VI we use tax spread as a proxy for non-debt tax shields in cross-sectional capital structure regressions to see if it works better than previous proxy variables. Our summary is contained in Section VII.

II. Taxes and Capital Structure

Capital structure and taxes have a long history dating back to the Modigliani and Miller (1958, 1963) theories. The MM Theory with corporate taxes shows that the tax advantage of debt, without any debt-related costs, implies that firms should take on a maximum level of debt. It is easily recognized that firms do not do this in practice, so theories have developed over the years that introduce economic factors that mitigate the powerful tax advantage to debt.

The trade-off theory attempts to characterize factors that reduce the tax benefit of debt. The main factor is the costs of bankruptcy and financial distress. The tax benefit of debt coupled with the costs of default creates an optimal debt to equity ratio where the value of the firm is maximized. Studies by Altman (1984) and Weiss (1990) find that direct bankruptcy costs are only 3% of total assets and 20% of equity. Indirect financial distress costs, such as lost sales, agency costs (Jensens and Meckling (1976)), earnings variability (Bradley, Jarrell and Kim (1984)), or underinvestment costs (Myers (1977)) are difficult to quantify but are probably not so large as to justify the tax advantage of debt that could be realized with additional leverage. Miller (1977) referred to this as the "horse and rabbit stew" scenario. The apparent benefits of the tax deductions of debt far outweigh the even liberally estimated costs of financial distress.

Miller (1977) shows that the corporate tax advantage of debt is traded-off against the personal tax disadvantage of debt income. In Miller's equilibrium, this trade-off is exactly matched at the margin such that there is no net advantage at the firm level for any particular capital structure. However, DeAngelo and Masulis (1980) demonstrate that the existence of non-debt tax shields substitute for the tax advantage of debt, reducing the demand for debt, and leading to capital strucuture relevance once again at the individual firm level.

Theories of capital structure with asymmetric information provide support for a larger role for debt beyond taxes. For example, the pecking order theory states that firms prefer internal to external financing. Asymmetric information between managers and outside investors make internally generated funds a less costly source of financing. Debt financing is considered to be next in the financing pecking order because debt is not subject to the adverse selection problems associated with outside equity financing. According to Myers and Majluf (1984), the use of interest tax shields is a second-order effect. Shyam-Sunder and Myers (1999) test this theory by regressing a measure of capital investment and other current commitments on debt and find a positive correlation. Others fail to verify these results or call into question the techniques used to test the theory (Chirinko and Singha (2000), Barclay et al. (2001), and Frank and Goyal (2004)).

Early empirical work in the determinants of capital structure failed to find consistent tax effects (such as Bradley, Jarrell, and Kim (1984) or Titman and Wessels (1988)). One problem with the early capital structure studies was the use of the average tax rate (or other proxies for the tax paying position of the firm), not the marginal tax rate as suggested by theory. The marginal tax rate is defined as the present value of current and expected future taxes paid on an additional dollar of income earned today. Graham (1996) calculates the marginal tax rate using an algorithm based on reported income that incorporates the nuances of the U.S. tax code. Because the marginal tax rates are a function of future income, he also simulates future income paths to calculate the expected taxable income. Using a version of this measure, the before-financing MTR, Graham, Lemmon and Schallheim (1996) find strong evidence that high MTR firms do have higher debt levels thus providing an answer to Myers (1984) challenge to demonstrate the connection between a firm's tax status and debt policy.

Graham (2000) uses his previously calculated proxy for the marginal tax rate to simulate the interest deduction benefit functions for individual firms and uses them to estimate the tax-reducing value of each incremental dollar of interest expense. Graham integrates over possible states of the world (taxable and nontaxable) to determine the expected tax benefit of an incremental dollar of interest deduction. After accounting for reductions for personal taxes, he finds that the tax benefit of debt under the marginal benefit curve is between seven to eight percent of firm value. Graham also quantifies how aggressively firms use debt. He calls this estimate the "kink" because it is the point at which the next dollar paid in interest changes from a flat to decreasing marginal tax benefit.

Although Graham's kink measure is based on the proper application of the tax code and simulated future earnings from public financial statements, the measure cannot account for all non-debt tax shields available to U.S. corporations that are not publicly reported. For example, the exercise of executive and employee stock options in the late 1990s offered very large tax deductions to many firms, particularly smaller growth firms. Graham, Lang, and Shackelford (2004) analyze these corporate stock options and find that they account for some but certainly not all of the unexplained under-leverage of corporations. Stock options account for about 20 percent of the mean kink in the Graham, et al. study. Our contention in this paper is that there are other unobservable tax shields that further reduce incentives by firms to use debt.

III. The Tax Spread

Our measure of unobserved tax shields is called the tax spread – the difference between provision for taxes on the firm's income statement and taxes actually paid as revealed in the footnotes to the accounting statements. Although a complete list of specific tax shelters and deferrals is not available, factors that are likely to affect spread are categorized as: 1) tax favored investing activities (e.g. investment tax credits, net operating losses), 2) timing differences, such as depreciation schedules and retirement benefit expensing, and 3) permanent differences such as accounting for items of income or loss that bypass the income statement (e.g. exercised employee stock options, change in other comprehensive income, discontinued operations, extra ordinary items, and cumulative effect of change in accounting policies)

Although Graham (2000) accounts for tax favored investing activities in his calculation of the marginal tax rate, firms have significant incentives to permanently defer or avoid taxes, usually without transparency. Bankman (1999) provides anecdotal evidence on several known tax sheltering schemes that have been or could be used to reduce taxable income while not affecting book income. Plesko (1999) suggests that the relation between financial and tax reporting may be very weak. For example, GAAP requires foreign subsidiaries to consolidate under the parent company. These earnings are not recognized as taxable income until the income is transferred to the parent company. Companies may permanently defer income tax through reinvestment. Some evidence of this is found in the tax footnotes of Microsoft's 2002 annual report;

> Microsoft has not provided for U.S. deferred income taxes or foreign withholding taxes on $780 million of its undistributed earnings for certain non-U.S. subsidiaries, all of which relate to fiscal 2002 earnings, since these earnings are intended to be reinvested indefinitely.

In addition, an element of judgment is required in financial reporting that may be applied differently across firms. Accounting rules place emphasis on consistency within a firm over time and less weight on uniformity between firms. Such differences in discretion could confound the relationship between tax and financial results.

Why do firms prefer tax shelters to debt? First, many tax shelters are less costly than debt. Debt usually requires costly interest payments. Many tax shelters do not require any additional outlays for the firm. Other tax shelters have a much larger return per dollar invested (subject to the risk of disqualification by the IRS). Another reason for the preference of non-debt tax shields is the cost to the firm associated with debt covenants. Debt covenants are likely to cause high transaction costs for some firms. Finally, tax shelters often exploit provisions in the accounting rules that allow the firm to reduce taxes without affecting the income statement. If accounting earnings matter, and there is a large literature claiming support for this notion (see…….), then these tax shelters can be favored over debt tax shields.

A. Measuring the Tax Spread

Our measure of the tax spread attempts to capture tax shields or shelters that often have been overlooked in the capital structure literature. Well-known tax shields such as depreciation are captured by the account deferred taxes. To remove these "known" tax shields, we define the tax spread as follows.

The total tax expense or provision for taxes is comprised of two parts: deferred tax and current tax expense.

(1) Current Tax Expense = Total Tax Expense - Deferred Income Tax

We then subtract the annual tax paid from the current tax expense to calculate the tax spread.

(2) Tax Spread = Current Tax Expense – Taxes Paid

The data used in this paper consists of all COMPUSTAT firms from the periods 1987 to 1999 (beginning with more than 40,000 firm-year observations). We are limited to those firm-year observations from 1987 due to the lack of cash flow summary data available prior to that year. The variables from equations (1) and (2), total tax expense, deferred tax, and tax paid as reported by Compustat as Data16, Data50, and Data317 respectively.

As stated earlier, the sources of tax spread involve three areas: tax favored investing activities, timing differences, and permanent differences. Differences between financial and tax income revenue and expense recognition policy give rise to timing differences. These timing differences create deferred tax account balances. For example, postretirement benefits expense funds often create tax-deferred assets while accelerated depreciation of new assets will likely increase tax-deferred liabilities. These deferred taxes are the net balance of tax-deferred assets and tax-deferred liabilities reported on the income statement. Tax deferrals reverse over time and current tax expense will increase netting out the deferral. The firm benefits from deferred liabilities by the present value of the deferral.

Permanent deferrals arise when revenue or expense is recognized under one system but not the other. Items such as interest paid on municipal bonds and dividends received from other corporations are generally excluded from taxable income but are included for financial reporting purposes. Unlike deferred taxes, these permanent differences do not reverse.

Permanent differences also arise when items of income or loss by-pass the income statement during the year that goes directly to comprehensive income. Some examples of this

are employee stock options that are exercised, the taxes on discontinued operations, extraordinary items, and cumulative effect of changes in accounting policy. When book income is greater (less) then tax income, a net tax induced gain (loss) occurs. Given the difference between financial and tax reporting incentives, well-designed shelters are continually being created with the purpose to reduce taxable income often without affecting reported financial income.

Compustat defines taxes paid as cash payments for income taxes to federal, state, local, and foreign governments during the fiscal period. This variable by nature has a timing aspect that does not directly match that of tax expense reported on the income statement. For instance, fourth quarter taxes are not commonly paid until the following year and in rare cases - due to audits and/or disputes - tax expenses in one fiscal term may not be paid until several periods following. Pre-payment may also occur in rare occasions when firms anticipate future taxes or hold a tax credit. There is no way to match dollar to dollar the tax bill to the tax payment. In most cases, taxes are paid continuously with some lag; on average, these lags do not change significantly over time.

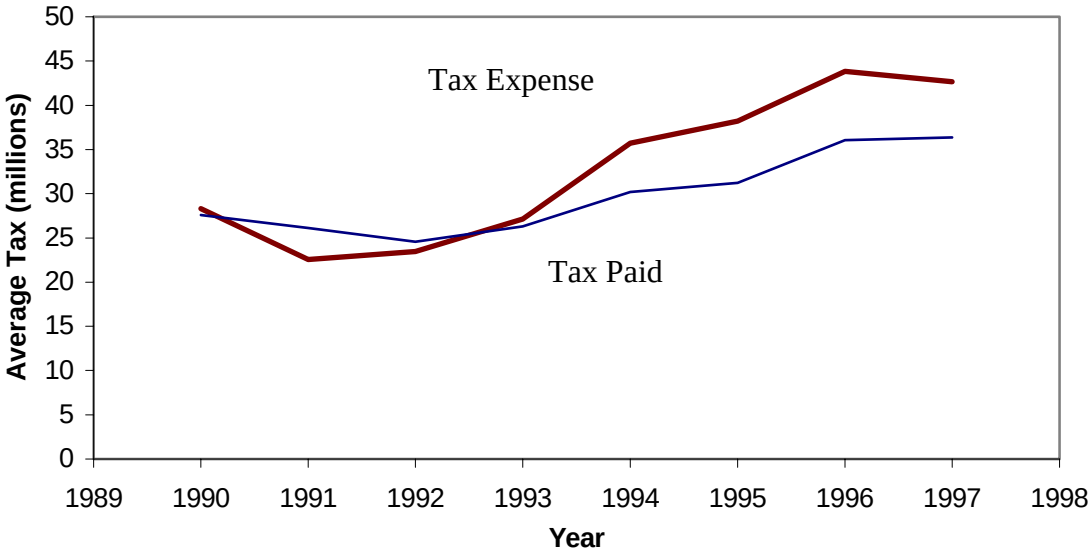
B. Time Series of Tax Spread and Book/Income Spread

Over our sample period, there has been a consistent increase in the discrepancy between tax provision (tax expense) as reported on the income statement and taxes paid as reported in the footnote disclosures. Figure 1 shows this general trend from data collected from Compustat.

Figure 1 – Time Series of Tax Spread as Reported in Financial Statements.

Tax Expense = Total income tax reported on the annual income statement

Tax Paid = Total taxes paid from footnote disclosure



Our measure of tax spread is simlar to the spread between book and tax income that is examined by Manzon and Plesko (2001), Mills and Newberry (2002), and Desai (2003). Several methods have been used to estimate taxable income from financial statements (See Zimmerman (1983), Shevlin (1990), Manzon and Plesko (2001)). There are limits to inferring taxable income from financial statement data due to differences in reporting entities, operating losses, non-qualified stock options compensation, etc.

Ideally, access to tax income information reported in schedule M-1 of form 1120 for publicly traded corporations would provide the most accurate detail for comparison. While not available at the individual firm level, schedule M-1 information is available for aggregate data. Figure 2 shows the aggregate book and taxable income reported by a select group of firms from 1987 to 1996 reported by the U.S. Department of the Treasury (1999). The dip in 1992

where book income actually was below taxable income – on average – is most likely due to sweeping accounting changes in amortization schedules. Both exhibits show a similar trend.

Figure 2 – Book and Tax Corporate Income[2]

Figures 1 and 2 demonstrate that the tax spread has been growing since 1993 and the book-tax income spread began growing even a little earlier. The figures also demonstrate that there are times when even the average corporate taxes paid actually exceed the book income tax expense. The latter appears to happen in economic downturn (as in the early 1990s) in addition to the increased use of tax shields such as the change in goodwill amortization rules or the increased exercise of employee stock options. In our analysis, we examine the sample using both the entire range of the tax spread as well as just the non-negative observations of the tax spread.

[2] Book Income = After-tax book income from Schedule M-1 + Federal taxes – tax exempt interest
Tax Income = Total Receipts – Total Deductions
Corporations with mean assets over $1 Billion, excluding S-Corp, Rics, Reits and Foreign Corporations.
Source: Internal Revenue Service

IV. Kink and the Tax Spread

Tax spread is our variable of interest and our proxy for the unobserved tax shields that reduce firms' incentives to use debt. Our first set of tests explores the extent to which tax spread can explain Graham's kink variable. Kink is determined by the firm's marginal tax rate (MTR) and amount of existing debt. We control for these two variables in the regression analysis before adding tax spread. After that, we add several other traditional control variables. Graham (2000) finds that large, profitable firms with low expected distress costs use debt conservatively. As a control for size, we include the log of total assets. We control for profitability before financing decisions by earnings before interest, taxes, depreciation and amortization. We include the ex ante probability of financial distress by Altman's (1968) Z-score as modified by MacKie-Mason (1990). Variable descriptions are reported in Appendix A.

Summary statistics for the variables used in our regression analysis our presented in Table 1, Panel A. The mean (median) kink for our sample is around 2.5 (1.6), indicating most firms appear to be substantially under-levered based on Graham's measure. The debt ratio measured by total debt to market value has a mean (median) in our sample in access of 40 (50) percent.

The correlations among these variables are presented in Table 1, Panel B. The kink is determined by a firm's debt level and MTR. The MTR has the highest correlation with the kink at a highly significant 46.8 percent. However, the debt ratio shows only about a -2 percent correlation coefficient with kink. The tax spread shows a correlation with kink of 3.8 percent for the entire sample. When we examine only non-negative spreads, the correlation coefficient rises to 12 percent. But if we limit the sample to kink values less than or equal to 6

(and non-negative tax spread), the correlation between the two variables is 48 percent (sample size is cut to 46 percent of the total). If kink is limited to a value of 2, the correlation between the two rises to an impressive 91 percent (and the sample is cut to 34 percent of the total).

We next estimate the extent to which kink can be explained by tax spread in a multivariate framework, controlling for MTR, debt, size, profitability, bankruptcy probability, and mean industry kink levels. We estimate the following Censored Tobit model controlling for annual effects.

(3) $\text{Kink} = \beta_o + \beta_1 (\text{MTR}) + \beta_2 (\text{D/V}) + \beta_3 (\text{Tax Spread}) + \beta_4 (\text{Log of Total Assets}) + \beta_5(\text{EBITDA}) + \beta_6(\text{Altman's Z-score}) + \beta_7 (\text{Mean Industry Level}) + \beta_{7+i} (\text{Year Dummy})$

Table 2 presents the estimated coefficients of the model. Because our dependent variable is right censored, we adjust for this censoring by using a Tobit regression. We control for year so that intra-firm year-to-year observations are independent. We omit firms with SIC codes less then 2000 and greater than 6000.

Table 2 presents the results of these tests in a step-wise fashion. Model (1) shows a regression on kink based on the two variables that determine the kink, MTR (which should be positively related to kink) and debt (which should be negatively related to kink). Both variables are significant at the 1 percent level and the regression has an R-square of 0.27. Model (2) shows the impact of tax spread on the previous regression. Tax spread is highly significant with a positive sign, indicating that firms with higher tax spreads are more likely to have higher kink. However, the R-square does not increase with the addition of tax spread.

Model (3) in Table 2 shows that all of the variables are significant predictors of kink increasing the R-square to 0.47. We find that tax spread remains significant and positively

correlated with kink in the presence of the additional control variables. We infer that firms that appear under-levered - having a kink significantly greater than one - may be using non-debt tax shields in place of debt. However, we are unable to establish much economic significance with these regressions. Ceteris paribus, increasing tax spread from the 1st to the 3rd quartile only increases kink by 0.03 or roughly a 2 percent increase in kink.

We know from Table 1 that over 40 percent of the tax spread values in our sample are less than zero. If we examine only the firms with non-negative values of kink, Models 4-6, the addition of tax spread does show incremental improvement in the R-square. Furthermore, the coefficient on the tax spread increases by a factor of 18. In Model (6), all the control variables remain significant with the same sign as previously and the R-equare is 50 percent.

In summary, tax spread certainly is significantly related to kink as predicted. However, the relation is weak because the tax spread can take on negative as well as positive values. When limiting the analysis to non-negative values of the tax spread, the correlation with kink is much higher. Furthermore, if extreme cases of kink are eliminated, the correlation between tax spread and kink if very high. In multivariate analysis, tax spread is still correlated with kink, but the incremental explanatory power is weak. This may be due to multicollinearity or measurement problems. Further analysis is warranted.

V. Determinants of the Tax Spread

The focus of our study is tax spread, but similar research by Manzon and Plesko (2001) examine the differences between book and taxable income. They identify four types of activities that are likely to affect book-tax income spread: 1) demand controls for tax favored investment and financing action, 2) direct sources of investment related timing differences, 3) permanent differences and 4) noise factors. We use the Manzon and Plesko set of variables as determinants of tax spread, as well as adding accounting changes, lease obligations, and employee stock options. A description of each variable (and Compustat Data Item Number) and our prediction of the sign with relation to the tax spread are presented in this section (and summarized in the Appendix). Unless otherwise noted, each variable is standardized by dividing by total assets.

A. Demand Controls

The variables used by Manzon and Plesko (MS) to capture demand controls are *Profitability*, *Presence of NOLs*, and *Change in Net Sales*. For our purposes, more profitable firms are naturally more likely to have higher tax spreads due to a higher tax paying position and thus more incentives to make efficient use of tax deductions and tax shelters. We measure profitability by pre-tax income (Data170). Firms that have NOL carryforward will not be able to benefit as much from tax deductions and other tax benefits relative to firms that do not have NOL carryforward. Therefore, we expect tax spread and NOL carrryforward to be negatively related. NOL carryforward is measured as a dummy variable equal to one if a firm reports any NOL carryforward (Data52). Growing firms are likely to make more investments in tax-favored assets that generate timing differences between financial and tax reporting. Thus we

expect to see a positive relation between firm growth and tax spread. Growth is measured by net sales less prior year net sales (Data12).

B. Timing Differences

MP measure the timing differences from investment activity with the variables *Gross and Net Property, Plant, and Equipment*, *Goodwill, Non-Goodwill Intangibles*, and *Post-Retirement Benefits*.

Depreciation is perhaps the largest factor to cause deviations between book and tax income and probably the largest component of the tax deferrals The variable Gross Property, Plant, and Equipment (Data7) measures the stock of depreciable assets. However, there are several complications in the use of PP&E. First, depreciation is usually the largest contributor to deferred taxes, which we have removed from the tax spread calculations. Nevertheless, firms with larger PP&E will often have greater opportunities to shelter taxable income. However, because depreciation creates a timing difference, a greater tax shield in early years of the asset's life will reverse itself in the later years of the asset's life. The end result is that PP&E's impact on tax spread is indeterminate. In order to capture firms containing younger assets, we also measure the ratio of Net to Gross PP&E (Data8 / Data7) and expect a positive relation to kink.

Goodwill created after 1993 could be amortized for tax purposes over 15 years. If goodwill is amortized for more than 15 years for financial reporting purposes, accounting income would be greater than taxable income in the early years of the asset's life, creating a positive relation between tax spread and post-1993 goodwill. Conversely, if goodwill created after 1993 were amortized over less than 15 years for financial reporting purposes, financial

reporting income would be less than taxable income in the early years of the asset and there would be a negative relation between tax spread and post-1993 Goodwill. The same logic applies to non-goodwill intangible assets in which different amortization periods are applied for financial reporting than for tax purposes. Thus we cannot predict the sign of the post-1993 Goodwill or Non-goodwill Intangible assets variable due to the unknown assets' lives. Change in Goodwill after 1993 is measure as the difference between reported goodwill and the goodwill reported by the firm in 1993 and zero prior to 1993 (Data2004). Non-Goodwill Intangible Assets are the difference between total intangible assets and goodwill (Data33-Data2004).

Under Financial Accounting Statement No. 106 effective 1992, firms are required to report post-retirement benefit obligations based on accrual estimates, while these obligations are recognized as expenses on a cash basis for tax purposes. Post-retirement benefit obligations can be subjective and susceptible to earnings management problems. Firms reporting a decrease (increase) in benefit obligations for financial reporting by an amount less (greater) than the reduction in post-employment obligations deducted from taxable income will have a positive (negative) impact on tax spread (i.e. increasing financial income relative to tax income). We expect the change in post-employment obligations, measured as the postretirement benefit reported on the Balance Sheet (Data273) minus the previous year obligation, to be negatively related to tax spread.

C. Permanent Differences

MP report only one permanent difference in their analysis: *Pre-1993 Goodwill*, the accounting and tax treatments of goodwill before 1993. Prior to 1993, Goodwill assets under GAAP standards were amortized for a period not to exceed 40 years but were not amortized for

tax purposes. This would have artificially reduced financial income relative to taxable income, decreasing the tax spread. Pre-1993 Goodwill is the amount of goodwill reported in 1993 and earlier and equal to the 1993 value thereafter (Data204).

D. Noise Factors

MP categorize several variables as noise factors including *Foreign Operations*, *Size*, and *Lagged Spread*. If firms operate in foreign countries that tax corporate income at a lower rate than it is taxed in the U.S., they will have an incentive to shift taxable earnings to those foreign countries. Yet foreign income is likely to be reported in the firms accounting statements. Thus it is likely that firms with more foreign operations will have a higher spread. Firms report Foreign Pretax Income (Data273) which is the variable we use to measure foreign operations.

Total Assets less PP&E and intangible assets (Data6-Data8-Data33) represent other long-term assets used for the production of revenue. MP include this variable to account for size. This variable also is intended to catch the value of all additional assets that may be held or created for other than economically viable reasons (minority holdings, restricted investments, lease in/lease out contracts, etc.). We expect this variable to be positively related to tax spread.

The tax spread may follow either a trending or mean reverting process. If the firm is continually investing in tax advantaged investments, tax spread should increase each year. If firms make one time investments or experience shocks due to differential accounting, tax spread will exhibit a spike and return to normal levels the following year. We also include the lagged tax spread to control for the noise created by the time lag in taxes paid. As previously

discussed, the current tax expense is often lagged by at least a quarter and possibly more due to the delay in paying the current quarter's tax bill.

E. Other Factors Affecting Tax Spread

In addition to the MP variables described above, we have added three additional variables that we expect to be important in determining the tax spread. These variables are *Accounting Change*, *Current Operating Lease Expense*, and *Employee Stock Options*.

GAAP accounting rules give management a large amount of leeway in determining how to report their earnings to shareholders. At times, a company may opt to change the way it has accounted for a particular item in the past, which will have the affect of increasing or decreasing the amount of reportable earnings although the company has not undergone any economic change. Accounting changes may be motivated for several reasons. Managers may want to conform to industry standards or they may be motivated by regulatory or political pressure. Managers may select accounting practices based on their own performance-related bonuses or for earnings management incentives. Regardless of the motivation, accounting changes as reported by COMPUSTAT are the net affect of all types.

In general, accounting changes are recognized as an adjustment to income during the period(s) in which an accounting change occurs; however, each type may or may not affect book and tax income equally. We cannot predict the type of accounting change but in aggregate, positive adjustments to income as an accounting change will increase income and is typically temporary. In addition, many accounting changes will have no effect on tax income. Therefore, changes in accounting policy on net will have a positive relation to tax spread. If an accounting change is not reported (Data183) for a given firm-year observations, a value of zero is assumed.

Leasing creates the potential for divergence between book and tax income. While operating leases should be treated the same for tax and financial reporting,[3] capital leases tend to be treated differently for financial and tax reporting purposes. Capital leases result in depreciation and interest expenses. Depreciation usually results in timing differences as previously discussed. Interest expense for capital leases could result in a book-tax difference because the interest rate on capital leases is an imputed figure. Different assumptions could easily lead to different interest expense. Leasing also has been employed in some tax shelter transactions (for example, the so-called lease-stripping transactions and the SILO, Sales-In, Lease-Out, transactions employed by municipalities). It is unclear how these transactions are reported in financial statements, but it is likely that they could lead to deviations between tax and accounting reporting.

The Execucomp database reports three main categories of non-qualified or employee stock options. Options Exercised is the value of the stock exercised during the fiscal year, Options Unexercised is the end of the year value had exercisable options been exercised and Options Granted which is the value of the option based on a company specific valuing method (typically Black and Scholes). When non-qualified employee stock options are exercised, it reduces taxable but not book income, thus increasing the tax spread. Options granted and options unexercised represent a contingent expense and future potential tax spread that is callable at an unknown time in the future.

In order to proxy for employee stock options, we use the EXECUCOMP database which provides the options granted, outstanding unexercised and exercised options for top executive management. We standardized by dividing by total assets. Desai (2003) finds that

[3] There are the exceptions such as the synthetic lease that is treated as debt for tax purposes but treated as an operating lease for financial disclosure.

estimates from EXECUCOMP for the overall corporate universe are reliable estimates for the aggregate levels of the impact of option exercises on the corporate tax base.

F. Regression Results

To estimate the extent that tax spread can be explained by the institutional and economic factors described above, we estimate the fixed effects model found in Table 3. We include a dummy variable for each year for changes within the firm over time to create a cross-sectional panel for firm-year observations. We limit our sample set to manufacturing firms, transportation and communication firms, and wholesale and retail firms with SIC codes from 2000 to 6000. Model (1) does not include employee stock options due to the limiting sample set available on the Execucomp tapes. Model (2) uses the same variables as Model (1) but limits the sample size to those firms reporting employee stock options. Model (3) includes all firms reporting employee stock options. The three regressions are repeated using observations with non-negative tax spread and are reported in Models 4-6.

The reported adjusted R^2 indicates that the model explains a significant portion of the variation in the total tax spread (.288), explaining even more of the variation in the non-negative tax spread (.658). However, the addition of the employee stock option variables does not add much explanatory power to the model. For total tax spread, Model (3) indicates that the option "overhang," represented by both granted options and unexercised options, is significant and positively related to the tax spread. However, the same is not true for the non-negative tax spread where the option variables are not significantly related to the measure of the spread. These results are puzzling and may be indicative of measurement error regarding our proxy for employee stock options. We only measure the executive options while the firm's tax advantage applies to total employee stock options.

The variables Gross PP&E, Goodwill, and Other Intangible Assets, representing timing differences, display a curious and consistent pattern. These variables are negatively related to the total tax spread, but positively related to non-negative tax spread. A plausible explanation for this pattern is that firms with negative tax spread are likely to have larger but older depreciating assets or amortizations, resulting in lower tax deductions than financial-reporting deductions. This results in a negative relation between these assets and the tax spread. When limiting the sample to the non-negative tax spread, however, firms with newer depreciating and amortizing assets appear to have a positive relation with the spread. This explanation also is supported by the positive sign of the ratio of Net to Gross PP&E, indicating that "newer" assets have a more positive tax spread.

The other variable representing timing differences according to Manzon and Plesko is the Change in Postretirement Benefits which is significant and negative in all regressions. This is consistent with earnings management theory where the manager is given accounting discretion under GAAP to adjust postretirement accounts.

The profitability variable, Pretax Income, is positive and highly significant in all the regression models. This is consistent with firms' increasing demand for tax-favored investments and financing actions, especially tax-favored actions that reduce taxable income but may not affect book income, naturally increasing with profits. Curiously, the NOL indicator variable is not significant related to the spread. Change in Sales, the proxy for firm growth, is not significantly related to the total tax spread, but is negatively and significantly related to the non-negative tax spread. For the non-negative tax spreads, this may indicate that the highest growth firms, possibly younger firms with lower earnings, have lower tax spread.

The coefficients on Pre-1993 Goodwill is positive and significant which is opposite the prediction that Goodwill amortization prior to 1993 reduced income for financial reporting purposes but was not deductible for tax purposes. The Foreign Pretax Income is positive which is consistent with firms transferring income form U.S. operations to lower-taxed foreign countries.

The coefficient on the size proxy, Total Assets Less PP&E and Intangibles, is positive and significant which is consistent with larger firms being able to create a larger tax spread by reducing taxable income more than financial income. Accounting change is positive and significant only for our reduced sample set which may be biased to larger firms. Current Operating Lease Expense is not significant (except in Model (4)) but perhaps it was not expected to affect tax spread because operating leases affect both book and tax income equally. The Capital Lease Obligation also is not generally significant (except, again, in Model (4) where is a significantly negative). Finally, the lag tax spread is significant in all the regression equations indicating a trend in the tax spread as might be expected from an examination of Figures 1 and 2.

In summary, the accounting variables suggested by Manzon and Plesko as explaining the book-tax income spread, also help to explain the tax spread. Although the signs of the coefficients are not always as predicted, the variables generally support the notion that demand controls, timing differences, and noise factors explain the tax shelter motivations of corporations. The variables that we added in addition to Manzon and Plesko – employee options, leases, and accounting change – also support the tax-shelter activities by corporations leading to greater tax spread.

VI. Capital Structure Empirical Models and the Tax Spread

Empirical tests of capital structure theories have been ongoing for decades. One of the puzzles resulting from early capital structure tests was the inability to demonstrate reliable and consistent tax results. This led Myers (1984) to issue a challenge to the profession to find a significant relation between taxes and debt policy as well as Myers and Majluf (1984) to suggest that taxes may be a second-order effect in the determination of debt policy. In this section we use the tax spread as a proxy for non-debt tax shields in capital structure cross-sectional regressions. We add this variable to three extant models: Bradley, Jarrell, and Kim (1984), Graham, Lemmon, and Schallheim (1998), and Frank and Goyal (2003) representing the last 20 years of empirical work in this area.

Bradley, Jarrell and Kim (1984) (BJK) develop a model that incorporates tax effects and expected costs of financial distress. BJK develop a model of optimal capital structure and conclude that there are three testable implications for the trade-off theory. Debt policy should be related to (1) the costs of financial distress, (2) non-debt tax shields (NDTS), and (3) the volatility of earnings. They hypothesize that due to financial distress costs – both bankruptcy and agency costs of debt – firms with higher volatility of earnings will use debt more conservatively. They empirically measure volatility directly by the standard deviation of the first difference in annual earnings.

BJK measure NDTS as the sum of depreciation charges and investment tax credits (ITC). BJK also include a measure of the sum of R&D and advertising expenses. They argue that these expenses may be related to tax affects, decreasing the need for debt. Alternatively, BJK point out that Myers (1977) argues that these two activities create assets that may be

viewed as creating growth options that increase the agency costs of debt. Thus their model predicts that both will vary inversely with the level of debt.

They compare their empirical measures to the 20-year average of debt to value to minimize the effects of transient variations through time due to business cycles or lagged adjustments by firm towards their "target" leverage ratios. Empirically, debt levels are not random nor are they consistently high but are clustered among industries (Schwartz and Aronson (1967), Scott (1972)).

They find that the volatility of firm earnings is and important and inverse determinant of firm leverage. The level of use of R&D and advertising expenditures is also related inversely to leverage. Contrary to the prediction of their model, they find a statistically significant, positive relation between firm leverage and the relative amount of NDTS.

We retest their results substituting tax spread for their measure of NDTS. Rather than a single year cross-section, we control for year with dummy variables and include observations from 1987 to 1999. This increases the sample size from 851 firms to 6519 firm-year observations. We are not able to directly compare their results to ours due to data availability constraints, but we do find similar results despite the time variance. Table 4 reports the results of the cross-sectional regressions of firm leverage ratios on their hypothesized determinants.

All four predictors are significant for both inter- and intra-industry variations in firm leverage ratios. Firm volatility and Advertising and R&D are inversely related to firm leverage as predicted. The NDTS proxy, as calculated by BJK, is positively related to firm leverage as they found in their 1982 cross-sectional empirical test and contrary to their model predictions. When we substituted tax spread for NDTS, we find an inverse relationship as predicted. As an explanation to their "puzzling" results, BJK state:

> A fundamental problem with the cross-sectional regressions is misspecification, which suggests a "missing variable" explanation for the perverse result on non-debt tax shields. The danger is that excluded variables are correlated with included variables, which can cause misleading inferences to be drawn from the regression results.

Our proxy for NDTS (tax spread) circumvents the misspecification problem by aggregating all NDTS (both transparent and opaque). As trade-off theory models predict, debt ratio is inversely related to the level of NDTS in aggregate.

Mackie-Mason (1990) showed significant tax effects when he regressed changes in debt and equity financing (i.e., incremental changes) on the lagged tax variables. Graham (1996) computes a forward-looking marginal tax rate using the tax code, a series of forecasted earnings, and the resulting simulated tax rates. Graham, Lemmon, and Schallheim (1998) (GLS) use a before-financing version of the simulated MTR to demonstrate a positive relation between taxes and the level of debt. GLS also include a large set of control variables for financial distress costs and contracting costs. They also control for industry and year effects.

In Table 5, we replicate the GLS results and then add the tax spread or the non-negative tax spread. The non-negative tax spread has the proper sign as a proxy for non-debt tax shields and is significant even in the presence of the before-financing MTR variable. This result further confirms the idea that firms have unobservable tax shelters that lower their choices of debt levels.

Recently, Frank and Goyal (2003) (FG) perform tests of debt ratios of U.S. firms in an attempt to determine the relative importance of 39 factors in the leverage decision. FG suggest their evidence is consistent with the trade-off theory, but do not find support for the pecking order or market timing theories. They find 6 factors to be the most reliable: median industry leverage (+ effect on leverage), market-to-book ratio (-), collateral (+), profitability (-),

dividend-paying firm (-), and log of assets (+).4 FG also suggest that the tax factors, such as net operating loss carry forwards are not robust in their analysis.

We add tax spread to the FG analysis. The tax spread is highly significant and negative, as predicted. It is robust for both total and non-negative tax spreads. Again, however, the incremental contribution of the tax spread is small.

VII. Conclusions

[4] FG also include expected inflation, a factor we have not added in this version of the paper.

Appendix A

In the following, we define the variables and how they were constructed. Compustat data names are included in the parenthesis.

Table 1-2

- Kink – See Graham (2000). Data is proprietary.
- MTR After Interest Deduction – See Graham (1996a). Data is proprietary.
- Debt to Value is calculated as the sum of the long and short term debt divided by total assets ((Data9+Data44)/Data6).
- Tax Spread is defined as the current Foreign, Federal, State and other taxes minus deferred taxes minus the taxes paid during the current period divided by total assets ((Data16-Data50-Data317)/Data6).
- Log of Size is the natural log of total assets (ln(Data6)).
- EBITD is directly collected from Compustat Data13.
- Modified Altman's Z-score is calculated as (3.3*EBIT + 1.0*Sales +1.4*Retained Earnings + 1.2*Working Capital)/Total assets.

Table 3

- Tax Spread is defined as the Total Foreign, Federal, State and other taxes minus deferred taxes minus the taxes paid during the current period divided by total assets ((Data16-Data50-Data317)/Data6).
- Pretax Income is directly collected from Compustat Data170.

- Positive NOL carryforward is a binary variable equal to on if the firm reports a NOL carryforward and zero otherwise (I(Data52)).

- Change in Net Sales is the current year net sales minus less the prior year net sales (Data12-lag(Data12)).

- Gross PP&E is the cost of fixed property of a company used in the production of revenue before adjustments for accumulated depreciation, depletion, and amortization (Data7).

- Net/Gross PP&E is the cost of tangible fixed property used in the production of revenue, less accumulated depreciation divided by gross PP&E (Data8/Data7).

- Change in Goodwill after 1993 is the difference between reported goodwill and the goodwill reported by the firm in 1993 and zero prior to 1993 (Data204).

- Non-Goodwill Intangible assets are the difference between total intangible assets and goodwill (Data33-Data204).

- Pre-1993 Goodwill is the amount of goodwill reported 1993 and earlier and equal to the value reported in 1993 thereafter. (Data204).

- Change in Post Retirement Benefit is the current year company's obligation or prepaid cost for postretirement benefits that is reported on the Balance Sheet minus the previous year obligation (Data330-lag(Data330)).

- Foreign Pretax Income is the income of a company's foreign operations before taxes as reported by the company (Data273).

- Total Assets less net PP&E and Intangibles is the company's total assets minus net PP&E minus intangible assets (Data6-Data8-Data33).

- Change in Accounting Policy is the adjustments during the period in which an accounting change occurs (Data183). All missing data is set to zero.

- Operating Lease Obligation is the current lease obligation plus the minimum lease obligation for the next 4 years discounted by 10% per year (Data96+(Data164 to 167/$(1.1)^t$).

- Employee Options Excersized/Unexersized/Granted is the mean for the top 5 executives.

Table 1

Summary Statistics on Variables Used in Kink Regressions

Panel A

Variable	Observations	Mean	Median	25th Percentile	75th Percentile
Kink	33159	2.47943	1.6	0.2	4
	30530	2.52636	1.6	0.2	4
	17054	2.65435	1.6	0.2	4
MTR After Interest Deduction	31479	0.20734	0.31732	0.00812	0.34
	30530	0.20814	0.31859	0.00819	0.34
	17054	0.21172	0.32712	0.00837	0.3408
Total Debt to Market Value	40111	0.42096	0.50013	0.12663	0.78414
	30530	0.43586	0.51423	0.14821	0.78132
	17054	0.39805	0.48621	0.12663	0.76791
Tax Spread	46596	0.000596	0	-0.00398	0.00599
	30530	0.000101	0	-0.00437	0.00621
	17054	0.010455	0.005103	0.00129	0.01273
Log of Size	46721	5.03183	4.90614	3.44375	6.51149
	30530	5.07856	4.95773	3.60294	6.47685
	17054	5.0174	4.92809	3.51268	6.45670
EBITDA	46623	0.095586	0.12456	0.06834	0.17931
	30530	0.10302	0.12685	0.07238	0.17986
	17054	0.10721	0.13614	0.08215	0.18906
Modified Altman's Z-score	45280	2.78477	2.65776	1.50832	3.91460
	30530	2.87818	2.79092	1.70126	3.98961
	17054	2.89655	2.874	1.75704	4.07283

- The first row for each variable includes all observations for the year 1987 through 1999 for firms with SIC codes between 2000-5999.
- The second row for each variable includes all observations with no missing values which are included in the regression on Table x.
- The third row for each variable includes all observations with no missing values and a non-negative tax spread.

Table 1 (continued)

Summary Statistics on Variables Used in Kink Regressions

Panel B

	Kink	MTR After Interest Deduction	Total Debt to Market Value	Tax Spread (All)	Tax Spread (>= 0)	Log of Size	EBITDA	Modified Altman's Z-score
Kink	1							
MTR After Interest Deduction	0.46767 (<.0001)	1						
Total Debt to Market Value	-0.01963 (-0.0006)	0.0088 (.124)	1					
Tax Spread (All)	0.03808 (<.0001)	0.04222 (<.0001)	-0.00071 (-0.9013)	1				
Tax Spread (>= 0)*	0.1201 (<.0001)	0.05317 (<.0001)	-0.00957 (.2115)	1 (<.0001)	1			
Log of Size	0.19306 (<.0001)	0.27689 (<.0001)	0.06765 (<.0001)	0.02357 (<.0001)	-0.08327 (<.0001)	1		
EBITDA	0.3773 (<.0001)	0.42696 (<.0001)	0.01178 (.0396)	0.05666 (<.0001)	0.09934 (<.0001)	0.30209 (<.0001)	1	
Modified Altman's Z-score	-0.25123 (<.0001)	0.19729 (<.0001)	-0.01947 (-0.0007)	0.01349 (.0184)	0.05211 (<.0001)	-0.00342 (-0.5501)	0.36808 (<.0001)	1

* Based on 17,054 observations

All other correlations are based on 30,530 observations

Table 2

Tobit Regression Using the Kink in the Benefit Function as Dependent Variable

	Estimated Coefficients											
	All Observations						Observations w/ Tax Spread >= 0					
Intercept	0.7041	***	0.7060	***	-1.6950	***	0.8452	***	0.6895	***	-1.9096	***
	(139.14)		(139.93)		(570.07)		(104.64)		(69.24)		(376.29)	
MTR After Interest Deduction	8.8949	***	8.8783	***	6.0272	***	9.3737	***	9.2654	***	6.2435	***
	(7635.11)		(7596.96)		(3447.27)		(4366.26)		(4305.39)		(1920.4)	
Total Debt to Market Value	-0.0201	***	-0.0200	***	-0.0173	***	-0.0106	***	-0.0100	**	-0.0097	***
	(26.81)		(26.79)		(24.8)		(6.71)		(6.08)		(7.11)	
Tax Spread			0.9426	***	0.5229	**			17.0239	***	12.1032	***
			(14.86)		(5.72)				(204.18)		(125.2)	
Log of Size					0.0695	***					0.1129	***
					(90.13)						(124.46)	
EBITDA					2.3429	***					2.0927	***
					(630.19)						(325.39)	
Modified Altman's Z-score					0.0758	***					0.0500	***
					(464.06)						(158.15)	
Mean Industry Level					0.9472	***					0.9819	***
					(4867.58)						(2718.49)	
OLS R^2	0.272		0.272		0.474		0.292		0.305		0.503	
Log Likelihood	69567		69560		66249		39044		38942		37143	
Observations	30530		30530		30530		17054		17054		17054	

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent level, respectively

Chi-Square statistics reported in the parenthesis

Table 3

Determinants of Tax Spread Regressions

	Predicted Sign	Estimated Coefficients					
		All Observations			Observations w/ Tax Spread >= 0		
Intercept		-2.18380	-12.73203	-12.38945	0.71079	4.12402	4.40751
		(0.55)	(1.28)	(1.26)	(0.19)	(0.46)	(0.49)
Pretax Income	+	0.05708 ***	0.05319 ***	0.05615 ***	0.05403 ***	0.05054 ***	0.05022 ***
		(26.55)	(14.39)	(15.01)	(30.56)	(17.56)	(16.95)
Positive NOL Carryforward	-	-2.47818	-2.42196	-2.39329	1.37182	1.44028	1.62761
		(1.19)	(0.53)	(0.52)	(0.71)	(0.36)	(0.40)
Change in Sales	+	0.00094	-0.00005	0.00016	-0.00167 ***	-0.00262 ***	-0.00247 **
		(1.22)	(0.04)	(0.13)	(2.70)	(2.61)	(2.45)
Gross PP&E	?	-0.00354 ***	-0.00419 ***	-0.00410 ***	0.00047 *	0.00047	0.00050
		(12.54)	(7.84)	(7.67)	(1.78)	(0.93)	(0.99)
Net/Gross PP&E	+	13.19788 **	35.71099 **	30.00755 *	1.18381	-3.55552	-2.83770
		(2.21)	(2.28)	(1.92)	(0.21)	(0.25)	(0.20)
Change in Goodwill after 1993	?	-0.00968 ***	-0.00928 ***	-0.00994 ***	0.00425 ***	0.00358 **	0.00362 **
		(10.44)	(5.65)	(5.71)	(4.69)	(2.31)	(2.24)
Non-Goodwill Intangible Asset	?	-0.01365 ***	-0.01605 ***	-0.01767 ***	0.00433 ***	0.00568 ***	0.00700 ***
		(14.88)	(11.68)	(12.48)	(3.58)	(2.86)	(3.11)
Pre-1993 Goodwill	-	0.00017	0.00458 **	0.00123	0.00389 ***	0.00083	0.00030
		(0.13)	(2.19)	(0.54)	(3.16)	(0.45)	(0.14)
Change in Postretirement Benefits	-	-0.00231 *	0.00395 *	0.00273	-0.00778 ***	-0.00918 ***	-0.00914 ***
		(1.67)	(1.52)	(1.05)	(6.55)	(4.13)	(4.09)
Foreign Pretax Income	+	0.02978 ***	0.03356 ***	0.02713 ***	0.03273 ***	0.04575 ***	0.04717 ***
		(6.03)	(3.62)	(2.92)	(8.16)	(6.27)	(6.38)
Total Assets less PP&E and Intangibles	+	0.00136 ***	0.00068 ***	0.00088	0.00145 ***	0.00207 ***	0.00205 ***
		(4.75)	(1.27)	(1.64)	(6.14)	(4.77)	(4.66)
Accounting Change	+	0.34940 ***	0.36398 ***	0.33852 ***	-0.09318	-0.05579	-0.07045
		(4.74)	(2.91)	(2.72)	(1.32)	(0.50)	(0.62)
Current Operating Lease Expense	+	0.00338	0.01346	0.00943	0.01851 **	0.01521	0.01650
		(0.39)	(0.83)	(0.58)	(2.36)	(1.05)	(1.13)
Capital Lease Obligation	-	0.00111	-0.00321	0.00047	-0.01623 **	0.00694	0.00484
		(0.13)	(0.19)	(0.03)	(2.07)	(0.45)	(0.31)
Lag of Tax Spread	+	0.05834 ***	0.04447 *	0.05144 *	0.21053 ***	0.19975 ***	0.20607 ***
		(3.83)	(1.66)	(1.88)	(15.43)	(8.59)	(8.61)
Employee Options Exercised	+			0.00014			-0.00087
				(0.22)			(1.02)
Employee Options Unexercised	+			0.00298 ***			-0.00136
				(3.15)			(1.15)
Employee Options Granted	+			0.01347 ***			-0.00041
				(3.86)			(0.15)
Adj. R^2		0.288	0.276	0.287	0.658	0.638	0.638
F-Statistic		77.43	28.06	26.58	214.35	76.12	68.28
Observations		5469	1845	1845	3217	1107	1107

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent level, respectively

N/P - Not Predicted

T-statistics are reported in the parentheses in absolute values

Table 4

Regressions of Debt-to-Value Ratio using Bradley, Jarrell, and Kim Model

	Estimated Coefficients					
	Without Industry Dummy Variables			With Industry Dummy Variables		
	All Observations		Tax Spread >=0	All Observations		Tax Spread >=0
Intercept	0.1744 ***	0.1760 ***	0.3251 ***	0.3146 ***	0.3162 ***	0.2419 ***
	(25.54)	(25.80)	(31.84)	(20.09)	(20.19)	(11.28)
Firm Volatility	-0.2168 ***	-0.2169 ***	-0.3353 ***	-0.1680 ***	-0.1682 ***	0.1060
	(-9.21)	(-9.21)	(-4.47)	(-7.46)	(-7.46)	(1.54)
Non-Debt Tax Shields	0.0049 **			0.0049 ***		
	(2.54)			(2.73)		
Tax Spread		-0.1233 **	-1.0191 ***		-0.1052 **	-0.7946 ***
		(-2.32)	(-4.84)		(-2.14)	(-4.59)
Advertising and R&D Expense	-0.2116 ***	-0.2114 ***	-1.6862 ***	-0.0985 ***	-0.0984 ***	-0.5865 ***
	(-10.10)	(-10.10)	(-28.01)	(-4.77)	(-4.76)	(-7.76)
Adj R^2	0.049	0.049	0.276	0.188	0.188	0.529
F-Statistic	23.58	23.51	82.29	37.03	36.94	68.72
Firm-Year Observations	6519	6519	2987	6519	6519	2987

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent level, respectively

Dependent variable - Firm Debt to Value Ratio is calculated as 20-year moving sum of annual book value of long-term debt divided by the sum of long-term debt and the market value of equity

Firm Volatility - The standard deviation of the first difference in annual earnings before interest, depreciation and taxes over a moving 10 year period divided by the average value of total assets over the same time period.

Non-Debt Tax Shields - The ratio of the moving 20 year sum of annual depreciation plus investment tax credits divided by the sum of annual earnings before interest, depreciation and taxes over the same period

Tax Spread - The difference between the current period's current tax expense and taxes paid. The current tax expense is the total tax expense minus deferred taxes.

Advertising and R&D Expense - The moving 10 year sum of annual advertising, plus research and development expenses divided by the sum of annual net sales over the same period.

- Year dummy variables are included for all regressions
- Numbers in parenthesis represent t-statistics
- Industry dummy variables are defined in Bradley, Jarrell and Kim (1984)

Table 5

Regressions of Debt-to-Value Ratio using Graham, Lemmon, and Schallheim Model

	Predicted	Estimated Coefficients			
				Observations w/	
	Sign	All Observations		Tax Spread >= 0	
Intercept		0.11640 ***	0.11245 ***	0.10158 ***	0.10306 ***
		(14.08)	(14.15)	(9.86)	(9.99)
Before-financing Marginal Tax Rate	+	0.08570 ***	0.07845 ***	0.06657 **	0.07118 ***
		(3.80)	(3.69)	(2.30)	(2.46)
ECOST	-	-0.09851 ***	-0.09869 ***	-0.08217 ***	-0.08122 ***
		(7.92)	(7.93)	(5.06)	(5.01)
Z-Score	-	-0.01476 ***	-0.01478 ***	-0.01100 ***	-0.01580 ***
		(13.45)	(13.47)	(8.29)	(7.89)
OENEG	+	0.10256 ***	0.10236 ***	0.10463 ***	0.10555 ***
		(11.38)	(11.35)	(9.32)	(9.40)
Tax Spread	-		0.04488		-0.26872 **
			(1.53)		(2.17)
Market-to-Book	-	-0.02244 ***	-0.02253 ***	-0.01924 ***	-0.01880 ***
		(20.47)	(20.53)	(15.51)	(14.96)
Collateral	+	0.14358 ***	0.14419 ***	0.13649 ***	0.13348 ***
		(15.11)	(15.16)	(11.26)	(10.94)
Size (log of firm value)	+	0.00265 ***	0.00261 ***	0.00136	0.00123
		(3.24)	(3.19)	(1.31)	(1.18)
SIC codes 2000-2999		-0.01497 ***	-0.01487 ***	-0.00664	-0.00715
		(3.02)	(3.00)	(1.06)	(1.14)
SIC codes 3000-3999		-0.00850 **	-0.00845 **	-0.00068	-0.00062
		(2.30)	(2.28)	(0.14)	(0.13)
SIC codes 4000-4999		-0.02293	-0.02310	-0.01786	-0.01644
		(1.48)	(1.49)	(0.91)	(0.84)
Year 1987-1992		-0.00463	-0.00461	-0.00349	-0.00290
		(1.41)	(1.41)	(0.83)	(0.69)
Adj. R^2		0.193	0.194	0.175	0.176
F-Statistic		115.28	105.89	60.81	56.20
Observations		5244	5244	3095	3095

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent level, respectively

T-statistics are reported in the parentheses in absolute values

Telephone Dummy not applicable because it became an unregulated industry before 1987

Utilities Dummy dropped out due to missing variables

Dummy for 1986 dropped because this data starts in 1987

Table 6

Regressions of Debt-to-Value Ratio using Frank and Goyal Model

	Estimated Coefficients		
	All Observations		Tax Spread >=0
Intercept	-0.0643 ***	-0.0640 ***	-0.06848 ***
	(-21.46)	(-21.36)	(-18.18)
Industry Level	0.8534 ***	0.8527 ***	0.8640 ***
	(113.30)	(133.23)	(90.88)
Market to Book ratio	-0.0005 ***	-0.0005 ***	-0.0005 ***
	(-7.52)	(-7.50)	(-6.30)
Collateral	0.1250 ***	0.1247 ***	0.1163 ***
	(30.62)	(30.56)	(23.04)
Profitability	-0.0063 ***	-0.0064 ***	-0.0054 ***
	(-6.89)	(-7.04)	(-5.77)
Dividend	-0.0968 ***	-0.0969 ***	-0.0859 ***
	(-41.36)	(-41.42)	(-28.63)
Log of Assets	0.0193 ***	0.0194 ***	0.0174 ***
	(36.91)	(36.99)	(26.97)
Tax Spread		-0.1013 ***	-0.1168 ***
		(-5.59)	(-5.5)
Adj R^2	0.286	0.287	0.290
F-Statistic	3585.61	3079.58	1861.65
Firm-Year Observations	53508	53508	31927

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent level, respectively

OLS regression using the first 6 factors determining TDM plus tax spread - all factors are lagged by one year

Dependent variable - Total Debt to Market Value of Assets (TDM) = the ratio of total debt (34(current liabilities) +9 (long-term debt)) to Market Value of Assets (MVA) +34 (current liabilities) + 9 (long-term debt) + 10 (preferred-liquidation value) - 35 (deferred taxes and investment tax credits)

Median Industry Level (IndustLev) = the median of total debt to market value of assets by SIC code and by year defined at the four-digit level

Market to Book ratio - the ratio of MVA to total assets (Data 6)

Collateral - the ratio of 3 (inventory) + 8 (net PPE) to 6 (total assets)

Profitability - the ratio of the operating income before depreciation (Data13) to total assets (Data6)

Dividend Paying Dummy - dummy variable that takes the value of one if Data 21 is positive and zero otherwise

Log of Assets - the log of total assets (ln(Data 6))

Tax Spread - The difference between the current period's current tax expense and taxes paid. The current tax expense is the total tax expense minus deferred taxes.

- Numbers in parenthesis represent t-statistics

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