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THE DETERMINATION OF OPTIMAL CAPITAL STRUCTURE: THE EFFECT OF FIRM AND INDUSTRY DEBT RATIOS ON MARKET VALUE

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Abstract

DeAngelo and Masulis (1980) demonstrated that the presence of corporate tax shield substitutes for debt implies that each firm has a "unique interior optimum leverage decision..." Masulis (1983) argued further that when firms which issue debt are moving toward the industry average from below, the market will react more positively than when the firm is moving away from the industry average. We examine this hypothesis by classifying firms' leverage ratios as being above or below their industry average prior to announcing a new debt issue. We then test whether this has an effect on market returns for shareholders. Our overall finding is that the relationship between a firm's debt level and that of its industry does not appear to be of concern to the market.

INTRODUCTION

The relationship between capital structure and firm value has been the subject of considerable debate, both theoretically and in empirical research. Throughout the literature, debate has centered on whether there is an optimal capital structure for an individual firm or whether the proportion of debt usage is irrelevant to the individual firm's value.[1]

In their seminal article, Modigliani and Miller (1958 and 1963) demonstrate that, in a frictionless world, financial leverage is unrelated to firm value, but in a world with tax-deductible interest payments, firm value and capital structure are positively related. Miller (1977) added personal taxes to the analysis and demonstrated that optimal debt usage occurs on a macro-level, but it does not exist at the firm level. Interest deductibility at the firm level is offset at the investor level.

Other researchers have added imperfections, such as bankruptcy costs (Baxter, 1967; Stiglitz, 1972; Kraus and Litzenberger, 1973; and Kim, 1978), agency costs (Jensen and Meckling, 1976), and gains from leverage-induced tax shields (DeAngelo and Masulis, 1980), to the analysis and have maintained that an optimal capital structure may exist. Empirical work by Bradley, Jarrell and Kim (1984), Long and Malitz (1985) and Titman and Wessells (1985) largely supports bankruptcy costs or agency costs as partial determinants of leverage and of optimal capital structure.

DeAngelo and Masulis (1980) demonstrated that with the presence of corporate tax shield substitutes for debt (e.g. depreciation, depletion, amortization, and investment tax credits), each firm will have "a unique interior optimum leverage decision with or without leverage related costs" (p.3). The DeAngelo-Masulis model implies that a firm's optimal capital structure will be industry related in part because of the evidence that tax rates vary across industry (Vanils, 1978; Siegfried, 1984; and Rosenberg, 1969). Masulis (1983) argues further that when firms which issue debt are moving toward the industry average from below, the market will react more positively than when the firm is moving away from the industry average.

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In this study, we test this hypothesis. Employing a sample of 183 debt issue announcements, we classify firms' leverage ratios as being above or below their industry average prior to the announcement. To test the sensitivity of both the industry classification and the components of the leverage ratio, we use both Value Line and *COMPUSTAT* as sources of industry averages and define the leverage ratio in terms of market value for equity and book value for equity. We then test whether this has an effect on the stock market returns for shareholders. We do not find a statistically significant market reaction to announcements of new debt issues for either group of firms, nor do we find a significant relationship between a firm's debt level and its industry's debt level. This lack of significance continues when we control for each firm's anticipated growth. These results do not support Masulis' (1983) argument that a firm can increase its value by moving towards the industry's debt average.

PRIOR RESEARCH ON THE RELATIONSHIP BETWEEN INDUSTRY AND CAPITAL STRUCTURE

The relationship between industry membership and capital structure has received considerable attention. In their review of the capital structure literature, Harris and Raviv (1991) noted that it is generally accepted that firms in a given industry will have similar leverage ratios while leverage ratios vary across industries. Schwartz and Aronson (1967) documented a relationship between industry and capital structure in five industries. Harris and Raviv (1991) have summarized (see Table III, p. 334) findings of four studies [Bowen, Daly, and Huber (1982), Bradley, Jarrell, and Kim (1984), Long and Malitz (1985), and Kester (1986)] which investigated leverage ratios for selected industries. These studies all found that specific industries have a common leverage ratio which, over time, is relatively stable. Hamada (1972), using industry membership as a proxy for risk class, found that levered beta values within different industries varied more than unlevered beta values. He concluded that there was a relationship between the cost of equity and financial leverage. DeAngelo-Masulis (1980) and Masulis (1983) use the documentation of this industry effect as one argument for the presence of an industry-related optimal capital structure and imply that it is the tax code and tax rate differences across industries that causes the inter-industry similarities in leverage ratios.

The correlation of capital structure to industry membership and/or the DeAngelo-Masulis differential tax arguments have received empirical support in Schwartz and Aronson (1967), Scott and Martin (1975), Scott (1972), Bowen, Daley and Huber (1982), Cordes and Sheffrin (1983), and Ben-Horim, Hochman, and Palmon (1987). However, not all of the evidence is unanimous in its support. Boquist and Moore's (1984) findings did not support the tax shield hypothesis at the firm level; however, they did find weak evidence in support of the theory at the industry level. They, however, like other researchers, found that total leverage varies across industry groupings.

In addition to the tax shield hypothesis that explains the large body of empirical evidence relating industry membership and leverage, other arguments may relate industry membership to capital structure decisions. Lev (1974) compared operating leverage to industry membership and to systematic risk and found a positive relationship. Building on Lev's study, Mandelker and Rhee (1984) derived the relationship between beta and both operating leverage and financial leverage. They concluded that the "conjecture that firms engage in trade-offs between DOL and DFL seems to have gained strong empirical evidence in our study" (p.56).

Since industry, to a large degree, influences production processes and therefore operating leverage, and if there is a tradeoff in DOL and DFL as found by Mandelker and Rhee (1984), a firm's industry may have some influence on its capital structure decisions. Specifically, if firms attempt to keep combined leverage at a manageable level, and, if DOL is impacted by industry membership, then firms in an industry with a high DOL may carry less debt while firms in an industry with low DOL may carry more debt.

In addition, earnings variability is influenced by DOL and DFL. Bradley, Jarrell and Kim (1984) find that the volatility of earnings is a strong inverse determinant of debt. To the extent that earnings volatility may be industry related, this may also effect the relationship between industry membership and capital structure decisions.

Individual firms and industries can be characterized by their growth rates. Rapidly growing firms (and industries) have a surfeit of positive net present value projects while slow-growth firms may have an excess of cash. Jensen and Meckling (JM) (1976) suggest that a particular capital structure can result from using debt as a monitoring and controlling device for managers. Further developing the "free cash flow" argument, Jensen (1986) points out that slow-growth firms will have large amounts of excess cash that managers may decide to use for personal perquisites and other non-positive net present value projects. If the firm issues debt, then the manager will own an increasing percentage of the firm's stock. Furthermore, excess cash will be reduced, and the debt covenant and bondholders will act as monitoring and controlling agents over the manager's behavior. Following JM's and Jensen's arguments, low growth firms (and their industries) should demonstrate increasing debt levels in their capital structure.

Since numerous studies have documented a relationship between industry and capital structure, investigation of this relationship may uncover determinants of capital structure. Firms in an industry will have similar proportions of individual assets and liabilities. The literature referenced above has investigated tax shield substitutes, tax rates, and operating leverage. Other similar balance sheet items that have been related to capital structure decisions are research and development (R&D), fixed assets, and advertising.[2]

From the above discussion, it is apparent that these many different firm characteristics (i.e., non-debt tax shields, R&D, advertising, individual products, fixed assets) are the parts that sum to a whole. That is, there may be many factors that influence an individual firm's capital structure decisions, and the literature that we have cited relates many of these factors to industry membership. Rather than test each component for its relationship to capital structure, we test the whole (the firm as a member of an industry) for its relationship.

As stated above, DeAngelo and Masulis (1980) developed a model that suggested a "unique interior optimum" capital structure for a firm. They stated that their model "predicts that firms will select a level of debt which is negatively related to the ... level of available tax shield substitutes for debt" (p. 3). In a later article, Masulis (1983) summarized [from DeAngelo and Masulis (1980)] that the optimum debt level would be:

> where the expected marginal tax effect a* just equals the expected marginal cost of leverage b, so that a* is always positive. If a* >b, a firm could increase its value by increasing its debt; and, if a* < b , its value could be increased by decreasing debt... (p. 115).

Substantial prior research (as enumerated above) has documented similarities for tax rates within separate industries. Drawing on DeAngelo and Masulis (1980) and Masulis (1983), we let a* represent the industry's leverage ratio (i.e., industry tax rates and the expected marginal tax effect) and b represent the firm's leverage ratio (i.e., the marginal cost of leverage to the firm). We test the market's reaction to a firm's issuing debt as measured by its relation to the industry. Following Masulis (1983), if a* > b , then the firm can increase its value as it increases debt because it is moving towards the industry average. On the other hand, if a* < b, then decreasing debt would increase firm value. We hypothesize that the market reaction will be positive when issuing debt moves a firm towards the industry average and less positive when it moves a firm away from the industry average.

DATA AND METHODOLOGY

The sample consists of 183 firms which announced a new debt issue for the period January 1, 1982, through December 31, 1986.[3] We only include those debt issues whose purpose was not stated as a refinancing of maturing debt so that the new issue would impact debt ratios. We also excluded debt issues from firms in highly regulated industries. The event date is the date the debt issue was first announced in the *Wall Street Journal*. The single index market model (see Appendix A) was used to test the market's reaction to the announcement.[4]

We compared each firm's leverage ratio to its industry's leverage ratio. The industry ratios came from two separate data sources (Value Line Investment Survey and the *COMPUSTAT* tapes), and we constructed two separate ratios.[5]

Using the Value Line industrial classification, we identified fifty-five industries. The industrial averages came from the Composite Statistics table. The leverage ratio that we used was long-term debt to net worth (LTD/NW). We compared each firm's LTD/NW ratio prior to the event-year with the same leverage ratio for its industry (i.e., the industrial average) to determine whether the firm was above or below the industry average. We classified firms that had a LTD/NW ratio above the industrial average as High Debt firms and firms which had a leverage ratio below that of their industry as Low Debt firms. Using the Value Line industrial averages, there were one hundred and six firms classified as High Debt firms and seventy-seven firms classified as Low Debt.

To test for the sensitivity of the results to a particular leverage ratio or a particular industry classification scheme, we also employed the Standard Industrial Classification (SIC) code to compute industrial averages. We defined each firm's industry based on the first two digits of the four digit SIC code. Using the two-digit classification, our firms fell into thirty-six industries. We then used the *COMPUSTAT* tapes to determine each firm's debt ratios and combined the ratios for each firm in the industry to produce the industry averages. In addition, instead of using long-term debt to net worth (from the balance sheet) as the leverage ratio, we employed total debt to market value of equity (TD/MVE) to measure leverage. Then we utilized the same methodology, as described above, to identify High Debt and Low Debt firms. Using the *COMPUSTAT* industrial averages, we identified fifty-four High Debt firms and one hundred and twelve Low Debt firms.[6]

It is possible that the growth of a firm may affect the market reaction to debt announcements. One might expect that a high growth firm could afford to have greater financial leverage because it could generate enough earnings to support the additional interest expense. On the other hand, it may be riskier for a low growth firm to increase its financial leverage as its earnings may not increase enough to cover the additional fixed obligations. We wish to test JM's (1976) and Jensen's (1986) argument (as discussed above) that the issuance of debt by low growth firms provides a device for monitoring and controlling managers by determining the market reaction to debt issuance by firm's with different growth rates. We would expect to find a positive reaction in the market for low growth firms that announce a debt issue.

While there are many alternative growth measures, a long-term measure of earnings potential seemed appropriate for our purpose because both debt (excluding current assets) and equity are long-term. Thus, we compared the average sales growth per year for a five year period from year -5 to year -1 (year 0 is the event year) to the anticipated average sales growth per year of another five year period, from year 1 to year 5. If the prior-event growth rate was lower than the post-event growth rate, then we identified the firm as a high growth firm. By the same token, if the prior-event growth rate was equal to or higher than the post-event growth rate, we classified the firm as a low growth firm. We collected the growth rates and anticipated growth rates from Value Line. Data was available for growth rate calculations for one hundred and forty-seven firms, of which seventy-seven were classified as high growth and seventy as low growth.

Table 1 presents descriptive statistics for the debt ratios for both High Debt and Low Debt subsamples. Panel A reports the Value Line data while Panel B reports the *COMPUSTAT* data.[7]

Both panels reveal that the average debt ratio of the firms is, as expected, much higher in the High Debt subsamples than that of the Low Debt subsamples. In addition, the corresponding industrial averages for both subsamples (Panels A and B) have similar mean values. This implies that, on average, book and market values are not different.

TABLE 1
Descriptive Statistics Of Debt Ratios For Samples
Debt Announcements For The Period 1982-1987

Panel A (Value Line)

	N	Mean	Std.	Max.	Min.
High Debt:					
Firm Debt[1] (%)	106	74.46	76.07	8.50	480.40
Industry Debt[2] (%)	106	32.22	29.58	4.00	176.00
Low Debt:					
Firm Debt (%)	77	18.37	19.67	0.00	93.40
Industry Debt (%)	77	39.16	33.91	4.90	154.00

1 Firm debt is long-term debt to net worth (LTD/NW) for the sample firms.
2 Industry debt is the industrial average of LTD/NW using Value Line industrial classification and data.

Panel B (*COMPUSTAT*)*

	N	Mean	Std.	Max.	Min.
High Debt:					
Firm Debt[3] (%)	54	181.49	107.37	535.40	52.40
Industry Debt[4] (%)	29	126.11	49.25	238.00	31.72
Low Debt:					
Firm Debt (%)	112	72.47	44.01	268.90	7.10
Industry Debt (%)	64	158.97	110.45	614.10	31.72

3 Firm debt is the total debt to market value of equity (TD/MVE) for the sample firms.
4 Industry debt is the industrial average TD/MVE using *COMPUSTAT* industrial classification and data.
* One outlying observation was excluded from the calculations.

RESULTS

Table 2 reports the results for the total sample.

While the prior-event intervals are not significant, the post-event interval (2 to 90) shows a -3.2% loss (z = 1.964). While there is no significant announcement effect, this post-event loss suggests that the announcement of a debt issue precedes a slow, negative stock price decline. The results from using both Value Line and *COMPUSTAT* data are somewhat similar. To avoid lengthy discussion concerning repetitive tables, we report the *COMPUSTAT* results. For reference, the Value Line results are presented in Appendix B (a,b,c).

TABLE 2
Debt Increase Announcements
For Total Sample
N = 183

INTERVAL	MCPE
-90 to 90	-0.02669 (-1.23875)
-20 to 20	-0.01094 (-0.50104)
-90 to -2	0.00754 (0.32103)
1 to 90	-0.03237 (-1.96494)*
-5 to 5	-0.00909 (-1.56335)

INTERVAL	MCPE
-1 to 1	-0.00186 (-0.70262)
-1	-0.00217 (-1.64200)
0	-0.00020 (0.02080)
1	0.00052 (0.40420)

*Significant at the 0.05 level using a two-tailed test.

TABLE 3
MCPE Comparison Of Debt Increase Announcements
For High Debt And Low Debt Firms
(*COMPUSTAT*)

	HIGH DEBT (N=54)	LOW DEBT (N=112)	
Intervals	**MCPE**	**MCPE**	**Difference**
-1 to 1	-0.0016 (-0.07)	-0.0034 (-0.82)	0.0018 (0.07)
-5 to 5	-0.0126 (-1.84)*	-0.0072 (-0.57)	-0.0054 (-0.38)
-90 to 90	-0.0658 (-1.87)*	-0.0076 (-0.03)	-0.0582 (-0.24)
2 to 90	-0.0705 (-2.45)**	-0.0069 (0.17)	-0.0636 (-1.27)
-90 to -2	0.0063 (-0.20)	0.0026 (-0.06)	0.0037 (0.07)
-20 to 20	-0.0113 (-0.64)	-0.0082 (-0.04)	-0.0031 (-0.02)
-1	0.0014 (0.89)	-0.0039 (-2.07)**	0.0053 (2.16)**
0	-0.0003 (0.04)	-0.0009 (-0.19)	0.0006 (0.06)
1	-0.0027 (-1.04)	0.0014 (0.84)	-0.0041 (-1.33)

* Significant at the 0.10 level using a two-tailed test
** Significant at the 0.05 level using a two-tailed test
*** Significant at the 0.01 level using a two-tailed test

Table 3 compares High Debt firms with Low Debt firms.

The debt issue announcement of the High Debt subsamples experiences a significant negative market reaction for multiple intervals. The MCPE from -5 to 5 is -0.0126 (z = -1.84). However, the differences between the two groups are not statistically significant except on day -1. On this day, the High Debt firms earn 0.53% more than the Low Debt firms. This result contradicts our expectation that a High Debt firm could increase its value by decreasing debt. Notably, the difference only occurs on a single day, -1, and other factors besides the debt ratio differential may cause the different price performance. Additional analysis of this result must be completed before this finding can be viewed as support for a theory that High Debt firms which issue additional debt are viewed more favorably than Low Debt firms that issue debt.[8]

Table 4 controls for the firms' growth rate while comparing the subsamples. Following JM (1976) and Jensen (1986), we hypothesize that the Low Growth-High Debt subsamples should receive the most favorable market reaction because additional debt provides a means for controlling managers. In contrast, a High Growth-Low Debt

TABLE 4
MCPE Comparison Of Debt Increase Announcements For High Growth And Low Growth Firms (*COMPUSTAT*)

	HIGH GROWTH (N=51)	LOW GROWTH (N=20)	
Intervals	**MCPE**	**MCPE**	**Difference**
-1 to 1	-0.0056 (-0.42)	-0.0029 (-0.14)	-0.0027 (-0.11)
-5 to 5	-0.0114 (-0.87)	0.0052 (0.21)	-0.0166 (-0.60)
-90 to 90	-0.0284 (-0.18)	-0.0891 (-1.67)*	0.0607 (0.37)
2 to 90	-0.0173 (-0.13)	-0.0647 (-1.36)	0.0474 (0.34)
-90 to -2	-0.0054 (-0.05)	-0.0216 (-0.99)	0.0162 (0.15)
-20 to 20	-0.0140 (-0.16)	0.0067 (-0.13)	-0.0207 (-0.21)
-1	-0.0050 (-0.88)	-0.0045 (-0.83)	-0.0005 (-0.06)
0	-0.0005 (-0.13)	0.0017 (0.48)	-0.0022 (-0.43)
1	-0.0001 (0.28)	-0.0001 (0.10)	0.0000 (0.00)

* Significant at the 0.10 level using a two-tailed test
** Significant at the 0.05 level using a two-tailed test
*** Significant at the 0.01 level using a two-tailed test

firm may not be able to service additional debt and should not have any excess cash reserves which a manager could use for perquisite consumption. As shown in Table 4, the difference in the MCPEs for the two groups is not significant.[9]

To further test for these effects, we regressed the MCPE from the interval -1 to 1 against the growth and industry firm leverage ratios. These tests also produced insignificant results.[10]

Appendix B (c) uses Value Line data to make the same comparison of the subsamples while controlling for growth rates. For the interval -5 to 5, the MCPE of -0.0147 is statistically significant (z = (-1.90) and negative for the High Growth-Low Debt firms. While the MCPE (0.0036) for the High-Debt-Low Growth firms is not statistically significant, it is positive. The difference between these two subsamples is statistically significant (MCPE = -0.0183; z = -2.10). This result may lend support to the JM and Jensen argument that increasing debt levels for firms with free cash flow should be viewed by the market as a positive action because of the accompanying managerial controls. As this is an isolated case in our results which contradicts the *COMPUSTAT* data results, drawing definitive conclusions at this time is not possible.

CONCLUSIONS

This study tests DeAngelo and Masulis' (1980) and Masulis' (1983) theory that a firm would seek an "optimum debt level," and that a firm could increase or decrease its value by changing its debt level so that it moved toward or away from the industry average. Our results do not find support for the argument. We defined industry using two different databases (Value Line and *COMPUSTAT*) and calculated the leverage ratio based on book and market values for equity, but the results did not change. Our overall conclusion is that the relationship between a firm's debt level and that of its industry does not appear to be of concern to the market. A single post-event interval (day 2 to 90) depicted a slow, negative effect following the debt issue (a 3.2% loss). The High Debt firms had significant negative market reactions for several intervals; however, the difference between this group and the Low Debt firms was not statistically significant. These results suggest, overall, that the market does not consider industry averages for leverage as discriminators for firms' financial leverage.

The findings were surprising. The above review of empirical research cited numerous studies which had documented a relationship between industry membership and capital structure. Firms in a given industry tend to have similar capital structures. Our study shows that the market does not appear to consider the relationship between a firm's leverage ratio and the industry's leverage ratio important. This finding is consistent with the original Modigliani and Miller (1958) proposition that financial leverage is irrelevant to the value of the firm. Further research that employs additional leverage ratios and alternate industry classifications will provide additional evidence and insight into this problem.

ENDNOTES

1. For current reviews of capital structure literature, see Masulis (1988), and Harris and Raviv (1991).

2. For a summary of studies that investigate firm characteristics that determine capital structure, see Harris and Raviv (1991).

3. In order to make sure that the debt issue actually increases the debt ratio of the firm, we exclude all refinancing issues.

4. For a detailed description of the event-time methodology, see the appendix to Dodd, P. and J. Warner, "On Corporate Governance: A Study Of Proxy Contests," *Journal of Financial Economics*, 1983, pp. 401-438.

5. Harris and Raviv (1991) point out how many different leverage ratios can be constructed using numerators that include or exclude liabilities, e.g., current assets, notes payable, and denominators based on some measure of book or market value. We use two separately constructed leverage ratios to test the sensitivity of the results to the ratio.

6. The sample from the *COMPUSTAT* tape has fewer firms because 17 firms in the Value Line sample were not on the *COMPUSTAT* tape.

7. The number of High and Low debt firms given for mean calculations for the *COMPUSTAT* data are different than those given above because several of the firms had multiple debt issue announcements in a single year.

8. Appendix B (Panel A) reports the same analysis but using the Value Line data. None of the differences between the CPEs are significant. Appendix B (Panel B) compares the top quartile with the bottom quartile. The results are very similar. This provides strong support that the stock market does not use industrial averages as the determining factor when responding to debt issues announcements.

9. For the interval -90 to 90, the CPE of -0.0891 is statistically significant ($z = -1.67$) at the 10 percent level (two-tailed test) for the Low Growth-High Debt firms, and the sign is negative. However, as reported above, there is no statistically significant difference between the subsamples.

10. We also ran a cross-sectional regression which is as follows: $CPE_{-1 \text{ to } 1}$ (and $Z_{-1 \text{ to } 1}$) = f [differential debt ratio between the firm and its industry, and a dummy variable representing growth (high growth = 1, low growth = 0)]. None of the coefficients were significant; thus, the regression results are not reported here. However, the regression results lend support to our CPE results by confirming that the abnormal returns to the firms which announce a debt issue are independent of the firms' debt ratio (relative to the industrial averages) and growth opportunities.

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APPENDIX A

This study uses the ordinary least squares (OLS) procedure to estimate the single index market model return for the companies in the sample. The model is illustrated as follows:

$$R_{jt} = \alpha_j + \beta_j(R_{mt}) + e_{jt}$$

where:

R_{jt} = the rate of return on security j at time t;
α_j = the intercept term for security j's equation;
β_j = the covariance of the market return with security j's return;
R_{mt} = the return on the CRSP value-weighted index at time t; and
e_{it} = the error term for security j at time t.

The parameter estimates, αj and βj, are determined from the daily returns during the 200-day regression period. The test period is 40 days prior to and after the announcement period.

Cumulative Abnormal Return (MCPE) analysis is employed as described by Dodd and Warner (1983). For each security j, a prediction error (PE) is calculated for each day in the test period. The prediction error is the difference between the forecasted and actual rate of return.

$$PE_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt})$$

Prediction errors can be cumulated for various intervals of time. This cumulative prediction error (CPE) is defined as:

$$CPE_j = \sum_{t=T_{1j}}^{T_{2j}} PE_{jt}$$

T_{1j} and T_{2j} represent the days between which the CPE_j is calculated. For a sample of N securities, the cumulative abnormal return is:

$$MCPE = \frac{1}{N}\sum_{j=1}^{N} CPE_j$$

The expected value of MCPE is zero in the absence of abnormal performance.

Test statistics is needed to determine whether MCPE is statistically different from zero. Computation of the test statistics as developed by Dodd and Warner is obtained by first standardizing the PE_{jt} by its estimated standard deviation, s_{jt}.

$$SPE_{jt} = PE_{jt} / s_{jt}$$

where s_{jt} is the estimated standard error of the regression forecast error and SPE_{jt} is the test statistics for the abnormal return for security j at time t.

Second, to test the returns over time, the SPEs are cumulated and divided by the square root of the number of days in the test interval ($t = T_{1j}, ..., T_{2j}$) as follows:

$$MSCPE = \sum_{t=T_{1j}}^{T_{2j}} SPE_{jt} / (T_{2j} - T_{1j} + 1)^{1/2}$$

Finally, the test statistic for a sample of N securities is:

$$Z = \sum_{j=1}^{N} MSCPE_j / N^{1/2}$$

Each SPE_{jt} is assumed to be distributed unit normal in the absence of abnormal performance. Under this assumption, Z is also unit normal.

APPENDIX B

MCPE Comparison Of Debt Increase Announcements
For High Debt And Low Debt Firms
(Value Line)

PANEL A

Intervals	HIGH DEBT (N=106) MCPE	LOW DEBT (N=77) MCPE	Difference
-90 to 90	-0.0358 (-1.34)	-0.0120 (-0.37)	-0.0238 (-0.57)
-20 to 20	-0.0073 (-0.12)	-0.0019 (0.18)	-0.0054 (-0.09)
-90 to -2	0.0056 (-0.18)	-0.0007 (-0.18)	0.0063 (0.20)
2 to 90	-0.0395 (-1.65)*	-0.0103 (-0.29)	-0.0292 (-0.69)
-5 to 5	-0.0039 (-0.30)	-0.0071 (-0.93)	0.0032 (0.21)
-1 to 1	-0.0019 (-0.39)	-0.0010 (-0.29)	-0.0009 (-0.15)
-1	-0.0019 (-1.06)	-0.0024 (-1.04)	0.0005 (0.17)
0	-0.0007 (-0.46)	0.0009 (0.85)	-0.0016 (-0.86)
1	0.0006 (0.84)	0.0004 (-0.32)	0.0002 (0.14)

* Significant at the 0.10 level using a two-tailed test
** Significant at the 0.05 level using a two-tailed test
*** Significant at the 0.01 level using a two-tailed test

APPENDIX B
MCPE Comparison Of Debt Increase Announcements For High Debt And Low Debt Firms (Value Line)

PANEL B

Intervals	TOP QUARTILE (N=53) MCPE	BOTTOM QUARTILE (N=41) MCPE	Difference
-90 to 90	-0.0600 (-1.10)	0.0202 (-0.47)	-0.0802 (-1.15)
-20 to 20	-0.0239 (-0.99)	-0.0011 (0.36)	-0.0228 (-0.94)
-90 to -2	0.0066 (0.13)	0.0128 (0.39)	-0.0062 (-0.10)
2 to 90	-0.0594 (-1.50)	-0.0235 (-0.74)	-0.0359 (-0.71)
-5 to 5	-0.0079 (-0.75)	-0.0103 (-0.79)	0.0024 (0.14)
-1 to 1	-0.0072 (-1.09)	-0.0095 (-1.74)*	.0023 (0.27)
-1	-0.0043 (-1.46)	-0.0081 (-2.46)**	.0038 (0.86)
0	-0.0024 (-1.04)	0.0008 (0.69)	-0.0032 (-1.24)
1	-0.0005 (0.61)	-0.0021 (-1.25)	0.0016 (0.86)

* Significant at the 0.10 level using a two-tailed test
** Significant at the 0.05 level using a two-tailed test
*** Significant at the 0.01 level using a two-tailed test

APPENDIX B
MCPE Comparison Of Debt Increase Announcements For High Growth And Low Growth Firms Value Line

PANEL C

	HIGH GROWTH (N=77)	LOW GROWTH (N=70)	
Intervals	**MCPE**	**MCPE**	**Difference**
-90 to 90	-0.0238 (0.50)	-0.0195 (0.63)	-0.0043 (-0.08)
-20 to 20	-0.0095 (-0.12)	0.0088 (0.94)	-0.0183 (-0.23)
-90 to -2	0.0109 (0.49)	0.0008 (-0.07)	0.0101 (0.40)
2 to 90	-0.0330 (-1.19)	-0.0213 (-0.80)	-0.0117 (-0.30)
-5 to 5	-0.0147 (-1.90)*	0.0036 (0.91)	-0.0183 (-2.10)**
-1 to 1	-0.0017 (-0.01)	0.0009 (-0.17)	-0.0026 (-0.02)
-1	-0.0008 (0.43)	-0.0022 (-1.64)*	0.0014 (0.61)
0	0.0013 (0.39)	-0.0010 (-0.37)	0.0023 (0.54)
1	-0.0023 (-0.84)	0.0041 (1.73)*	-0.0064 (-1.77)*

* Significant at the 0.10 level using a two-tailed test
** Significant at the 0.05 level using a two-tailed test
*** Significant at the 0.01 level using a two-tailed test