Corporate Financing Choices

Constrained by the Amount of Debt Firms Can Support*

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Abstract

We examine firm financing choices by considering the amount of debt firms can support. Our analysis indicates that when the amount of debt that firms can support is explicitly accounted for, the debt-deficit relationship is concave and piecewise linear with slopes close to the predicted values of 1 and 0, in line with the pecking order theory predictions. We also find that conventional factors predicted by the trade-off theory are useful in determining the amount of debt firms are able to support.

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1. Introduction

The pecking order theory of capital structure (Myers(1984), Myers and Majluf (1984)) hypothesizes that the primary determinant of corporate debt-equity choice is the information asymmetry about firm value between firm insiders and outsiders. Faced with the problem of external investors demanding a lemons premium (Akerlof (1970)) as compensation for their informational disadvantage, insiders follow a pecking order of financing choices: first, internal cash, for which the problem does not exist; next, debt, for which the problem is small; and finally as a last resort, external equity, for which the problem is severe. The trade-off theory, on the other hand, explains leverage ratios as a function of conventional factors based on a trade-off between taxes and bankruptcy costs[1].

According to the pecking order theory, firms should prefer internal to external financing, and within external financing, prefer debt to equity. There is strong empirical support for the first prediction. Beginning with Fazzari, Hubbard, and Petersen (1988), a vast literature has repeatedly found positive sensitivity of investments to internal funds, thus confirming the preference for internal over external financing.[2] Lamont (1997) estimates that over three-fourths of corporate investments in the U.S. are financed through internal generations. Regarding the second prediction, Shyam-Sunder and Myers (1999) argue that 'normal' firms should fill their financing deficits by issuing new debt,

[1] See, e.g., Bradley, Jarrell, and Kim (1984), Titman and Wessels (1988), Harris and Raviv (1991), Smith and Watts (1992), Rajan and Zingales (1995), and Graham (1996, 2000), Ju, Parrino, Poteshman and Weisbach (2005).

[2] See Hubbard (1998) for a detailed survey. Some studies (Kaplan and Zingales (1997), Cleary (1999) have questioned if estimated investment-cash flow sensitivities measure the *extent* of external financing constraints, but they do not dispute the *existence* of this constraint relative to internal funds. Also, while recent work by Erickson and Whited (2000) suggests that estimated investment-cash flow sensitivities may be due to measurement error in Tobin's q, Blanchard, Lopez-de-Silanes, and Shleifer (1994), Love (2003), and Rauh (2006) confirm earlier findings using approaches that do not rely on q.

rather than new equity, resulting in a debt-deficit sensitivity coefficient of 1. For their sample, they find that the estimated sensitivity, while being statistically significantly smaller than 1, is typically in the [0.7,0.9] range. Hovakimian, Opler, and Titman (2001) and Lemmon and Zender (2002, 2004) also find that the theory does a satisfactory job of providing a first-order description of U.S. corporate financing practices.

However, there is also extensive evidence against the pecking order theory, especially with respect to the second prediction, i.e., the choice between debt and external equity. Fama and French (2002) find that many firms issue equity even when their leverage ratios are relatively low. Frank and Goyal (2003) examine a broad cross-section of U.S. firms over the 1970-1999 period and report that: (1) On average, net equity issues contribute a larger fraction of external finance than net debt issues. (2) The regression coefficient of net debt issues on the financing deficit is much lower than 1, and the explanatory power is small. (3) The financing deficit plays only a small, though statistically significant, role in explaining net debt issues when used in conjunction with conventional factors[3].

In this paper, we show that the divergence in the above findings can be explained by the constraint on the amount of debt that firms can support. We first show that the pecking order theory's predictions hold for the average financing mix of all firms, but not for the financing mix of the 'average' firm. The difference is due to the difference between financing practices of large and small firms, and the high positive skewness of the firm size distribution. Sorting firms into size deciles, we find that the proportions of internal cash and debt, debt-deficit sensitivity coefficients, and associated R^2 values are

[3] Note that the literature has concentrated on securities issued for cash. Non-cash-related issuance of securities, e.g., equity issued in mergers and employee incentive plans, has typically not been considered.

low for small firms and for the equally-weighted average, as in Frank and Goyal (2003), while they are high for large firms and in aggregate, as in Shyam-Sunder and Myers (1999).[4]

Next, we explore a possible explanation for the difference between the financing practices of large and small firms by examining the amount of debt firms can support. This concept of 'debt capacity' is considered by Myers (1984) and empirically examined by Lemmon and Zender (2004). How much a firm borrows depends on how much it *can* borrow (its debt capacity), as well as how much it *wants* to borrow. The observed debt level is the lower of the two. Since the pecking order theory focuses on the amount of debt firms want to borrow, it is a more natural theory of large firms that are typically older and more profitable, and have more tangible assets and fewer growth options. Such firms can support larger amounts of debt but their need to borrow is low, since their internal generations are large relative to their limited investment needs. Their external financing choices are therefore guided primarily by the preference for debt over external equity, as predicted by the pecking order theory. On the other hand, small firms are younger, riskier, less profitable and have greater growth options. Barclay, Morellec, and Smith (2001) argue that not only is the incremental debt capacity associated with growth options lower than that of tangible assets, it is in fact negative. At the same time, their need to borrow is high as their internal cash flows are small relative to their large investment needs. Therefore, the amount of debt they can support is quickly exhausted, forcing them to issue equity to fill their financing deficits. This is consistent with Baker

[4] We also note that even for small firms, the low levels of internal cash and debt in the financing mix do not constitute evidence against the pecking order theory, since the theory's predictions are about the sequencing of internal cash, debt, and external equity, and not about their proportions.

and Wurgler's (2002) finding that firms with histories of high market-to-book ratios have low leverage, and Fama and French's (2002) finding that small firms issue equity in spite of their debt levels being low.[5]

We first examine this possibility by using credit rating as a proxy for (the lack of) debt capacity constraints. Firms that have rated debt enjoy access to public debt markets and are therefore considerably less constrained with respect to amounts they can borrow. If the poor performance of the pecking order theory is indeed driven by the impact of debt capacity constraints, then this theory should perform better for firms for which this constraint is less relevant, i.e., for credit-rated firms. Estimating the debt-deficit sensitivity for such firms, we find evidence supportive of this argument. Across all size deciles for which there are sufficient observations, estimated debt-deficit sensitivities and R^2 values are large and similar to those reported by Shyam-Sunder and Myers (1999). The improvement in performance is particularly striking for small firms, lending support to the hypothesis that their poor performance in earlier tests is indeed due to limitations on the amounts of debt that they can issue.

We pursue this line of reasoning further by modifying the baseline debt-deficit regression of Shyam-Sunder and Myers (1999). As pointed out by Chirinko and Singha (2000), the baseline regression lacks power to distinguish between the pecking order and alternative financing patterns. We address this problem by implementing three alternative specifications of the debt-deficit relationship, based on Chirinko and Singha's (2000) insight. If firms issue debt before issuing equity, as predicted by the pecking order theory,

[5] Viswanath (1993) extends this idea to a multiperiod setting by arguing that firms will conserve cash and debt capacity by issuing equity when adverse selection costs are low, in anticipation of those costs rising in the future.

then the debt-deficit profile should be concave and piecewise-linear, with the kink occurring at the point where the firm's debt capacity gets exhausted. Thus, the unobservable amount of debt firms can support can be estimated from the data. In contrast to the baseline regression, our specifications have power to reject the pecking order theory in favor of alternatives.[6] The first specification tests for general concavity in the relation by including a quadratic deficit term in the regression equation, and yields strong supporting evidence of concavity across all size deciles. Our second specification imposes additional structure by assuming piecewise-linearity and estimating the slopes of the two line segments and the breakpoint as free parameters. The evidence is in line with the pecking order theory: the estimated slope coefficients before the breakpoints are large, and beyond the breakpoints are small, although they are statistically significantly different from their theoretically predicted values of 1 and 0, respectively. The breakpoint, i.e., the estimated maximum deficit that can be financed with debt, increases with firm size – from 24% of assets for the smallest decile to 78.8% for the largest. In our third specification of the debt-deficit profile, we explicitly model the amount of debt firms can support as a function of the conventional factors. In this specification, the estimated deficit slope coefficients are closer to 1 and 0, respectively, and the signs of the coefficients on the conventional factors are consistent with predictions of the trade-off theory. The explanatory power of the regressions increases progressively from the baseline pecking order model through each of the three alternative specifications, with the greatest improvements occurring for the smallest size deciles.

The overall evidence thus suggests that while the amount of debt that a firm *wants* to issue is primarily determined by the size of the deficit, the amount it is *able* to support

[6] Leary and Roberts (2006) propose a different approach to overcome this problem.

is limited by the trade-off factors − asset tangibility, growth options, size, and profitability. Firms prefer to issue debt over equity if they can. For small firms, however, the amount of debt they can support is small, forcing them to issue equity even though their observed debt levels are low relative to the unconditional cross-sectional average. Therefore, an extended pecking order model that takes into account the role of the trade-off theory in determining the amount of debt firms are able to support appears to provide a more realistic description of corporate financing practices.

The rest of the paper is organized as follows. Section 2 describes the data and shows the sensitivity of results on U.S. corporate financing patterns to scaling by firm size, thus highlighting the difference between small and large firms. Section 3 contains the main results of the paper, where we explicitly model and estimate firm financing decisions considering the amount of debt firms can support. Section 4 concludes.

2. The Data and Descriptive Statistics

Our sample is constructed from the universe of all firms that are covered by COMPUSTAT over the 1971-2001 period. All utilities and financial services firms are excluded, as are all observations with missing data for total assets. The appendix describes the variables used. Stock variables (total assets, net property plant and equipment, equity, and debt) are measured at the beginning of the period, i.e., one-period lagged values are used, while flow variables are measured during the period. To reduce the impact of outliers, all variables are truncated at the top and bottom 1 percentiles. For all regressions, the same dataset with a total of 114,704 firm-year observations is used to facilitate comparisons between alternative specifications. Similarly, decile compositions remain constant for all decile-based tests.

Table 1 describes certain properties of the sample, broken down into deciles on the basis of total assets. For each year, firms are sorted by total assets and allocated to deciles for that year. Deciles for each year are then combined over three sub-periods (1971-80, 1981-90, and 1991-2001) and over the full sample period, and mean values are reported. Table 1, Panels A and B show that for the full sample, firms in the tenth decile account for over 85% of total assets and 87% of fixed assets of all firms. In contrast, firms in the first five deciles together account for less than 1% of all total assets and fixed assets. Sub-period results are very similar. Panel C shows a clear pattern of higher growth rates for smaller firms. In Panel D, larger firms have higher debt ratios than smaller firms. Panel E shows that smaller firms have higher market-to-book ratios. The evidence is consistent with small firms having greater growth options, issuing less debt, and receiving higher valuation multiples. Finally, Panel F shows that large firms are generally more profitable than small firms.

Table 2 presents annual mean levels of net new equity and net new debt issued, as well as internal cash generated, by firms in each of the 10 deciles. Amounts shown are in millions of dollars, and averages are reported for the three sub-periods and for the full sample. Panel A reports net new equity issued. For the 1971-1980 sub-period, average new equity issued increases from \$0.135 million for decile 1 to \$15.3 million for decile 10. The pattern for 1981-90 is similar for the first 9 deciles. The relative reduction in equity issues by the largest firms gets further accentuated in the 1991-2001 sub-period. Panel B presents average levels of net new debt issued by firms in the 10 deciles. For all sub-periods and for the full sample, new debt levels increase from decile 1 through decile 10. Decile 10 firms account for more than 78% of all net new debt issued, while firms in the first five deciles together account for less than 1%. Panel C reports average levels of internal cash flow generated by firms. Once again, mean levels rise rapidly from decile 1 to decile 10. The 10th decile contributes more than 86% of all internally generated cash, while deciles 1 through 5 together account for less than 0.5% .

This picture changes when the numbers are scaled by total assets. Table 3 presents mean scaled values of net new equity, net new debt, and internal cash flow for the 10 deciles. Panel A shows that small firms rely much more on new equity than large firms. Panel B shows that net new debt (as a fraction of total assets) is roughly similar across size deciles and time periods, with no clearly discernible patterns. The relation between the net debt and net equity issue, however, is similar to that presented in Table 2. After 1980s, the first six size deciles issue more equity than debt, whereas the last four deciles issue more debt than equity. Finally, Panel C shows that larger firms generate more internal cash (as a proportion of total assets) than smaller firms.

The above evidence highlights the differences in the financing choices of large and small firms. Internal cash and debt dominate for large firms and the aggregate economy, and external equity for small firms and the equally weighted mean. However, even for small firms, the preponderance of external equity cannot be interpreted as evidence against the pecking order theory. The pecking order theory's prediction is about the relative *sequencing* of internal cash, debt, and equity. It is not about their relative proportions.[7] This important distinction needs to be taken into account while analyzing

[7] As an example, consider a firm that has a single dollar in internal cash in a given year and a positive NPV project that requires six dollars as initial outlay. Suppose the lenders are willing to lend the firm just two more dollars in fresh loans. If this firm finances its first dollar of investments with internal cash, the next two by issuing debt, and the last three dollars by issuing equity, it will have behaved exactly as per the pecking order theory, but its financing pattern will appear to be precisely the opposite. See also Chirinko and Singha (2000), and Leary and Roberts (2006).

firm financing choices. We therefore examine the question further in Section 3 by devoting special attention to the issue of amount of debt firms can support.

3. Firms' Financing Choices

3.1 Firm Size and the Performance of the Baseline Pecking Order Theory

We begin our analysis with the baseline pecking-order theory that is tested by Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) according to the following specification:[8]

$$\Delta DEBT_{it} = b_1 DEFICIT_{it} + \varepsilon_{it} \qquad (1)$$

The theory predicts the debt-deficit sensitivity coefficient b_1 to be 1. For their sample of 157 firms with 19 years (1971-89) of continuously reported data on COMPUSTAT, Shyam-Sunder and Myers (1999) find that the estimated coefficient is close to, though statistically significantly smaller than, this predicted value of 1, and that the explanatory power of the regression is high. Extending the sample to include firms that do not have continuously reported data, however, Frank and Goyal (2003) find that the estimated coefficient is only 0.283, and the explanatory power is sharply lower as well. The primary difference between firms that have continuously reported data and those that do not is size – as reported by Frank and Goyal (2003), firms in the former group have assets almost twice as large as the others. Explicitly decomposing the sample into size quartiles too, Frank and Goyal (2003) find that the pecking order model performs satisfactorily for large firms, but poorly for small firms. Lemmon and Zender

[8] In this specification, firm fixed effects are accounted for by estimating the regression in the first difference form. Chang and Dasgupta (2006) and Lemmon, Roberts and Zender (2006) discuss the importance of controlling for firm fixed effects by bringing evidence that persistence in leverage ratios is firm specific.

(2002) also find that the pecking order model performs better for old firms than for young firms.[9]

Firm size has been used as a proxy for information asymmetry in the literature (e.g., Harris (1994)), i.e., larger firms have more public information available and thus have lower information asymmetry problems. Since information problems are more severe for smaller firms, the performance of the pecking order theory for them is more relevant. Size-based cuts of the data may therefore prove useful in providing additional insights into the performance of the pecking order theory, as in Frank and Goyal (2003).

Using size deciles, we find that a result similar to Frank and Goyal's (2003) holds in our sample. Table 4 Panel A reports results from estimating equation (1) for each of the 10 total assets-based deciles. There is a clear pattern of the model performing better for larger firms. The estimated debt-deficit sensitivity coefficient increases steadily from 0.155 for decile 1 to 0.721 for decile 10. The explanatory power as measured by adjusted R^2 also increases from 0.152 for decile 1 to 0.738 for decile 10.

The prediction of a unit debt-deficit sensitivity is based on a literal interpretation of the model that assumes away all financial distress and agency costs of debt.[10] In reality, such costs exist and can be substantial, limiting the firm's ability to issue debt. While the firm's demand for credit may well be determined by the size of its deficit as predicted by the pecking order model, the willingness of lenders to supply that credit is

[9] However, their estimated sensitivity coefficient for the young firms (0.476) is higher than the small-firm coefficient estimated by Frank and Goyal (2003). The difference is probably explained by the fact that Lemmon and Zender (2002) exclude firms with average total assets less than $50 million, thereby eliminating a large subset of the small firms included in the Frank and Goyal (2003) sample.

[10] Myers and Majluf (1984, p. 209) themselves point out the problem associated with this modeling simplification: "The chief difficulty with this analysis is that we end up leaving no room at all for stock issues. We could of course recreate a role for them by introducing agency or bankruptcy costs of debt…." Shyam-Sunder and Myers (1999, p. 225) also state "….if costs of financial distress are serious, the firm will consider issuing equity to finance real investment or pay down debt…..Thus a broader pecking order hypothesis would accommodate some equity issues."

limited by their expectation of the firm's ability to service it. The debt capacity constraint is particularly severe for small high-growth firms, which reduces the amount of debt they can issue, and forces them to issue equity as a last resort. This may result in the observed poor performance of the pecking order theory for small firms. Therefore, as pointed out by Lemmon and Zender (2002, 2004), it is necessary to control for debt capacity when testing the theory empirically.

3.2 Debt Capacity and Credit Rating

Accounting for debt capacity in empirical tests is difficult since it is not observable. Lemmon and Zender (2004) address this problem by using the absence of credit rating as a proxy for debt capacity constraints. Earlier studies by Whited (1992) and Gilchrist and Himmelberg (1995) have also used the existence of credit rating to distinguish between firms that are credit-constrained and those that are not. Firms with credit ratings have better access to debt markets, and debt capacity concerns are less likely to be important for them. Recent work by Faulkender and Petersen (2003) shows that firms with rated debt have significantly more total debt than those that do not. Lemmon and Zender (2004) find that for firms that do have rated debt, the estimated debt-deficit sensitivity is close to 1, as predicted by the pecking order theory. However, this finding is potentially subject to a concern that arises from the strong correlation between a firm's having a credit rating and its size. As shown below, most firms with rated debt are relatively large, so that dividing the sample on the basis of the absence or presence of credit rating may be effectively equivalent to dividing it into small and large firms. It may then be difficult to conclusively attribute financing differences between small and large firms to the debt capacity constraint, rather than to some other (unknown) variable that may also be correlated with firm size. To overcome this possible concern, we extend Lemmon and Zender's (2004) approach by examining firms with credit ratings within each size decile.

Panel B of Table 4 reports results from estimating (1) for those firms for which COMPUSTAT reports credit ratings. The sample becomes much smaller now, with only 13,859 observations out of 114,704 being associated with credit ratings. Most of these observations belong to the higher deciles. There is insufficient number of observations in deciles 1 through 3 to allow parameters to be estimated. For the remaining deciles, there is improvement in the empirical performance of the pecking order model, especially for small firms, i.e., for firms for which the model performed the worst in Panel A. The estimated sensitivities of new debt to deficit for deciles 4, 5, and 6 increase from 0.268, 0.371, and 0.483, respectively, to 0.705, 0.782, and 0.732, respectively. For the full sample, the estimated sensitivity increases from 0.326 to 0.718, and the adjusted R^2 increases from 0.323 to 0.764.

This evidence indicates that the weak empirical performance of the baseline pecking order model for small firms is indeed caused by the debt capacity constraint binding for such firms. For firms that are not credit constrained, i.e., large firms and firms with credit ratings, debt capacities are much greater, allowing them to fill most of their financing deficits with debt and leading to the high observed debt-deficit sensitivities and adjusted R^2 values.

3.3 Alternative Specifications for Testing the Pecking Order Theory

Chirinko and Singha (2000) argue that given the empirically observed proportions of new debt and new equity issued by firms, imposing a simple linear structure on the debt-deficit relationship and estimating this single slope coefficient (as in Shyam-Sunder and Myers (1999)) will fail to adequately test the pecking order model, which predicts a specific piecewise-linear relationship. In particular, it is not possible to distinguish between the following three possible scenarios:

(i) Firms prefer to issue new debt before issuing new equity, as predicted by the pecking order theory.

(ii) Firms prefer to issue new equity before issuing new debt.[11]

(iii) Firms do not have any sequencing preferences in issuing equity and debt, but issue both together in a certain relative ratio.

This analysis leads to an alternative approach to distinguish between the three scenarios. As shown in Figure 1, if the first scenario is correct, i.e., the pecking order theory is valid empirically, then net new debt issued will be a concave function of the deficit. Similarly, if the second scenario is correct, the debt-deficit relation will be convex. Finally, under the third scenario, it will be linear. Therefore, a test of the sign of the second-order term in the debt-deficit relation has power to reject the pecking order theory if it is invalid empirically. Accordingly, we estimate the following regression:

$$\Delta DEBT_{it} = b_1.DEFICIT_{it} + b_2.DEFICIT_{it}^2 + \varepsilon_{it} \quad (2)$$

The pecking order model (scenario (i) above) predicts a negative b_2 while alternatives (ii) and (iii) above predict positive and insignificant coefficients, respectively. Results are reported in Table 5 Panel A. The estimated coefficient b_2 is negative and highly significant for all deciles and for the full sample, indicating support for the concavity hypothesis and the pecking order theory. The coefficient b_1 on the first-order term is also uniformly closer to 1 and the adjusted R^2 value higher than in the baseline case reported

[11] Chirinko and Singha (2000) call this a 'convoluted financing hierarchy'.

in Table 4 Panel A, with the greatest increases in the lower deciles. The performance of the pecking order theory is thus improved, especially for the smaller firms, when the concavity in the relation is taken into account.

Chirinko and Singha's (2000) analysis further shows that if the pecking order theory is valid, then the debt-deficit profile is not only concave but also piecewise linear, with the slope coefficient being 1 when the deficit is less than the amount firm can support, and 0 when the deficit is greater (see Figure 2). We can thus impose more structure on the estimation problem by estimating the two slopes (k_1 and k_3) and the point at which the firm reaches the amount it can support (k_2) as free parameters in the following specification:

$$\Delta DEBT_{it} = \text{MIN}[\, k_1.DEFICIT_{it},\ k_2.k_1 + k_3.(DEFICIT_{it} - k_2)] + \varepsilon_{it}$$

$$= \text{MIN}[\, k_1.DEFICIT_{it},\ k_2.(k_1 - k_3) + k_3.DEFICIT_{it}\,] + \varepsilon_{it} \qquad (3)$$

The first term in the MIN function is the left segment of the piecewise-linear relationship (starting at 0 and slope of k_1) and the second term is the right segment (starting at $k_1.k_2$ and slope of k_3). Since the left segment corresponds to the section where debt capacity constraints are not binding, firms finance deficit solely by debt according to pecking order theory, i.e. under the null, k_1=1. The right segment, on the other hand, corresponds to the section where debt capacity constraints are binding, and therefore firms are not able to issue debt (and go to equity market as a last resort), i.e. under the null $k_3 = 0$. The break-point in the debt-deficit relation, k_2 is the maximum deficit that can be financed with debt. We estimate the above equation using nonlinear least squares and report results in Panel B of Table 5.[12] The break-point in the debt-deficit relation, k_2, increases steadily

[12] We estimate the three k parameters in equation (3) using nonlinear least squares implemented in SAS. All programs are available from the authors upon request.

from 24% of total assets for decile 1 to 78.8% of total assets for decile 10, providing evidence for the hypothesis that smaller firms can support lower levels of debt. The two slope coefficients, k_1 and k_3, are close to, though statistically significantly different from, their hypothesized values of 1 and 0, respectively. Relative to the baseline pecking order model (Table 4), there is improvement in the model's performance, especially for the lower size deciles. The estimated slope coefficient k_1 increases from 0.155 for the baseline case to 0.592 in the piecewise linear model for decile 1, and from 0.22 to 0.634 for decile 2. For the full sample, it increases from 0.326 to 0.647. The slope coefficients k_3 beyond the break-point k_2 are uniformly small suggesting that debt issues are capped at the amount that the firm can support. The R^2 values are generally higher compared to Panel A, indicating that the piecewise linear specification is appropriate, especially for smaller firms. Overall, the results suggest that the low sensitivities estimated for the lower deciles in the baseline model are due to imposing a single slope coefficient over the entire range of deficits when two distinct slopes over different ranges are called for. The lack of significant improvement in the performance of the model for the higher deciles also indicates that the baseline model is adequate for larger firms, probably because the debt capacity constraint does not bind for many observations.[13]

While the piecewise linear specification (3) above has the advantage of explicitly accounting for the amount of debt firms are able to support, it suffers from the limitation of assuming the same unconditional level of k_2 for every firm within each decile.[14] This does not take into account the wide variation in estimated amount of debt firms can

[13] If we instead assume convexity and estimate the three corresponding parameters (results not reported) we get meaningless estimates and standard errors.
[14] This is similar to the Leary and Roberts (2006) unconditional specification of debt capacity, which they find leads to significant degradation of their model's predictive performance. (Table 4 Panel A in their paper.)

support across deciles. To overcome this problem, we explicitly model the amount of debt a firm can support as a function of the factors that earlier research (Harris and Raviv (1991), Rajan and Zingales (1995)) has found useful – firm size, asset tangibility, growth options as measured by market-to-book ratios, and profitability. The estimated debt levels firms are able to support conditional on these factors is then used in place of k_2 in equation (3) to yield

$$\Delta DEBT_{it} = \min[\, k_1.DEFICIT_{it},\ (a_0 + a_1.TANGIBILITY + a_2.MARKET\text{-}BOOK + a_3.LOGSALES + a_4.PROFITABILITY)\,.(k_1 - k_3) + k_3.DEFICIT_{it}\,] + \varepsilon_{it} \qquad (4)$$

This approach is similar in spirit to that of Lemmon and Zender (2002) who also model the debt-deficit coefficient as a function of the conventional factors.[15] However, while they model the sensitivity as a linear function of the factors, we view it as taking on one of two values, k_1 or k_3 , depending on the size of the deficit relative to the estimated k_2 . Modeling the amount of debt a firm can support in this way allows us to combine the predictions of pecking order and tradeoff theories in a more natural way. The underlying hypothesis of this model is that while trade-off theory determines the amount of debt a firm *can* issue, pecking order theory explains the amount of debt a firm *wants* to issue. The amount of debt a firm can support, therefore, is a function of the conventional factors. If a firm is in a region where there is no constraint on the amount of debt it can support due to conventional factors, then firms issue debt to finance deficit, as predicted by the pecking order theory.

[15] Leary and Roberts (2006) also model debt capacity using conventional factors together with some other firm specific factors such as age, anticipated investment and cash flow, dividend paying firm dummy and Altman's (1968) Z-score. Furthermore, Hovakimian, Opler, and Titman (2001) and Lemmon and Zender (2002, 2004) document that tradeoff theory can be the dominant factor in capital structure at the extremes.

Results from estimating regression (4) are presented in Panel C of Table 5. The estimated slope coefficient k_1 is closer to its hypothesized value of 1 for all deciles, ranging from 0.674 to 0.791. The estimated slope coefficient k_3 is close to the predicted value of 0 for deciles 1 through 8, as well as for the full sample. For deciles 9 and 10, the estimated slope coefficients k_3 are qualitatively larger and the nonlinear least squares estimator fails to converge satisfactorily.[16] This suggests that the baseline pecking order specification is adequate for large firms since they can support larger amounts of debt.

For 9 of the 10 deciles, the estimated coefficient on *TANGIBILITY* is positive and significant, indicating that firms with more tangible assets can offer more collateral and hence support more debt.[17] Similarly, for every decile, estimated coefficients on *MARKET-BOOK* are negative and significant, suggesting that firms with greater growth options are associated with higher financial distress costs and are therefore only able to support lower levels of debt. The coefficient on *LOGSALES* is positive and significant for 9 of 10 deciles and for the full sample, indicating that larger firms can issue more debt.[18] For *PROFITABILITY*, however, the estimated coefficient a_4 is positive and significant for 8 of the 10 deciles and for the full sample, and is insignificantly different from 0 for the 2 remaining deciles. Positive estimates of the *PROFITABILITY* coefficient supports the trade-off theory argument of more profitable firms being *able* to issue more debt. Finally,

[16]The generalized sum of squared errors $e'V^{-1}e/n$ is minimized by minimizing the scale-independent $(e'V^{-1}J(J'V^{-1}J)^{-1}J'V^{-1}e)/(e'V^{-1}e)$, which measures the extent of orthogonality between the errors and the columns of the Jacobian matrix and approaches 0 as the gradient of the sum of squares (with respect to the parameters) approaches the zero vector. e is the vector of residuals, V is the estimated variance-covariance matrix, J is the Jacobian matrix, and n is the number of observations. (See Bates and Watts (1981, 1988), and SAS/STAT User's Guide (1990).) The numerical minimization is implemented using the Gauss optimization method first, and the Levenberg-Marquardt method next. For deciles 9 and 10, the minimized measure (0.0023 and 0.0026, respectively) fails to meet the convergence criterion of 0.001, in contrast to all the other deciles.

[17] The estimated coefficient for the 8th decile is insignificant.

[18] As in the case for *TANGIBILITY* , the estimated coefficient for the 8th decile is insignificant.

the explanatory powers of the regressions are also uniformly higher than other specifications, ranging from 35.8% for decile 1 to 74.6% for decile 10. The adjusted R^2 value for the full sample regression is 56.2%, indicating significant improvement over the baseline pecking order model's adjusted R^2 of 32.3%.[19]

3.4 Discussion

The evidence from the three specifications presented above highlights the importance of controlling the amount of debt firms can support while examining firms' financing choices. At low levels of the deficit, the estimated sensitivity of debt to the deficit is close to 1 for all size deciles, indicating that debt is indeed the first choice of firms in covering their financing deficits. As the size of the financing need increases, however, the amount of debt a firm can support begins to bind, leading to the debt-deficit profile flattening out. The amount of debt firms can support increases steadily as a function of firm size, and large firms' need to borrow seldom exceeds their ability to do so.[20] The low level of debt that small firms can support also explains Fama and French's (2002) finding that small high-growth firms issue large amounts of equity even though their observed leverage ratios are low.

At the same time, however, note that even after explicitly modeling the amount of debt firms can support as in Panel C of Table 5, the estimated debt-deficit sensitivity

[19] We also run these specifications by controlling for year dummies to consider the impact of time effects. The results are comparable to those reported and available upon request.

[20] In light of Lemmon and Zender's (2002) and Frank and Goyal's (2003) finding that the pecking order theory's performance is poorer in the nineties relative to earlier years, we repeat the analysis separately for data before and after 1990. Results (not reported) are available on request. For the decile-based tests, the estimated debt-deficit sensitivity coefficient k_1 from the third specification is in the (0.725,0.819) range for 1971-1990, and (0.582,0.793) for 1991-2001. For the complete cross-sections, it is estimated as 0.757 over 1971-1990 and 0.676 over 1991-2001; the corresponding estimates of k_3 are 0.031 and -0.029. The adjusted R^2 values are 0.633 and 0.498, respectively. From the second specification, estimated debt capacity as a fraction of total assets (k_2) rises from 0.280 (decile 1) to 0.785 (decile 10) for 1971-1990, and from 0.191 to 0.893 for 1991-2001.

coefficient k_1 is around 0.7 for all deciles, and is consistently and significantly lower than the hypothesized value of 1. This indicates that firms typically cover about 20-30% of their deficits by issuing equity, even when they are able to issue debt. Thus, even this extended model represents only a first-order approximation, and not a complete description, of corporate financing practices. Other hypothesized determinants of capital structure (transaction costs, owner-manager and debt-equity agency conflicts, etc.), dynamic multi-period issues such as conserving cash and debt capacity, and side-effects on capital structure of other corporate policies (mergers, stock- and option-based employee incentive programs, dividend reinvestment plans, etc.) probably play important roles in explaining the residual.

4. Conclusion

In this paper, we first show that financing choices of small and large firms differ. To explain the differences in these financing choices, we consider the amount of debt firms can support by building on the analysis of Chirinko and Singha (2000).

We consider alternative specifications and show that the debt-deficit relationship is concave and piecewise linear, with estimated slopes close to, but statistically distinct from, the predicted values of 1 and 0. We then model the amount of debt firms can support as a function of conventional trade-off factors, and show that while firms follow pecking order theory in their financing decisions when they are able to support debt, the ability to support debt is determined by the conventional factors. Therefore, an extended pecking order model that takes into account the role of the trade-off theory in determining the amount of debt firms are able to support appears to provide a more realistic description of corporate financing practices.

Appendix

The raw data from COMPUSTAT are used to create the following variables:

DEFICIT: (new debt issued - debt retired + new equity issued - equity bought back) / (total assets).

ΔEQUITY: (new equity issued - equity bought back) / (total assets).

ΔDEBT: (new debt issued - debt retired) / (total assets).

DEBTRATIO: (long term debt) / (total assets).

ΔDEBTRATIO: annual change in *DEBTRATIO*.

CASHFLOW: (net income + depreciation and amortization + other internal sources of cash [21]) / (total assets).

TANGIBILITY: (net property, plant, and equipment) / (total assets).

MARKET-BOOK: (total assets + market value of equity - book value of equity) / (total assets).

LOGSALES: natural log of sales, deflated by Consumer Price Index.

PROFITABILITY: (income before extraordinary items) / (total assets).

[21] Other internal cash sources include deferred taxes; equity in net loss; sale of property, plant, equipment, and investments; other funds from operations; and other sources of funds.

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Table 1
Descriptive Statistics

This table reports mean characteristics of deciles of firms in the sample. Deciles are formed by ranking firms in ascending order of total assets in each year. Mean values are reported for three sub-periods (1971-80, 1981-90, and 1991-2001) and for the full sample period. Total assets and net property, plant, and equipment are book values and are reported in $ millions. Annual growth rate in assets refers to growth in asset book values. Debt to assets ratio is calculated as book value of long term debt divided by the sum of book value of long term debt and market value of equity. Market to book ratio is calculated as the sum of book value of assets and the difference between market and book values of equity, divided by the book value of assets. Return on Assets is calculated as net income divided by book value of total assets.

	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	All Firms
Panel A: Total Assets											
1971-1980	2.303	5.694	10.104	16.637	26.063	42.237	69.879	129.100	313.796	2694.827	331.064
1981-1990	1.324	3.797	7.828	15.247	28.181	51.888	102.377	212.826	609.349	6292.299	732.512
1991-2001	2.137	7.094	15.144	29.624	54.333	98.104	185.205	387.662	1036.128	12047.030	1386.246
Full Sample	1.928	5.578	11.158	20.797	36.778	65.174	121.284	247.856	665.447	7173.826	834.983
Panel B: Net Property, Plant, and Equipment											
1971-1980	0.640	1.687	3.326	5.409	8.327	14.153	24.431	47.987	130.417	1368.990	160.537
1981-1990	0.393	1.170	2.391	4.726	9.343	17.327	35.222	77.871	260.407	3121.280	353.013
1991-2001	0.556	1.730	3.623	7.105	14.133	27.487	57.581	131.563	392.470	4693.683	532.993
Full Sample	0.530	1.536	3.130	5.791	10.715	19.908	39.675	87.283	265.336	3113.974	354.788
Panel C: Annual Growth Rate (Assets) (%)											
1971-1980	25.690	17.495	15.119	13.584	13.399	13.090	12.452	12.039	12.264	10.791	14.592
1981-1990	36.391	20.594	20.222	18.367	15.117	15.122	13.671	11.494	11.230	8.704	17.091
1991-2001	40.642	34.919	32.030	25.364	22.244	19.134	17.504	14.846	12.040	7.975	22.670
Full Sample	34.447	24.677	22.766	19.307	17.092	15.890	14.638	12.859	11.851	9.119	18.265
Panel D: Debt to Assets Ratio (Market)											
1971-1980	0.0905	0.1647	0.2220	0.2739	0.3100	0.3348	0.3407	0.3434	0.3346	0.3345	0.2749
1981-1990	0.0668	0.1305	0.1728	0.1967	0.2344	0.2615	0.2734	0.2986	0.2982	0.3022	0.2235
1991-2001	0.0689	0.0988	0.1181	0.1360	0.1555	0.1959	0.2288	0.2682	0.2815	0.2587	0.1810
Full Sample	0.0752	0.1303	0.1692	0.2001	0.2308	0.2618	0.2793	0.3023	0.3040	0.2972	0.2250
Panel E: Market to Book Ratio (Assets)											
1971-1980	4.153	1.805	1.330	1.220	1.220	1.176	1.186	1.211	1.205	1.219	1.572
1981-1990	4.575	2.696	1.944	1.623	1.481	1.445	1.420	1.402	1.385	1.315	1.928
1991-2001	5.585	3.226	2.729	2.293	2.100	1.955	1.880	1.769	1.800	1.784	2.512
Full Sample	4.797	2.597	2.024	1.731	1.616	1.539	1.508	1.470	1.474	1.450	2.021
Panel F: Return on Assets (%)											
1971-1980	0.707	4.641	5.562	5.715	6.065	6.207	6.275	6.563	6.633	6.429	5.480
1981-1990	-46.421	-11.764	-3.967	0.573	1.811	2.819	3.864	4.08	4.517	4.766	-3.972
1991-2001	-90.788	-31.57	-17.561	-8.66	-3.937	-0.696	1.316	2.069	2.621	3.86	-14.335
Full Sample	-46.962	-13.5	-5.717	-1.045	1.144	2.665	3.738	4.167	4.527	4.981	-4.600

Table 2
Sources of Funds (in Million Dollars)

This table reports mean levels of the three sources of funds for deciles of firms in the sample. Deciles are formed by ranking firms in ascending order of total assets in each year. Mean values are reported for three sub-periods (1971-80, 1981-90, and 1991-2001) and for the full sample period. Values are reported in $ millions.

	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	All firms
Panel A: Net Equity Issued											
1971-1980	0.135	0.162	0.209	0.253	0.333	0.376	0.566	1.106	2.177	15.304	2.062
1981-1990	0.469	0.657	0.955	1.249	1.554	2.020	2.379	3.061	5.915	5.836	2.410
1991-2001	1.242	2.880	5.102	6.238	7.067	7.832	9.000	11.573	17.199	-8.506	5.963
Full Sample	0.636	1.286	2.186	2.698	3.116	3.552	4.143	5.451	8.713	3.801	3.558
Panel B: Net Debt Issued											
1971-1980	0.075	0.143	0.286	0.421	0.704	1.170	1.705	2.893	7.049	45.035	5.948
1981-1990	0.030	0.086	0.144	0.273	0.540	1.304	2.645	4.709	12.309	80.008	10.205
1991-2001	0.059	0.159	0.144	0.310	0.754	1.953	4.923	12.627	31.292	191.344	24.356
Full Sample	0.055	0.130	0.190	0.334	0.669	1.491	3.150	6.933	17.348	108.233	13.853
Panel C: Internal Cash Flow											
1971-1980	0.312	0.754	1.350	2.154	3.345	5.608	9.147	17.917	44.525	386.979	47.209
1981-1990	-0.186	0.007	0.493	1.537	2.981	6.127	12.712	27.154	83.649	890.381	102.485
1991-2001	-0.786	-0.939	-0.762	0.522	3.460	8.669	19.996	42.529	117.199	1310.416	150.030
Full Sample	-0.238	-0.088	0.324	1.376	3.269	6.862	14.147	29.630	82.933	877.038	101.525

Table 3
Sources of Funds (Scaled by Total Assets)

This table reports mean levels of the three sources of funds for deciles of firms in the sample, scaled by total assets. Deciles are formed by ranking firms in ascending order of total assets in each year. Mean values are reported for three sub-periods (1971-80, 1981-90, and 1991-2001) and for the full sample period.

	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	All firms
Panel A: Net Equity Issued											
1971-1980	0.0758	0.0257	0.0182	0.0144	0.0120	0.0083	0.0074	0.0077	0.0065	0.0054	0.0181
1981-1990	0.3633	0.1651	0.1166	0.0790	0.0546	0.0378	0.0236	0.0146	0.0103	0.0027	0.0868
1991-2001	0.4638	0.3458	0.3042	0.1890	0.1223	0.0754	0.0466	0.0291	0.0165	0.0015	0.1594
Full Sample	0.3062	0.1843	0.1514	0.0972	0.0649	0.0416	0.0266	0.0175	0.0113	0.0032	0.0904
Panel B: Net Debt Issued											
1971-1980	0.0229	0.0221	0.0241	0.0235	0.0253	0.0259	0.0227	0.0217	0.0211	0.0162	0.0226
1981-1990	0.0196	0.0209	0.0179	0.0171	0.0183	0.0241	0.0250	0.0223	0.0202	0.0147	0.0200
1991-2001	0.0214	0.0161	0.0075	0.0089	0.0103	0.0163	0.0242	0.0292	0.0275	0.0150	0.0176
Full Sample	0.0213	0.0196	0.0162	0.0163	0.0177	0.0219	0.0240	0.0246	0.0231	0.0153	0.0200
Panel C: Internal Cash Flow											
1971-1980	0.0969	0.1203	0.1261	0.1251	0.1253	0.1292	0.1284	0.1345	0.1373	0.1342	0.1257
1981-1990	-0.1595	-0.0063	0.0558	0.0937	0.1000	0.1120	0.1205	0.1245	0.1324	0.1382	0.0711
1991-2001	-0.3350	-0.1024	-0.0345	0.0271	0.0649	0.0866	0.1029	0.1043	0.1065	0.1118	0.0132
Full Sample	-0.1391	0.0004	0.0464	0.0802	0.0957	0.1085	0.1168	0.1206	0.1248	0.1275	0.0682

Table 4
Baseline Pecking Order Model

This table reports results from the regression based on the baseline pecking order model

$$\Delta DEBT_{it} = b_1 DEFICIT_{it} + \varepsilon_{it}$$

for each decile, for deciles 1 through 5 combined, and for the full sample. $\Delta DEBT_{it}$ refers to net new debt issued scaled by total assets, for firm i and year *t* . $DEFICIT_{it}$ refers to the financing deficit (net new equity plus net new debt) scaled by total assets, for firm i and year *t* . Panel A reports results for all firms in each decile. Panel B reports results for only those firms in each decile that have rated debt. Heteroscedasticity consistent robust standard errors are reported in parentheses. a, b, and c represent significance at the 1%, 5%, and 10% levels, respectively.

	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Deciles 1-5	Full Sample
Panel A												
Deficit	0.155 [a]	0.222 [a]	0.248 [a]	0.272 [a]	0.375 [a]	0.486 [a]	0.638 [a]	0.686 [a]	0.754 [a]	0.732 [a]	0.233 [a]	0.332 [a]
	(0.008)	(0.010)	(0.012)	(0.014)	(0.016)	(0.018)	(0.018)	(0.017)	(0.012)	(0.016)	(0.005)	(0.005)
Adjusted R^2	0.171	0.242	0.263	0.278	0.390	0.501	0.676	0.728	0.781	0.747	0.278	0.350
Number of Observations	11458	11458	11458	11458	11458	11458	11458	11458	11458	11582	57290	114704
Panel B												
Deficit				0.716 [a]	0.794 [a]	0.725 [a]	0.669 [a]	0.721 [a]	0.770 [a]	0.742 [a]	0.781 [a]	0.729 [a]
				(0.085)	(0.048)	(0.042)	(0.037)	(0.022)	(0.017)	(0.021)	(0.042)	(0.012)
Adjusted R^2				0.819	0.886	0.771	0.776	0.775	0.802	0.752	0.876	0.782
Number of Observations	0	0	3	26	121	441	1079	2321	4176	5692	150	13859

Table 5
Specifications for Firms' Financing Choices

This table reports results from estimating three alternative regression specifications for firms' financing choices. Panel A examines nonlinearity in the debt-deficit relation and reports results for the regression

$$\Delta DEBT_{it} = b_1.DEFICIT_{it} + b_2.DEFICIT_{it}^2 + \varepsilon_{it}.$$

Panel B reports results for the piecewise linear specification

$$\Delta DEBT_{it} = \min[\, k_1.DEFICIT_{it},\ k_2.(k_1 - k_3) + k_3.DEFICIT_{it}\,] + \varepsilon_{it}$$

where k_1 is the debt-deficit sensitivity when the deficit is less than the debt capacity, k_2 is the estimated amount of debt firms are able to support and k_3 is the debt-deficit sensitivity when the deficit is greater than the amount firms can support.

Panel C reports results for the regression

$$\Delta DEBT_{it} = \min[\, k_1.DEFICIT_{it},\ (a_0 + a_1.TANGIBILITY + a_2.MARKET\text{-}BOOK + a_3.LOGSALES + a_4.PROFITABILITY)\,.(k_1 - k_3) + k_3.DEFICIT_{it}\,] + \varepsilon_{it}$$

where k_1 and k_3 are as above, but the amount of debt firms are able to support is modeled as a function of the conventional factors (asset tangibility, growth options, size, and profitability) instead of the unconditional estimate k_2.

Panel D reports results of regression

$$\Delta DEBT_{it} = \min[\, k_1.DEFICIT_{it},\ (a_0 + a_1.TANGIBILITY + a_2.MARKET\text{-}BOOK + a_3.LOGSALES + a_4.PROFITABILITY + industry\ dummies)\,.(k_1 - k_3) + k_3.DEFICIT_{it}\,] + \varepsilon_{it}$$

Industry dummies are based on 2 digit SIC codes. Regression results reported in Panels B, C and D are estimated by nonlinear least squares. For Panel D, convergence criteria based on Bates and Watts (1981, 1988) are also reported since the convergence criterion of 0.001 is not met for any size decile. Heteroscedasticity consistent robust standard errors are reported in parentheses. Number of observations is 11,458 in each size decile. a, b, and c represent significance at the 1%, 5%, and 10% levels, respectively.

	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Deciles 1-5	Full Sample
						Panel A						
Deficit	0.433 [a]	0.534 [a]	0.623 [a]	0.655 [a]	0.711 [a]	0.776 [a]	0.821 [a]	0.843 [a]	0.803 [a]	0.763 [a]	0.577 [a]	0.694 [a]
	(0.014)	(0.015)	(0.016)	(0.017)	(0.018)	(0.016)	(0.017)	(0.019)	(0.012)	(0.015)	(0.007)	(0.005)
$Deficit^2$	-0.263 [a]	-0.326 [a]	-0.404 [a]	-0.430 [a]	-0.455 [a]	-0.446 [a]	-0.322 [a]	-0.300 [a]	-0.126 [a]	-0.087 [c]	-0.364 [a]	-0.429 [a]
	(0.012)	(0.015)	(0.016)	(0.018)	(0.025)	(0.028)	(0.037)	(0.045)	(0.040)	(0.052)	(0.007)	(0.006)
Adjusted R^2	0.305	0.394	0.452	0.473	0.522	0.583	0.708	0.750	0.783	0.749	0.481	0.518
						Panel B						
k_1	0.592 [a]	0.634 [a]	0.631 [a]	0.665 [a]	0.632 [a]	0.659 [a]	0.734 [a]	0.758 [a]	0.774 [a]	0.757 [a]	0.624 [a]	0.647 [a]
	(0.013)	(0.011)	(0.008)	(0.008)	(0.007)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)
k_2	0.240 [a]	0.271 [a]	0.367 [a]	0.356 [a]	0.461 [a]	0.543 [a]	0.630 [a]	0.676 [a]	0.717 [a]	0.788 [a]	0.325 [a]	0.428 [a]
	(0.007)	(0.006)	(0.007)	(0.006)	(0.008)	(0.009)	(0.009)	(0.010)	(0.016)	(0.024)	(0.003)	(0.002)
k_3	-0.047 [a]	-0.052 [a]	-0.148 [a]	-0.151 [a]	-0.189 [a]	-0.176 [a]	-0.119 [a]	-0.123 [a]	0.078	0.040	-0.101 [a]	-0.165 [a]
	(0.006)	(0.007)	(0.008)	(0.009)	(0.014)	(0.019)	(0.024)	(0.029)	(0.061)	(0.053)	(0.003)	(0.003)
Adjusted R^2	0.310	0.389	0.449	0.464	0.503	0.561	0.699	0.742	0.772	0.742	0.412	0.501

Table 5 *–Continued*

	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Deciles 1-5	Full Sample
						Panel C						
k_1	0.684 [a]	0.712 [a]	0.730 [a]	0.712 [a]	0.674 [a]	0.684 [a]	0.742 [a]	0.766 [a]	0.791 [a]	0.769 [a]	0.706 [a]	0.721 [a]
	(0.013)	(0.011)	(0.009)	(0.008)	(0.007)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)
k_3	0.005	0.025 [a]	-0.014 [b]	-0.034 [a]	-0.073 [a]	-0.058 [a]	0.005	0.043 [c]	0.401 [a]	0.353 [a]	-0.009 [a]	-0.017 [a]
	(0.005)	(0.006)	(0.006)	(0.007)	(0.011)	(0.015)	(0.019)	(0.023)	(0.028)	(0.025)	(0.003)	(0.002)
a_0	0.098 [a]	0.108 [a]	0.120 [a]	0.139 [a]	0.176 [a]	0.155 [a]	0.371 [a]	0.823 [a]	0.735 [a]	-0.126	0.094 [a]	0.053 [a]
	(0.007)	(0.010)	(0.012)	(0.015)	(0.019)	(0.026)	(0.042)	(0.059)	(0.089)	(0.091)	(0.004)	(0.003)
a_1	0.243 [a]	0.306 [a]	0.327 [a]	0.374 [a]	0.469 [a]	0.389 [a]	0.063 [b]	0.007	0.488 [a]	0.598 [a]	0.334 [a]	0.371 [a]
	(0.014)	(0.016)	(0.016)	(0.018)	(0.024)	(0.028)	(0.029)	(0.032)	(0.068)	(0.073)	(0.007)	(0.006)
a_2	-0.003 [a]	-0.019 [a]	-0.030 [a]	-0.033 [a]	-0.025 [a]	-0.046 [a]	-0.059 [a]	-0.057 [a]	-0.029 [a]	-0.049 [a]	-0.010 [a]	-0.010 [a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.005)	(0.003)	(0.0004)	(0.0003)
a_3	0.035 [a]	0.030 [a]	0.038 [a]	0.038 [a]	0.036 [a]	0.074 [a]	0.070 [a]	-0.013	-0.046 [a]	0.068 [a]	0.033 [a]	0.055 [a]
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.007)	(0.009)	(0.012)	(0.012)	(0.001)	(0.0006)
a_4	0.055 [a]	0.035 [a]	0.015	0.094 [a]	0.146 [a]	-0.019	0.243 [a]	0.422 [a]	0.482 [a]	0.200 [b]	0.041 [a]	0.015 [a]
	(0.005)	(0.008)	(0.010)	(0.013)	(0.018)	(0.034)	(0.049)	(0.053)	(0.059)	(0.102)	(0.004)	(0.003)
Adjusted R^2	0.358	0.435	0.501	0.519	0.539	0.593	0.713	0.746	0.774	0.746	0.460	0.562

Figure1
Alternative Debt-Deficit Relationships

This figure depicts three alternative theoretical relationships between the financing deficit and new debt issued by a firm. The solid line (Alternative 1) represents the pecking order model in which debt is used first to fill the deficit, and equity is issued only when the debt capacity has been exhausted. The dotted line (Alternative 2) represents a reverse pecking order in which equity is issued first and debt next. The dashed line (Alternative 3) represents the scenario in which there is no sequencing preference between issuing debt or equity, and both are issued in a certain proportion simultaneously.

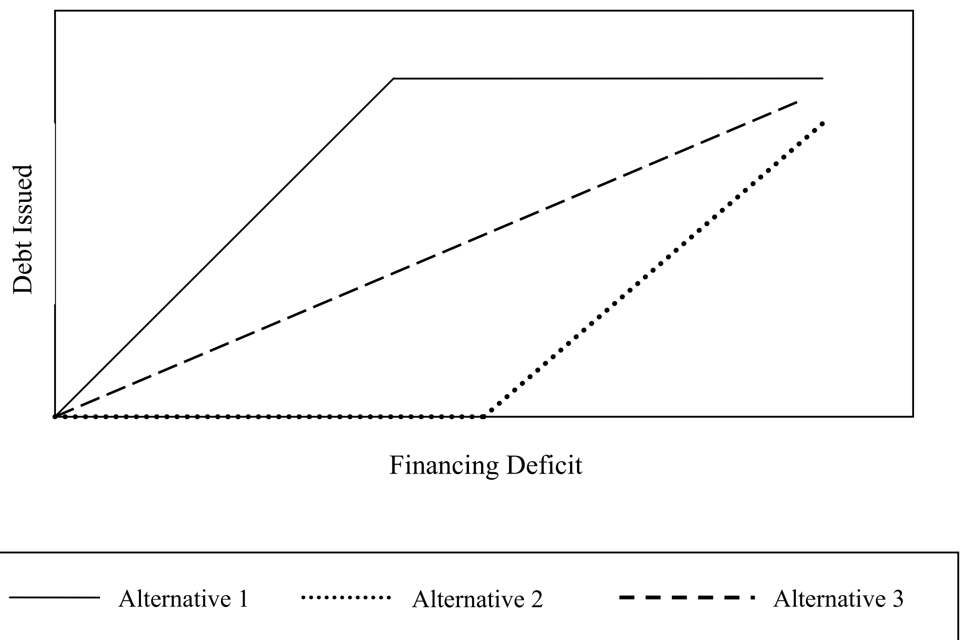

Figure 2
Two Firms with Different Capacities to Support Debt

This figure depicts the debt-deficit relationship as predicted by the pecking order theory for two firms with different capacities to support debt. The dotted line (Firm 1) represents the firm with the lower capacity and the solid line (Firm 2) the one with the higher capacity. Initially, both firms issue debt to fill their financing deficits resulting in a debt-deficit slope $k_1 = 1$. Firm-1's smaller capacity k_2' is exhausted first, while Firm-2's larger capacity k_2'' allows it to issue more debt. After exhausting their respective capacities to support debt, both firms have to issue equity, resulting in the debt-deficit slope $k_3 = 0$.