Debt capacity and firms' debt-equity decisions

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Abstract

This paper tests the static tradeoff theory against the pecking order theory. We measure firms' target leverage and debt capacity in order to discriminate between the theories. In case leverage exceeds the target and is below the debt capacity, static tradeoff predicts a decrease in leverage while the pecking order yields debt issuance until the debt capacity is reached. We find that the pecking order theory is a better descriptor of firms' financing and repurchasing behavior than the static tradeoff theory. We find firms to be consistent over time in their preference for a specific capital structure theory.

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The capital structure literature has been dominated by two theories. The first theory, known as the static tradeoff theory, implies that firms have a target debt ratio and that firms try to move towards this target ratio.[1] Alternatively, the pecking order theory argues that, due to asymmetric information, firms adopt a hierarchical order of financing preferences: internal financing is preferred over external financing. If external financing is needed, firms first seek debt funding. Equity is only issued as a last resort, when debt financing will be extremely costly. In the words of Myers (1984): "*you will refuse to buy equity unless the firm has already exhausted its "debt capacity"——that is, unless the firm has issued so much debt already that it would face substantial additional costs in issuing more.*"

The empirical relevance of both theories has been tested in several papers.[2] Shyam-Sunder and Myers (1999) attempt to distinguish the influence of each of the two theories on firms' financing decisions. With two simple models, they show that the static tradeoff theory can appear to be valid, even in case the pecking order model is actually driving the financing decisions. To establish the underlying theory for firms' financing decisions it is therefore essential to incorporate the inferences of the pecking order theory when addressing the relevance of the static tradeoff theory, and vice versa. In this paper we do exactly this to elaborately test the empirical relevance of both theories.

We argue that a key concept in comparing both theories is the debt capacity of a firm. We construct a framework that indicates in which situations the predictions of the pecking order theory and the static tradeoff theory differ. For example, if a firm issues a security and its debt ratio is currently below its target debt ratio, both theories will predict the firm to issue debt: the static tradeoff theory implies that a firm moves towards its target, while in a pecking order world a firm will always cover its external financing needs with debt as long as it is not constrained by its debt capacity. Also, when a firm wants to repurchase securities and has a debt ratio above its target, both theories predict that the firm buys back debt.[3] Figure 1 provides a graphical overview of the predictions of the two theories and indicates whether the pecking order theory and the static tradeoff theory predict a debt or equity issue (repurchase) for different ranges of the debt ratio.

[please insert Figure 1 here]

The most interesting parts of the debt ratio spectrum are the regions in which the theories have contrasting predictions. There are two regions where this is the case. For issuing decisions, the theories disagree when the current debt ratio is above the target ratio but below the debt capacity. In this case, the static tradeoff theory predicts a decrease of leverage, whereas the pecking order theory predicts that a firm would still increase leverage. For repurchase decisions the theories disagree when the firm's current debt ratio is below the target debt ratio. The pecking order model predicts that the firm repurchases debt and therefore decreases leverage, whereas the static tradeoff model predicts a move towards the target and therefore an increase of leverage. By identifying the observations in these two regions, we are able to test which predictions are most accurate.

Our framework requires a quantification of the debt capacity. We base our estimates of the debt capacity on statements by Myers (1984) and Shyam-Sunder and Myers (1999).[4] In particular, we construct a model explaining a firm's credit rating and use this to derive an estimate of the marginal debt ratio that would make a firm lose its investment grade rating and hence substantially increase its costs of issuing debt.[5] We interpret this debt ratio as an estimate for a firm's debt capacity. We find that the average value of a firm's debt capacity is about 60% of the firm's total assets.

We use the regression specification of Hovakimian, Opler, and Titman (2001), in which a firm's decision to either issue (or repurchase) debt or equity is regressed on the difference between a firm's debt ratio and its supposed target, to explain firms' debt-equity choices. However, we extend the specification with the deviations between firms' leverage and their estimated debt capacity. For the situations in which the pecking order theory and the static tradeoff theory have contrary predictions regarding the issue decision, we find the deviation from the debt capacity to be a better descriptor of firms' debt-equity choices than firms' deviations from their targets. In fact, we find the estimated target to have a statistically insignificant impact on the debt-equity choice when we control for the debt capacity. This latter finding is strong evidence against the static tradeoff theory. For repurchase decisions, both the deviation from the estimated target and the estimated debt capacity are statistically significant.

Next, we use our framework to identify firms that behave in accordance with the pecking order theory in a given year, and firms that act according to the static tradeoff theory in a given year. Corroborating our earlier results, we find that most observations are in line with the pecking order theory. By exploiting these classifications, we examine whether a firm's preference for a capital structure theory is situation-specific, as argued by Myers (2001), or whether the preferences are firm-specific. This latter hypothesis can be deducted from survey evidence of, for example, Graham and Harvey (2001). A situation-specific preference would imply, for example, that firm-years with high informational asymmetry correspond to a preference for the pecking order theory. Firm-specific preferences imply that firms have certain preferences, irrespective of their situation and the conditions of the market. Information on preferences could explain the supremacy of the pecking order theory in our Hovakimian, Opler, and Titman (2001) test.

For our final empirical tests, we identify in each year whether a firm's financing behavior is consistent with the pecking order or static tradeoff theory. Subsequently, we relate a firm's preference for a theory, as indicated by its financing behavior, to its characteristics and find that only profitability constantly influences the preferences in a specific firm-year. The more profitable a firm is in a given year, the higher the probability that it will act according to the pecking order theory. An examination of the preferences for a capital structure theory over time shows that these preferences are relatively stable over the years. These findings imply that time-varying variables do not have a strong impact on the preferred theory. We find that the lagged preference of a firm has an influence: a firm that acts according to the pecking order theory or static tradeoff theory in year *t-1*, is more likely to do so again in year *t*. Apparently, firms are persistent in financing according to a capital structure theory, which explains the supremacy of the pecking order model in each year of our analysis.

We contribute to the literature in various ways. First, we contribute to the ongoing battle between the pecking order theory and the static tradeoff theory. Fama and French (2002) examine the conflicting indirect predictions of both theories with regard to the influence of dividends and profitability on leverage. They find mixed evidence. We choose to solely focus on the predictions regarding issue and repurchase decisions.

Second, we quantify a firm's debt capacity. Although the concept of the debt capacity has been used throughout the pecking order literature, we do not know of attempts to construct an advanced empirical measure of this concept in terms of a debt ratio. Mostly related is Turnbull (1979), who models the maximum level of debt that lenders should be willing to provide. Lemmon and Zender (2004) use a dummy variable to control for the debt capacity: they argue that firms with a credit rating (either investment grade or speculative grade) are not constrained by the debt capacity, while firms without a credit rating are concerned with the constraints. Lemmon and Zender use Shyam-Sunder and Myers' (1999) regression specification and find that firms with credit ratings issue higher proportions of debt.

I. Data

A. Sample selection

In our empirical analysis, we employ a broad cross-section of US firms from the Compustat and CRSP databases covering the period 1985-2005. The starting point is 1985 because we require credit rating data (Compustat item 280), and these data are not available prior to 1985. Regulated utilities (SICs 4900-4999) and financial firms (SICs 6000-6999) are excluded. We delete firm-years with missing information for our variables. All variables are winsorized at the 1st and 99th percentile. Our final sample contains 2,259 firms and 13,338 firm-year observations.

B. The financing deficit

The financing deficit is introduced by Shyam-Sunder and Myers (1999) to test the pecking order model. The financing deficit represents the inadequacy of internal cash flows for real investments and dividend commitments, and is calculated as the sum of the change in working capital, the investments, and the cash dividends, minus the internal cash flows. In Shyam-Sunder and Myers' definition, the financing deficit is equal to the sum of net long-term debt issues and net equity issues. For details about the computation of the deficit, see Frank and Goyal (2003).[6]

In this paper we define leverage as total debt divided by total assets, as trade credit (which is short-term financing) can provide financing when a firm would otherwise be constrained (Petersen and Rajan, 1997). We therefore need to adjust the deficit in that it represents the need for total (short-term and long-term) financing. We adjust the computation of the deficit by not including changes in current debt (item 301) and changes in accounts payable (item 304; if format code 7). Consequently, our deficit represents the need for total financing. The variable is scaled by assets at the beginning of the book-year. We employ the financing deficit in Section IV.

C. Informational asymmetry

An important aspect of the pecking order theory is informational asymmetry. Myers and Majluf (1984) show that managers, when acting on behalf of the current shareholders, pass up good investments in case the new shareholders will capture the benefits of the investment. Consequently, with informational asymmetry, investors will reason that an investment decision without an equity issue signals good news, while issuing shares signals bad news. This signal causes the stock price to drop. An interesting discussion is whether the *level* of informational asymmetry matters. Basically, the theoretical underlying of the pecking order theory in Myers and Majluf (1984) does not imply that only firms with high informational asymmetry have the financing hierarchy of first internal funds, then external debt, and then external equity. Instead, their model implies that any firm with informational asymmetry would have this financing hierarchy. Still, it could be argued that higher informational asymmetry leads to a larger decrease of the stock price due to an equity issue, as the uncertainty about the true value of the investment opportunity is higher.

Our proxy of informational asymmetry measures the firm-specific return variation, ψ, as constructed in Durnev, Morck, Yeung, and Zarowin (2003). This measure is based on the assumption that greater firm-specific variation in stock prices reflects more information getting into the stock price, i.e. less informational asymmetry. The firm-specific stock return variation follows from the regression

$$Firm\ return_t = \beta_0 + \beta_1 * market\ return_t + \beta_2 * industry\ return_t + \varepsilon_{t,}$$

which is estimated for each firm using monthly returns within a given calendar year. Industry returns are measured at the level of 2-digit SIC-codes. The market return and the industry return are value-weighted averages excluding the firm for which the regression is estimated. The variance of ε is scaled by the total variance of the dependent variable in the regression. This is equal to dividing the residual sum of squares by the total sum of squares, or $1 - R^2$. The resulting ψ is a measure for the firm-specific return variability in a given year relative to the total variability. High ψ corresponds to low informational asymmetry. Various papers have used this measure. Dittmar and Thakor (2007), for example, show that firms with a high ψ are more likely to issue equity.

D. Summary statistics

In our framework we use a firm's credit rating to eventually determine the debt capacity. The credit ratings are from Standard and Poor's and provide information on a firm's creditworthiness. Long-term credit ratings have a scale from AAA to D: a rating of AAA implies that a firm is reliable, stable, and of high quality, while a rating of D qualifies the firm as being expected to default on most or all obligations. The ratings AAA, AA, A, and BBB are called investment grade ratings. As of BB, ratings are called non-investment grade or speculative grade ratings.

Table I shows firm characteristics for our total sample, for our sample of firms with investment grade ratings, and for our sample of firms with speculative grade ratings.

[please insert Table I here]

The average firm in our sample has assets worth of 6,133 million dollars. Firms with investment grade rating are on average larger than firms with non-investment grade ratings. The leverage of speculative grade firms is higher: on average these firms have a debt-assets ratio of 0.434, while investment grade firms have an average debt ratio of 0.267. The firms with investment grade ratings have been rated by Standard and Poor's for seven years (median), while firms with non-investment grade ratings have been rated for just four years (median).

II. Target leverage and debt capacity

A. Target leverage

The target debt ratio in the static tradeoff theory is the result of various factors. The tax shield of debt (Modigliani and Miller, 1963) provides an incentive for firms to have higher debt ratios, just as the monitoring and disciplining role of debt holders in case of agency problems (Jensen and Meckling, 1976; Jensen, 1986). On the other hand, financial distress costs decrease firms' optimal debt ratio. Other factors that give incentives to lower debt ratios are the debt overhang problem (Myers, 1977), the cost of personal taxes (Miller, 1977), and non-debt tax shields (DeAngelo and Masulis, 1980). According to the target adjustment theory firms are attempting to move to their target debt ratio, and adjust their financing decisions towards this goal.

In modeling the target, we allow for a current deviation from the target and allow for different targets across firms:

$$dr_{i,t+1}^{*} = x_{it}^{'}\beta, \tag{1}$$

where $dr^*_{i,t+1}$ is firm i's desired debt ratio at *t+1*; x_{it} is a vector of firm characteristics related to the costs and benefits of operating with various leverage ratios. The coefficient vector β is estimated using a regression explaining the debt ratio in year *t+1* from the firm characteristics in year *t*.

We select firm characteristics for estimating firms' debt ratios based on Rajan and Zingales (1995). These characteristics are size, tangibility, profitability, and the market-to-book ratio. We also include the median industry leverage as an explanatory variable for a firm's target debt ratio. For firms' target ratios, we use book ratios.[7] We exclude the targets of firms that have speculative ratings, as these firms' debt ratios are most likely not the desired ratios of these firms (Kisgen, 2006). Also, these firms are likely to face more difficulties in adjusting their debt ratios than firms with investment grade ratings. Following recommendations of Petersen (2007), we employ panel-robust standard errors throughout the paper. Table II shows the results.

[please insert Table II here]

Size and tangibility increase the target leverage of firms. The relation between size and leverage is usually explained by bankruptcy considerations: larger firms are generally more diversified and therefore less prone to bankruptcy. Also, the direct bankruptcy costs (e.g., hiring bankruptcy lawyers) will generally be a smaller portion of the firm's assets. Firms are generally believed to use their tangible assets as collateral, which decreases the costs of debt. Indeed we find firms with higher tangibility to have higher debt targets. We further observe that the market-to-book ratio and profitability have a negative effect on a firm's target, which is also in line with the current literature (see, for example, Rajan and Zingales, 1995).

Up front, we do not know whether a firm has a target debt ratio. Still, we estimate firms' targets on all investment grade firms, which means that we will also incorporate the firms that do not have a target. In a robustness check, we consider an alternative measure for a firm's target debt ratio, by taking the average debt ratio of a given firm over the preceding five years: in this way, the target debt ratio of a firm that actually has a target is not contaminated by the effects of firms without targets.

B. Debt capacity

The proxy for the debt capacity should represent the debt ratio for which firms are somewhat restricted in issuing debt. This restriction relates to a firm's constraint in issuing debt against 'normal' costs. When it cannot issue debt against these reasonable costs (interest rates) anymore, a debt issue will bring the firm dangerously close to financial distress, and equity might be a better option. Shyam-Sunder and Myers (1999) interpret the pecking order theory as follows (p. 225): *"If costs of financial distress are ignored, the firm will finance real investment by issuing the safest security it can. Here safe means not affected by revelation of managers' inside information. In practice, this means that firms which can issue investment-grade debt will do so rather than issue equity."* We follow Shyam-Sunder and Myers' (1999) interpretation of the pecking order model and link the debt capacity to investment grade ratings. A firm is constrained in its debt issuing if it cannot issue investment grade debt. The reason why speculative debt is costly is that issuing speculative debt substantially increases the chance of bankruptcy. As a result, it requires higher interest payments (Almeida and Philippon, 2006).[8] Grinblatt and Titman (2002) argue that the cost for speculative debt is also increased as many bond portfolio managers are restricted from owning speculative grade bonds.

The relationship between debt ratings and debt ratios is empirically shown by, for example, Huang and Huang (2003), Molina (2005), and Almeida and Philippon (2006). Table III confirms that leverage and credit ratings are strongly related in our sample. The table also shows the 10-year historical cumulative default rates for US firms with a specific rating in the period 1981-2005, based on a report of Standard and Poor's (2006).

[please insert Table III here]

On average, firms with the highest rating (AAA) have the lowest debt-asset ratios (mean of 0.177). It can be seen that the lower the credit rating, the higher the leverage. The table also shows how we recode the ratings AAA-D into numerical ratings, based on Ashbaugh-Skaife, Collins, and LaFond (2006). Table III further shows that over the period 1981-2005 the historical 10-year cumulative probability of default is 5.73% for firms having a rating BBB in the US (investment grade rating), whereas this default probability rises to 17.87% for firms with rating BB (speculative grade rating).

We use firms' credit ratings to determine the debt capacity for a firm in a given year. First, we determine in what way the credit rating depends on various firm characteristics. The set of characteristics is based on Altman and Rijken (2004) and originates from the Z-score model (Altman, 1968). These variables are working capital, retained earnings, profitability, size, and age. Age is the number of years since a firm was first rated by Standard and Poor's (with a maximum of ten). We model a firm's credit rating y_{it} using an ordered response model, where y_{it}^* is the underlying latent variable:

$$y_{it}^* = \alpha_1 dr_{it} + x_{it}^{'}\alpha_2 + \varepsilon_{it}, \tag{2}$$

where x_{it} is a set of characteristics of firm *i* in year *t*, and dr_{it} is the debt ratio of firm *i* in year *t* (not included in x_{it}). We define a firm's debt ratio as total debt over the book value of assets. Short-term debt is included as, for example, trade credit can provide financing when a firm would otherwise be constrained (see Petersen and Rajan, 1997). We observe y_{it} on a 7-point scale and we specify our model as an ordered logit model. In this model, γ refers to the boundaries between the different credit ratings.[9] We observe y_{it} = 1 if $y_{it}^* \leq \gamma_1$, y_{it} = 2 if $\gamma_1 < y_{it}^* \leq \gamma_2$, …, and y_{it} = 7 if $y_{it}^* > \gamma_6$. An investment grade rating corresponds to $y_{it} \geq 4$. From Table I we know that 7,284 of the 13,338 firms in our sample have an investment grade rating. It holds that for a given set of characteristics x_{it}, the probability of getting an investment grade rating is given by

$$P\{y_{it} \geq 4\} = P\{y_{it}^* \geq \gamma_3\} = P\{\alpha_1 dr_{it} + x_{it}^{'}\alpha_2 + \varepsilon_{it} \geq \gamma_3\} = F(-\gamma_3 + \alpha_1 dr_{it} + x_{it}^{'}\alpha_2), \tag{3}$$

where *F* denotes the logistic distribution function.

We define the debt capacity of a firm as the marginal value of the debt ratio, given its other firm characteristics, that increases the probability of obtaining a speculative grade to 0.50. In other words, we vary the debt ratio and take the value of this debt ratio for which we expect a specific firm in a specific year to have a fifty percent chance of getting a speculative grade, given the firm's other characteristics.

As we vary the debt ratio to find the level for which a firm is expected to lose its investment grade rating, we need the control variables to be constant for changes of the debt ratios. However, a change in short-term debt will, per definition, have an impact on the working capital. Also, a change in leverage will increase a firm's interest payments and therefore its retained earnings. Therefore, in estimating the debt capacity, we take the orthogonal variables for a firm's working capital and the retained earnings.[10] Table IV shows the estimation results of the ordered logit model.

[please insert Table IV here]

It can be seen that an increase of a firm's size, profitability, or retained earnings on average has a positive effect on Standard and Poor's credit rating. Leverage has a negative effect. The sign of working capital is somewhat unexpected: firms with higher working capital have on average lower ratings. This is also found by Altman and Rijken (2004). The pseudo R^2 is 0.313, and our model gives the right prediction of investment grade ratings or speculative grade ratings in 85% of the cases (not reported).

As mentioned, we define the debt capacity (dr_{it}^c) of a firm as the value of the debt ratio, given the other firm characteristics, that increases the probability of obtaining a speculative grade to 0.5. For our model, this means that we look for dr_{it} that – given x_{it} –

changes the expected value of y_{it}^* to γ_3. Solving $\alpha_1 dr_{it} + x_{it}^{'}\alpha_2 = \gamma_3$ for the debt ratio it follows that

$$dr_{it}^c = \gamma_3 - (x_{it}^{'}\alpha_2)/\alpha_1. \tag{4}$$

This measure for a firm's debt capacity ignores information on unobserved firm characteristics that can be inferred from the currently observed credit rating. We can exploit this information by noting that the expected value of ε_{it} in (2), given the credit rating y_{it} and other characteristics, is nonzero. Our preferred measure for a firm's debt capacity takes this into account. Accordingly, we define the debt capacity to that value for dr_{it}, given x_{it} and given the current rating y_{it} that increases the probability of a speculative grade to 0.5. It follows that the debt capacity can be derived from

$$\alpha_1 dr_{it} + x_{it}^{'}\alpha_2 + E\{\varepsilon_{it} | y_{it}, x_{it}, dr_{it}\} = \gamma_3. \tag{5}$$

The term $E\{\varepsilon_{it} | y_{it}, x_{it}, dr_{it}\}$ in this expression is nonzero and corresponds to the generalized residual of the ordered response model in Eq. (2), as proposed by Gourieroux, Monfort, Renault, and Trognon (1987). The generalized residual (denoted λ_{it}) is positive for firms that have an unexpectedly high credit rating: these firms have unobservable firm characteristics that make their rating higher than expected. The debt capacity can be estimated as

$$dr_{it}^{c} = \gamma_3 - (x_{it}^{'}\alpha_2 + \lambda_{it}) / \alpha_1. \quad (6)$$

Assuming $\alpha_1 < 0$, the debt capacity in Eq. (6) will be higher than the debt capacity in Eq. (4) for firms that currently have an unexpected good credit rating, and lower for firms that currently have an unexpected poor credit rating.

Using Eq. (6) and the estimated underlying ordered logit model from Eq. (2) we find the average debt capacity of firms to be 60.3% of total assets. The median is 59.2%, and the standard deviation is 0.212. Some firms have estimates of debt capacities that are above one or below zero. This means that our model estimates these firms to have a probability smaller than 0.5 of ever getting an investment grade rating (in case of a debt capacity below zero) or a speculative rating (in case of a debt capacity above one), regardless of the change in debt ratio. There are 208 observations (3% of the sample) with values above one and 77 observations (1%) of values below zero. For subsequent analyses, we set these values to one and zero, respectively.

III. Testing the influence of a firm's target ratio and debt capacity on its debt-equity choice

In this section we relate the estimated target and debt capacity to the debt-equity choice. Our test is based on Hovakimian, Opler, and Titman (2001), who analyze the debt-equity choice of US firms for the period 1979-1997. They define a firm as being a debt issuer in a year when the net amount of debt issued in that year exceeds 5% of total assets. Likewise, an equity issue indicates that the net amount of equity issued exceeds

5% of total assets. Using a binary logit model, they estimate whether the difference between the firm's current leverage and its estimated target has an effect on whether the firm issues (repurchases) debt or equity. They find that the higher the target with respect to the current leverage, the higher the probability that the firm issues debt. For repurchase decisions, it is found that the higher the target relative to the current leverage, the higher the likelihood that the firm repurchases equity.

Although these findings seem to provide evidence for the static tradeoff theory, we argue that the pecking order theory potentially interfered with the results. For instance, when a firm's current debt ratio is substantially below its target debt ratio, it is likely that the firm also substantially deviates from its debt capacity, and the choice for debt can just as well be explained by the pecking order theory. As was shown in Figure 1, the most interesting region for empirical tests on the capital structure theories for issue decisions is the one in which a firm's leverage is above the target, but below the debt capacity. In this case, the static tradeoff theory predicts a strong influence of the target debt ratio, while the pecking order model predicts a strong influence of the debt capacity and an insignificant impact of the target debt ratio. We therefore extend the test of Hovakimian, Opler, and Titman (2001) by incorporating the estimated debt capacity in the regression specification. We limit our sample to the firms that issue or repurchase amounts of either debt or equity that exceed 5% of total assets. Summary statistics of this sub-sample are presented in Table V.

[please insert Table V here]

Firms that issue debt have average total assets of 6,566 million dollars, which is larger than the equity issuers (5,880 million), but smaller than the average firm that repurchases debt (6,888 million) or equity (8,409 million). Firms that issue equity or repurchase debt, and herewith decrease leverage, have higher current leverage than firms that issue debt or repurchase equity.

Table V also includes summary statistics for the control variables used in Hovakimian, Opler, and Titman (2001). The variable 'NOLC' represents the net operating loss carryforward. NOLC, ROA, the stock return, and the market-to-book ratio might proxy for the extent to which firms are over- or underlevered. The dilution dummy equals one when an equity issue could dilute earnings, which makes an equity issue less favorable. The percentage of debt that is due in three years is related to the wealth transfer from equity holders to debtholders in case new equity is issued.

The estimation results for the extended Hovakimian, Opler, and Titman regression are given in Table VI.

[please insert Table VI here]

For the total spectrum of debt ratios, reported in Model (1), the difference between the target debt ratio and the current leverage significantly increases the likelihood that firms issue debt in our sample of investment grade firms, as the variable 'target – leverage' is significant and has a positive sign (coefficient of 3.205). To test whether the debt capacity is important for firms' debt-equity decisions, we look at the variable representing the difference between the debt capacity and the current leverage. It can be seen that this difference also has a significant impact on firms' debt-equity choice in the total spectrum of debt ratios. For higher debt capacities with respect to the current leverage, the probability that the firm issues debt is larger (coefficient of 2.002).

For a comparison between the static tradeoff theory and the pecking order theory in predicting issue decisions, we focus on the situations in which a firm's leverage is above the target. Therefore, we also estimate the model using only those observations for which the target is lower than the firm's current leverage. From the results in Model (3), it can be seen that the difference between the firm's leverage and its targets loses statistical significance. That is, the estimated target does not have an influence on firms' debt-equity choices when a firm is overlevered with respect to its supposed target. The difference with the debt capacity remains significant: the larger the deviation from the debt capacity, the higher the probability that debt is issued (coefficient of 2.190). Hence, if a firm has surpassed its potential target, the debt capacity predicts which security the firm will issue. Accordingly, we conclude that our test provides evidence for the pecking order theory. When the book leverage is below the target debt ratio, the impact of the debt capacity is not significant at the 1% level. Probably, this is because the debt capacity is generally substantially higher than the target. As the firms in this sub-sample are currently below their estimated targets, they are therefore unlikely to be constrained by the debt capacity.

For repurchase decisions, reported in Models (4)-(6), we find that both the estimated target and the estimated debt capacity have an influence on firms' financing decisions. An increase of the difference between a firm's estimated target and its current leverage increases the probability that equity is repurchased, just as a higher debt capacity with respect to the current leverage. The finding that the target debt ratio is more influential in repurchase decisions than in issue decisions is in line with the findings of Hovakimian, Opler, and Titman (2001).

The control variables indicate that more profitable firms are more likely to issue debt and repurchase stock. High market-to-book ratio firms are more likely to repurchase equity, which is also found by Hovakimian, Opler, and Titman (2001). This is intriguing, as high market-to-book ratios can imply overvaluation, which makes the firm repurchase at the inflated price. Contrary to Hovakimian, Opler, and Titman, we do not find significant effects of two-year stock returns and the market-to-book ratios on firms' issuing choices in our overall sample. This is probably due to the fact that our sample only includes firms with investment grade ratings. As could be seen from Table I, median stock returns and market-to-book ratios are higher for these firms. Firms for which an equity issue is likely to dilute earnings have a higher probability of preferring a debt issue over an equity issue (coefficient of 0.948). In Hovakimian, Opler, and Titman this coefficient is 0.519, implying that dilution has an even stronger effect on our sample of investment grade firms.

Several papers, like Shyam-Sunder and Myers (1999), take the average historical leverage as the firm's target. An advantage of this method is that the estimated targets for static tradeoff firms are not contaminated by firms that do not have a target, which potentially occurs in models that base the estimation of the target on firm characteristics. As a robustness check we therefore take the average debt ratio over the last five years as the target debt ratio.[11] We do not find strong differences with our earlier results: in our overall sample, we find that the deviation of firms' leverage from both the estimated target and debt capacity are significant. For the subset of observations where book leverage is above its target leverage, the spread between the target debt ratio and current leverage has no impact on the decision to issue debt versus equity. We also check for robustness by including firms' marginal tax rates (before interest expenses) into our target estimation model. Graham (1999) uses these marginal tax rates to show that firms with higher marginal tax rates have significantly higher leverage, indicating that interest deductibility encourages higher debt ratios.[12] We find our results to be robust for the inclusion of marginal tax rates: both the signs and the significance of all variables in our model remain unaltered.

IV. The classification of pecking order and static tradeoff observations

The more accurate predictions of the pecking order theory in Section III can potentially be explained by various factors. One factor relates to firm characteristics: the majority of firms in our sample might have high informational asymmetry. Another factor is related to the sample period: the majority of the observations can be in years with favorable conditions for the pecking order theory. Alternatively, the more accurate predictions of the pecking order theory might also be explained by a group of firms who constantly act in accordance with this theory. To establish why the pecking order theory predicts well, this section uses Figure 1 to segregate observations that are in accordance with the predictions of the pecking order theory from observations that are in accordance with the predictions of the static tradeoff theory. Pecking order observations, for example, correspond to firm-years in which a security has to be issued, while the firm's leverage is above its supposed target but below the debt capacity, and the firm decides to issue debt.

A typical static tradeoff observation is a firm in a similar situation that decreases leverage. We will use these classifications to analyze the strength of the pecking order theory in Section V.

A. Estimating the firm's position with respect to its estimated target

In order to identify pecking order and static tradeoff observations, we need to determine the firm's position towards the target and debt capacity. Basically, we have determined a firm's position towards its estimated target in Section III when we used Hovakimian, Opler, and Titman's (2001) regression specification. However, in the tests in Section III, the firm's current leverage is the debt ratio at the beginning of the fiscal year. We will extend the analysis by taking into account that firms do not only finance projects at the beginning or end of a book-year. Therefore, instead of the debt ratio that a firm has at the beginning of the year, we are interested in the debt ratio at the time of the financing decision. More specifically, we argue that firms' managers compare the expected debt ratio at the end of the book-year with the firm's possible target debt ratio at the time of the decision. This expected debt ratio is influenced by the expected retained earnings. When a firm expects to have retained earnings, it expects the balance sheet total of the firm to grow. The retained earnings do however not alter the absolute level of debt. Therefore, retained earnings decrease leverage when a firm obtains no external financing. In order to establish their position with respect to their possible targets, firms need to incorporate the effect of retained earnings:

$$dr_{i,dec} = d_t / (a_t + re_{t+1}), \quad (7)$$

where $dr_{i,dec}$ is the leverage at the time of decision, d is the debt level, a is total assets, and re are the expected retained earnings.

Next, we determine whether a firm is below or above its estimated target. Basically, we can observe whether the estimated leverage at the time of the decision is higher or lower than the estimated target. However, we also take the estimation error of the target debt ratio into account. That is, we control for uncertainties about the exact value of the firm's target. We determine the probability that a firm's leverage at the time of the decision is above its estimated target as follows:

$$P\{dr_{i,dec} > dr^*_{i,t+1}\} = F\left(\frac{dr_{i,dec} - \hat{dr}^*_{i,t+1}}{se\{\hat{dr}^*_{i,t+1}\}}\right), \quad (8)$$

where se denotes the appropriate standard error. Remember that $\hat{dr}^*_{i,t+1} = x'_{it}\hat{\beta}$. If we denote the estimated covariance matrix of $\hat{\beta}$ by $\hat{\text{var}}(\hat{\beta})$, then the appropriate standard error can be computed as

$$se(\hat{dr}^*_{i,t+1}) = \sqrt{x'_{it}\,\hat{\text{var}}(\hat{\beta})x_{it}}\,. \quad (9)$$

B. Estimating the firm's position with respect to its estimated debt capacity

The identification of static tradeoff and pecking order observations further requires the determination of whether a firm is restricted by its debt capacity. A firm's debt capacity is likely to become an issue when a firm substantially increases its leverage. The debt capacity therefore does not only relate to the current debt level, but also to the securities needed for financing decisions. The question is: does a firm get above its debt capacity when it uses debt to finance its investments?

To answer this question, we employ the need for external financing. This financing deficit plays a prominent role in Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). We calculate the hypothetical debt ratio as the debt ratio that a firm would have if it financed its deficit completely with debt:

$$dr_{i,t+1}^{hyp} = (d_t + def_{t;t+1}) / (a_t + di_{t;t+1} + ei_{t;t+1} + re_{t+1}), \tag{10}$$

in which $dr_{i,t+1}^{hyp}$ is the hypothetical debt ratio, *d* is the debt level, *def* is the financing deficit, *a* is total assets, *di* is the net debt issued, *ei* is the net equity issued, and *re* are the expected retained earnings. The indication *t;t+1* for the flow variables corresponds to a time frame between year *t* and year *t + 1*.

The probability that a firm is limited by its debt capacity depends on the hypothetical debt ratio and the estimated debt capacity. If we take into account the estimation error in determining the debt capacity, we can determine the chance that a firm cannot exclusively issue debt without losing its investment grade rating by:

$$P\{dr_{i,t+1}^{hyp} > dr_{i,t+1}^{c}\} = F(\frac{dr_{i,t+1}^{hyp} - \hat{dr}_{i,t+1}^{c}}{se\{\hat{dr}_{i,t+1}^{c}\}}), \quad (11)$$

where *se* denotes the standard error. This standard error can be derived from the covariance matrix of the maximum likelihood estimator for the coefficients in Eq. (2) and the functional form in Eq. (6) using the so-called delta method (see Greene, 2003, p. 913). It is given by

$$se(\hat{dr}_{i,t+1}^{c}) = \sqrt{f_{it}^{'} \hat{\text{var}}(\hat{\theta}) f_{it}}, \quad (12)$$

where $\hat{\text{var}}(\hat{\theta})$ is the estimated covariance matrix of the coefficients in Eq. (6) and f_{it} is a vector with derivatives. Its elements are

$$(-\hat{\gamma}_3 + (\hat{\alpha}_2 x_{it}^{'} + \hat{\lambda}_{it}) / \hat{\alpha}_1^{2}, -x_{it} / \hat{\alpha}_1, 0,0,1/\hat{\alpha}_1, 0,0,0).$$

C. Determining pecking order and static tradeoff observations for issue decisions

Although Figure 1 provides our basic framework for comparing the pecking order theory and the static tradeoff theory, we extend the framework as we compare the target debt ratio with the leverage at the time of the financing decision and the debt capacity with the hypothetical debt ratio. For firms that need funding, our framework provides nine regions that relate to the firm’s current and hypothetical debt ratio; see Figure 2. A firm's current debt ratio can be below its potential target, above its potential target, and above its debt capacity (firms with a speculative rating). Also, the firm's hypothetical debt ratio can be below the potential target, above the potential target, and above the debt capacity. The target ratio of a firm lies below its debt capacity: financial distress, as incorporated in the debt capacity, is not the only factor that withholds firms from exclusively having debt. A firm's target is also decreased by for example non-debt tax shields, personal taxes, and agency considerations. On the relation between a firm's target and its debt capacity, Turnbull (1979) shows that a firm's optimal leverage is below the level of debt that lenders are willing to provide. Figure 2 shows the nine possible regions.

[please insert Figure 2 here]

We are interested in the financing decisions of firms that currently have investment grade ratings. These firms are not likely to have a high probability of being currently above the debt capacity. Also, the hypothetical debt ratio assumes that a firm solely uses debt for its investments. Therefore, the hypothetical debt ratio portraits higher leverage than the debt ratio at the time of the decision, which excludes the region in which a firm's current ratio is above target and the hypothetical ratio is below target. This leaves five relevant regions.

Figure 2 includes the predictions of both the pecking order theory and the static tradeoff theory in these five regions. For issue decisions the pecking order theory is well-known: firms will issue debt, as long as they have not reached their debt capacity. The static tradeoff theory predicts that firms will issue debt when they are below their target, and will issue equity when they are above their target. Previous papers have found that firms do not close the whole gap in one year, but move gradually towards their supposed target (e.g., Flannery and Rangan, 2006). For our research, this partial adjustment will not pose a problem, as we do not require that firms end up exactly at their target to provide evidence for the static tradeoff theory. A move towards the target will suffice.

Observations that are below their target will increase their leverage under both theories, when a firm is not limited by its debt capacity: the pecking order model implies a preference for debt when external financing is needed, which will increase leverage. The static tradeoff model implies that a firm moves towards the target, which means it also has to increase its leverage. The difference is that the pecking order model implies that the firm solely issues debt, whereas the static tradeoff model would predict that some firms issue a mix between debt and equity, to exactly reach the target debt level.

When a firm's debt capacity constrains a firm to finance its investments with debt only (that is, against reasonable interest rates), the predictions of the pecking order model depend on a firm's willingness to do a mixed issue. Possibly, a firm would still increase leverage by issuing more debt than equity. However, there are costs involved in issuing securities. Therefore, a firm can also opt for a single issue. Given the limitations imposed by the debt capacity for issuing debt, the most likely option would then be to solely issue equity.

Again, when a firm is above its target and is not limited by its debt capacity, the pecking order model predicts that a firm will issue debt and herewith increase leverage. The static tradeoff theory predicts that a firm moves towards the target and decreases leverage. This region is therefore the most interesting one when comparing the theories, as they strongly disagree. We label this region as region X. We can compute each firm's probability of being in a region by using the probabilities of being above the target and above the debt capacity. For example, the probability that a firm-year is in region X is the probability that the firm is above target and not restricted by the debt capacity, and is given by

$$P\{dr_{it} > dr^{*}_{i,t+1}\} * P\{dr^{hyp}_{i,t+1} < dr^{c}_{i,t+1}\}.$$

These probabilities can be derived from the results in Subsection IV.B. In each region we want to know whether the firms increase or decrease leverage. We therefore compare the current leverage with the leverage after the financing decision, given by

$$dr_{i,after} = d_{t+1} / (a_t + di_{t;t+1} + ei_{t;t+1} + re_{t+1}). \quad (13)$$

We find that 73% of the observations that have a higher than 50% chance of being in region X (542 firm-years) increase leverage. Again, the pecking order theory predicts firms' financing decisions better than the static tradeoff theory. We label the observations that account for the 73% as pecking order observations. Observations in which leverage is decreased (27%) are labeled as static tradeoff observations.

D. Determining pecking order and static tradeoff observations for repurchase decisions

We also construct a framework to identify pecking order and static tradeoff observations for repurchase decisions. The pecking order theory implies that firms have a preference of reducing debt over repurchasing equity (Shyam-Sunder and Myers, 1999). Given firms' preferences to pay down debt in the pecking order theory, our framework indicates that for repurchase decisions the theories disagree when a firm's debt ratio is below its target. The static tradeoff theory predicts that a firm in this situation increases leverage by repurchasing stock, whereas the pecking order theory predicts that the firm repurchases debt. For repurchase decisions, the debt capacity is not of interest for the predictions of the pecking order theory, as the repurchase of debt decreases leverage. What is of importance is the level of debt that a firm has outstanding: if a firm has a surplus worth more than the remaining outstanding debt, the firm cannot use the complete surplus to repurchase debt, even if it would want to do so.

We select observations with repurchase decisions that have a higher than 50% chance of being below the estimated target. Deleting observations for which the financing surplus is larger than the debt outstanding, leaves us with 2,241 observations. Our findings are that 60% of the observations use the repurchases to decrease leverage. Hence, we find that the pecking order theory is also a better predictor of firms' financing behavior than the static tradeoff theory in repurchase decisions.

V. Is pecking order and static tradeoff behavior situation-specific or firm-specific?

We exploit our classification of ‘pecking order observations’ and ‘static tradeoff observations’, as established in Section IV, to examine whether a choice for a theory, as revealed by a firm’s decisions, is situation-specific or firm-specific. The possibility that a choice for a theory is situation-specific results from Myers (2001). He argues that there is no universal theory of capital structure, but that the static tradeoff theory and the pecking order theory are good conditional theories. In other words, different theories are important in different circumstances. In contrast, several surveys of Chief Financial Officers have shown that some firms claim to follow a pecking order model, while others follow the trade-off model (Pinegar and Wilbricht, 1989; Kamath, 1997; Graham and Harvey, 2001). This implies that a choice for a theory is manager-specific or firm-specific.

A. Testing whether pecking order behavior and static tradeoff behavior is situation-specific

We test whether a choice for a capital structure theory is situation-specific in two ways. First, we test whether specific firm characteristics in region X can explain which observations are consistent with the pecking order theory and which are not. Second, we test whether the percentage of pecking order firms differs over the years. If macro-economic variables are of influence, we expect to find differences over the years.

A.1. Explaining financing choices in Region X

Our framework allows us to examine when an observation is consistent with the pecking order theory or with the static tradeoff theory by examining the financing choices of firms in Region X. A 'pecking order observation' is an observation in Region X for which the leverage increases (dummy = 1), and a 'static tradeoff observation' is an observation for which leverage decreases in Region X (dummy = 0). Table VII shows the results for a multivariate probit model explaining pecking order behavior, where the dependent variable is a dummy variable indicating whether leverage is increased or not. Because we cannot classify firm-year observations as being in Region X with absolute certainty, we estimate the model over all observations, but weigh them by their probability of being in Region X. That is, our model puts more weight on observations with a high probability of being in Region X than on observations with a low probability of being in Region X.

[please insert Table VII here]

The results in Table VII indicate that the pecking order theory becomes of less importance when a firm is smaller (see also Frank and Goyal, 2003) and in situations in which profitability is lower. Apparently, firms with low profits in a given year do not want to take on more debt, even if their debt capacity allows for it. Firm-years for which we observe higher informational asymmetry are not associated with an increased likelihood of pecking order behavior: the coefficient for *psi* – which scores high for low informational asymmetry – is positive but statistically insignificant. As discussed earlier, the theory of Myers and Majluf (1984) does not necessary imply that high informational asymmetry leads to more pecking order behavior. In their model, the existence of informational asymmetry is sufficient. It can be argued that all firms or all situations have some level of informational asymmetry. Another issue relating to informational asymmetry is that the measure requires the availability of multiple variables, which substantially decreases our sample size. Model (4), which is estimated over a substantially larger sample, shows that excluding the proxy for informational asymmetry causes the size effect to disappear.

The pseudo R^2 of the estimation is 0.039 without industry and year dummies, and 0.073 with these dummies. Apparently, much of the variation in the dependent variable cannot be explained by the variables in our model. Also, profitability is the only variable that is uniformly significant in all four models. Hence, we do not find strong evidence in favor of circumstance-driven pecking order behavior in region X.

A.2. Time-varying pecking order and static tradeoff behavior

Macro-economic variables, like the US inflation rate and GDP growth, vary over time. These macro-economic variables can have an effect on for instance informational asymmetry and therewith financing decisions (Korajczyk and Levy, 2003). If circumstances drive the choice for a capital structure theory, we would expect the distribution of observations that are consistent with the pecking order theory and observations that are consistent with the static tradeoff theory to differ among years.

[please insert Table VIII here]

Table VIII shows that the percentage of pecking order observations is in fact quite stable. This stability holds for both issue and repurchase decisions. For issue decisions, there is not a single year in which there are more static tradeoff observations than pecking order observations. Hence, we again find no strong evidence of circumstance-driven preferences.

B. Testing whether pecking order behavior and static tradeoff behavior is firm-specific

To test whether a choice for a theory is firm-specific, we examine whether a firm that acts according to a theory in one year is more likely to have acted in line with the same theory in the past year. We look at firms with investment grade ratings that issue securities. We assign a firm-year to the region for which it has the highest probability of being in, according to our previous computations. The dependent variable registers whether the firm acts according to the pecking order theory (static tradeoff theory) in a specific region. We look whether the firm acted according to the pecking order theory (static tradeoff theory) the year before. An important difference with our analysis in Section V.A.1 is therefore that we do not solely focus on the observations in Region X: to establish firms' lagged decisions, we include the other regions in which firms issue securities. In this way, we can track firms' financing preferences over time, even if they are not constantly in region X. Note that in some regions a given observation can be one for both the dependent variable in the pecking order-regression and the dependent variable in the static tradeoff-regression (for example when the firm's leverage is below its estimated target and the firm issues debt).

[please insert Table IX here]

Model 1 in Table IX shows that firms acting according to the pecking order theory in year *t-1* are more likely to repeat this behavior in year *t*, as the variable 'pecking order behavior_{t-1}' is statistically significant and has a positive coefficient (0.322). This result holds when we include firms with missing values for our informational asymmetry variable *psi* (Model 2) and when we include a variable indicating that the firm acted according to the static tradeoff model in year *t-1* (Model 3). In Models 4, 5, and 6 we test whether firms are more likely to adjust their debt ratio towards their target debt ratio in year *t* when they did so in year *t-1*. It can be seen that this is the case, as the impact of static tradeoff behavior in year *t-1* is positive and significant at the 1% level. Moreover, the coefficients for lagged decisions are higher in Model (4)-(6) than in Model (1)-(3), indicating that more persistence exists in acting according to the static tradeoff model. Note the significance of book leverage in the static tradeoff regression: the lower the leverage, the higher the probability that the static tradeoff predicts correctly. This is in line with our findings in Table VI that the target is important when a firm's leverage is below the target. We can conclude that firms exhibit consistency in their capital structure decisions: a financing decision in accordance with a particular theory in year *t-1* significantly increases the probability that the same firm will act according to the same theory in year *t*. Still, much of the variance of the dependent variable remains unexplained: the highest pseudo R^2 in Table IX is 0.158.

VI. Conclusion

Like Lemmon and Zender (2004), this paper stresses the importance of the debt capacity in firms' financing decisions. We argue that the pecking order theory does not imply that firms always issue debt when external financing is needed. Instead, the theory implies that firms have a preference for issuing investment grade debt over issuing equity. We construct a model in which we estimate the maximum debt ratio that a firm can obtain before facing a higher than 50% probability of losing its investment grade rating. The loss of this investment grade rating would considerably increase the costs of debt.

We use the estimated debt capacity to show that the static tradeoff theory can appear to be true, even when the underlying financing behavior is driven by the pecking order theory. We hereby corroborate results of Shyam-Sunder and Myers (1999). In an extended test of Hovakimian, Opler, and Titman (2001), we show that the debt capacity is of higher importance than the supposed target when a firm's leverage is above this target. We interpret these findings as evidence for the pecking order theory.

We also construct a framework in which we focus on observations for which the pecking order theory and the static tradeoff theory have contrary predictions regarding the preferred financing choices. We find that the pecking order theory is of primary importance for both issue and repurchase decisions. By exploiting our classifications of observations that are consistent with pecking order behavior and static tradeoff behavior, we do not find strong evidence that firms' choices for a capital structure theory in a given year are situation-specific. Corroborating the survey evidence of Graham and Harvey (2001), we do find evidence that the choice of a theory is firm-specific: managers or firms are to some extent consistent in their capital structure decisions.

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[1] Myers (1984) focuses on the tradeoff between tax benefits and bankruptcy costs when describing the static tradeoff theory. Several other papers incorporate more factors into the static tradeoff theory, like non-debt tax shields and agency costs (see, e.g., Flannery and Rangan, 2006).

[2] The pecking order model is tested in, for example, Frank and Goyal (2003), whereas the static tradeoff model is tested in Leary and Roberts (2005) and Flannery and Rangan (2006).

[3] For a description of the pecking order theory regarding repurchase decisions, see Shyam-Sunder and Myers (1999, p. 225).

[4] In Shyam-Sunder and Myers the pecking order theory is described as follows (p. 225): *"If costs of financial distress are ignored, the firm will finance real investment by issuing the safest security it can. Here safe means not affected by revelation of managers' inside information. In practice, this means that firms which can issue investment-grade debt will do so rather than issue equity."*

[5] The higher costs for non-investment grade rated firms are mainly the result of the higher probability of default. Standard and Poor's (2006) report that the average 10-year default rate is 2.81% for firms with investment grade ratings, and 27.31% for non-investment grade ratings.

[6] Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) use the financing deficit as an explanatory variable for the long-term debt issued. Several authors, like Chirinko and Singha (2001), have criticized this regression specification. Also, it can be argued that the deficit is endogenous, and the size of the deficit should therefore not be solely used to test the pecking order model. In our paper, we use the deficit in a different way. As a result, our test is not subject to the limitations of Shyam-Sunder and Myers' regression specification.

[7] This is in accordance with for example Shyam-Sunder and Myers (1999). Still, the target ratio has also been quantified in terms of market leverage. Generally, when authors analyze both market and book leverage, the results are comparable (Flannery and Rangan, 2006).

[8] Sometimes firms issue junk bonds (bonds with a rating lower than BB), and hence opt for high interest rates. Gilson and Warner (1997) find that this is mainly to gain financial flexibility, as junk bonds do usually not have the restrictive covenants that normal debt has.

[9] The imposed normalization constraint implies that Eq. (2) has no intercept term.

[10] We define the orthogonal variables as the residuals of a regression of the debt ratio on a specific variable. Hence, the orthogonal variables are uncorrelated to the debt ratio. In robustness tests we have estimated the model with all five variables as orthogonal. Also, we have estimated specifications in which we use firms' dividends as proxy for retained earnings, and firms' current assets as a proxy for the working capital. Our results prove to be robust for these alterations.

[11] We also test the impact of target debt ratios that are specified as the three-year average debt ratio and the ten-year average debt ratio.

[12] The marginal tax rates can be downloaded from John Graham's website.

Figure 1

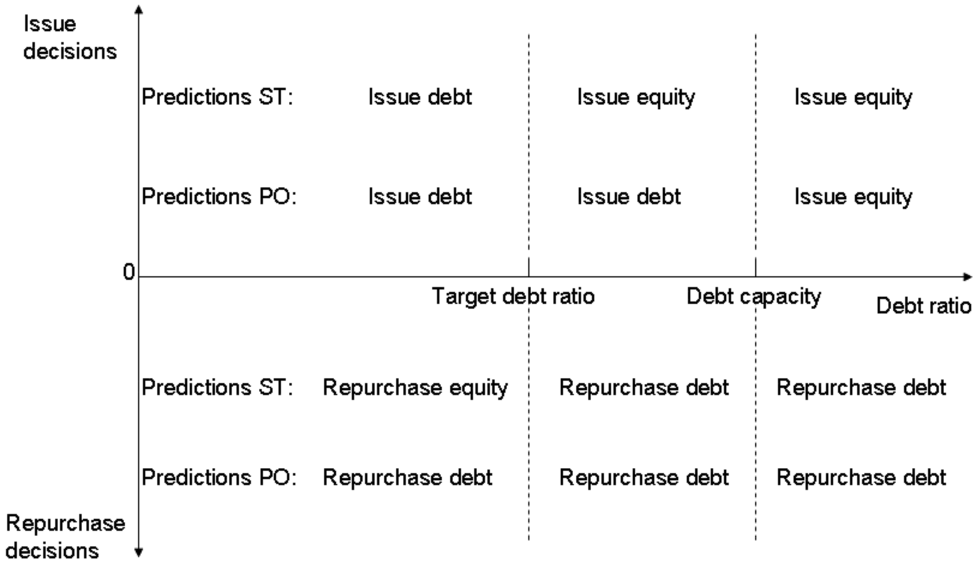

Figure 1. The predictions of the pecking order theory and the static tradeoff theory for different debt ratios. This figure shows whether the pecking order theory and the static tradeoff theory predict a debt or equity issue/repurchase for different positions of the debt ratio. 'ST' corresponds to the static tradeoff theory, and 'PO' corresponds to the pecking order theory.

Figure 2

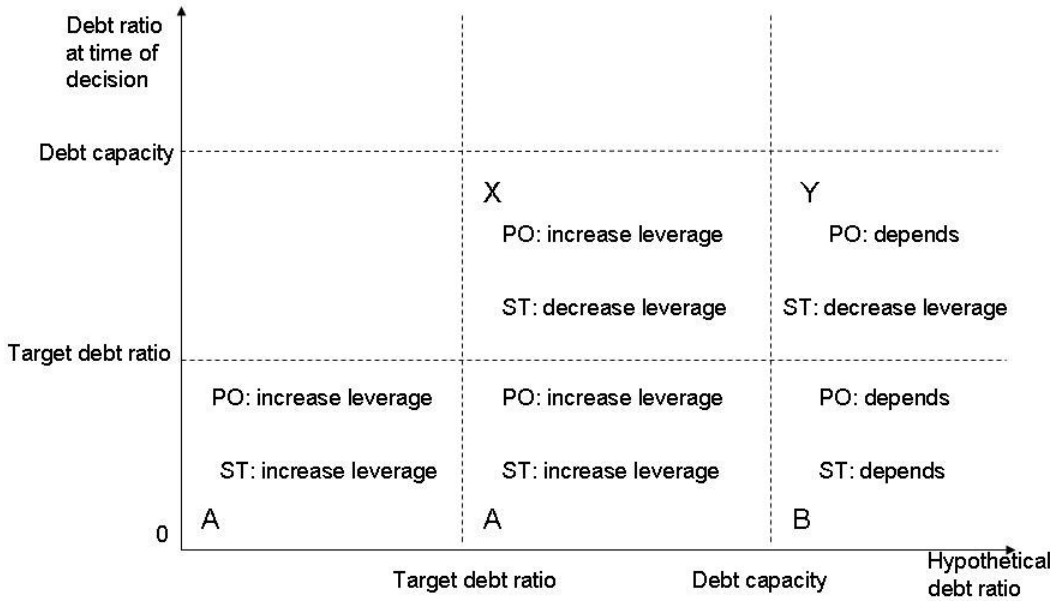

Figure 2. The predictions of the pecking order theory and the static tradeoff theory for issue decisions. This figure shows whether the pecking order theory and the static tradeoff theory predict an increase or decrease of the debt ratio for different positions of the debt ratio. 'PO' corresponds to the pecking order theory, and 'ST' corresponds to the static tradeoff theory. The debt ratio at the time of decision can be below and above the target debt ratio. A firm's hypothetical debt ratio is the debt ratio that a firm would have when it finances the investments with debt. The hypothetical debt ratio can be below and above the target debt ratio, and can also be above the debt capacity.

Table I

Summary statistics

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows firm characteristics for the firm-years in our sample. We also provide information for two sub-samples: observations for firms with investment grade ratings and observations for firms with speculative grade ratings. Assets are determined by Compustat Item 6 and are reported in millions of dollars. Sales is Item 12 and is also in millions of dollars. Tangibility is Item 8. Book leverage is computed by dividing the sum of Item 9 and Item 34 by Item 6, and market leverage is (Item 9 + Item 34) / (Item 34 + Item 9 + Item 24 * Item 25). EBIT is Item 18 + Item 15 + Item 16 and EBITDA is Item 13. The market-to-book ratio is calculated as (Item 24 * Item 25 – Item 60 + Item 6) / Item 6. Age is the number of years since the firm was first rated by Standard and Poor's, and has a maximum value of ten. Dividends correspond to the sum of Item 19 and Item 21, and retained earnings to Item 34. Working capital is Item 4 minus Item 5. Rating is Item 280. The financing deficit is computed as in Frank and Goyal (2003), with the addition of Item 301 and possibly Item 304 (if the format code is 7). Informational asymmetry is measured by *Psi*, as in Durnev, Morck, Yeung, and Zarowin (2003). Industry book leverage is the median book leverage per industry and per year, based on the Fama-French 30-industry classification. The two-year stock return is computed by dividing the stock price in a given year (Item 24) by the stock price two years before. Tangibility, EBIT, EBITDA, dividends, retained earnings, working capital, and the financing deficit are scaled by total assets. We report the means, and the medians are between parentheses.

	All firm-years		Firm-years with an investment grade rating		Firm-years with a speculative grade rating	
	N	Mean (median)	N	Mean (median)	N	Mean (median)
Total assets	13,338	6,133 (1,804)	7,284	9,748 (3,626)	6,054	1,783 (744)
Sales	13,338	5,621 (1,721)	7,284	8,939 (3,705)	6,054	1,630 (641)
Tangibility	13,338	0.391 (0.350)	7,284	0.407 (0.365)	6,054	0.373 (0.330)
Book leverage	13,338	0.343 (0.320)	7,284	0.267 (0.262)	6,054	0.434 (0.428)
Market leverage	13,338	0.351 (0.306)	7,284	0.245 (0.223)	6,054	0.478 (0.470)
EBIT	13,338	0.079 (0.086)	7,284	0.104 (0.102)	6,054	0.049 (0.065)
EBITDA	13,338	0.133 (0.131)	7,284	0.156 (0.151)	6,054	0.105 (0.106)
Market-to-book ratio	13,338	1.612 (1.341)	7,284	1.789 (1.479)	6,054	1.400 (1.195)
Age	13,338	5.719 (5.000)	7,284	6.426 (7.000)	6,054	4.869 (4.000)
Dividends	13,285	0.014 (0.008)	7,253	0.021 (0.016)	6,032	0.006 (0.000)
Retained earnings	13,338	0.163 (0.172)	7,284	0.289 (0.283)	6,054	0.010 (0.045)
Working capital	13,338	0.148 (0.124)	7,284	0.129 (0.108)	6,054	0.170 (0.148)
Credit rating	13,338	3.706 (4.000)	7,284	4.719 (5.000)	6,054	2.486 (3.000)
Financing deficit	12,454	0.030 (0.000)	6,887	0.014 (-0.002)	5,567	0.049 (0.003)
Informational asymmetry	6,846	0.578 (0.611)	4,693	0.581 (0.614)	2,153	0.572 (0.608)
Industry book leverage	13,017	0.458 (0.458)	7,136	0.457 (0.458)	5,881	0.460 (0.458)
Two-year stock return	12,469	0.115 (0.013)	7,098	0.100 (0.043)	5,371	0.135 (-0.044)

Table II

Target leverage

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows the estimated targets for the firms in our sample with an investment grade rating. We estimate the following regression specification: $dr^*_{i,t+1} = x'_{it}\beta,$ where $dr^*_{i,t+1}$ is firm i's desired debt ratio at t+1; x'_{it} is a vector of firm characteristics related to the costs and benefits of operating with various leverage ratios, and β is a coefficient vector. T-statistics appear in parentheses and are computed using panel-robust standard errors. *, **, *** indicate significance at the 10%, 5%, and 1% confidence level, respectively.

	Target debt ratio
Constant	0.106***
	(2.60)
Log(sales)	0.008***
	(2.74)
Tangibility	0.100***
	(5.84)
EBITDA	-0.068
	(-1.06)
Market-to-book ratio	-0.016***
	(-5.12)
Industry Median	0.460***
	(5.72)
Year dummies	Yes
N	7,136
R^2	0.133

Table III

Credit ratings and leverage

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows the book leverage for firms with various long-term credit ratings. We report means, medians, and standard deviations. The table also shows the numerical classifications of credit ratings as in Ashbaugh-Skaife, Collins, and LaFond (2006). The default rate is the cumulative average 10-year default rate of US firms in the period 1981-2005, as reported by Standard and Poor's (2006).

Credit rating	N	Numerical	Investment or speculative	10-year default rate	Book leverage		
					Mean	Median	St. dev.
AAA	234	7	Investment	0.35%	0.177	0.167	0.082
AA	864	6	Investment	0.77%	0.205	0.200	0.109
A	2,807	5	Investment	2.06%	0.254	0.251	0.110
BBB	3,379	4	Investment	5.73%	0.300	0.297	0.128
BB	3,238	3	Speculative	17.87%	0.393	0.385	0.161
B	2,523	2	Speculative	32.65%	0.482	0.490	0.188
CCC & D	293	1	Speculative	55.65%	0.473	0.504	0.238

Table IV

Credit ratings

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows the estimation of an ordered logit model. We estimate $y_{it}^{*} = \alpha_1 dr_{it} + x_{it}^{'}\alpha_2 + \varepsilon_{it}$, in which y_{it}^{*} is the underlying latent variable of the credit rating, x_{it} is a set of characteristics of firm *i* in year *t*, and dr_{it} is the debt ratio of firm *i* in year *t* (not included in x_{it}). We also report the boundaries that correspond to an ordered logit model. T-statistics appear in parentheses and are computed using panel-robust standard errors. *, **, *** indicate significance at the 10%, 5%, and 1% confidence level, respectively.

	Credit rating
Log(sales)	0.918***
	(24.12)
Book leverage	-6.590***
	(-22.13)
EBIT	2.674***
	(6.26)
Retained earnings	4.559***
	(19.70)
Working capital	-1.853***
	(-6.80)
Age dummies	Yes
Year dummies	Yes
N	13,244
Pseudo R^2	0.313
Boundaries	
γ_1	-2.529
γ_2	1.557
γ_3	3.925
γ_4	6.063
γ_5	8.524
γ_6	10.641

Table V

Summary statistics for the debt-equity choice

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows mean values of key characteristics. Firms are defined as issuing (repurchasing) a security when the net amount issued (repurchased) divided by the book value of assets at the beginning of the fiscal year exceeds 5%. Cases where firms issued (repurchased) both debt and equity in a fiscal year are omitted. Assets are determined by Compustat Item 6 and are reported in millions of dollars. Book leverage is computed by dividing the sum of Item 9 and Item 34 by Item 6. Target leverage is estimated on the basis of firm characteristics. The debt capacity is calculated with Eq. (6). ROA is the three year average of Item 13 divided by Item 6. NOLC is the net operating loss carryforward (Item 52), divided by Item 6. The two-year stock return is computed by dividing the stock price in a given year (Item 24) by the stock price two years before. The market-to-book ratio is calculated as (Item 24 * Item 25 – Item 60 + Item 6) / Item 6. The MTB-dummy is one when the market-to-book ratio exceeds one, and is zero otherwise. The dilution dummy examines whether an equity issue could dilute earnings. It is set to zero, except when one minus the assumed tax rate times the yield on Moody's Baa rated debt is less than the firm's after-tax earnings-price ratio. In accordance with Hovakimian, Opler, and Titman (2001), the tax rate is assumed to be 50% before 1987 and 34% afterward. The after-tax earnings price ratio is calculated as Item 18 / (Item 24 * Item 25). The fraction of debt that is due in three years is computed as (Item 44 + Item 91 + Item 92) / (Item 9 + Item 34).

	Debt issue	Equity issue	Debt repurchase	Equity repurchase
Total assets	6,566	5,880	6,888	8,409
Book leverage	0.272	0.341	0.346	0.215
Target – leverage	0.005	-0.065	-0.072	0.029
Capacity – leverage	0.315	0.177	0.198	0.452
Three-year mean ROA	0.163	0.137	0.145	0.203
NOLC	0.011	0.019	0.015	0.010
Two-year stock return	0.120	0.105	0.100	0.185
Market-to-book ratio	1.871	1.720	1.597	2.716
MTB-dummy	0.953	0.929	0.912	0.985
Dilution dummy	0.523	0.231	0.377	0.485
Fraction of debt due in 3 years	0.177	0.167	0.229	0.193
Observations	1,219	182	567	720

Table VI

The impact of the debt capacity on debt-equity choices

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows the impact of target leverage and the debt capacity on the debt-equity choice for firms with an investment grade rating. We estimate a binary logit model. Firms are defined as issuing (repurchasing) a security when the net amount issued (repurchased) divided by the book value of assets at the beginning of the fiscal year exceeds 5%. Cases where firms issued (repurchased) both debt and equity in a fiscal year are omitted. Target leverage is estimated based on firm characteristics. The control variables are taken at the beginning of the fiscal year. T-statistics appear in parentheses and are based on panel-robust standard errors. *, **, *** indicate significance at the 10%, 5%, and 1% confidence level, respectively.

	Debt vs. Equity issue			Debt reduction vs. Equity repurchase		
	All	When target > book leverage	When target < book leverage	All	When target > book leverage	When target < book leverage
	(1)	(2)	(3)	(4)	(5)	(6)
Target – leverage	3.205***	16.455***	1.089	-7.928***	-13.371***	-3.499**
	(4.13)	(5.11)	(0.82)	(-8.30)	(-5.30)	(-2.25)
Capacity – leverage	2.002***	1.777**	2.190***	-2.217***	-1.504**	-2.987***
	(4.12)	(1.96)	(3.63)	(-4.17)	(-2.05)	(-3.84)
Three year mean ROA	4.282*	6.183*	1.467	-6.336***	-7.470**	-4.703*
	(1.68)	(1.84)	(0.38)	(-3.25)	(-2.52)	(-1.87)
NOLC	0.615	-3.240	1.507	0.775	3.274	-2.525
	(0.25)	(-0.85)	(0.83)	(0.42)	(1.17)	(-1.10)
Two-year stock return	-0.068	0.150	-0.204	0.145	-0.137	-0.004
	(-0.35)	(0.52)	(-0.91)	(0.14)	(-0.51)	(-0.02)
Market-to-book ratio	-0.005	-0.174	0.386*	-0.932***	-0.766**	-0.966***
	(-0.03)	(-1.24)	(1.85)	(-4.68)	(-2.45)	(-3.26)
Dummy for MTB > 1	-0.113	-0.141	-0.169	-0.414	-0.666	-0.469
	(-0.30)	(-0.23)	(-0.31)	(-1.05)	(-1.30)	(-0.58)
Dilution dummy	0.948***	1.265***	0.969***	-0.770***	-0.281	-1.210***
	(4.41)	(3.41)	(3.42)	(-4.12)	(-0.95)	(-4.40)
Fraction of debt due in	0.361	1.020	-0.079	1.238***	1.592***	1.295
three years (FD3)	(0.79)	(1.28)	(-0.13)	(2.77)	(2.62)	(1.56)
Dummy for loss*FD3	-3.979***	-4.473*	-5.024*	-1.614	-2.538	-1.019
	(-2.86)	(-1.94)	(-1.88)	(-1.55)	(-1.48)	(-0.70)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	1,401	745	656	1,287	630	657
Pseudo R^2	0.177	0.223	0.180	0.400	0.312	0.381

Table VII

Pecking order behavior in region X

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. We solely consider firm-years in which firms have financing needs and in which the firm has an investment grade rating. The sample period is 1985-2005. This table presents the results of the estimation of a weighted probit model. The observations are weighted by the probability of being in region X. The dependent variable is a dummy that equals one for observations in which leverage is increased, and zero otherwise. T-statistics appear in parentheses and are based on panel-robust standard errors. *, **, *** indicate significance at the 10%, 5%, and 1% confidence level, respectively.

	Increase of leverage			
	(1)	(2)	(3)	(4)
Constant	-0.774	-0.600	-0.579	0.188
	(-1.08)	(-0.86)	(-0.83)	(0.30)
Log (Assets)	0.133**	0.180***	0.181***	0.064
	(2.05)	(3.14)	(3.14)	(1.26)
Tangibility	-0.275	-0.387	-0.363	-0.356
	(-0.76)	(-0.93)	(-0.87)	(-1.10)
Book leverage	0.112	-0.050	-0.009	-0.012
	(0.13)	(-0.06)	(-0.01)	(-0.02)
EBIT	4.161**	4.666***	4.056*	4.121***
	(2.50)	(2.64)	(1.93)	(3.67)
Loss-dummy			-0.252	
			(-0.69)	
Market-to-book	-0.090*	-0.089	-0.078	-0.037
	(-1.88)	(-1.46)	(-1.22)	(-0.90)
Retained earnings	0.242	0.125	0.147	0.260
	(0.46)	(0.22)	(0.26)	(0.56)
Psi	0.117	0.093	0.085	
	(0.43)	(0.39)	(0.36)	
Industry dummies	No	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes
N	2,096	2,096	2,089	3,215
Pseudo R^2	0.039	0.073	0.074	0.058

Table VIII

Percentages of pecking order behavior per year

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table presents the percentages of observations that we classify as 'pecking order behavior' in regions X and A per year. Region X corresponds to the observations that issue securities, that are above their estimated target, and that are not restricted by their debt capacity. Increasing leverage in Region X classifies as pecking order behavior. Region A corresponds to the observations that repurchase securities and that are below their estimated target. Decreasing leverage classifies as pecking order behavior in Region A.

	Issue decisions: percentage of pecking order behavior in Region X		Repurchase decisions: percentage of pecking order behavior in Region A	
	%	N	%	N
Total	73%	542	60%	2,241
1985	75%	12	57%	75
1986	71%	7	66%	98
1987	69%	13	58%	91
1988	71%	21	52%	86
1989	81%	26	49%	86
1990	66%	29	75%	104
1991	70%	27	72%	104
1992	56%	32	75%	106
1993	77%	48	70%	107
1994	76%	37	59%	95
1995	68%	37	64%	118
1996	73%	37	55%	121
1997	81%	31	46%	125
1998	85%	27	44%	120
1999	74%	38	60%	122
2000	57%	21	65%	144
2001	88%	24	64%	139
2002	73%	26	61%	137
2003	78%	27	60%	133
2004	59%	22	58%	130
St.dev.	0.09		0.09	

Table IX

Firm-specific behavior

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. We solely consider firm-years in which firms have financing needs and in which the firm has an investment grade rating. The sample period is 1985-2005. This table presents the results of the estimation of a probit model. The dependent variable is either a dummy that equals one for observations that are consistent with the pecking order theory, and is zero otherwise (models 1, 2, and 3), or a dummy that equals one for observations that are consistent with the static tradeoff theory, and is zero otherwise (models 4, 5, and 6). The variable 'Pecking order behavior$_{t-1}$' equals one if the firm acted according to the pecking order theory in the year before, and is zero otherwise. The variable 'Static tradeoff behavior$_{t-1}$' equals one if the firm acted according to the static tradeoff theory in the year before, and is zero otherwise. T-statistics appear in parentheses and are based on panel-robust standard errors. *, **, *** indicate significance at the 10%, 5%, and 1% confidence level, respectively.

	Pecking order behavior			Static tradeoff behavior		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Log (assets)	0.041	0.020	0.021	-0.052	-0.011	-0.007
	(0.95)	(0.57)	(0.58)	(-1.23)	(-0.32)	(-0.20)
Book leverage	-0.207	-0.223	-0.188	-3.660***	-3.343***	-3.087***
	(-0.40)	(-0.50)	(-0.41)	(-7.27)	(-7.84)	(-6.91)
Profitability	1.740	2.443***	2.448***	-1.586	-1.078	-1.093
	(1.50)	(2.69)	(2.70)	(-1.49)	(-1.28)	(-1.30)
Retained earnings	0.622	0.398	0.390	0.555	0.715**	0.736**
	(1.54)	(1.22)	(1.20)	(1.38)	(2.21)	(2.29)
Tangibility	-0.017	-0.033	-0.037	1.105***	0.796***	0.764***
	(-0.06)	(-0.15)	(-0.17)	(3.93)	(3.59)	(3.45)
Market-to-book ratio	-0.094**	-0.102***	-0.100***	-0.041	-0.060	-0.057
	(-2.34)	(-2.81)	(-2.81)	(-0.77)	(-1.21)	(-1.15)
Psi	0.120			0.097		
	(0.72)			(0.62)		
Pecking order behavior$_{t-1}$	0.322***	0.401***	0.378***			-0.172
	(2.87)	(4.19)	(3.37)			(-1.47)
Static tradeoff behavior$_{t-1}$			0.033	0.585***	0.591***	0.684***
			(0.32)	(5.46)	(6.52)	(6.22)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	971	1,398	1,398	971	1,398	1,398
Pseudo R^2	0.072	0.056	0.056	0.158	0.131	0.132