Debt ratios or debt-equity choice? Revisiting the association between firm-specific characteristics and capital structure

Evangelos C. Charalambakis*
Ian Garrett†

*Corresponding author. Manchester Business School, University of Manchester, UK, email: evangelos.charalambakis@mbs.ac.uk

†Manchester Business School, University of Manchester, email: ian.garett@mbs.ac.uk.

Debt ratios or debt-equity choice? Revisiting the association between firm-specific characteristics and capital structure

Abstract

Debt ratios can be misleading when examining the determinants of capital structure. We find that, corporate tax status and the probability of financial distress are endogenously associated with debt ratios and there is a mechanical association between profitability and debt ratios. This can obscure our understanding on how firm-specific factors affect corporate financing decisions. We focus on debt-equity choices instead of debt ratios. Looking at debt versus equity issues we show that firms with high average tax rates will prefer to issue debt to equity and firms with high probability of financial distress are less likely to issue debt. We provide evidence that profitability is positively related to the probability of a firm to issue debt, which contradicts the negative association between profitability and debt ratios. In line with debt ratio regressions , growth opportunities have a negative effect on the probability of debt issuance. When we examine equity repurchase versus debt retirement decision, we show that marginal corporate tax rates, profitability and growth opportunities have a positive effect on the probability of debt retirement as firms are reluctant to lose the tax advantages of debt. Firms with higher probability of financial distress are more likely to reduce debt . We conclude that debt-equity issue choice and debt -equity repurchase choice are affected by the same factors.

1 Introduction

A fundamental question in corporate finance is: How firms make financing decisions? To answer this question many studies have identified a number of firm-specific factors that explain actual debt ratios; see, for example, Rajan and Zingales (1995) Frank and Goyal (2009). Although we know how firm-specific characteristics are associated with debt ratios we do not yet fully understand how some of the firm-specific characteristics are related to the theoretical aspects of capital structure.. Chen and Zhao (2007) and Chang and Dasgupta (2009), among others, argue that debt ratios can be uninformative to distinguish corporate financing policies and suggest to focus on corporate debt-equity choices. In this paper we empirically investigate the effect of firm-specific factors on debt versus equity choice to provide a more comprehensive analysis on how firm-specific factors affect corporate financing decisions.

One of the main predictions of the tradeoff theory is that debt increases with a firm's marginal corporate tax rate as the interest expense is tax deductable. However, several studies fail to provide evidence on the positive association between debt ratios and corporate tax rates. Graham et al. (1998) point out that any measure of corporate tax rate that is based on income after interest deductions (after-financing) is endogenously related to debt ratios. Due to the tax deductability of interest expense a company that issues debt reduces its taxable income lowering its expected marginal corporate tax rate. This can confound the inference of the corporate tax rate effect on debt ratios. Graham (2003) suggests that there are two ways to address the endogenous relationship between corporate tax status and debt ratios. The first approach proposed by Graham et al. (1998) is to measure the corporate tax rate before- financing, i.e., based on income before interest is deducted. They show that a simulated marginal corporate tax rate before-financing is positively related to debt ratios. The use of an after-financing measure of marginal corporate tax rate induces a negative bias to the coefficient of the after-financing estimate of the marginal corporate tax rate documented in previous studies. Booth et al. (2001), Antoniou et al. (2008) and Byoun (2008), among others, report a negative relationship between after-financing corporate tax rates and debt ratios, which is inconsistent with the tradeoff theory. The second approach is to focus on corporate financing decisions instead of debt ratios when examining the effect of tax on capital structure. MacKie-Mason (1990) focus on debt versus equity issuance decisions

stating that debt to equity ratios may obscure the tax effect on the current-period financing choice as they reflect the cumulative outcome of many historical decisions. He finds a positive relation between debt issuances and tax rates.

Tradeoff theory also suggests that debt decreases as financial distress costs increase. Despite this straightforward prediction most studies fail to find a negative relationship between financial distress costs and debt ratios. Graham et al. (1998) and Byoun (2008) use a modified version of Altman's (1968) Z-score as a measure of financial distress costs. They find that firms with lower Z-score (higher financial distress) have higher debt ratios, which is counter-intuitive. Charalambakis et al. (2008) shed a light on why this result occurs. They argue that any measure of the probability of financial distress can be endogenously related to debt ratios as both debt ratios and the probability of financial distress are jointly determined. Using an estimated probability of financial distress they document a positive effect of the probability of financial distress on debt ratios in line with Graham et al. (1998). They show that the endogeneity of financial distress costs can be properly addressed by accounting for leverage dynamics. High levels of debt in the past will increase a firm's probability of financial distress, which in turn leads to a decrease in debt levels. Using a model that allows for leverage dynamics they find a negative association between the probability of financial distress and debt ratios.

The negative impact of profitability on debt ratios documented in several studies does not help us to fully understand how profitability is related to capital structure. Tradeoff theory suggests that profitability is positively related to debt ratios. Higher profitable firms have higher tax benefits of debt and lower bankruptcy costs. However, it is widely documented that more profitable firms have lower debt ratios. Myers (1993) states that: "The most telling evidence against the static tradeoff theory is the strong inverse correlation between profitability and financial leverage" (p. 6). Some studies (see, for example, Fama and French (2002)) argue that the negative effect of profitability is evidence that favours the pecking order theory as more profitable firms have retained earnings to meet their financing needs. Therefore, they do not resort to costly external source of financing. A line of other studies argue that the negative effect of profitability on leverage ratios can be explained by dynamic tradeoff models. Fischer, Heinkel and Zechner (1989) and Strebulaev (2007) argue that firms

cannot adjust immediately toward their optimal target debt ratios due to transaction costs. In this case actual debt ratios move within a range around optimal debt ratios. As debt ratios remain within this range the market value of more profitable firms increases leading to a negative relation between profitability and debt ratios. When actual debt ratios exceed this range firms will prefer to issue debt to equity to move toward their target debt ratios.Flannery and Rangan (2006) and Kayhan and Titman (2007) also suggest that leverage and profitability are negatively associated because firms passively accumulate earnings.

Our study contributes to the literature in many ways. First, it suggests that examining the effect of firm-specific characteristics on debt-to-equity ratios can be misleading as debt-to-equity ratios cannot distinguish between corporate financing choices. This is because leverage ratios is the cumulative outcome of historical corporate financing choices. Second, we properly address the endogeneity of corporate tax status and the probability of financial distress by focusing on debt-equity choices. Third, we point out that there is a mechanical negative association between profitability and debt ratios. This is because profitability consists of retained earnings, which is a component of equity in the denominator of the debt-to-equity ratio. Therefore, when profitability increases, the debt ratios automatically decreases. The interesting property about this association is that it causes a change in the debt-to-equity ratios attributable to the company's operating rather than financing activities. We remove the mechanical impact of profitability on debt ratios by examining corporate financing choices. Fourth, the investigation of debt-equity choices provides a more complete understanding of corporate financing decisions. We show that not only debt-equity issue choice but also debt-equity repurchase is important in examining capital structure decisions.

We begin our analysis with examining the effect of firm-specific factors on debt ratios. We use the simulated marginal corporate tax rate proposed by Graham(1996a) and Graham (1996b) as a proxy for the simulated marginal corporate tax rate to quantify the tax effect on debt ratios. As a proxy for financial distress costs we estimate the probability of financial distress from a discrete hazard model. We find a negative association between tax rates and debt ratios and a positive association between the probability of financial distress and leverage ratios. This is counter-intuitive. We show that size and tangibility are positively related to leverage ratios whereas profitability and growth opportunities are negatively associated with

debt ratios, which is in line with the evidence on how these four widely documented factors impact leverage.

We proceed to explore how the firm-specific factors are associated with corporate financing activities. Using balance sheet data we identify four types of corporate financing activities based on firms' financing deficit. Debt issues and equity issues if the financing deficit is positive. Equity repurchases and debt retirements if the financing deficit is negative (financing surplus). We first focus on debt issues versus equity issues. Using a logit model we provide evidence that firms are more likely to issue debt when they have a higher corporate tax rate whereas firms prefer equity issuance to debt issuance when their probability of financial distress increases. In contrast to leverage ratio regressions we show that profitability is positively related to the probability of a firm to issue debt versus equity. These findings reveal that firms tradeoff the tax benefit of debt against financial distress costs when they choose between debt issue and equity issue. Similar to debt ratio regressions, size has a positive effect on the probability of a firm to issue debt versus equity whereas growth opportunities have a negative impact on a firm's likelihood to issue debt. We also find that tangibility of assets is not related to the debt-equity issue decision.

We then follow a logit approach to examine the effect of firm-specific factors on the probability of a firm to repurchase equity instead of retiring debt. We find that firms with higher marginal corporate tax rates are more likely to repurchase equity instead of retiring debt so as not to pass up the expected tax benefit of debt. We show that the probability of financial distress is negatively related to the firm's likelihood to repurchase equity. In other words firms with higher financial distress costs prefer debt retirement to equity repurchase as an equity repurchase would lead to an increase in debt, which in turn would increase the financial distress costs. More profitable firms prefer to repurchase equity instead of retiring debt as they would lose the advantage to "shield" more taxable income. We show that larger firms and firms with high growth opportunities are more likely to repurchase equity instead of debt. This is because firms that have financing surplus are willing to take advantage of debt as they are not close to tax exhaustion. We find that tangibility of assets is not associated with debt-equity repurchase choice.

To confirm the robustness of our results we perform three robustness checks. We first

define security issues and security repurchases based on cash flow data. The results remain unaltered except that tangibility has a positive effect on the probability of debt issuance and a negative effect on the probability of equity repurchase. Second, we use alternative cutoff points to define debt and equity issues (repurchases). Instead of the widely used 5% cutoff point we use the 1% and 10%. While the signs of the coefficients of most of the variables is the same as with the core results, tangibility is sensitive to the change of the cutoff points.

The remainder of the paper is organized as follows. Section 2 briefly discusses the related literature. Section 3 defines the variables and analyzes the sample selection.Section 4 presents the results from the debt ratio regressions. Section 5 analyzes the findings from the logit models of debt-equity choice and performs some additional tests to verify our results. Section 6 summarizes our findings and concludes.

2 Related Literature

Most research investigates the predictions of the tradeoff theory using debt ratios. Several studies estimate how fast firms adjust toward their target capital structure using a partial adjustment model; see, for example, Fama and French (2002), Flannery and Rangan (2006) and Huang and Ritter (2009). They estimate a target capital structure by regressing actual debt ratios on firm-specific factors, which are associated with the underpinnings of the tradeoff theory. However, according to Chang and Dasgupta (2009), partial adjustment models cannot distinguish between the mechanical mean reversion of debt ratios and target behaviour. They suggest that tests based on corporate financing decisions could be more powerful to examine the underpinnings of the tradeoff theory.

There is mixed evidence on the association between firm's debt-equity choice and target behaviour. The study of Marsh (1982) is the first that develops a logit model to examine the determinants of the choice between debt and equity issues for UK firms. He provides evidence that a firm's choice between debt and equity issuance depends on market conditions and the past history of security prices. He also examines whether firms adjust toward a long-run target debt ratio. He shows that firms that have a debt ratio below the average of the last 10 years are more likely to issue debt. MacKie-Mason (1990) uses a probit model to investigate the effect of taxes on the choice between issuing debt or equity. In particular, he analyzes the

decision to issue debt by examining not only different measures of non-debt tax shields but interacting them with the probability of the firm that will have no taxable earnings and hence will become tax exhausted. He finds that firms with high tax-loss carry forwards are less likely to use debt. He also documents that investment tax credits do not reduce the likelihood of a debt issue. However, he provides evidence that when firms are nearly tax exhausted there is a negative association between investment tax credits and the probability of debt issuance.

Hovakimian et al. (2001) use a logit model to analyze issuance and repurchase decisions. They find that while the effect of the deviation between the actual and the target debt ratios (leverage deficit) is strong when firms choose between equity repurchases and debt retirements, the coefficient of the leverage deficit is marginally significant when firms choose between equity and debt issues. Hovakimian(2004) explores the role of target leverage in security issues and repurchases. He finds that only debt reductions offset the deviation from the target debt ratio. The issuance of debt and the issuance of equity increases rather than decreases the deviation from the target debt ratio. Finally, equity repurchases fail to offset any significant portion of the accumulated deviation from the target debt ratio. Hovakimian et al. (2004) investigate the role of target leverage focusing on dual debt and equity issues. They find that firms that issue both debt and equity offset the deviation from the target debt ratio. Leary and Roberts (2005) examine whether adjustment costs impact corporate financing decisions. They document that firms issue equity less frequently than debt as equity issuance costs are much higher than debt issuance costs. They also estimate hazard models for each type of refinancing event (debt issues, debt retirements, equity issues and equity repurchases). They show that transaction costs play an important role in firms' financing decisions.

More recent studies suggest that we need to focus on financing activities instead of debt ratios as debt ratios are uninformative with respect to corporate financing policies. Chen and Zhao (2007) illustrate how a debt ratio can revert mechanically to its mean, which blurs our understanding on the extent to which firms adjust toward a target debt ratio. Chang and Dasgupta (2009) show that a partial adjustment model cannot distinguish between the mechanical mean reversion of debt ratios and target adjustment behaviour. In particular, they generate samples of firms where financing choices are made randomly, that is, financing choices are unrelated to the underpinnings of the tradeoff theory. They show that firms that

make financing decisions randomly exhibit similar speed of target adjustment with those that follow a target debt ratio.

3 Definition of Variables and Data

3.1 Variables associated with the underpinnings of the tradeoff theory

Tradeoff theory suggests that firms tradeoff the tax benefit of debt against the costs of debt to obtain the optimal capital structure. The tax benefit of debt and the costs of debt are related to firm characteristics. We specify the following firm-specific characteristics to examine the predictions of the tradeoff theory.

1. Marginal Tax Rate After Financing (MTRAF)

   Graham (1996b) documents several proxies for the marginal corporate tax rate.He provides evidence that a simulated marginal corporate tax rate is the best proxy for the marginal corporate tax rate. We use Graham's simulated marginal corporate tax rate after interest expenses are deducted. Based on the prediction of the trade-off theory of capital structure, we expect there to be a positive relationship between MTRAF and leverage.

2. Probability of Financial Distress (PROBFD)

   This is the fitted value from the multi-period logistic regression

$$P_{i,t} = \frac{1}{1 + e^{(-\alpha + \boldsymbol{\beta}' \mathbf{x}_{i,t-1})}} \tag{1}$$

   where $P_{i,t}$ is the probability that firm i will enter either bankruptcy or liquidation at time t and $\boldsymbol{\beta}' \mathbf{x}_{i,t-1} = \beta_1 PROF_{i,t-1} + \beta_2 BLEV_{i,t-1} + \beta_3 REL\_SIZE_{i,t-1} + \beta_4 EXRET_{i,t-1} + \beta_5 \sigma_{i,t-1}$.[1] In contrast to Shumway (2001), we place greater emphasis on the prediction of corporate financial distress, that is, when a firm enters bankruptcy or liquidation, rather than on bankruptcy alone. The dependent variable is a dummy equalling zero if the firm has not filed for bankruptcy or entered liquidation. If the firm has entered

[1] Shumway (2001) shows in detail that a hazard model is econometrically equivalent to a multi-period logit model.

liquidation or bankruptcy, then the dependent variable equals one only for its last firm-year observation; zero otherwise. $PROF$ is profitability, which we define as earnings before interest, taxes depreciation and amortization (EBITDA) divided by total assets. $BLEV$ is book leverage, defined as the book value of debt divided by the book value of debt plus stockholders' equity, REL_SIZE is a firm's market capitalization expressed relative to the total market capitalization of NYSE and AMEX firms, $EXRET$ is a firm's past return in excess of the market and σ_i is firm i's stock return volatility. We expect there to be a negative relationship between the probability of financial distress and leverage.

The remaining four variables appear regularly in the literature as they are strongly associated with debt ratios (e.g. Rajan and Zingales, 1995; Fama and French, 2002).

3. Firm Size (SIZE)

   We define this as the natural logarithm of sales. Larger firms have more taxable income to shield when using debt. In addition to this, large firms are less likely to face financial distress costs. We therefore expect to see a positive relationship between firm size and leverage.

4. Tangibility (TANG)

   This is defined as fixed assets divided by total assets. If a firm has a large amount of fixed (tangible) assets then these assets can serve as collateral to debtholders. If debt is collateralized then the risk of the lender suffering agency costs of debt diminishes and the firm's debt capacity increases. We therefore expect to see a positive relationship between tangibility and leverage ratios.

5. Profitability (PROF)

   This is defined as earnings before interest, tax, depreciation and amortization (EBITDA) divided by total assets. According to the tradeoff theory more profitable firms to have more tax benefits of debt and lower financial distress costs. Therefore, there is a positive relationship between profitability and leverage ratios.

6. Market to book (MTB)

This is defined as the market value of assets divided by book value of assets. Market to book proxies for growth opportunities. Due to the agency costs of debt firms issue less leverage to protect their investment opportunities; see, Myers (1977).

3.2 Sample selection and Data description

Our sample consists of public firms traded on NYSE, AMEX and NASDAQ over the period 1980–2006. We exclude financial, insurance and real estate firms (SIC code 6000-6900) and regulated utilities (SIC code 4900-4999). The sample period starts from 1980 as the simulated marginal corporate tax rates after interest expenses developed by Graham (1996a) are available since 1980. [2] All accounting and market data are obtained from the from the CRSP/Compustat Merged database. We include all firms with data for at least two consecutive years. The initial sample includes 9,596 firms with 74,734 observations. We use this sample for the debt ratio regressions.

We define net equity issues and net debt issues using balance sheet data.[3] Given that book equity equals balance sheet retained earnings plus paid-in share capital, we define net equity issues as the change in book equity minus the change in retained earnings. We then define net debt issues as the change in total assets less the change in retained earnings and net equity issues. The difference between the change in total assets and the change in retained earnings is the financing deficit (DEF), which also equals to the net equity and net debt issued. If firms have a financing deficit (DEF>0), firms are forced to close the financing gap by issuing either debt or equity. If firms have financial surplus DEF<0, firms use it to reduce debt or repurchase equity. A net debt (equity) issue occurs if a firms net debt (equity) issue scaled by total assets exceeds 5%. A net equity repurchase occurs if a firms net equity repurchase scaled by total assets is greater than 5%. A net debt retirement occurs if a firms net debt retirement scaled by total assets is greater than 5%. [4] Years in which both debt and equity is issued or repurchased in a given fiscal year are omitted. Years in which the net amount of debt or equity issued (repurchased) is not above 5% are also excluded. The sample of security issues consists of 7,044 firms with 18,523 firm-year observations whereas the sample

[2] We thank John Graham for kindly providing us with his dataset of simulated marginal corporate tax rates.
[3] We prefer the balance sheet data to cash flow data because the latter are missing more often.
[4] For a more detailed definition of all the variables used in the study, see Appendix A.

of security repurchases consists of 3,498 firms with 8,491 firm-year observations.

Table 1 presents the cross-sectional distribution of security issues and repurchases from 1980–2006. We observe that the most frequent source of external financing is the issuance of debt and debt reduction is the most frequent repurchasing activity. In the sample of firms that raise external capital 67% of firms issue debt whereas 33% firms issue equity. In the security repurchase sample, 21% of firms repurchase equity whereas 79% of firms reduce debt. All the variables are winsorized at the 0.5th and 99th percentiles except market leverage, estimated probability of financial distress and size. Table 2 presents the summary statistics of the variables after the winsorization. The number of available observations for either the net amount of debt issued (repurchased) scaled by total assets or the net amount of equity issued (repurchased) scaled by total assets is considerably lower as these variables correspond to the sample of security issues and repurchases, respectively.

4 What is wrong with the estimation of target debt ratios?

Tradeoff theory suggests that firms adjust toward target capital structures, which are determined by trading off the tax benefits of debt financing against the costs of financial distress.Most studies regress debt ratios on predetermined variables associated with the underpinnings of the tradeoff theory to estimate target capital structures. In this section we thoroughly examine whether the estimated target debt ratio is the outcome of firms' tradeoff between the tax advantage to debt and financial distress costs.

Table 3 presents the results from a regression of book debt ratio on predetermined firm-specific variables. We use three methods to estimate the coefficients of the factors associated with the debt ratios. First, we use a double-censored Tobit estimator so as the dependent variable is restricted to the range zero to one. Second, a fixed-effects estimator to control for unobserved firm-specific effects. Third, we cluster our sample by firm and year to account for cross-sectional and time-series dependence. The results remain the same irrespective of the estimation method. We show that the simulated marginal tax rate after-financing (MTRAF) is negatively related to book debt ratios, inconsistent with the tradeoff theory. The negative sign of MTRAF is due to the endogenous relationship between corporate tax rates and debt ratios documented in Graham et al. (1998). We find a positive association between the estimated

probability of financial distress (PROBFD) and book debt ratio, which also contradicts the prediction of the tradeoff theory. According to Charalambakis et al. (2008) the positive coefficient of PROBFD is produced as PROBFD and debt ratios are jointly determined.

We provide evidence that there is a negative effect of profitability (PROF) on book debt ratios. While this finding is in line with previous studies, we would expect a positive impact of profitability on debt ratios based on the prediction of the tradeoff theory. We argue that the negative impact of profitability on book debt ratios is possibly due to the mechanical relationship between profitability and debt ratios. Profitability affects retained earnings, which are a component of the denominator of the debt ratios. If profitability increases, retained earnings increase, which in turn increases equity. This automatically causes a decrease in the leverage ratios. The remaining variables enter with the expected sign. Size and tangibility are positively related to book debt ratios whereas growth opportunities are negatively related to book debt ratios.

To ensure that our results are not driven by the measure of debt ratios Table 4 demonstrates the results of market debt ratio on these predetermined factors using a double-censored Tobit model, a Fixed-Effects model and a model to control for cross-sectional and time-series dependence. As with the book debt ratio regressions, the estimated coefficients of MTRAF, PROBFD and PROF have the opposite signs from those suggested by the tradeoff theory. The inference on the effect of size, tangibility and growth opportunities is the same as in Table 3. Taken together Tables 3 and 4 we conclude that debt ratios fail to provide an insight into how the key-components of the tradeoff theory, i.e., marginal corporate tax rate and the probability of financial distress, affect corporate financing decisions. Our results show that firms do not tradeoff between the tax benefit of debt and financial distress costs. In addition to this, the use of debt ratios can be misleading when estimating the effect of profitability on capital structure. The mechanical association between profitability and debt ratios raises the need to be cautious when using debt ratios to capture the outcome of financing activities as the debt ratios are further driven by the outcome of operating activities. Producing inconsistent estimates of the variables related to the tradeoff theory is of major concern as it leads to an incorrect specification of the target debt ratio.

5 Focusing on corporate financing activities

5.1 Debt versus Equity Issues

The previous section shows that debt ratios fail to provide evidence on the main predictions of the tradeoff theory. This is because there is an endogenous effect of corporate tax status and financial distress costs associated with debt ratios and a mechanical association between profitability and debt ratios. In this section we examine the underpinnings of the tradeoff theory focusing solely on corporate financing choices instead of the outcome of these choices, i.e., debt ratios. First, we examine how the factors related to the tradeoff theory impact the choice between debt issues versus equity issues.

We use a logit model of the following form:

$$P_{i,t}(DISS_{i,t} = 1) = \frac{1}{1 + exp(-\alpha + \boldsymbol{\beta}' \mathbf{x}_{i,t-1})} \tag{2}$$

where P stands for the probability of debt being issued, $DISS_{i,t}$ is an indicator that takes the value of 1 if the net amount of debt issued by company i in fiscal year t is greater than 5% of its total assets and 0 if the net amount of equity issued exceeds 5% of its total assets, $\mathbf{x}_{i,t-1}$) is a vector of explanatory variables known at the end of the previous year, i.e, MTRAF, PROBFD, SIZE, TANG, PROF, and MTB. Years in which either the net debt issued or the net equity issued is lower than 5% of its assets are excluded. Also, years in which both debt and equity are issued in a given fiscal year are omitted.

Panel A of table 5 presents the estimated coefficients of the firm-specific factors derived from the logit model described in (2). In contrast to tables 3 and 4, we show that there is a positive association between the marginal tax rate after-financing (MTRAF) and the probability of a firm to issue debt whereas there is a negative relationship between the probability of financial distress (PROBFD) and the probability of debt issuance. There is also a positive effect of profitability (PROF) on the probability of debt issuance. In line with the evidence on factors associated with debt ratios, we provide evidence that larger firms are more likely to issue debt rather than equity and firms with higher growth opportunities (MTB) are less likely to issue debt. However, we find that there is no effect of tangibility (TANG) on the likelihood of a firm to issue debt. We report the marginal effects of the factors on the probability of

debt issuance in Panel B of Table 5 . We observe that the marginal effect of PROBFD on a firm's probability of debt issuance is the highest in magnitude (-3.76) . The marginal effects for PROF and MTRAF document that PROF and MTRAF increase the probability of debt issuance by 0.35 and 0.21, respectively. MTB and SIZE exhibit the lowest marginal effect on the probability of debt issuance (-0.06 and 0.03, respectively). TANG has no marginal effect on firm's likelihood to issue debt.

Taken together we properly address the endogenous effect of corporate tax rates and financial distress costs and the mechanical relationship between profitability and debt ratios focusing on debt issue versus equity issues instead of debt ratios. Examining the choice between debt and equity issues, we provide evidence that firms with higher corporate tax rates and higher profits are more likely to prefer debt issues to equity issues because of the tax advantage to debt. On the other hand, firms with higher probability of financial distress are likely to issue equity as they avoid issuing debt due to high financial distress costs they will incur in the event of financial distress. In line with the results of Tables 3 and 4, the remaining variables, except the tangibility of firm's assets, retain the correct sign. We find that tangibility of assets is not related to a firm's debt-equity issue choice.

5.2 Equity Repurchases versus Debt Retirements

A firm's capital structure can change not only because of the choice between debt issues and equity issues but also when firms opt between equity repurchases and debt reductions. We investigate how firm-specific factors are associated with the probability of equity repurchase versus the probability of debt reduction. Similar to the issuance decision in the previous section we use a logit model of the following form:

$$P_{i,t}(EQREP_{i,t} = 1) = \frac{1}{1 + exp(-\alpha + \boldsymbol{\beta}'\mathbf{x}_{i,t-1})} \tag{3}$$

where P stands for the probability of equity being repurchased, $EQREP_{i,t}$ is an indicator that takes the value of 1 if the net amount of equity repurchased by company i in fiscal year t is greater than 5% of its total assets and 0 if the net amount of debt retired exceeds 5% of its total assets, $\mathbf{x}_{i,t-1}$) is a vector of explanatory variables known at the end of the previous year, i.e, MTRAF, PROBFD, SIZE, TANG, PROF, and MTB. Years in which either the net

equity repurchased or the net debt retired is lower than 5% of its assets are excluded. Also, years in which both equity and debt are repurchased in a given fiscal year are omitted.

Panel A of Table 6 presents the results derived from the logit regression of equity repurchase versus debt reduction. We show that the effect of marginal tax rates after-financing (MTRAF) on the probability of equity repurchase is positive and the impact of the probability of financial distress (PROBFD) on the probability of a firm to repurchase equity is negative. Also, more profitable firms are more likely to repurchase equity rather than reduce debt. Larger firms and firms with more growth opportunities prefer to repurchase equity instead of retiring debt. We document that there is no effect of tangibility of assets on the choice between equity repurchase and debt retirement. We present the marginal effects for MTRAF, PROBFD, SIZE, TANG, PROF and MTB on the probability of equity repurchase versus debt reduction in panel B of Table 6, which is consistent with the estimated coefficients of the logit model . We provide evidence that the marginal effect of PROBFD on the probability of equity repurchase is the strongest (-11.19). PROF and SIZE increase the probability of equity repurchase by 0.23 and 0.21, respectively. The marginal effect for MTB (0.04) and SIZE (0.01) are the lowest among the independent variables. Finally, there is no marginal effect of TANG on debt-equity repurchase decision.

The results of the choice between equity repurchases and debt reductions suggests the following. First, firms with higher corporate tax rates and more taxable income will choose to repurchase equity rather than reduce debt because should they reduce debt they will lose the tax benefit of debt. Second, firms with greater probability of financial distress are more likely to reduce their debt rather than repurchase equity as the latter would increase debt. Third, size and growth opportunities are more likely to repurchase equity to avoid passing up the tax advantage to debt. The tax benefits of debt are expected to be larger when firms choose between equity repurchase and debt retirement because they have financing surplus ruling out the possibility of being tax-exhausted. This lends support to the result of MacKie-Mason (1990) that investment tax credits reduce the probability of a debt issue only when firms are close to tax exhaustion. Comparing Table 5 with Table 6 we observe that debt versus equity issue choice and debt versus equity repurchase choice are driven by the same factors. However, we notice that the magnitude of the coefficients of MTRAF and PROBFD are stronger in

the repurchase (1.50 and -78.22, respectively) rather than the issuance decisions (0.99 and -17.40, respectively).

5.3 Robustness tests

This section performs three robustness checks. We first repeat the tests presented in Tables 5 and 6 using an alternative definition of debt and equity issues (repurchases). We calculate debt and equity issues based on cash flow data instead of balance sheet data. We measure debt issues as long-term debt issuance minus long-term debt reduction and equity issues as the sale of common and preferred stock. Table 7 presents the results of logit regressions of the debt-equity choice. In line with Table 5, we show that MTRAF, SIZE and PROF have a positive effect on the probability of debt issuance whereas PROBFD and MTB have a negative effect on the probability of debt issuance. We notice that tangibility of assets is vulnerable to the measure of equity and debt issues. Unlike Table 5 we document that TANG affects debt-equity issue decision. In particular, there is a positive association between TANG and the probability of debt issuance when cash flow data is used to calculate debt and equity issues. The result from the choice between equity repurchases and debt reductions reveals that the estimated coefficients of MTRAF, PROBFD, PROF and MTB are qualitatively the same as in Table 6. While Table 6 suggests that TANG is not related to the choice between debt and equity repurchase, Table 7 shows that firms with more tangible assets are more likely to reduce debt rather than repurchase equity. A possible explanation could be that firms would like to reduce debt so as not to lose the tangible assets, which were used to issue debt in the past. Also, when we use cash flow data, SIZE has no effect on the probability of equity repurchase.

The second issue is to check whether the results remain robust when we alter the 5% cutoff criterion to identify debt-equity choices. Table 8 presents the results from logit regressions of debt-equity issues and debt-equity repurchases using 1% and 10% cutoff points. Looking at debt versus equity issues we observe that the coefficients of MTRAF, PROBFD, SIZE, PROF and MTB retain the same sign as in Table 5. However, we show that the magnitudes of the coefficients of MTRAF and PROBFD vary considerably across the cutoff points. In particular, the magnitude of MTRAF increases from 0.51 to 1.09 when we use the 10% instead of the 1%

cutoff. The magnitude of PROBFD decreases from -21.27 to -9.83 when we move from 1% to 10% cutoff. We also notice that the tangibility of assets is sensitive to the cutoff points. When we use 1% cutoff TANG is negatively related to the probability of debt issuance whereas TANG is positively related to the probability of debt issuance when we use the 10% cutoff. Therefore, firms with a higher proportion of fixed assets are more likely to issue debt only when the amount of debt issued exceeds 10%. With respect to equity repurchase versus debt reduction choice we show that MTRAF, PROBFD, SIZE, PROF and MTB enter significantly with the expected signs, consistent with Table 6. As we move from 1% to 10% cutoff point, the magnitude of MTRAF increases (from 0.78 to 1.76) whereas the magnitude of PROBFD decreases (from -70.90 to -64.05). TANG is positively related to the probability of equity repurchase when we use as a cutoff to define debt and equity repurchases 1%. However, as with cutoff 5%, TANG is not associated with the probability of equity repurchase when the cutoff is 10%.

6 Conclusion

The last several decades have produced a wealth of information about how firms make financing decisions . However, most of the evidence derives from the investigation of the effect of firm-specific factors on debt ratios. In this paper we point out that debt ratios can be misleading in identifying how specific factors can be associated with firms' debt-equity choices. We show that corporate tax status and the probability of financial distress are endogenously related to debt ratios, which leads to erroneous inferences on the impact of these two factors on debt ratios. In particular, we find that corporate tax rates are negatively related to debt ratios whereas the probability of financial distress is positively related to debt ratios. These findings are counter-intuitive to the theoretical underpinnings of capital structure. We provide evidence that profitability is negatively related to debt ratios, which is also widely documented result in the literature. We argue that this finding is due to the mechanical relationship between profitability and debt ratios. The logic behind this is as follows; debt ratios include in their denominator the firm's retained earnings, which is a component of equity. Therefore, if profitability increases, the equity increases and as a result leverage ratio decreases. The coefficient estimates of size, tangibility of assets and growth opportunities are

the same as documented in the previous studies.

We turn to debt-equity choices to address properly the impact of firm-specific factors on corporate financing decisions. In contrast to debt ratios, the focus on debt-equity choice allows us to distinguish between corporate financing policies. We first investigate the extent to which corporate tax status, probability of financial distress, profitability, firm size, tangibility of assets and growth opportunities affect the choice between debt issues and equity issues. Unlike the evidence based on debt ratios, we find that marginal corporate tax rates are positively associated to the probability of debt issuance whereas the probability of financial distress is negatively related to the probability of debt issuance. We also provide evidence that more profitable firms are more likely to issue debt instead of issuing equity. Similar to the debt ratio regressions, size is positively related to the probability of debt issuance and growth opportunities are negatively related to the probability of debt issuance. However, tangibility of assets is not related to firm's likelihood of debt issuance. We then investigate whether and to what extent these variables can explain the choice between equity repurchase and debt reduction. This is of major importance as a firm's capital structure can change not only because of corporate issuance decisions but also because of corporate repurchasing decisions. We show that firms with higher marginal corporate tax rates, large firms and more profitable firms are more likely to repurchase their equity so as not to lose the tax benefits of debt. Firms with higher probability of financial distress are more likely to reduce debt than repurchase equity. Growth opportunities have a negative effect on the probability of debt reduction as they are not close to tax exhaustion, which enables them to reap the tax advantage to debt. We perform three additional tests to check the robustness of our results. We use cash flow data instead of balance sheet data to define security issues and repurchases. We find that the signs of the variables remain the same except that of tangibility of assets. We document that tangibility is positively related to the probability of debt issuance and negatively related to the probability of equity repurchase. The inference on the effect of variables is qualitatively the same when we use alternative cutoff points to identify security issues and repurchases. Tangibility of assets is the only factor that is sensitive to the change of cutoff points.

In sum, looking at debt-equity choices enables us to investigate effectively what drives corporate financing decisions. We conclude that debt versus equity issue choice is driven by

the same factors as equity-debt repurchase choice. This could hardy been evidenced by the debt ratios. This is because debt ratios is the cumulative outcome of financing choices failing to elaborate what corporate financing policy a firm follows.

References

Altman, E., 1968, Financial ratios, discriminant analysis and the prediction of corporate bankruptcy, *Journal of Finance* 23, 589–609.

Antoniou, A., Y.Guney, and K.Paudyal, 2008, The determinants of capital structure: Capital market oriented versus bank oriented institutions, *Journal of Financial and Quantitative Analysis* 47, 59–92.

Booth, L. V. Aivazian, A. Demirguc-Kunt, and V. Maksimovic, 2001, Capital structures in developing countries, *Journal of Finance* 56, 87–130.

Byoun, S., 2008, How and when do firms adjust their capital structures toward targets?, *Journal of Finance* 63, 3069–3096.

Chang, X., and S.Dasgupta, 2009, Target behavior and financing: How conclusive is the evidence?, *Journal of Finance* 64, 1767–1796.

Charalambakis, E.C., S.K. Espenlaub, and I. Garrett, 2008, Leverage dynamics, the endogeneity of corporate tax status and financial distress costs, and capital structure, working paper.

Chen, L.and X.Zhao, 2007, Mechanical mean reversion of leverage ratios, *Economics Letters* 95, 223–229.

Fama, E.F., and K.R. French, 2002, Testing trade-off and pecking order predictions about dividends and debt, *Review of Financial Studies* 15, 1–33.

Fischer, E.O., R. Heinkel, and J. Zechner, 1989, Dynamic capital structure choice: theory and tests, *Journal of Finance* 44, 19–40.

Flannery, M.J., and K.P. Rangan, 2006, Partial adjustment toward capital structures, *Journal of Financial Economics* 79, 469–506.

Frank, M.Z., and V.K. Goyal, 2009, Capital structure decisions: which factors are reliably important?, *Financial Management* 38, 1–37.

Graham, J.R., 1996a, Debt and the marginal tax rate, *Journal of Financial Economics* 41, 41–73.

——— , 1996b, Proxies for the marginal tax rate, *Journal of Financial Economics* 42, 187–221.

——— , 2003, Taxes and corporate finance: A review, *Review of Financial Studies* 16, 1075–1129.

Graham, J.R, M. Lemmon, and J. Schallheim, 1998, Debt,leases and the endogeneity of corporate tax status, *Journal of Finance* 53, 131–162.

Hovakimian, A., 2004, The role of target leverage in security issues and repurchases, *Journal of Business* 77, 1041–1071.

Hovakimian, A., G.Hovakimian, and H.Techranian, 2004, Determinants of target capital structure: The case of combined debt and equity financing, *Journal of Financial Economics* 71, 517–540.

Hovakimian, A., T. Opler, and S. Titman, 2001, The debt-equity choice, *Journal of Financial and Quantitative Analysis* 36, 1–24.

Huang, R., and J.R.Ritter, 2009, Testing theories of capital structure and estimating the speed of adjustment, *Journal of Financial and Quantitative Analysis* 44, 237–271.

Kayhan, A., and S. Titman, 2007, Firms' histories and their capital structures, *Journal of Financial Economics* 83, 1–32.

Leary, M.T., and M.R. Roberts, 2005, Do firms rebalance their capital structures?, *Journal of Finance* 60, 2575–2619.

MacKie-Mason, J.K, 1990, Do taxes affect corporate financing decisions?, *Journal of Finance* 45, 1471–1491.

Marsh, P., 1982, The choice between equity and debt: an empirical study, *Journal of Finance* 37, 121–144.

Myers, S.C., 1977, Determinants of corporate borrowing, *Journal of Financial Economics* 5, 147–175.

Myers, S., 1993, Still searching for optimal capital structure, *Journal of Applied Corporate Finance* 6, 4–14.

Rajan, R.G., and L. Zingales, 1995, What do we know about capital structure? some evidence from international data, *Journal of Finance* 50, 1421–1460.

Shumway, T., 2001, Forecasting bankruptcy more accurately: A simple hazard model, *Journal of Business* 74, 101–124.

Strebulaev, I.A., 2007, Do tests of capital structure theory mean what they say?, *Journal of Finance* 62, 1747–1787.

Table 1

Distribution of security issues and repurchases by year

This table shows the distribution of debt issues, equity issues, equity repurchases and debt reductions by year. A net debt (equity) issue occurs if a firms net debt (equity) issue scaled by total assets exceeds 5%. A net equity repurchase occurs if a firms net equity repurchase scaled by total assets is greater than 5%. A net debt retirement occurs if a firms net debt retirement scaled by total assets is greater than 5%. Years in which both debt and equity is issued or repurchased in a given fiscal year are omitted. Years in which the net amount of debt or equity issued (repurchased) is not above 5% are also excluded.

Year	Debt issues	Equity issues	Equity repurchases	Debt reductions
1980	317	90	11	91
1981	431	148	17	189
1982	414	125	39	237
1983	426	255	27	242
1984	597	144	65	189
1985	507	189	50	263
1986	493	215	59	286
1987	538	193	71	265
1988	627	140	75	254
1989	600	183	73	293
1990	533	168	83	358
1991	380	236	58	407
1992	414	247	55	328
1993	507	265	51	263
1994	563	203	52	182
1995	523	184	50	162
1996	546	331	72	240
1997	662	320	88	267
1998	754	288	131	242
1999	656	327	144	277
2000	479	342	111	323
2001	292	331	66	403
2002	241	251	69	342
2003	261	287	52	259
2004	294	270	67	177
2005	265	196	79	115
2006	146	127	55	67
Total	12,468	6,055	1,770	6,721

Table 2

Summary Statistics

This table presents descriptive statistics for the variables used in this study. The initial sample consists of 9,596 firms with 74,734 observations from 1980–2006. The variables are winsorized at the 0.5% fractile in either tail of distribution, apart from market leverage, size and the probability of financial distress. Book debt ratio (BDR) is book value of debt divided by book value of debt plus book value of stockholders' equity. Market debt ratio (MDR) is book value of debt divided by book value of debt plus market value of equity. MTRAF is the simulated marginal corporate tax rate after interest expense developed by Graham (1996). PROBFD is the estimated probability of financial distress. PROF is earnings before tax,interest, depreciation and amortization divided by total assets. MTB is the market value of assets divided by the book value of assets. NDEBT_TA is the net amount of debt issued scaled by total assets whereas NEQ_TA is the net amount of equity issued scaled by total assets.NDEBT_TA is the net amount of debt issued scaled by total assets whereas NEQREP_TA is the net amount of equity repurchased scaled by total assets. NDRET_TA is the net amount of debt retired scaled by total assets.

Variable	N	Mean	Median	Std.dev	Min	Max
BDR	74,734	0.34	0.30	0.32	-0.00	2.26
MDR	74,734	0.26	0.19	0.24	0.00	1.00
MTRAF	74,734	0.20	0.27	0.18	0.00	0.51
PROBFD	74,734	0.00	-0.00	0.01	0.00	0.23
SIZE	74,734	4.94	4.98	2.24	-7.02	12.62
TANG	74,734	0.31	0.26	0.22	0.00	0.92
PROF	74,734	-0.03	0.03	0.25	-2.17	0.28
MTB	74,734	1.86	1.34	1.68	0.50	15.02
NDEBT_TA	12,468	0.16	0.12	0.12	0.05	0.80
NEQ_TA	6,055	0.30	0.18	0.30	0.05	1.49
NEQREP_TA	1,770	-0.14	-0.10	0.09	-0.37	-0.05
NDRET_TA	6,721	-0.21	-0.12	0.23	-1.24	-0.05

Table 3

Book Debt Ratio Regressions

This table contains results from a regression of debt ratio on predetermined firm-specific factors. The dependent variable is book debt ratio which is book value of debt divided by book value of debt plus book value of stockholders' equity. The sample consists of 66,232 firm-year observations from 1980–2006. MTRAF is the simulated marginal corporate tax rate after interest expense developed by Graham (1996). PROBFD is the estimated probability of financial distress. PROF is earnings before tax,interest, depreciation and amortization divided by total assets. MTB is the market value of assets divided by the book value of assets. The regression is estimated using a Tobit model censoring at zero at the lower end and one at the upper end with robust standard errors a Fixed effects(FE) model and a model that accounts for cross-sectional and time-series dependence . The estimated model 1 is: $BDR_{it} = \alpha + \beta_1 MTRAF_{i,t-1} + \beta_2 PROBFD_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 TANG_{i,t-1} + \beta_5 PROF_{i,t-1} + \beta_6 MTB_{i,t-1} + \epsilon_{it}$. ***,** and * denote significance at the 1, 5 and 10 percent level respectively.

Dependent Variable=Book Debt Ratio			
	Censored Tobit	Fixed-Effects	Clustered standard errors
Constant	0.0600 ***	0.1946***	0.0901***
	(16.28)	(23.24)	(3.56)
MTRAF	-0.2651***	0.1466***	-0.2664***
	(-39.63)	(-22.17)	(-13.18)
PROBFD	13.6037***	3.3829	14.6499
	(176.59)	(16.60)	(7.62)
SIZE	0.0433***	0.0253***	0.0412***
	(77.96)	(17.68)	(14.26)
TANG	0.2764***	0.1473***	0.2411***
	(56.16)	(13.73)	(13.59)
PROF	-0.1720***	-0.2006***	-0.2130***
	(-28.30)	(-32.67)	(-7.68)
MTB	-0.0263***	-0.0053***	-0.0179***
	(-38.01)	(-7.10)	(-7.99)
Number of observations	66,232	66,232	66,232

Table 4

Market Debt Ratio Regressions

This table contains results from a regression of debt ratio on predetermined firm-specific factors. The dependent variable is market debt ratio is book value of debt divided by book value of debt plus market value of equity. The sample consists of 66,232 firm-year observations from 1980–2006. MTRAF is the simulated marginal corporate tax rate after interest expense developed by Graham (1996). PROBFD is the estimated probability of financial distress. PROF is earnings before tax,interest, depreciation and amortization divided by total assets. MTB is the market value of assets divided by the book value of assets. The regression is estimated using a Tobit model censoring at zero at the lower end and one at the upper end with robust standard errors a Fixed effects(FE) model and a model that accounts for cross-sectional and time-series dependence . The estimated model 1 is: $MDR_{it} = \alpha + \beta_1 MTRAF_{i,t-1} + \beta_2 PROBFD_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 TANG_{i,t-1} + \beta_5 PROF_{i,t-1} + \beta_6 MTB_{i,t-1} + \epsilon_{it}$. ***,** and * denote significance at the 1, 5 and 10 percent level respectively.

	Dependent Variable=Market Debt Ratio		
	Censored Tobit	Fixed-Effects	Clustered standard errors
Constant	0.1262***	0.1211***	0.1643***
	(40.01)	(20.96)	(8.62)
MTRAF	-0.2272***	-0.1203***	-0.2166***
	(-39.91)	(-26.39)	(-10.19)
PROBFD	10.7709***	1.7049	9.7747
	(139.35)	(12.13)	(8.64)
SIZE	0.0293***	0.0267***	0.0241***
	(61.89)	(27.11)	(12.85)
TANG	0.2280***	0.1571***	0.1943***
	(54.39)	(21.21)	(11.79)
PROF	-0.0992***	-0.0996***	-0.0765***
	(-19.19)	(-23.50)	(-3.73)
MTB	-0.0533***	-0.0155***	-0.0439***
	(-87.33)	(-30.35)	(-15.27)
Number of observations	66,232	66,232	66,232

Table 5

Logit model of Debt versus Equity Issues

This table reports the results from logit regressions of debt issues on the predetermined factors associated with the predictions of the tradeoff theory. The dependent variable DISS is a dummy variable that equals 1 if the net amount of debt issued scaled by total assets (NDEBT_TA) exceeds 5% and equals 0 if the net amount of equity issued scaled by total assets (NEQ_TA) exceeds 5% . Years in which both debt and equity is issued in a given fiscal year are omitted. Years in which the net amount of debt or equity issued is not above 5% are also excluded. The sample consists of 16,741 firm-year observations from 1980–2006. MTRAF is the simulated marginal corporate tax rate after interest expense developed by Graham (1996). PROBFD is the estimated probability of financial distress. PROF is earnings before tax,interest, depreciation and amortization divided by total assets. MTB is the market value of assets divided by the book value of assets. The estimated logit model is: $P_{i,t}(DISS_{i,t} = 1) = \frac{1}{1+e^{(-\alpha+\beta_1 MTRAF_{i,t-1}+\beta_2 PROBFD_{i,t-1}+\beta_3 SIZE_{i,t-1}+\beta_4 TANG_{i,t-1}+\beta_5 PROF_{i,t-1}+\beta_6 MTB_{i,t-1})}}$. Wald-Chi Square statistic is reported in parentheses. Panel B reports the marginal effects for each independent variable . ***,** and * denote significance at the 1, 5 and 10 percent level respectively.

Panel A: Debt versus Equity Issues	
Constant	0.6215 ***
	(73.50)
MTRAF	0.9893***
	(70.94)
PROBFD	-17.3975***
	(20.15)
SIZE	0.1264***
	(157.40)
TANG	0.1187
	(2.14)
PROF	1.6150***
	(212.44)
MTB	-0.2726***
	(498.10)
Number of observations	16,741
DISS=1	11,337
DISS=0	5,404
Wald statistic	1869.68***
Panel B: Marginal Effects for the independent variables	
MTRAF	0.2136***
PROBFD	-3.7593***
SIZE	0.0273***
TANG	0.0256
PROF	0.3487***
MTB	-0.0589***

Table 6

Logit model of Equity Repurchases versus Debt Retirements

This table reports the results from logit regressions of equity repurchases on the predetermined factors associated with the predictions of the tradeoff theory. The dependent variable EQREP is a dummy variable that equals 1 if the net amount of equity repurchased scaled by total assets (NEQREP_TA) exceeds 5% and equals 0 if the net amount of debt retired scaled by total assets (NDRET_TA) exceeds 5% . Years in which both equity is repurchased and debt is retired in a given fiscal year are omitted. Years in which the net amount of equity repurchased or debt retired is not above 5% are also excluded. The sample consists of 7,931 firm-year observations from 1980–2006. MTRAF is the simulated marginal corporate tax rate after interest expense developed by Graham (1996). PROBFD is the estimated probability of financial distress. PROF is earnings before tax,interest, depreciation and amortization divided by total assets. MTB is the market value of assets divided by the book value of assets. The estimated logit model is: $P_{i,t}(EQREP_{i,t} = 1) = \frac{1}{1+e^{(-\alpha+\beta_1 MTRAF_{i,t-1}+\beta_2 PROBFD_{i,t-1}+\beta_3 SIZE_{i,t-1}+\beta_4 TANG_{i,t-1}+\beta_5 PROF_{i,t-1}+\beta_6 MTB_{i,t-1})}}$. Wald-Chi Square statistic is reported in parentheses. Panel B reports the marginal effects for each independent variable . ***,** and * denote significance at the 1, 5 and 10 percent level respectively.

Panel A: Equity Repurchases versus Debt Retirements	
Constant	-2.0505 ***
	(249.90)
MTRAF	1.4953***
	(62.17)
PROBFD	-78.2236***
	(67.06)
SIZE	0.0839***
	(26.05)
TANG	-0.0681
	(0.23)
PROF	1.5916***
	(70.11)
MTB	0.2704***
	(194.86)
Number of observations	7,931
EQREP=1	1,677
EQREP=0	6,254
Wald statistic	703.86***
Panel B: Marginal Effects for the independent variables	
MTRAF	0.2138***
PROBFD	-11.1851***
SIZE	0.0120***
TANG	-0.0097
PROF	0.2276***
MTB	0.0387***

Table 7

Logit model of Debt-Equity Choice with cash flow data

This table reports the results from logit regressions of debt-equity choice.For debt versus equity issues the dependent variable DISS is a dummy variable that equals 1 if the net amount of debt issued scaled by total assets (NDEBT_TA) exceeds 5% and equals 0 if the net amount of equity issued scaled by total assets (NEQ_TA) exceeds 5% . For debt versus equity repurchase the dependent variable EQREP is a dummy variable that equals 1 if the net amount of equity repurchased scaled by total assets (NEQREP_TA) exceeds 5% and equals 0 if the net amount of debt retired scaled by total assets (NDRET_TA) exceeds 5% . Years in which both debt and equity is issued (repurchased) in a given fiscal year are omitted. Years in which the net amount of debt or equity issued (repurchased) is not above 5% are also excluded. The sample of debt and equity issues consists of 7,519 firm-year observations and the debt-equity repurchase sample includes 4,758 firm-year observations from 1980–2006 . MTRAF is the simulated marginal corporate tax rate after interest expense developed by Graham (1996). PROBFD is the estimated probability of financial distress. PROF is earnings before tax,interest, depreciation and amortization divided by total assets. MTB is the market value of assets divided by the book value of assets. The estimated logit model is: $P_{i,t} = \frac{1}{1+e^{(-\alpha+\beta_1 MTRAF_{i,t-1}+\beta_2 PROBFD_{i,t-1}+\beta_3 SIZE_{i,t-1}+\beta_4 TANG_{i,t-1}+\beta_5 PROF_{i,t-1}+\beta_6 MTB_{i,t-1})}}$. Wald-Chi Square statistic is reported in parentheses. Panel B reports the marginal effects for each independent variable . ***,** and * denote significance at the 1, 5 and 10 percent level respectively.

Panel A: Debt versus Equity Choice

	Debt versus Equity issue	Equity repurchase versus Debt reduction
Constant	-0.1821	-0.0779
	(2.49)	(0.10)
MTRAF	1.4333***	1.2757***
	(67.73)	(22.02)
PROBFD	-14.0590**	-435.5***
	(6.59)	(211.77)
SIZE	0.1792***	-0.0195
	(120.31)	(0.53)
TANG	0.9202***	-1.4250***
	(66.57)	(52.71)
PROF	1.4691***	7.8529***
	(82.98)	(148.38)
MTB	-0.2878***	0.3557***
	(219.83)	(66.38)
Number of observations	7,519	4,758
DISS=1	4,319	
DISS=0	3,200	
EQREP=1		1,566
EQREP=0		3,192
Wald statistic	1279.43***	982.19***

Panel B: Marginal Effects for the independent variables

	Debt versus Equity issue	Equity repurchase versus Debt reduction
MTRAF	0.3550***	0.1430***
PROBFD	-3.4822***	-48.32 ***
SIZE	0.0444***	-0.0022
TANG	0.2279***	-0.1597***
PROF	0.3639***	0.8802***
MTB	-0.0713***	0.0399***

Table 8

Logit model of Debt-Equity Choice with alternative cutoff

This table reports the results from logit regressions of debt-equity choice using cutoff 1% and 10%. For debt versus equity issues the dependent variable DISS is a dummy variable that equals 1 if the net amount of debt issued scaled by total assets (NDEBT_TA) exceeds 1% (10%) and equals 0 if the net amount of equity issued scaled by total assets (NEQ_TA) exceeds 1% (10%) . For debt versus equity repurchase the dependent variable EQREP is a dummy variable that equals 1 if the net amount of equity repurchased scaled by total assets (NEQREP_TA) exceeds 1% (10%) and equals 0 if the net amount of debt retired scaled by total assets (NDRET_TA) exceeds 1% (10%) . Years in which both debt and equity is issued (repurchased) in a given fiscal year are omitted. Years in which the net amount of debt or equity issued (repurchased) is not above 5% are also excluded. MTRAF is the simulated marginal corporate tax rate after interest expense developed by Graham (1996). PROBFD is the estimated probability of financial distress. PROF is earnings before tax,interest, depreciation and amortization divided by total assets. MTB is the market value of assets divided by the book value of assets. The estimated logit model is: $P_{i,t} = \frac{1}{1+e^{(-\alpha+\beta_1 MTRAF_{i,t-1}+\beta_2 PROBFD_{i,t-1}+\beta_3 SIZE_{i,t-1}+\beta_4 TANG_{i,t-1}+\beta_5 PROF_{i,t-1}+\beta_6 MTB_{i,t-1})}}$. Wald-Chi Square statistic is reported in parentheses. ***,** and * denote significance at the 1, 5 and 10 percent level respectively.

	Debt versus Equity issue		Equity versus Debt repurchase	
Cutoff	> 1%	> 10%	> 1%	> 10%
Constant	0.6363***	0.3493***	-1.5233***	-2.0788***
	(109.32)	(16.01)	(337.69)	(122.10)
MTRAF	0.5129***	1.0870***	0.7788***	1.7623***
	(29.39)	(55.30)	(46.13)	(33.54)
PROBFD	-21.2687***	-9.8278**	-70.9006***	-64.0468***
	(33.90)	(5.18)	(121.22)	(32.33)
SIZE	0.0648***	0.1307***	0.1035***	0.0554**
	(69.94)	(105.38)	(109.37)	(4.39)
TANG	-0.3103 ***	0.1842*	0.1565*	0.1930
	(22.24)	(3.58)	(3.62)	(0.78)
PROF	1.9004***	1.3617***	1.9258 ***	1.0056 ***
	(289.64)	(137.12)	(153.72)	(21.92)
MTB	-0.2212***	-0.2609***	0.1336***	0.2457 ***
	(310.91)	(364.14)	(88.09)	(95.17)
Number of observations	22,240	10,202	16,883	3,490
DISS=1	13,845	5,992		
DISS=0	8,395	4,210		
EQREP=1			5,121	632
EQREP=0			11,762	2,858
Wald statistic	1310.08***	1410.12***	1205.77***	271.80***

Appendix A

Table A1

Definition of Variables

This appendix defines the variables used in the study. All numbers in parentheses refer to the Compustat code of each accounting item.

Variable Name	Variable definition
Total Debt	Debt in Current Liabilities (34) + Long–term Debt (9)
Book Leverage	$\frac{\text{Total Debt}}{\text{Total Debt} + \text{Stockholders' Equity (216)}}$
Total debt	Debt in current liabilities (34) + Long–term debt (9)
Book Leverage	$\frac{\text{Total debt}}{\text{Total debt} + \text{Stockholders' equity (216)}}$
Market value of equity	Stock Price (199) $*$ Shares outstanding (54)
Market Leverage	$\frac{\text{Total debt}}{\text{Total debt} + \text{Market value of equity (mcap)}}$
NEQ	Change in book equity − Change in retained earnings
NDEBT	change in book value of assets − change in retained earnings − NETEQ
NDEBT_TA	$\frac{\text{NDEBT}}{\text{Total assets (6)}}$
NEQ_TA	$\frac{\text{NETEQ}}{\text{Total assets}}$
NEQREP	net amount of equity repurchases
NDRET	net amount of debt retirements
DISS	takes a value of 1 if NDEBT_TA > 5% and 0 if NETEQ_TA > 5%
EQREP	takes a value of 1 if NEQREP_TA > 5% and 0 if NDRET_TA > 5%
MTRAF	Marginal tax rates after-financing obtained from John Graham.
PROBFD	Estimated probability of financial distress from a hazard model
Working Capital	Current assets(4) − Current liabilities(5)
Z-Score	$3.3\frac{\text{EBIT}}{\text{Total Assets}} + 1.0\frac{\text{Sales(12)}}{\text{Total Assets}} + 1.4\frac{\text{Ret.Earnings(36)}}{\text{Total Assets}} + 1.2\frac{\text{Working Capital}}{\text{Total Assets}}$
Size	Natural logarithm of Sales, where net sales are deflated by the GDP deflator
Tangibility	$\frac{\text{Property, plant and equipment (8)}}{\text{Book value of assets (6)}}$
Profitability	$\frac{\text{Operating income before depreciation (13)}}{\text{Book value of assets}}$
Market to book	$\frac{\text{Book value of assets} - \text{Common equity (60)} + \text{Market value of equity}}{\text{Book value of assets}}$