JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS VOL. 36, NO. 1, MARCH 2001

The Debt-Equity Choice

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Abstract

When firms adjust their capital structures, they tend to move toward a target debt ratio that is consistent with theories based on tradeoffs between the costs and benefits of debt. In contrast to previous empirical work, our tests explicitly account for the fact that firms may face impediments to movements toward their target ratio, and that the target ratio may change over time as the firm's profitability and stock price change. A separate analysis of the size of the issue and repurchase transactions suggests that the deviation between the actual and the target ratios plays a more important role in the repurchase decision than in the issuance decision.

I. Introduction

Traditional corporate finance models suggest that firms select optimal capital structures by trading off various tax and incentive benefits of debt financing against financial distress costs. While there is support for these tradeoff models in the empirical literature, recent evidence suggests that a firm's history may play a more important role in determining its capital structure. For example, highly profitable firms often use their earnings to pay down debt and, as a result, are usually less levered than their less profitable counterparts (see, for example, Titman and Wessels (1988)). In addition, firms tend to issue equity following an increase in stock prices, (see, for example, Masulis and Korwar (1986) and Asquith and Mullins (1986)), implying that firms that perform well subsequently reduce their leverage.

A number of authors have noted that the negative correlation between profits and leverage is consistent with Donaldson's (1961) "pecking order" description of how firms make their financing decisions. Donaldson observes that managers prefer to fund new investment with retained earnings rather than debt, but prefer debt to equity financing. According to this description, firms passively accumulate retained earnings, becoming less levered when they are profitable, and accumulate

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debt, becoming more levered when they are unprofitable. If firms are otherwise indifferent about their capital structures, as suggested by Miller (1977), then they will not make future capital structure choices that offset the effect of their earnings history. Shyam-Sunder and Myers (1999) argue that this pecking order story provides a better empirical description of capital structures than do traditional tradeoff models.

Dynamic models of capital structure, such as Fischer, Heinkel, and Zechner (1989) and Leland (1994), (1998), introduce transaction costs that generate short-run pecking order behavior. However, these models also suggest that firms will periodically readjust their capital structures toward a target ratio that reflects the costs and benefits of debt financing found in the static tradeoff models. In particular, the models suggest that firms repurchase equity after their share prices increase to adjust toward an optimal capital structure. However, this characterization is inconsistent with the observation that firms tend to issue equity following stock price increases.

This paper tests the hypothesis that firms tend to move toward a target debt ratio when they either raise new capital or retire or repurchase existing capital. However, in contrast to previous empirical work as well as the above-mentioned dynamic models, our tests explicitly account for the fact that firms may change over time, causing their target ratios to change. Following Myers (1977) and Myers and Majluf (1984), we recognize that firms consist of both assets in place and growth opportunities and argue that target ratios are likely to be determined as a function of the changing relative weights of these two components of value. In particular, firms should use relatively more debt to finance assets in place and relatively more equity to finance growth opportunities.[1] As a result, firms may choose to issue equity rather than debt in response to an increase in their value, if the change in value is generated by an increase in the perceived value of their growth opportunities.

We assume that, when firms make significant changes in their levels of debt or equity capital, their managers tend to make a fairly thorough analysis of the various tradeoffs involved in their capital structure choices. This suggests that, absent information or agency considerations, the financing choice is likely to move the firm toward an optimal or target debt ratio if one in fact exists. Our motivation is thus quite similar to those described in studies by Baxter and Cragg (1970), Marsh (1982), and Mackie-Mason (1990).[2]

However, as we describe below, our estimation procedure allows us to directly test whether firms adjust toward a target debt ratio that reflects the costs and benefits of debt financing proposed in the static tradeoff models. We also

[1]This distinction between the debt capacity of assets in place and growth opportunities is also important in agency settings (see Stulz (1990), Hart and Moore (1995), and Zwiebel (1996)). Moreover, in a signaling framework (see Ross (1977)), managers may be under more pressure to signal that their firm is undervalued when growth opportunities are perceived to be poor, than when they are perceived to be favorable. Jung, Kim, and Stulz (1995) find empirical evidence consistent with the view that the equity issue/share price runup linkage is due to changing investment opportunities. Smith and Watts (1992) present cross-sectional evidence consistent with the view that leveraged firms typically have lower growth opportunities.

[2]Bayless and Chaplinsky (1990) and Jung, Kim, and Stulz (1996) make a similar analysis of the debt vs. equity choice as the first stage of event studies that examine stock price responses to the issuing choices.

examine a larger sample and consider a wider variety of financing instruments, including the firm's choice to repurchase equity or retire debt. Finally, we investigate how various factors affect the amount of capital raised or retired.

To empirically capture the idea that firms make financing choices that move them toward a target debt ratio, we employ a two-stage estimation procedure. In the first stage, we estimate target debt ratios by regressing observed debt ratios on many of the variables used in earlier cross-sectional studies. In the second stage, we use the predicted debt ratio from this first stage regression as a proxy for the firm's target or its long-run optimal debt/assets ratio.[3] The difference between a firm's predicted debt/assets ratio and its actual ratio is then included in the second stage regressions as a predictor of whether the firm issues debt (both straight and convertible) or equity (both common and preferred).

The second stage regressions include additional variables that may also proxy for deviation between the firm's current and target debt ratio. For example, the past cash flows of the firm may be related to this deviation for two reasons. The first is that firms may have used high past cash flows to passively accumulate financial slack or pay down debt, leaving them temporarily under-levered. Second, firms that are more profitable, holding stock returns constant, are likely to have realized improvement in the value of their assets in place relative to their growth opportunities, which would likely increase their optimal debt ratio. Similarly, a firm's past stock return may also be related to the deviation between its current and target debt ratio. In particular, holding cash flows constant, a high stock return may reflect an increase in the perceived value of the growth opportunities and, therefore, may indicate a decline in the firm's target debt ratio.

Our results suggest that, although pecking order considerations affect corporate debt ratios in the short-run, firms tend to make financing choices that move them toward target debt ratios that are consistent with tradeoff models of capital structure choice. For example, our findings confirm that more profitable firms have, on average, lower leverage ratios. But we also find that more profitable firms are more likely to issue debt rather than equity and are more likely to repurchase equity rather than retire debt. Such behavior is consistent with our conjecture that the most profitable firms become under-levered and that firms' financing choices tend to offset these earnings-driven changes in their capital structures. In addition, we find that firms with higher current stock prices (relative to their past stock prices, book values, or earnings) are more likely to issue equity rather than debt and repurchase debt rather than equity. This finding is consistent with the tradeoff models if we assume that firms experience higher stock prices when they realize better growth opportunities. However, the finding is also consistent with agency and information asymmetry models where managers are either reluctant to issue equity at low prices or have an incentive to boost their leverage when the

[3]Previous studies that examine adjustments of capital structure around long-run optima include Auerbach (1985), Marsh (1982), and Jalilvand and Harris (1984). Marsh (1982) predicts the debt-equity choice for U.K. companies and finds that firms that have a debt/assets ratio below the average of the last 10 years are more likely to issue debt. Jalilvand and Harris (1984) show that 108 U.S. manufacturing firms tend to issue long-term debt when levels of long-term debt are below historical levels. Auerbach (1985) predicts change in a firm's debt/assets ratio as a function of the lagged debt/assets ratio and then solves for the implied optimal debt ratio and concludes that firms adjust leverage toward optimum targets.

stock prices are low. On balance, we find that variables that proxy for the deviation between a firm's debt ratio and its target ratio tend to be more important in regressions explaining the repurchase choice while stock price variables tend to be more important in regressions explaining the issuance choice.

The next section describes our empirical approach. Section III discusses the determinants of the target leverage ratio and provides estimates of our first stage regression model. Section IV discusses explanatory variables included in the second stage regressions. Section V provides our univariate results. We present multivariate debt-equity choice results in Section VI and security issue size results in Section VII. Section VIII summarizes our findings.

II. Empirical Approach

A. Data

We use firm level data from the 1997 Standard and Poor's Compustat annual files (including the Research file). We require firms to have financial statement and stock price information in the issue year and in the two preceding years. Firms in the financial sector are not included in the sample because their capital structures are likely to be significantly different from the other industrial, natural resources, and services firms in our sample. In total, we have 39,387 firm years covering the 1979–1997 period. Nominal asset values were converted to real asset values in 1979 dollars.

Equity issuances and repurchases are identified from the statement of change in cash flows as reported on Compustat.[4] Debt issuances and reductions are identified by tracking the change in total debt (short-term plus long-term) reported in Compustat. The sample thus includes debt and equity raised from both private and public sources. Our sample contains a total of 11,136 security issues and 7,366 security repurchases defined this way.

Table 1 presents the distribution of observations in our sample by the form of capital raised or retired and by year. The table reveals considerable time-series variation in capital acquisition activity. Most notably, seasoned equity issuances were widespread in "hot market" periods, including 1983 and 1991–1996, but rare in other years. Cross-sectionally, we observe that long-term straight debt issues are the most frequent way of raising capital in our sample, followed by short-term straight debt, common equity, convertible debt, and preferred stock.[5] Firms retired debt more frequently than they repurchased equity.

[4] A firm is defined as issuing (repurchasing) equity when net equity issued (repurchased) for cash divided by the book value of assets exceeded 5% (i.e., equity is issued when (Compustat Annual Item 108–Compustat Item 115) / Compustat Item 6 > 5%). This way of defining equity issues means that some cases will be included in our sample when equity was issued in a call of convertible bond. We have found that our main results hold when using a dataset of new debt and equity issues drawn from the Securities Data Company.

[5] Unfortunately, firms frequently report revolving bank debt and commercial paper, which we would view as short-term debt, as long-term debt when they plan to roll it over. Consequently, our measures of short-term and long-term debt are potentially biased.

TABLE 1

Distribution of Sample Security Issuances by Year

Year	Common Equity Issue	Preferred Issue	Long-Term Debt Issue	Short-Term Debt Issue	Convertible Issue	Equity Repurchase	Debt Reduction
1979	36	9	310	234	12	43	178
1980	71	11	234	172	27	24	247
1981	93	9	238	164	37	34	238
1982	79	9	253	120	22	46	289
1983	223	22	154	133	26	35	350
1984	83	11	239	236	26	92	233
1985	82	15	215	190	47	82	275
1986	114	22	213	195	62	97	315
1987	116	23	225	217	60	115	324
1988	60	17	269	234	19	99	301
1989	86	23	248	215	32	107	297
1990	95	17	206	198	20	87	351
1991	150	26	150	109	25	53	447
1992	158	37	155	123	31	81	367
1993	189	32	184	147	29	69	358
1994	144	25	270	160	27	113	287
1995	167	23	331	178	25	103	287
1996	170	35	334	163	60	148	395
1997	115	24	330	146	36	141	258
Total	2,231	390	4,558	3,334	623	1,569	5797

The sample consists of 11,136 Compustat firm years covering security issuance behavior and 7,400 Compustat firm years covering security repurchase behavior from 1979 to 1997. Firms were defined as issuing (repurchasing) a security when the net amount issued (repurchased) divided by the book value of assets exceeded 5%. For example, a firm was defined as issuing equity when (equity issued−equity retired)/assets > 5%. Cases where firms issued (repurchased) both debt and equity in a given fiscal year are omitted.

B. Estimation Procedure

As we mentioned in the Introduction, our estimation procedure involves two stages that are described by the following equations,

$$\text{Lev}_{it} = W_{it}\alpha + \eta_{it}, \tag{1}$$

$$D^*_{it} = \beta \text{LevDef}_{it-1} + X_{it-1}\gamma + \varepsilon_{it}. \tag{2}$$

In the first stage, the debt/assets (leverage) ratio, Lev, is regressed on a vector of explanatory variables, W, that have been used in past cross-sectional studies of capital structure. Debt/assets is defined as the book value of debt divided by the sum of the book value of debt and the market value of equity.[6] The purpose of this first stage regression is to provide an estimate of each firm's optimal or target leverage ratio, which we define as the debt ratio that firms would choose in the absence of information asymmetries, transaction costs, or other adjustment costs.

The dependent variable in the first stage regression, Lev, is, by definition, censored from both below (by the value of zero) and above (by the value of one). To obtain consistent estimates, we estimate regression (1) as a Tobit regression with double censoring. To account for changes in tax rates, effects of financial innovation, as well as industry effects, the first stage regression is estimated with

[6]We separately ran regressions with debt ratios measured entirely with book values, positing that some managers have book value rather than market value targets. The results in our second stage regressions, using these book value targets, were very similar to the results reported below that use market value targets.

the dependent and the independent variables defined as the differences from three-digit SIC industry means for a given year.[7]

The second stage model is a logit regression that predicts a firm's financing choice in a given year, D_{it}. The key explanatory variable is LevDef, which is equal to the difference between the firm's actual leverage and its estimated targeted leverage, estimated from the first stage. In equation (2), we also include a vector of predetermined control variables, X,[8] that serve as proxies for things that cause a firm to deviate from its target ratio. These explanatory variables will be discussed in Section IV.

If the variables used in the first stage regressions indeed proxy for important determinants of the firms' target capital structures, then we would expect the leverage deficit to have a significant positive (negative) coefficient estimate in the second stage debt-equity issue (repurchase) regressions. However, if the variables used in our first stage regression are poor predictors of target debt ratios or, alternatively, if capital structure choice is irrelevant, then the coefficient of the leverage deficit variable will not differ significantly from zero.[9]

One should note that, since the leverage deficit variable is estimated from the first stage regression, it is measured with error and its coefficient will be biased downward. Pagan ((1984), p. 232), however, shows that the estimate of β is consistent if $E(\eta_{it}\varepsilon_{it}) = 0$.[10] However, the variance-covariance matrix of the coefficient estimates has to be corrected to account for the fact that one of the regressors, leverage deficit, is estimated with error in the first stage. Our correction follows the recommendation in Murphy and Topel (1985).

III. Determinants of the Target Debt Ratio

In this section, we present estimates of our first stage regressions that explain observed debt ratios. Most of the explanatory variables included in these regressions are drawn from the set of variables used in earlier empirical studies of capital structure.[11] However, since our goal here is to obtain a proxy for the target

[7]The second stage results reported in the paper do not change when the first stage (1) is estimated without the industry adjustment.

[8]We are assuming that the choice to raise capital is exogenous, but the type of capital raised is not. We have tried to estimate both decisions simultaneously using a bivariate probit model with selection where the choice of the form of financing is observable only when capital is raised. Unfortunately, our numerical optimization routines did not converge. We can, however, use a Lagrange multiplier test to see whether the coefficients in the bivariate probit model would be reliably different from the values obtained from probit regressions that assume exogenous issuance, i.e., probit versions of logit regressions from Table 5. The tests failed to reject these restrictions at conventional significance levels, suggesting that our estimates are not significantly affected by this endogenous problem.

[9]As Shyam-Sunder and Myers (1999) point out, many of the variables included in the first stage could also proxy for variables that are important to the pecking order theory. If they are correct in this regard, then the difference between the actual and predicted debt ratios should not be a good predictor of future financing choices.

[10]Estimates of β may be inconsistent if $E(\eta_{it}\varepsilon_{it}) \neq 0$. This could happen in a variety of circumstances. For example, an errors-in-variables problem in the first stage model could cause the first stage error to influence the unexplained portion of the issue choice logit. In practice, the standard errors of the first-stage coefficients turn out to be quite small relative to the coefficients. Thus, even with substantial inflation in variance, our primary economic conclusions will be unchanged.

[11]Since we are not really concerned about the coefficient estimates from this cross-sectional regression, our specification ignores the errors in variables and multicollinearity problems described in

debt ratios, we must explicitly characterize the variables as being either proxies for the determinants of a firm's target debt ratio (i.e., elements of the vector W in equation (1)) or as proxies for variables that cause a firm to deviate from its target ratio (i.e., elements of the vector X in equation (2)). Those variables that appear to proxy for the firm's deviation from its target ratio will not be included in the first stage regression. A list of variables, along with their conjectured relation with both the target ratios and the expected deviation between the actual and target debt ratio, are described in Table 2.

TABLE 2

Predicted Effect of Explanatory Variables on Target Leverage and Deviation from Target

	Predicted Effect on	
	Target Leverage	Deviation from Target Leverage
Three-year mean operating income/assets	+	−
Net operating loss carryforwards	−	+
Two-year stock return	−	−
Market-to-book ratio	−	−
R&D expenditures/sales	−	
Selling expenses/sales	−	
Tangible assets ratio	+	
Firm size	+	

Our assignment of variables to the first stage regression is based on our theoretical priors about the relation between the proxy variables and target debt ratios along with an initial regression that includes all of the explanatory variables listed in Table 2. Those proxies with regression estimates that correspond with our theoretical priors about the determinants of a target debt ratio are assigned to the first stage regression. Similarly, those proxies with regression estimates that correspond with our theoretical priors about what causes firms to deviate from their target debt ratio are assigned to the second stage regression.

The estimates from this initial regression are reported in panel A, Table 3. These estimates suggest that R&D expenses/sales (R&D), selling expenses/sales (Exp), firm size (Sz), defined as natural log of total assets, and the proportion of tangible assets (Tng) belong in the first stage regression. In particular, R&D and selling expenses/sales capture, among other things, constructs like future growth opportunities and product uniqueness that might otherwise be captured by the market-to-book ratio. The negative coefficient estimates for these variables in the first stage regression are consistent with the Titman and Wessels (1988) hypothesis that firms with higher R&D and Exp should have lower target leverage ratios. In addition, as indicated in Table 2, we expect the target leverage ratio to be higher for larger firms for two related reasons. Cash flows of larger, more diversified firms are less volatile. Less volatile cash flows increase the probability that the firm will be able to fully use tax shields from interest payments and reduce the probability and, therefore, the expected costs of bankruptcy. We also expect

Titman and Wessels (1988). We also ignore the possibility that our test statistics may be overstated if the errors in the regression are not i.i.d.

firms with higher proportions of tangible assets to have higher target debt ratios because such assets can serve as collateral. The positive coefficient estimates for Sz and Tng in Table 3 confirm this intuition.

TABLE 3

Tobit Regressions Predicting Debt/Assets Ratio

	Panel A		*Panel B*		*Panel C*	
	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
Constant	−0.009**	−8.5	−0.009**	−8.2	−0.009**	−7.8
Three-year mean ROA	−0.469**	−48.3				
NOLC	0.004	1.2				
Two-year stock return	−0.014**	−13.4	−0.018**	−17.5		
Market-to-book ratio	−0.059**	−59.6	−0.066**	−65.7		
R&D expenditures/sales	−0.241**	−15.4	−0.128**	−8.1	−0.273**	−16.1
Selling expenses/sales	−0.096**	−20.4	−0.035**	−7.5	−0.055**	−11.1
Tangible assets ratio	0.213**	37.9	0.184**	31.7	0.195**	31.7
Firm size	0.008**	15.8	0.001	1.2	0.001*	2.5
Log-likelihood	16215**		14874**		12354**	
OLS R^2	0.413		0.374		0.292	
Observations	39,387		39,387		39,387	

The estimates are from a tobit model with censoring at zero at the lower end and one at the upper end. All variables are defined as differences from three-digit SIC industry means for a given year. The dependent variable, debt/assets, equals the (book value of debt)/(book value of debt + market value of equity). ROA is earnings before interest, taxes, depreciation, and amortization divided by the book value of assets. NOLC is the net operating loss carryforwards scaled by the book value of assets. The two-year stock return is defined as the split- and dividend-adjusted percentage return from the beginning of the pre-issue year until close of the issue year. The market-to-book ratio is defined as (market value of equity + book value of debt)/total assets. Tangible assets ratio is the ratio of property, plant, and equipment to the book value of assets. Firm size is the natural log of total assets. OLS R^2 does not measure the goodness-of-fit of a tobit model and is provided as a reference only. Coefficients significantly different from zero at 1% are marked ** while those significant at 5% are marked *.

The coefficient estimates also suggest that two of the explanatory variables, net operating loss carryforwards (NOLC) and past profitability (ROA), proxy for a firm's deviation from its target debt ratio and should thus be included in the second stage regression, rather than the first stage. Our rationale for excluding NOLC from the first stage is quite clear. NOLC should reduce a firm's marginal tax rate and should thus decrease its target debt ratio (see, e.g., Graham (1996)). However, the estimated coefficient is actually positive, which probably reflects the fact that firms that have accumulated losses in the past tend to be over-levered relative to their targets.[12] Hence, it is probably more appropriate to view NOLC as a proxy for the deviation from the target debt ratio rather than as a proxy for the target ratio. As such, NOLC is excluded from the first stage regression and is included directly into the second stage regression.

Past profitability, which we measure as the three-year pre-issue average return on assets (ROA), is likely to be related to both a firm's target capital structure and its deviation from the target.[13] If firms passively accumulate retained earnings, becoming less levered when they are profitable, and accumulate debt, becoming more levered when they are unprofitable as suggested by Donaldson

[12]The insignificance of NOLC is due to its very strong negative correlation with ROA. NOLC is highly significant when ROA is omitted from the first stage model.

[13]Return on assets is defined as EBITDA/Assets (Compustat Variable 13/Compustat Variable 6).

(1961), then the effect of ROA on leverage in the first stage regression should be negative. On the other hand, firms with relatively high ROA are likely to have more valuable assets in place and, hence, higher target leverage ratios. Consistent with Donaldson's pecking order description, the coefficient estimate for ROA in this regression is negative, suggesting that it would be more appropriate to view ROA as a proxy for the deviation between the target and the observed debt ratio. As such, ROA is excluded from the first stage regression and instead is included directly into the second stage regression.

The estimates of the ROA and NOLC coefficients in the second stage regression allow us to test our assumptions. For example, if high ROA firms are temporarily under-levered and if firms make financing choices that move them toward a target capital structure, then the coefficient of ROA should be positive in the second stage regression. However, if ROA was found to be negatively related to debt ratios in our initial regression because it proxies for an omitted variable, like market power, which for some reason is negatively related to the leverage choice,[14] then ROA would enter negatively in the second stage logit regression. As reported below, ROA is positively related to leverage increases, indicating that it appropriately is included in the second stage regressions.

Two of the other variables, the market-to-book ratio (M/B) and the firm's stock returns in the pre-issue year and in the year in which capital was raised (Ret), can also proxy for both the target debt ratio and the deviation between the target and the actual debt ratio. If we view these variables as proxies for growth opportunities, higher values of these variables should be associated with lower target leverage ratios. On the other hand, M/B and Ret may be associated with the deviation between the target and actual debt ratio since firms that experience an increasing stock price will find their leverage ratios declining if they do not act to counteract the change. When included in the first stage regression, both M/B and Ret are related to leverage negatively, which is, unfortunately, consistent with either of the described scenarios. Therefore, we will repeat the subsequent analysis with and without M/B and Ret in the first stage model.

In summary, the results of the first stage regression with the full set of our explanatory variables (panel A, Table 3) are consistent with past cross-sectional studies (e.g., Titman and Wessels (1988) and Rajan and Zingales (1995)). However, the coefficient estimates for past profitability (negative for ROA and positive for NOLC) are inconsistent with our theoretical priors about how these variables should affect the target debt ratio. In addition, the results in panels A and B, Table 3, do not allow us to unambiguously determine whether the stock price variables (M/B and Ret) are proxies for the target leverage ratios or deviations from the target. Therefore, the results reported in subsequent tables are based on the target leverage ratio derived from the parsimonious version of our first stage regression (panel C).[15]

[14] A number of theoretical papers examine how imperfect competition affects the capital structure choice. See, for example, Brander and Lewis (1986).

[15] The results remain qualitatively the same when the first stage regressions in panels A and B are used instead.

IV. The Second Stage Explanatory Variables

In this section, we discuss variables that may explain the firm's choice between issuing debt or equity. The discussion in the last section described a number of variables that might proxy for the extent to which firms are over- or under-levered. These variables include NOLC, ROA, Ret, and M/B. In addition, we construct variables that measure the deviation from the target ratio estimated from our first stage regression. The first variable, leverage deficit, measures the difference between the debt ratio predicted from the first stage cross-sectional regression and the actual debt ratio. Our hypothesis is that this variable will be related to the firms' issuing choices as long as there is a tendency for firms to move toward their target debt ratio. To test whether our regression-based measure of target leverage improves upon a simpler industry-based measure, our reported regressions decompose the leverage deficit into two components. The first component is the difference between the regression-based target and the three-digit SIC industry mean debt ratio. The second component is the difference between the industry mean and the actual debt ratio.

We also introduce an additional variable, (DTLD−DTLE), which measures the projected difference between the absolute deviation from target leverage if the firm issues debt, $|\text{Lev}^D - \text{Tgt}|$, and the absolute deviation from target leverage if the firm issues the same amount of equity, $|\text{Lev}^E - \text{Tgt}|$.[16] A positive value of this variable indicates that a firm would end up closer to its target leverage ratio if it issues equity rather than debt.[17] The following example clarifies the motivation for this variable. Consider a firm with a debt/assets ratio of 0.20 and a target ratio of 0.21 that needs new financing in the amount of 0.10 of its assets. Because the firm is currently under-levered, one might think that it should issue debt. A closer look reveals, however, that if the firm issues equity, its debt ratio becomes 0.182. If the firm issues debt, its debt ratio becomes 0.273. Thus, despite the fact that the firm is under-levered, it stays closer to the target if it issues equity rather than debt. This seemingly counterintuitive result occurs only when the issue size is substantially larger than the deviation from the target.

Our second stage regression also includes variables that proxy for possible impediments to a move toward the firm's target debt ratio. One impediment arises because of a wealth transfer from equity holders to debtholders that occurs when new equity is issued. Since this wealth transfer is much larger for firms financed primarily with long-term debt, we can partially capture its effect by including the percentage of debt that is short term (due within three years) as an explanatory variable in the second stage logit regression. In addition, since these transfers are most relevant for financially distressed firms, we interact the fraction of debt that is short term with a dummy variable equal to one for firms with negative operating income.

A firm's stock price may also influence a firm's debt-equity choice. For a variety of reasons, if a firm's stock price is low relative to either its earnings or its

[16] Assuming the proceeds are retained to finance new assets, the leverage ratio after the assumed debt issuance, Lev^D, is calculated as [(Pre-Issue Debt + Issue Amount)/(Pre-Issue TA + Issue Amount)]. The leverage ratio after the assumed equity issuance, Lev^E, is calculated as [Pre-Issue Debt/(Pre-Issue TA + Issue Amount)].

[17] This assumes that the size of the financing is determined exogenously, e.g., by financing needs.

book value, managers may be reluctant to issue equity. For example, since managers are involved in the calculation of accounting numbers, they may place more weight on the credibility of earnings and book value numbers and may believe that their shares are under-valued when their stock price is low relative to either of these accounting measures of value.[18] There may also be agency/governance reasons why managers may be reluctant to issue equity when their stock price is low. For example, managers may, in general, prefer lower leverage because of the greater flexibility and prestige associated with a higher bond rating. However, because of outside takeover threats (see Zwiebel (1996)) or greater scrutiny by their board of directors, they are more likely to be forced toward an optimal capital structure when their stock price is low. Accounting considerations may also play a role in determining the issuing choice, perhaps because managers are evaluated partly based on accounting numbers. If a firm's stock price is low relative to its earnings or book value, an equity issue will further decrease its earnings per share or book value per share.

The M/B variable will partially capture the effect of the firm's stock price on its issuing choice. In addition, we include two dummy variables in our second stage regression that explicitly capture the above-mentioned accounting considerations. To indicate whether an equity issue will dilute the firms' earnings per share, a dummy variable, equal to one for firms with earnings/price ratios that exceed their estimated after-tax borrowing cost, is included in the regression.[19] Similarly, a dummy variable, equal to one for firms with market-to-book ratios that are greater than one, indicates whether an equity issue will dilute the firm's book value per share.

V. Descriptive Statistics and Univariate Analysis

Table 4 characterizes our sample.[20] The table reveals that firms that raise significant amounts (relative to their total assets) of external capital are substantially smaller, on average, than firms that do not raise significant amounts of external capital. Of these issuers, firms that raise either common equity or convertible debt tend to be the smallest. In contrast, firms that repurchase common equity are, on average, larger than any other group in Table 4. Firms that retire debt are, on average, half the size of firms that repurchase equity.

[18] Brealey and Myers ((1991), p. 328) refer to these influences as "Dilution Fallacies." See also Daniel, Hirshleifer, and Subrahmanyam (1998) for a discussion of both the psychology literature and empirical evidence that suggests that investors underreact to accounting information.

[19] E/P ratio is defined as (Net Income)/(Market Value of Equity) = (EBIT−Debt$\times r_d$)$(1-T_c)$/MVE. Issuing equity would dilute the E/P ratio more than issuing debt if the first derivative of E/P with respect to MVE is more negative than the first derivative of E/P with respect to Debt, which translates into the condition that E/P $> r_d(1 - T_c)$.

[20] An important problem in Compustat is the presence of outlier observations (such as stock returns in excess of 50000% in a given year). To minimize the influence of these outliers in our analysis, we replaced extreme observations (those with the highest 0.5% and, for some variables, lowest 0.5% of values) with missing values. This occurred when stock returns were greater than 500% or lower than −88.4%; when average operating income/assets was greater than 36.8% or less than −59.2%; when net operating loss carryforwards were greater than 4.390; when market-to-book was greater than 10.028; when selling expenses/sales was greater than 4.726, and when R&D/sales was greater than 1.634.

TABLE 4

Sample Characteristics by Issuer Type

	Common Equity Issue	Preferred Issue	Long-Term Debt Issue	Short-Term Debt Issue	Convertible Issue	No Issue	Equity Repurchase	Debt Reduction
Total assets	188.299	428.935*	444.016**	403.503**	238.611	577.465**	624.671	313.909**
Debt/assets	0.190	0.285**	0.213**	0.208**	0.180	0.209**	0.116	0.319**
Leverage deficit	0.000	−0.067**	0.013**	0.005	0.023**	0.003	0.076	−0.090**
DTLD−DTLE	0.032	0.060**	0.022**	0.021**	0.028	—	0.071	−0.062**
Three-year mean ROA	0.076	0.030**	0.146**	0.121**	0.111**	0.126**	0.168	0.100**
NOLC	0.226	0.321**	0.039**	0.077**	0.084**	0.069**	0.047	0.116**
Two-year stock return	0.782	0.122**	0.395**	0.282**	0.616**	0.290**	0.398	0.319*
Market-to-book ratio	2.175	1.704**	1.462**	1.457**	1.918**	1.407**	1.769	1.327**
Dummy for M/B > 1	0.890	0.821**	0.765**	0.707**	0.902	0.669**	0.836	0.644**
Dilution dummy	0.287	0.228*	0.557**	0.525**	0.364**	0.489**	0.590	0.363**
Fraction of debt due in three years	0.500	0.549**	0.435**	0.548**	0.476	0.453**	0.409	0.605**
Issue (repurchase) size	0.280	0.260	0.174**	0.140**	0.309	—	0.118	0.123*
Observations	2,231	390	4,558	3,334	623	26,937	1,569	5,797

Mean values of key characteristics are shown. The sample covers security issuance and repurchase behavior from 1979 to 1997. Firms are defined as issuing (repurchasing) a security when the net amount issued (repurchased) divided by the book value of assets exceeded 5%. Cases where firms issued (repurchased) both debt and equity in a given fiscal year are omitted. Total assets are in millions of 1979 dollars. Debt/assets is measured with equity at market in the year prior to the issuance period. Leverage deficit is the difference between target leverage, estimated as the fitted value from the regression in panel C, Table 3, and the actual debt/assets ratio. DTLD (DTLE) is the absolute difference between leverage ratio after an assumed debt (equity) issue and the target leverage. ROA is earnings before interest, taxes, depreciation, and amortization divided by the book value of assets. NOLC is the net operating loss carryforwards scaled by the book value of assets. The two-year stock return is defined as the split- and dividend-adjusted percentage return from the beginning of the pre-issue year until close of the issue year. The market-to-book ratio is defined as (market value of equity + book value of debt) / total assets. The dummy for whether an equity issue could dilute earnings was set to zero except when one minus the assumed tax rate times yield on Moody's Baa rated debt was less than a firm's after tax earnings-price ratio. The tax rate was assumed to be 50% before 1987 and 34% afterward. The issue (repurchase) size is measured relative to total assets. Values significantly different from those for common equity issuers (equity repurchasers for the debt reduction subsample) at 5% and 1% level are marked * and **, respectively.

The pre-issue debt ratio of issuers was about the same, on average, as that of non-issuing firms. The most important exception to this is for preferred stock issuers who had a mean debt/assets ratio of 28.5%, which is seven to 10 percentage points higher than that for other issuers. The preferred stock issuers are also the only significantly over-levered group of issuers. The predicted value of the pre-issue leverage deficit from the first step regression for preferred issuers is −6.7%. The pre-issue leverage deficit for other groups varies from a low of 0% for common equity issuers to a high of 2.3% for convertible debt issuers.[21] In contrast, firms that repurchase equity have very low debt ratios, 11.6%, on average, while firms that retire debt have very high debt ratios, 31.9%, on average. Moreover, firms that repurchase equity are substantially under-levered, with average debt ratios of 7.6%, and firms that retire debt are substantially over-levered, with average debt ratios of 9%.

Equity issuers tended to be far less profitable than both straight and convertible debt issuers.[22] This is especially true for the preferred stock issuers. Approximately 21% of the common and 32% of the preferred equity issuers experienced

[21]The average absolute values of the deficit vary from 10% for convertible debt issuers to 12.9% for issuers of preferred stock.

[22]Equity issuers in Loughran and Ritter (1997) were considerably more profitable than those in our sample. Two possible reasons are i) their sample excludes firms with less than $20 million in assets, which often have no cash flow at all, and ii) our sample includes issuers that raise private equity, which are also less profitable. Hertzel and Smith (1993), for example, find that private placements of equity are usually made by very small firms that have experienced negative returns. Approximately half of the firms in Hertzel and Smith (1993) were financially distressed.

negative operating income in the year prior to the offering. In contrast, only 3.7% of the long-term debt issuers had negative operating income. Net operating loss carryforwards were also much larger for equity and preferred issuers in the pre-issue fiscal year. Firms that repurchased equity, on the other hand, had much higher ROA and lower loss carryforwards than did firms that retired debt.

Past stock returns, defined as the two-year common stock return from the beginning of the year before the offering year to the end of the year of the offering, were relatively high for all types of issuers except for the preferred stock and short-term debt issuers. Preferred stock issuers realized returns that were lower, on average, than the non-issuers and more than half of the preferred stock issuers realized negative returns over the two years prior to the issue. In contrast, common stock and convertible debt issuers realized exceptionally good stock returns in the year of the issue and the year prior to the issue. This confirms previous findings that firms are most likely to issue equity following a stock price runup. Pre-event stock returns for firms that repurchase equity are slightly higher than for firms that retire debt.

The results in Table 4 also suggest that corporate financing choices might be affected by concerns about diluting the per-share earnings and book values. In particular, the proportion of equity issuers with the market-to-book ratio exceeding one is greater than the proportion of such firms among straight debt issuers. Similarly, the proportion of firms that would experience dilution of their earnings-per-share is substantially smaller among equity issuers. Moreover, consistent with the "debt overhang" hypothesis, equity issuers have a higher proportion of their debt in relatively short-term debt than long-term debt issuers.

Table 4 also reveals considerable variation in the sizes of different types of security issues. The largest issues were in the form of convertible debt, with common equity a close second, followed by preferred stock. Straight debt issues were substantially smaller. Comparing the average issue sizes with average values of the leverage deficit one can see that, on average, both debt and equity issue sizes substantially exceed the deviations from the target leverage ratios. This suggests that issue sizes might be primarily motivated by factors other than the firm's desire to adjust its debt ratio toward the optimum. In contrast, the amounts of repurchased equity and retired debt are much closer to the deviations of these firms from their target debt ratios. This suggests that the deviation from the target ratio might be a more important factor in security repurchase decisions than in security issuance decisions.

To summarize, the most striking finding in our univariate comparison between firms that make issuance and repurchase choices is that firms that act to increase their leverage ratios generally have higher operating incomes than those firms that choose to decrease their leverage ratios. In addition, equity issuers generally have much higher stock prices, relative to either their past stock prices or their book values, than straight debt issuers. In terms of these and other variables, convertible bond issuers are more similar to common equity issuers than they are to issuers that raise straight debt. Preferred stock issuers are fundamentally different than issuers of other securities. Our univariate comparisons suggest that many of these preferred issuers are either in or near financial distress and may need a capital infusion to stay in business. In addition, many of these firms have tax loss

carryforwards and would thus find debt unattractive from a tax perspective. Perhaps, because of asymmetric information considerations, firms in this situation are reluctant to issue common stock.

VI. Multivariate Analysis

A. An Analysis of the Choice between Straight Debt and Common Equity

The basic flavor of the univariate results in the last section generally holds when we analyze the effects of these variables simultaneously in the second stage logit regressions described earlier. These regressions are presented in Tables 5 and 6.[23]

Table 5 reports two logit regressions. The first regression compares firms that raised a significant amount of common equity with firms that raised a significant amount of straight debt.[24] The second regression compares firms that repurchased a significant amount of common equity with firms that retired a significant amount of straight debt.[25]

The estimates reported in these regressions are generally consistent with the hypothesis that firms tend to move toward a target capital structure when they either issue or repurchase securities. The coefficients on the three leverage deficit variables have the expected signs, and are all statistically significant in the repurchase regression. In the debt/equity issue choice regression, the deviation of actual leverage from the industry mean is highly significant, but the deviation of the industry mean from the regression-based target is only marginally significant (at 10%).[26] This suggests that factors proposed by static tradeoff models are quite important in the choice of the security being repurchased, but are only marginally important in the choice of the security being issued. In addition, firms with high past profits tend to issue debt rather than equity and repurchase equity rather than debt, which is consistent with the idea that firms tend to readjust their capital structures to offset the effect of accumulated earnings. The fact that firms tend to issue equity when they have net operating loss carryforwards is also consistent with this interpretation.

Our results are also consistent with the idea that, holding cash flows constant, high stock returns are associated with improved growth opportunities and, thus, lower optimal leverage ratios. Specifically, we find that high stock returns in the year of and the year before the transaction are associated with the issuance of equity rather than debt and the retirement of debt rather than the repurchase of equity. These results are also consistent with the idea that managers with superior

[23]The reported results use estimates of target leverage from regression in panel C, Table 3.

[24]The qualitative results in Table 5 do not change when we include preferred stock or convertible debt issues viewing these as either debt or equity issues.

[25]In 1,314 instances, firms issued both equity and debt in the same year. In 196 instances, firms repurchased both equity and debt in the same year. These cases are omitted. Our results do not change in a material way if these cases are instead classified by the maximum amount of a type of security issued (repurchased) in a given year.

[26]The deviation of the industry mean from the regression-based target is significant at 5% when the (DTLD−DTLE) is dropped from the second stage regression.

TABLE 5

Logit Regression Comparing Firms That Issue (Retire) Straight Debt to Those That Issue (Repurchase) Common Equity

	Debt vs. Equity Issue			Debt Reduction vs. Equity Repurchase		
	Coeff.	*t*-Stat.	Elasticity	Coeff.	*t*-Stat.	Elasticity
Target D/A−industry mean D/A	1.795	1.9	0.013	−5.589**	−4.1	−0.014
Ind. mean D/A−actual D/A	2.141**	7.3	0.070	−7.852**	−15.1	−0.179
DTLE−DTLD	−0.519	−1.3	−0.012	−4.821**	−8.3	−0.094
Three-year mean ROA	2.550**	7.8	0.065	−2.791**	−5.5	−0.024
NOLC	−0.455**	−5.4	−0.037	−0.101	−0.7	−0.003
Two-year stock return	−0.542**	−19.0	−0.122	0.209**	4.4	0.016
Market-to-book ratio	−0.410**	−13.4	−0.105	−0.255**	−5.4	−0.018
Dummy for M/B > 1	−0.754**	−8.8	−0.065	0.171	1.6	0.007
Dilution dummy	0.519**	8.1	0.060	−0.712**	−8.6	−0.035
Fraction of debt due in three years (FD3)	0.232**	2.6	0.017	2.114**	17.6	0.067
Loss dummy × FD3	−0.835**	−6.0	−0.041	0.929**	3.2	0.020
Log-likelihood	−4,300**			−2,422**		
Direct R^2	0.213			0.396		
Pseudo-R^2	0.195			0.365		
Dep. Var. = 0	2,231			1,569		
Dep. Var. = 1	7,892			5,797		
Observations	10,123			7,366		

Firms are defined as issuing (repurchasing) a security when the net amount issued (repurchased) divided by the book value of assets exceeded 5%. Cases where firms issued (repurchased) both debt and equity in a given fiscal year are omitted. D/A is the debt/assets measured with equity at market in the year prior to the issuance period. Target D/A is estimated as the fitted value from the regression in panel C, Table 3. DTLD (DTLE) is the absolute difference between leverage ratio after an assumed debt (equity) issue and the target leverage. ROA is earnings before interest, taxes, depreciation, and amortization divided by the book value of assets. NOLC is the net operating loss carryforwards scaled by the book value of assets. The two-year stock return is defined as the split- and dividend-adjusted percentage return from the beginning of the pre-issue year until close of the issue year. The market-to-book ratio is defined as (market value of equity + book value of debt)/total assets. The dummy for whether an equity issue could dilute earnings was set to zero except when one minus the assumed tax rate times yield on Moody's Baa rated debt was less than a firm's after tax earnings-price ratio. The tax rate was assumed to be 50% before 1987 and 34% afterward. Regressions include year dummies, which are not reported below. Elasticities indicate the change in the implied probability of a debt issue (reduction) for a change in an independent variable from minus one standard deviation to plus one standard deviation around its sample mean (or from zero to one for dummy variables), holding other variables constant at their respective means. Direct R^2 is the squared coefficient of correlation between the binary dependent variable and the predicted probability. Pseudo-R^2 is calculated as 1−(log-likelihood)/(log-likelihood when the slopes are restricted to be zero). Coefficients significantly different from zero at 1% are marked **.

private information time their equity issuance and repurchase decisions (see Lucas and McDonald (1990)).

These regression results also suggest that debt overhang can act as an impediment to moves toward a firm's target debt ratio. Specifically, firms with negative cash flows are less likely to take actions that reduce leverage (e.g., issue equity or retire debt) if a large portion of their outstanding debt matures after three years. In other words, financially distressed firms are less likely to reduce leverage if it transfers wealth to long-term debt holders.

The regressions indicate that a low stock price may also act as an impediment to a move toward a firm's optimal debt ratio. In particular, firms with low market-to-book ratios tend to issue debt rather than equity. One explanation for the negative coefficient of market-to-book in the issuance regression is the variable proxies for growth opportunities, which are likely to be negatively associated

TABLE 6

Multinomial Logit Comparison of Equity Issuers to Issuers of Straight Debt, Convertible Debt, and Preferred Stock

	Preferred Stock Issue		Long-Term Debt Issue		Short-Term Debt Issue		Convertible Debt Issue	
	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
Target D/A−industry mean D/A	−0.326	−0.2	3.529**	3.5	−0.095	−0.1	1.231	0.8
Industry mean D/A−actual D/A	−1.844**	−3.7	2.586**	8.2	1.684**	5.2	3.254**	6.1
DTLD−DTLE	−0.744	−1.0	0.329	0.8	−1.307**	−3.0	2.391**	3.8
Three-year mean ROA	−1.503**	−2.8	3.941**	10.6	1.350**	3.8	0.643	1.3
Net operating loss carryforwards	−0.005	−0.1	−0.633**	−5.5	−0.381**	−4.2	−0.634**	−3.8
Two-year stock return	−0.596**	−8.0	−0.488**	−15.9	−0.615**	−18.0	−0.189**	−4.1
Market-to-book ratio	−0.247**	−4.2	−0.506**	−13.6	−0.353**	−10.1	−0.120**	−2.8
Dummy for M/B > 1	−0.141	−0.9	−0.631**	−7.1	−0.856**	−9.4	0.193	1.2
Dilution dummy	−0.123	−0.8	0.465**	6.8	0.565**	7.9	0.072	0.7
Fraction of debt due in three years (FD3)	0.108	0.5	−0.204*	−2.2	0.866**	8.8	0.006	0.0
Loss dummy × FD3	0.121	0.5	−0.994**	−5.8	−0.872**	−5.9	−0.370	−1.6
Log-likelihood	−13,121**							
Pseudo-R^2	0.112							
Dep. Var. = 0	2,231		2,231		2,231		2,231	
Dep. Var. = 1	390		4,558		3,334		623	

Firms are defined as issuing (repurchasing) a security when the net amount issued (repurchased) divided by the book value of assets exceeded 5%. D/A is the debt/assets measured with equity at market in the year prior to the issuance period. Target D/A is estimated as the fitted value from the regression in panel C, Table 3. DTLD (DTLE) is the absolute difference between leverage ratio after an assumed debt (equity) issue and the target leverage. ROA is earnings before interest, taxes, depreciation, and amortization divided by the book value of assets. NOLC is the net operating loss carryforwards scaled by the book value of assets. The two-year stock return is defined as the split- and dividend-adjusted percentage return from the beginning of the pre-issue year until close of the issue year. The market-to-book ratio is defined as (market value of equity + book value of debt)/total assets. The dummy for whether an equity issue could dilute earnings was set to zero except when one minus the assumed tax rate times yield on Moody's Baa rated debt was less than a firm's after tax earnings-price ratio. The tax rate was assumed to be 50% before 1987 and 34% afterward. Regressions include year dummies, which are not reported below. Pseudo-R^2 is calculated as 1 − (log-likelihood)/(log-likelihood when the slopes are restricted to be zero). Coefficients significantly different from zero at 1% are marked ** while those significant at 5% are marked *.

with leverage. For a variety of reasons, we do not think that this is the case. First, our target debt ratio accounts for the importance of growth opportunities and the inclusion of market-to-book in the first stage estimation of the target debt ratio has very little effect on the results. Second, one would expect changes rather than levels of growth opportunities to explain deviations from historical targets and our second stage regressions include stock returns in the year of and the year prior to the issue to control for changes in growth opportunities. Moreover, the fact that high market-to-book ratios are associated with stock repurchases rather than debt retirements is inconsistent with market-to-book serving as a proxy for growth opportunities in these second stage regressions. We think it is more likely that the negative coefficient of this variable reflects the fact that managers are averse to issuing low-priced stock for the reasons specified earlier.[27]

We earlier suggested that part of the aversion to issuing low-priced stock relates to management concerns about earnings and book value dilution. The

[27]We have had informal conversations that suggest that investment bankers are also reluctant to underwrite equity issues for firms with low-priced stocks.

coefficients of the dummy variables in both regressions are consistent with the hypothesis that managers are, in fact, reluctant to make capital structure changes that reduce either earnings per share or book value per share.

To gauge the relative economic importance of the different variables, we also report their elasticities. For each regression, the rightmost column presents the change in the implied probability of a debt issue (retirement) for a change in the independent variable from minus one standard deviation to plus one standard deviation around its sample mean (or from zero to one for dummy variables), holding other variables constant at their respective means. The past stock returns, with an elasticity of 0.122, and the market-to-book ratio, with an elasticity of 0.105, are the two economically most important determinants of the debt vs. equity issue choice. The five variables that measure the deviation from target leverage are economically less important when considered individually. However, their combined effect on debt vs. equity choice is substantial. Thus, the deviation from target leverage is an important, though not dominant, factor affecting the debt vs. equity issue choice.

The deviation from the target debt ratio is, however, the dominant economic factor in determining whether a firm repurchases equity or retires debt. For example, the elasticity with respect to the leverage deficit (relative to industry mean) is 0.179. Wealth transfer concerns also appear to play an important role in choosing between repurchasing equity and retiring debt. The elasticity with respect to the proportion of short-term debt is 0.067. In contrast, the economic impact of the market price-based variables on the type of instrument that is repurchased is much weaker. For example, the elasticity with respect to past stock returns is only 0.016.

B. Robustness of the Results

It is possible that our test statistics are overstated because multiple appearances of the same firms in our sample may induce time-series dependence in the error term. To see whether this affects our results, we re-estimate the regressions in Table 5 for each year separately. The time-series means of the coefficient estimates from these cross-sectional regressions have the same signs as the estimates reported in Table 5.[28] With the exception of the market-to-book ratio in the repurchase model, which in these tests is statistically insignificant, the statistical significance of these means is similar to that in Table 5. Moreover, we find that those variables, which were highly significant in our previous tests, have the expected sign in about 90% of the years.

The results in Table 5 are robust to the specification of the first stage regression. Our qualitative results do not change when the target leverage is based on regressions reported in panels A and B of Table 3 or when the first stage regression is estimated without industry adjustments. The only difference is that (DTLD−DTLE) is significant in some of these regressions. The results are also qualitatively similar when we skip the first stage and use industry average or 10-year historical average as a proxy for the target leverage.

[28]Because of insufficient variation in some variables, the D/E issuance model could not be estimated in one year while the D/E repurchase model could not be estimated in two years.

C. Multinomial Logit Regression Predicting Short-Term, Long-Term, and Convertible Debt Issues as Well as Common and Preferred Equity Issues

In this section, we break down the debt issues by maturity (short-term and long-term) and convertibility and consider preferred as well as common stock.[29] A multinomial logit regression that predicts the choice between these financing options is presented in Table 6. The coefficient estimates in this table compare the likelihood of issuing straight long- and short-term debt, preferred stock, and convertibles relative to the likelihood of issuing common stock. So, for example, a significantly positive coefficient estimate in the convertible bond equation would indicate that high values of the variable increase the probability of a convertible bond issue vis-à-vis a common equity issue.

With few exceptions, the signs and the significance of the coefficient estimates for long- and short-term debt issuers are consistent with the results for straight debt vs. common equity presented in Table 5. The most important difference is that the deviation of the regression-based target leverage ratio from the industry mean is highly significant in the long-term debt regression. The negative coefficient estimate for the proportion of short-term debt in the long-term debt regression is consistent with the wealth transfer (debt overhang) hypothesis. The positive estimate in the short-term regression probably reflects the tendency of firms that utilize more short-term debt to raise new funds in the same form. Another difference from Table 5 is that the coefficient on (DTLD−DTLE) in the short-term debt regression is now significantly negative, as expected.

Consistent with the view that convertible debt is a debt-equity hybrid, our results indicate that convertible issuers have characteristics that are somewhere in between firms that raise long-term debt and common equity. For example, the coefficients on past returns, market-to-book ratio, and leverage deficit are of the same sign as they were in the straight debt regression but lower in magnitude and less significant.[30] Five other variables that were significant in the straight debt vs. common equity regression are not statistically significant in the convertible bond regression. Finally, the significant coefficient estimate on (DTLD−DTLE) has a perverse (positive) sign. This reflects the fact that, in our sample, (DTLD−DTLE) is positively correlated with the issue size and that bigger issues are more likely to be in the form of convertible debt rather than equity.

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[29] Short-term debt issues were defined as taking place when debt in current liabilities (Compustat Annual Item 34) increased by more than 5% of the book value of assets in the issue year. This measures the change in the amount of debt due within one year. Long-term debt issues were defined as taking place when long-term debt (Compustat Item 9) increased by more than 5% of the book value of assets in the issue year. If a firm issued both long-term and short-term debt by this definition we classified the issue type as short term. We defined convertible and preferred issues similarly, employing, respectively, Compustat Item 79 and Compustat Item 10. A firm was classified as a convertible or preferred issuer using these definitions even if it also issued debt or equity in the same year. Finally, to be classified as one of the three types of debt issues, the total debt must also increase by more than 5%. Thus, we exclude instances when, for instance, short-term debt substitutes for long-term or convertible and vice versa. We do so because the issue of maturity and convertibility choice is beyond the scope of this paper.

[30] An early study by Baxter and Cragg (1970) came to the same conclusion using a multinomial logit similar to the one estimated here for firms in Compustat from 1950 to 1965.

The multinomial logit regression results reveal that preferred stock issuers experienced significantly worse past profits as well as worse stock returns than equity issuers and are significantly more over-levered. They also exhibit lower market-to-book ratios. We interpret these results as indicating that preferred stock issuers do not need the corporate tax shields of straight debt and are often near financial distress, which creates a need to add equity to their balance sheets.[31] However, perhaps because of asymmetric information considerations, these firms are reluctant to issue common equity.

Overall, the multinomial logit results confirm what we found in the univariate analysis and the binomial logit regression presented earlier. However, the results also reveal significant differences among the four choice models presented in Table 6. In particular, the Likelihood Ratio test of the null hypothesis that the corresponding coefficients in all four models are equal is rejected at all conventional levels.

VII. Determinants of Issue (Repurchase) Size

Our earlier analysis assumes that the actual issue sizes were exogenous. In other words, we are assuming that the firm seeks to raise a pre-specified level of capital, and then decides whether the capital should be raised from debt or equity markets. In this section, we consider whether the firm characteristics that can lead them to decide between debt vs. equity financing have an effect on the amount of capital that they raise (retire). We define issue (repurchase) size as the net debt or equity issued (repurchased) as a percentage of the total assets at the beginning of the year. Because the determinants of the debt issue (reduction) size may differ from the determinants of the equity issue (repurchase) size, the size regressions are estimated separately for each firm type.

The results of the estimation of the issue size regressions are presented in Table 7. The two components of leverage deficit are insignificant in all but one of the regressions. In the short-term debt regression, both leverage deficit components are significant but have a perverse sign. High net operating loss carryforwards increase the issue sizes for short-term debt and especially for preferred equity. In all regressions, with the exception of the preferred stock regression, the issue size is negatively related to the profitability and positively to the fraction of debt due in three years. The effect of ROA on preferred equity issuance is significantly positive only in the presence of NOLC, implying that this result is just an aberration caused by ROA's negative correlation with NOLC.[32]

High past stock returns and market-to-book ratios are associated with larger issues of common equity as well as of long-term or convertible debt. These results are especially striking in the case of debt issuers because the effects of stock return, market-to-book ratio, and ROA on the size of a debt issue are opposite to their effects on the probability of a debt issue. Therefore, for long-term and convertible debt issuers, the only interpretation of these results is that those firms with

[31]Consistent with this characterization, Houston and Houston (1990) find that preferred issuers typically have below average effective tax rates.

[32]The effect of the NOLC on the probability of issuing preferred equity is positive significant with or without ROA on the right-hand side of the regression.

TABLE 7

Determinants of Issue Size

	Common Stock Issue		Preferred Stock Issue		Long-Term Debt Issue		Short-Term Debt Issue		Convertible Debt Issue	
	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
Constant	0.100**	3.7	−0.061	−0.4	0.136**	12.2	0.125**	15.2	0.047	0.9
Target D/A−industry mean D/A	0.241	1.1	0.300	0.2	−0.174	−1.6	−0.353**	−4.2	−0.187	−0.5
Industry mean D/A−actual D/A	0.058	1.0	0.086	0.3	−0.041	−1.7	−0.069**	−3.8	0.088	0.8
Three-year mean ROA	−0.337**	−5.0	0.876*	2.1	−0.131**	−2.8	−0.074**	−2.5	−0.293*	−2.1
NOLC	0.030*	2.1	0.327**	4.1	0.016	1.0	0.036**	4.1	−0.089	−1.5
Two-year stock return	0.057**	9.1	0.023	0.4	0.012**	3.1	0.002	0.6	0.033*	2.6
Market-to-book ratio	0.053**	9.6	0.044	1.0	0.024**	5.1	0.006	1.7	0.082**	5.9
Dummy for M/B > 1	0.040	1.7	0.017	0.1	0.013	1.6	0.008	1.4	0.080	1.8
Dilution dummy	−0.045**	−2.7	−0.063	−0.5	−0.005	−0.7	−0.008	−1.5	−0.023	−0.8
Fraction of debt due in three years (FD3)	0.041	1.9	0.045	0.3	0.025*	2.5	0.022**	2.8	0.137**	3.4
Loss dummy × FD3	−0.034	−1.1	0.426*	2.4	−0.001	0.0	−0.005	−0.4	−0.068	−1.0
R^2	0.153		0.087		0.018		0.029		0.142	
Observations	2,231		390		4,558		3,334		623	

Firms are defined as issuing a security when the net amount issued divided by the book value of assets exceeded 5%. Cases where firms issued both debt and equity in a given fiscal year are omitted. D/A is the debt/assets measured with equity at market in the year prior to the issuance period. Target D/A is estimated as the fitted value from the regression in panel C, Table 3. ROA is earnings before interest, taxes, depreciation, and amortization divided by the book value of assets. NOLC is the net operating loss carryforwards scaled by the book value of assets. The two-year stock return is defined as the split- and dividend-adjusted percentage return from the beginning of the pre-issue year until close of the issue year. The market-to-book ratio is defined as (market value of equity + book value of debt)/total assets. The dummy for whether an equity issue could dilute earnings was set to zero except when one minus the assumed tax rate times yield on Moody's Baa rated debt was less than a firm's after tax earnings-price ratio. The tax rate was assumed to be 50% before 1987 and 34% afterward. Coefficients significantly different from zero at 1% are marked ** while those significant at 5% are marked *.

good investment opportunities (high returns and market-to-book ratios) and little internal funds (low ROA) raise funds in larger amounts. The results for common equity issuers can be interpreted similarly. However, an alternative interpretation that more equity is issued when the target leverage is low is also plausible. The results for preferred equity and short-term debt issuers suggest that these forms of financing are used to cover current cash shortages rather than to finance investments, as these issue sizes are unrelated to investment opportunities.

Overall, our findings imply that security issue sizes are not affected by the deviations of issuers' debt ratios from their target levels, and are determined exogenously, to some extent, by financing needs of issuing firms. This is especially true for long-term and convertible debt issuers whose issue sizes relate inversely to some of the most important factors that make such issues more likely. These results also imply that the choice of the form of financing should be examined separately from the choice of the size of financing. Studies that use combined size-type dependent variables (e.g., positive issue size for debt issues and negative issue size for equity issues, as in Shyam-Sunder and Myers (1999)) run the risk of missing the effects of some potentially important factors.

The results of the estimation of the repurchase size regressions are presented in Table 8. In contrast to the issue size regressions, both leverage deficit com-

ponents are significant in the debt reduction regression. In the equity repurchase regression, the deviation of actual leverage from the industry mean is significant, but the deviation of the industry mean from the regression-based target is not. The signs of the coefficient estimates imply that the amount repurchased is, in fact, related to the leverage deficit. These results support our earlier conclusion that the deviation from the firm's target leverage ratio plays a more important role when firms retire capital than when they raise new capital. Aside from increasing with the size of the leverage deficit, the amount of repurchased equity increases with past stock returns and net operating loss carryforwards.

TABLE 8

Determinants of Repurchase Size

	Debt Reduction		Equity Repurchase	
	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
Constant	0.074**	17.4	0.124**	15.9
Target D/A−industry mean D/A	−0.255**	−7.1	0.072	0.9
Industry mean D/A−actual D/A	−0.183**	−22.1	0.060**	2.6
Three- year mean ROA	−0.045**	−3.1	−0.041	−1.3
NOLC	0.011**	3.2	0.026**	2.8
Two-year stock return	0.003**	2.9	0.011**	3.4
Market-to-book ratio	0.010**	5.8	−0.004	−1.2
Dummy for M/B > 1	0.018**	7.0	0.003	0.5
Dilution dummy	−0.010**	−3.9	−0.007	−1.3
Fraction of debt due in three years (FD3)	0.019**	4.8	−0.007	−1.0
Loss dummy × FD3	0.018**	3.8	0.054*	2.4
R^2	0.128		0.029	
Number of observations	5,797		1,569	

Firms are defined as repurchasing a security when the net amount repurchased divided by the book value of assets exceeded 5%. Cases where firms repurchased both debt and equity in a given fiscal year are omitted. D/A is the debt/assets measured with equity at market in the year prior to the issuance period. Target D/A is estimated as the fitted value from the regression in panel C, Table 3. ROA is earnings before interest, taxes, depreciation, and amortization divided by the book value of assets. NOLC is the net operating loss carryforwards scaled by the book value of assets. The two-year stock return is defined as the split- and dividend-adjusted percentage return from the beginning of the pre-issue year until close of the issue year. The market-to-book ratio is defined as (market value of equity + book value of debt)/total assets. The dummy for whether an equity issue could dilute earnings was set to zero except when one minus the assumed tax rate times yield on Moody's Baa rated debt was less than a firm's after tax earnings-price ratio. The tax rate was assumed to be 50% before 1987 and 34% afterward. Regressions include year dummies, which are not reported below. Coefficients significantly different from zero at 1% are marked ** while those significant at 5% are marked *.

The amount of debt that is retired decreases with past profitability, which is consistent with the hypothesis that higher profitability indicates higher value for assets-in-place and, therefore, a higher target leverage ratio. Other effects in the debt reduction regression, though statistically significant, are much smaller in magnitude. For example, higher net operating loss carryforwards increases the amount of debt that is retired, which is consistent with the hypothesis that firms with high NOLC have low target leverage because they cannot benefit from debt-related tax shields. The amount of retired debt also increases with past stock returns and with the market-to-book ratio, i.e., with growth opportunities. The results for market-to-book and past returns, as well as those for the market-to-book greater than one dummy and the dilution dummy might also be driven by instances of equity issuance, which are especially likely to accompany large debt

retirement programs. Finally, it appears that firms retire more debt when a higher proportion of it is short term, which is consistent with potential wealth transfers from equity holders to debt holders influencing the choice.

Once again, the results are robust to the inclusion of the M/B and Ret in the first stage regression. When the leverage deficit is estimated using the results from panel B of Table 3, the coefficient estimate for Ret in the debt reduction regression and the estimate for ROA in the equity repurchase regression become insignificant. All other explanatory variables in the issue size and repurchase size regressions retain their signs and significance.

VIII. Conclusion

Most of our insights about capital structure choice come from static models that consider tradeoffs between the costs and benefits of debt and equity financing. However, tests of these static models have been somewhat inconclusive since observed debt ratios are likely to deviate from the optimums suggested by these static models. In particular, there is evidence that suggests that firms tend to accumulate past profits and losses in a manner that is consistent with the pecking order behavior described by Donaldson (1961).

Our results suggest that although past profits are an important predictor of observed debt ratios, firms often make financing and repurchase decisions that offset these earnings-driven changes in their capital structures. Specifically, when firms either raise or retire significant amounts of new capital, their choices move them toward the target capital structures suggested by the static tradeoff models, often more than offsetting the effects of accumulated profits and losses. This qualitative pattern persists regardless of the maturity or the convertibility of the debt being issued.

The tendency of firms to make financial choices that move them toward a target debt ratio appears to be more important when they choose between equity repurchases and debt retirements than when they choose between equity and debt issuances. The leverage deficit variables are closely associated with whether debt or equity is repurchased and, in addition, the variables predict the amount that is repurchased. In contrast, the leverage deficit variables provide a somewhat weaker prediction of what kind of instrument is issued, and provide virtually no information about the amount issued. This evidence suggests that capital structure considerations play a much more important role when firms repurchase rather than raise capital.

Our results also suggest that stock prices play an important role in determining a firm's financing choice. Firms that experience large stock price increases are more likely to issue equity and retire debt than are firms that experience stock price declines. This observation is consistent with the idea that stock price increases are generally associated with improved growth opportunities, which would lower a firm's optimal debt ratio. The negative relation between past stock returns and leverage increasing choices is also consistent with agency models where managers have incentives to increase leverage when stock prices are low. These results are also consistent with the idea that managers are reluctant to issue equity when they view their stock as being underpriced.

The level of a firm's stock price, as measured relative to either its book value or its earnings, also plays a role in the issuing choice. One explanation is that these variables proxy for growth opportunities and firms with significant growth opportunities tend to issue equity. However, if our equations are properly specified, growth opportunities should not enter the second stage regression, but should instead enter indirectly through the leverage deficit variables. Only changes in growth opportunities, as measured by past stock returns, should enter the second stage regression. A second, more plausible, explanation is that managers are averse to issuing low-priced stock for reasons that have nothing to do with their optimal capital structure. For example, they may be averse to diluting either their earnings per share or their book value per share. Alternatively, managers may place more weight on accounting numbers, such as earnings and book values, as indicators of firm value than do outside shareholders. Managers might, therefore, believe that the firm's shares are underpriced when they are priced low relative to accounting ratios, which could lead them to forego an equity issue.

The results in this paper raise a number of interesting issues that can be addressed in future work. First, as we just mentioned, the reason why stock prices play such an important role in the issuance choice is still not particularly well understood. In addition, we have not provided a good explanation for why the deviation between a firm's current and target debt ratio seems to play a more important role in the repurchase choice than in the issuance choice. One possibility, mentioned anecdotally by investment bankers, is that since firms have more discretion when repurchasing capital than in issuing capital, capital structure conditions play a larger role in the repurchase decision while market conditions play a more important role in the issuance choice.

The fact that optimal capital structure considerations along with stock prices play an important role in the issuance and repurchase choice has a wide range of implications. For example, a firm's bonds might be priced very differently depending on one's assumptions about how firms' future financing choices respond to cash flow and stock price changes. In addition, a firm's capital expenditure choice might be closely related to management's concerns about deviating from their target debt ratio as well as their reluctance to issue equity when their stock price is low. Our results along these lines suggest that over-levered firms may choose to cut back their investment expenditures when their stock prices are low. This might explain why leverage has an especially strong effect on investment expenditures for firms with low market-to-book ratios, (see Lang, Ofek, and Stulz (1996)). These issues are topics of future research.

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