Do Adjustment Costs Impede the Realization of Target Capital Structure?

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Abstract

We investigate the role that adjustment costs play in keeping firms from annually reaching their target leverage ratios. Recognizing that firm cash flow outcomes determine whether adjustment costs are sunk or incremental, we estimate capital structure adjustment speeds across different cash flow realizations. Adjustment speeds approach 50% for firm-years in which adjustment costs are more likely to be sunk compared to closer to 25% for firm-years in which adjustment costs are more likely incremental. Relatively financially constrained firms also adjust more slowly, consistent with such constraints impeding capital structure adjustment.

The capital structure literature has focused on three main theories in its attempts to explain corporate leverage ratios: market timing, the pecking order, and the trade-off theory. Under market timing, a firm's issuance decision is based upon capital market conditions at the time funds are being raised while the pecking order theory argues that a firm's security issue will be based upon which least informationally sensitive source of funds is accessible. In both cases, firms do not have a target leverage ratio that they are trying to achieve. However, under the trade-off theory, the benefits and costs associated with the different security characteristics determine an optimal mix, i.e. a target capital structure. Therefore, recent empirical capital structure examinations have tried to separate these theories of capital structure by testing whether a target leverage ratio appears to exist.

The recent empirical literature argues that firms do have a target capital structure, but that observed capital structures frequently deviate from the desired level because adjustment costs are keeping firms from reaching their target structure every year. For instance, Leary and Roberts (2005) examine the frequency of issuance and repurchase activities of firms and find that issuances appear to be clustered in time, consistent with a fixed issuance cost. They additionally find that when firms issue, those firms estimated to be further from target leverage are more likely to engage in capital market activities that push them toward their target. Flannery and Rangan (2006), henceforth FR, generate a partial adjustment estimation procedure and estimate that approximately one-third of the gap between current and target leverage ratios are closed in an average year. Using different methods, both papers conclude that firms do behave consistent with managing their capital structure toward a target, but that observed capital structures appear to deviate from desired leverage, most likely due to the presence of adjustment costs.

Clearly the next step is to identify cross-sectional variation in adjustment costs and test whether such costs are correlated with capital structure activities. That is the objective of this paper. We first identify firms with large (positive or negative) free cash flows. These firms are likely to confront a relatively low marginal cost of adjusting leverage and, hence,

should manifest relatively rapid adjustment speeds.

Specifically, we hypothesize that firms with significantly negative free cash flows should have low adjustment costs because they must raise external capital to cover their financing deficit. Given their need to raise capital, they are likely to issue securities that will move them toward their target capital structure. Symmetrically, firms with large positive free cash flows are most likely to be distributing excess capital and can choose the form of their payouts to move toward their target capital structure (if they have one). Paying dividends or repurchasing shares will increase leverage, while paying down debt or accumulating cash balances will reduce leverage. We argue that firms with free cash flows close to zero are unlikely to be issuing or repurchasing, and will therefore confront the largest incremental costs. We therefore would expect that when we estimate the FR specification separately across these three groups, we would find adjustment speeds to be faster for the firms for whom incremental adjustment costs would be lower.

We proceed by first documenting that firms raising significant external capital do indeed have faster adjustment speeds. The absence of such a finding would significantly question the appropriateness of our methodology. After all, if issuing firms are not closing the estimated capital structure gap faster than non-issuers, the notion of a target capital structure would be questionable. We then move to the main empirical estimations of the paper: the adjustment speeds across the three groups and find that, as the above discussion suggests, firms with lower expected incremental adjustment costs approach target capital structure significantly more quickly than firms for which adjustment costs are expected to be higher. Using a GMM analysis to correct for short panel bias, we find that firm-years with free cash flows that are in the lower and upper tails of the distribution close nearly fifty percent of the gap between their current and target capital structure in an average year whereas those firm-years corresponding to the middle of the cash flow distribution have annual adjustment speeds closer to twenty-five percent. We confront these results with numerous alternative specifications of free cash flow and different free cash flow distribution cutoffs, finding very

stable estimates. We also document that the results are robust, and sometimes stronger, when we examine book leverage ratios rather than market leverage.

We recognize however that free cash flow could itself be endogenous if the negative realization of free cash flow were facilitated by accessing external capital markets, challenging our identification strategy. To confront this potential concern, we use lagged cash flow to generate our cutoffs. The findings are very similar to contemporaneous cash flow cutoffs.

An implicit assumption underlying our analysis is that firms would close their leverage gaps in the absence of capital structure adjustment costs. However, some firms may be capital constrained such that even after incurring any transaction costs associated with rebalancing their capital structure, they still cannot issue the additional securities that would enable them to achieve their target. We therefore follow Faulkender and Petersen (2006) and Almeida, Campello, and Weisbach (2004) and estimate adjustment speeds separately for firms with access to public debt markets relative to those without. If a debt rating proxies for the ease with which firms can issue their desired financial securities, we should see that rated firms have faster adjustment speeds. Indeed, we document that among firms with large, negative free cash flow flows - for which adjustment costs are likely sunk - those with access to public debt markets close more of their leverage gap than similar firms that lack access to public debt markets. Of course, firms could move more quickly toward a target simply because the distance from the target is great. We control for this distance and show that firms adjust more quickly when the cost of adjustment is sunk.

The remainder of the paper is organized as follows: We begin with a quick summary of the existing capital structure literature and discuss the contribution of our work in section I. Section II contains the baseline analysis following from FR as well as an analysis of adjustment speed based upon whether or not the firm raised external capital in the next period. We follow that with a discussion of our empirical strategy in section III followed by the primary results in section IV. In subsection IV.A, we conduct robustness tests using estimated cash flow while subsection IV.B analyzes financial constraints and subsection IV.C

analyzes the distance from target leverage. Section V concludes.

I Literature Review

The literature is replete with theories that attempt to explain the observed cross-sectional variation in capital structure including the trade-off theory, the pecking order theory, and more recently the theory of market timing. Under the trade-off theory, firms balance the costs and benefits of the characteristics of debt and equity to determine an optimal mix of financial claims based upon the fundamentals of the firm. There have been numerous empirical examinations, such as Titman and Wessels (1988), Zingales and Rajan (1995), Graham (1996), Graham, Lemmon, and Schallheim (1998), Hovakimian, Opler, and Titman (2001), and Faulkender and Petersen (2006) looking at the factors that seem to impact optimal capital structure. More recently, Frank and Goyal (2006) have aggregated this work to understand which firm attributes appear to provide the greatest incremental explanatory power, concluding that market-to-book, collateral, profitability, and size are robust determinants of observed capital structure.

However, profitability has consistently worked in the opposite direction of what would be predicted by a static trade-off theory and has, at least partially, emboldened advocates of other theories such as the pecking order theory (see Myers (1984)). This theory states that information asymmetries are the dominant issue confronting capital structure and that firms will therefore finance themselves according to the rank ordering of information sensitivity: internal liquidity, risk-free debt, risky debt, then equity as this is the rank ordering of information sensitivity. Shyam-Sunder and Myers (1999) conduct tests of this theory, finding that the financing deficit of firms does appear to be largely financed by debt, consistent with the theory. More recently however, work such as Frank and Goyal (2003) examines a broader sample and finds that debt finances a significantly smaller portion of the financing deficit than earlier documented. Furthermore, the firms most likely to be informationally opaque

use relatively less debt to fund their financing deficits. Additionally, Fama and French (2002) argue that equity issuances occur entirely too frequently for the pecking order to be a complete explanation for observed capital structure. In fact, they boldly declare that the pecking order is dead as a stand-alone theory of capital structure.

More recently, works such as Baker and Wurgler (2000, 2002) propose that firms time the issuance of financial securities based upon market conditions at the time they raise and distribute capital. They find that firms appear to raise equity when their share price seems to be relatively over-valued and raise debt when the firm is under-valued and that, while seemingly agnostic as to the source of mis-pricing (i.e. information asymmetry versus market irrationality), they contend that these issuance decisions have a persistent effect on capital structure. But this issue is far from settled: e.g. Butler, Grullon, and Weston (2005) have questioned the robustness of these results, generating a debate that is ongoing.

Central to disentangling these theories is the question of whether firms move toward a target capital structure toward when adjusting their leverage ratios. In addition to the recent works of Flannery and Rangan (2006) and Leary and Roberts (2005), recent work by Lemmon, Roberts, and Zender (forthcoming) argue that firms indeed appear to have a durable target capital structure but they often deviate from it temporarily. If information asymmetries are not the dominant factor determining capital structure, as the pecking order would suggest, managers will balance several costs and benefits when issuing new securities. A security's asymmetric information costs (benefits) would be balanced against its tax treatment, financial distress costs, and agency issues to generate a target capital structure that may vary over time with changes in information costs. Similarly, firms may have a target capital structure but also have a band around it within which they engage in the market timing of security issuance and repurchases. Finally, adjustment costs may limit the extent to which firms optimally alter their capital structure to achieve their target leverage. Our objective in this paper is to determine what portion of the deviation from target capital structure can be explained by adjustment costs.

Byoun has a similar paper which concludes that a firm's cash flows and the size/sign of its deviation from target affect its speed of adjustment toward the target (Byoun (forthcoming)). He pays particular attention to the sign, but not the amount, of free cash flows. Unfortunately, the equation he estimates (equation (1)) imposes the constraint that leverage adjustments can occur only through changes in outstanding debt. We have replicated his basic results in his Table V and find that correcting his specification (1) to allow both debt and equity adjustments yields nearly identical adjustment speeds for firms above and below their target leverage ratios. So, simply dividing on cash flow at the median point does not yield the same results we produce here. As we will demonstrate below, it is the magnitude of the cash flow rather than its sign that has a significant effect on the extent to which firms close the gap between current and target leverage in a fiscal year.

II Baseline Analysis

We begin with the FR framework, estimating the capital structure adjustment speed for Compustat firms (excluding financial firms (SIC 6000-6999) and utilities (SIC 4900-4999)) over the time period 1965-2004. FR generate a partial adjustment model in which the change in leverage is equal to the product of the speed of adjustment and the difference between current and target leverage:

$$\text{Lev}_{t+1} - \text{Lev}_t = \lambda \left(\text{Lev}^*_{t+1} - \text{Lev}_t \right) \tag{1}$$

where λ is the speed of adjustment and Lev^*_{t+1} is the firm's target leverage at time t+1. Following some algebraic manipulation, one generates the regression specification that they use in the paper in which one period ahead capital structure is regressed on current period capital structure and numerous current period controls that capture characteristics affecting

target capital structure:

$$\text{Lev}_{t+1} = (1 - \lambda)\,\text{Lev}_t + \lambda\beta(\text{controls}) + \epsilon \tag{2}$$

where controls are the set of firm characteristics hypothesized to affect target leverage and β is a vector of estimated coefficients representing the sensitivity of target capital structure to the corresponding control variables. Note that the coefficients that are estimated are the product of λ and β so the economic significance of the corresponding firm characteristic is determined by dividing the estimated coefficient by λ. We use the same set of controls as FR, including firm fixed effects to capture idiosyncratic, but stationary, drivers of capital structure that FR document to be important.

The combination of fixed effects and a lagged dependent variable can severely bias coefficient estimates, particularly with the panel length ("T") is small (Wooldridge (2002), Baltagi (2005)). Applying the within transformation or first differencing the variables to remove the time-invariant fixed effect creates a correlation between the transformed lagged dependent variable and the transformed error term that leads to biased and inconsistent results. This bias decreases with panel length (Nickell (1981)), but can be quite large even for panels with 30 observations (Judson and Owen (1999)). Therefore, capital structure data, like most corporate finance data, is susceptible to this short panel bias.

This short panel bias can be addressed in several ways. First, an appropriate instrumental variable (IV) can be used to instrument for the lagged dependent variable. (This method was applied by FR.) Because traditional instrumental variables are difficult to find in corporate finance, many researchers have employed a generalized method of moments (GMM) approach. Blundell and Bond (1998) suggest a system estimation (GMM_{BB}) that instruments for the first difference of endogenous (or predetermined) variables with lags of their own levels and differences. An alternative way to address the short panel bias comes from the recent advances in econometric theory. Given the length of each panel in the data,

one can compute the resulting fixed effects bias and explicitly remove it from the estimated coefficients (Bruno (2005)).[1] This "corrected least squares dummy variable" (LSDVC) approach for unbalanced panels calculates a consistent estimate of the short panel bias and then subtracts this bias from the LSDV estimate.[2]. We examine the importance of adjustment costs in achieving target capital structure using both the GMM_{BB} and LSDVC approaches. Because both methodologies yield similar coefficients, we report the GMM_{BB} results in the paper.

We use FR's firm characteristics to model each firm's annual target capital ratio, and provide summary statistics for all of our variables in Table I.

[Insert Table I]

The market value of leverage is defined as book value of the firm's interest bearing debt (Compustat item 9 + item 34) normalized by the market value of assets, where the market value of assets is simply the book value of assets (item 6) minus common equity (item 11) plus the product of the number of common shares outstanding (item 199) and the price per share (item 25). The book value of leverage is normalized by the book value of assets. To reduce the effect of outliers, all ratios are winsorized at the first and ninety-ninth percentile. In other words, all observations more extreme than these bounds are set to the boundary values. EBITTA is earnings before interest and taxes (item 18 + item 15 + item 16) normalized by the book value of assets. The market-to-book ratio is defined as the market value of assets normalized by the book value of assets. DEPTA is depreciation (item 14) normalized by the book value of assets. The item LN(BASSET) is the log of asset size, measured in 1983 dollars. The measure of fixed assets, FATA, is property, plant, and equipment (item 8) normalized by the book value of assets. RDDUMMY is defined as 1 if research and development expense (item 46) is positive and zero otherwise. RDTA is the ratio of research and development to the book value of assets. Finally, to control for industry effects, the industry leverage is included, INDMVLEV (or INDBVLEV), which

uses the Fama and French (2002) industry groups to calculate annual median market (book) value of leverage at the industry level.

Table II reports the estimation results for our baseline specification applied to the market value of leverage.

[Insert Table II]

Firm characteristics affect target capital structure in a way that is consistent with previous studies. the estimated adjustment speed of 22.5% (1 - 0.775) is slower than the speed estimated by FR, presumably because our GMM_{BB} estimates provide better instruments. Our results suggest that in an average year, the gap between current and target market capital structure is closed by just above one-fifth. Because it is not obvious whether firms care about market or book leverage ratios, we also run the baseline specification for the book value of leverage. These results are reported in the second column of Table II, and imply virtually the same adjustment speed as in the first column: 23.1% per year (1-0.769). We present all out subsequent analysis for both market- and book-valued leverage ratios.

To determine whether transaction costs prevent firms from fully adjusting to their target capital structure, we begin by comparing estimated adjustment speeds for those firms that do access external capital markets versus those that do not. In these specifications, we define "access" as a change in outstanding equity or debt exceeding 5% of total assets (in absolute value) during the next fiscal year (Recall that we are estimating period t+1 leverage so capital market access in year t+1 is the relevant year.) The motivation for such a test is that if there is a fixed cost associated with actively adjusting capital structure, then conditional on incurring this cost (raising external capital), we should see higher adjustment speeds for firms accessing external markets. The absence of such a finding would refute transactions costs as an explanation for partial adjustment.

Looking first at the market leverage ratio, the middle two columns in Table II indicate that firms accessing the capital market have an adjustment speed of 31.3%, versus 17.1%

for firms that do not access capital markets. These differences are both statistically and economically very significant.[3] The results are analogous when we look at the book leverage specifications (columns 5 and 6) in which the adjustment speed is just 6.3% for those that do not access external capital markets but 31.8% for those that do. It is not surprising that firms not accessing external capital have smaller adjustment speeds since it is only through operating cash flows and payout policy that their book value of leverage could have changed. However, to see that a third of the gap between the current leverage ratio and the estimated target book leverage ratio is closed in a single year is strong evidence that once a fixed transactions cost is overcome, firms engage in significant movements toward a desired leverage level, in strong contrast to work such as Welch (2004).

III Empirical Strategy and Identification

Although we have shown that significant movements toward a target capital structure take place when firms access external funds, the choice to tap the external capital markets is clearly an endogenous decision. Therefore, we need an exogenous condition associated with adjustment costs to identify the extent to which such costs impact observed capital structure.

We argue that the firm's cash flow position over the next fiscal year will generate such identification. If the firm has a sufficiently negative cash flow outcome, then it will be forced to access external markets to cover its financing deficit. The adjustment cost therefore becomes a sunk cost and our prediction is that such firms will adjust more toward their target capital structure than firms that are not forced to access external capital. Symmetrically, firms that generate rather high levels of cash flow are likely to distribute funds to financial claimants, thereby also making adjustments to their capital structure. If movement toward the firm's target leverage ratio requires that the next dollar of capital raised would take the from of debt, then the next dollar distributed should be to equityholders. Therefore, we should see qualitatively similar movements toward target for both subsets of firm-years.

However, the costs of issuing securities likely differs from the costs of retiring them. We therefore separately estimate capital structure adjustment speeds for firms with substantially negative cash flows over the proceeding year, substantially positive cash flow, and those closer to zero. The null hypothesis is that all three have the same adjustment speed. However, if we have correctly identified firms for which adjustment costs are likely to be sunk, we would expect adjustment speeds to be faster for firms with cash flows farther from zero. Such findings would be consistent with transactions costs limiting the extent to which firms' observed capital structures approach their desired levels in a particular fiscal year.

Our first measure of free cash flow (FCF0) in year t+1 is operating income before depreciation (13) minus taxes (16) and capital expenditures (128) divided by book assets at the end of year t (6). This measure estimates the amount of cash flow that is available for financing activities meaning that when it is high, there is a large amount available to be distributed and when it is negative, the firm would need to raise external funds to cover the shortfall. Our first alternative measure of cash flow (FCF1) also deducts interest expense in year t+1 as well as debt in current liabilities at the end of year t since both of these are obligatory payments of the firm that also could require the firm to raise external funds. Our second alternative measure (FCF2) also subtracts year t dividends, capturing the notion that firms may look upon existing dividend levels as obligatory, funded through the raising of external capital if necessary. Note that we do not use time t+1 dividends since any potential increase in dividends in year t+1 would be endogenous. Finally, we adjust FCF1 by adding the firm's cash position at the end of fiscal year t. This variable (FCF1A) captures the idea that if the firm has a high level of cash going into the fiscal year but has a negative cash flow year, the firm can avoid the cost of raising external funds by drawing down the firm's cash balance (Almeida, Campello, and Weisbach (2004)). Likewise, if the firm has a low cash level at the beginning of the year but a strong year in terms of cash flow generation, the firm may retain a large portion of the cash flow as cash and not materially change its leverage ratio. All of these robustness checks are important to conduct as we attempt to identify cross-sectional

variation in incremental transactions costs.

Given these measures of free cash flow, our next task is to determine the appropriate cutoff levels for a firm likely to access external markets due to the cash flow realization relative to those for which adjustment costs are likely to be incremental. Rather than being completely arbitrary in selecting the cutoffs, we divide the free cash flow distribution into twenty equal sized quantiles and calculate the percentage of each quantile that raised or distributed a significant amount of capital contemporaneous with the free cash flow outcome. We define raising significant capital as when the sum of debt and equity issuance exceeds five percent of book assets. Similarly, firms distribute significant capital when the sum of dividends, share repurchases, and debt retirements exceeds five percent of the book assets. Consistent with our intuition, Figure 1 reveals a negative and nearly monotonic relationship between cash flow levels and the likelihood of raising external capital over most of the distribution. 74.2% of those firm-years in the bottom five percent of the distribution raise external funds whereas 23.6% of those between the 50th and 55th percentile raise external funds. Interestingly, approaching the upper tail of the distribution, the likelihood of accessing external markets begins to increase again, with 34.9% of the top free cash flow firm-years raising external funds. Such behavior is potentially consistent with firms timing their capital market activities to correspond to periods when the firm's performance is particularly strong.

Similarly, we find a positive and nearly monotonic relationship between our primary measure of free cash flow (FCF1) and a significant distribution of capital to financial claimants. Among those in the bottom 5% of the cash flow distribution, only 8.1% of these firm-years contain significant distributions whereas among firm-years in the top quantile, 20.5% of the firm-years pay down a significant portion of their debt and / or engage in large cash distributions to equityholders (dividends and / or repurchases). These findings provide some assurance that our identification strategy does indeed capture firms that are likely to make adjustments to their capital structures in the corresponding fiscal year.

The data suggests a natural cut-off in the likelihood of accessing external markets for

firms in the fourth quantile (those between the 15th and 20th percentile of the cash flow distribution) relative to those in the third, as this is where the percentage of firms raising external funds drops below 50%. The portion of the fourth quantile accessing external funds is 47.0% whereas it is 51.0% for the third. We therefore use the 15th percentile of the distribution as our cutoff for firms likely to be confronting a sunk cost of adjusting their capital structures. For symmetry reasons, we use the same 15% cutoff at the upper end of the distribution to denote those firm-years for which adjustment costs associated with distributing funds are likely sunk. Therefore, the results presented below will show adjustment speeds for the bottom and top 15% of the cash flow distribution relative to the middle 70%.

One potential concern regarding our identification strategy is that if firms' with certain characteristics may be consistently in the top or bottom of the cash flow distributions. Estimated differences in adjustment speeds may then reflect differences in underlying firms characteristics rather than differences in the adjustment costs in the corresponding fiscal year. We investigate this possibility by calculating transition probabilities for the three cash flow groups, i.e. the probability that a firm will be in a particular cash flow category in one year conditional on its group assignment in the previous year. For the firms that were in the lowest 15% of the cash flow distribution, 52.4% of them are again in the bottom group of the distribution the following year. Symmetrically, firms in the highest 15% of the cash flow distribution in one year find themselves in that portion of the distribution in the following year 46.9% of the time. In both scenarios, there does appear to be a fair bit of movement in and out of the three groups, suggesting that differences in estimated adjustment speeds should be generated by differences in expected incremental costs and not differences in firm samples. Nevertheless, we have re-estimated our base regressions for only those firms that have at least one observation in more than one of the three cash flow groups (we eliminate the firms whose cash flows are always in same cash flow group). We find the same rank ordering of adjustment speeds and similar economic magnitudes in these regressions as for

the results we present below.

IV Results

Table III clearly indicates that firms for which adjustment costs are more likely to be sunk adjust more toward their target capital structure than those for which these costs would be incremental.

[Insert Table III]

In the first three columns of Table III, we see that firms with cash flows that are significantly negative (lowest 15% of annual cash flow) and significantly positive (highest 15% of annual cash flow) have adjustment speeds of 21.9% and 33.9% respectively compared to 20.7% for those firm-years with cash flows closer to zero.[4] The high and low groups' adjustment speeds are statistically different from each other. These initial results suggest that high cash flow firms make capital distributions that move their market leverage ratio approximately one third of the way toward target versus only one-fifth for the other two groups.

Looking at our alternative definitions of cash flow generates results even more consistent with our hypotheses. The middle three columns of Table III report estimation results for our first alternative measure of free cash flow (FCF1) which deducts interest expense and debt repayment form FCF0. A more pronounced pattern emerges in which the firms that are most likely to access external capital markets end up closing 41.7% of the gap between their current and target market leverage ratio, 47.8% of the gap for those likely to be distributing excess cash flow, and only 26.1% of the gap for those most likely to incur incremental transaction costs should they choose to adjust their capital structure. Under this measure, firms with highly positive cash flows have adjustment speeds that are statistically faster than the low cash flow group and both of these are significantly faster than the firms with free cash flow closer to zero. Given that the adjustment speed increased for both the positive and negative

free cash flow firms using this definition, it does appear that taking into account these other required payments more precisely identifies the firms most likely needing to raise external funds. Further, the baseline results are robust to the inclusion of year dummy variables.

Our second alternative definition of free cash flow (FCF2) also deducts lagged dividends. Estimation results when this variable is used to identify adjustment costs again results in estimated adjustment speeds that are significantly faster for firms in which adjustment costs are likely sunk (44.2% and 41.9%) relative to those for which they are most likely incremental (23.5%). In this specification, we do not find significant differences between the adjustment speeds of high and low cash flow firms, but they are both significantly different from the middle group of firm-years. Since most capital structure analysis approaches incremental capital raising and distributing symmetrically, i.e. that the same factors determining the form of capital raised affect which security is repaid, it is reassuring to see estimated adjustment speeds of similar size. Such results are consistent with optimal capital structure playing equivalent roles in financial decision making when firms are raising capital as when they are determining the firm's dividend policy.

Another set of robustness checks involved dropping the zero debt firms (consistent with Faulkender and Petersen (2006) and Strebulaev and Yang (2006)) for two reasons. The first is that zero leverage has empirically been a persistent phenomenon so tests estimating capital structure adjustment don't really apply to this subset of firms. Second, because their inclusion creates a large mass point at zero, the correct empirical specification would be a tobit with a lower bound at zero. However, fixed effects in a tobit specification generate biased estimates so dropping the zero debt firms alleviates the need to use a tobit (Wooldridge (2002)). The results do not materially change when the zero debt firm-years are dropped. We also examined adjustment speeds when there were differences in firm characteristics that may capture the benefits (as opposed to the costs) of deviating from target capital structure. We estimated that firms with high marginal tax rates (MTR) adjusted more quickly than firms with low MTR (Graham (1996)) and firms with potentially high costs of distress (proxied

using R&D) also adjust more quickly than firms with lower expected distress costs.

Recall that when we looked at the adjustment speeds for issuers versus non-issuers, we found larger differences for the book leverage ratio than for the market leverage ratio. So, we now examine book leverage adjustments across our three cash flow groups to see if the findings for market leverage persist. Table IV reports that they do persist. Firms in the inner 70% range of FCF0 close an average of 19.9% of the gap between their beginning of the year and target book leverage ratio. By contrast, the estimated adjustment speed is 28.7% for those with significantly positive free cash flow generation and 33.2% for those with significantly negative free cash flow. In this specification, all three of these estimates differ significantly from one another and the magnitudes of those differences again point to the large effect that transaction costs have on observed capital structure. The significantly higher adjustment speed for "low" free cash flow firms in Table IV contrasts the corresponding result in Table III, suggesting that book leverage targets play a larger role in the incremental issuance decision relative to dividend policy decisions.

[Insert Table IV]

Columns 4 through 6 contain the results using FCF1, which includes mandatory payments to debt, and find estimated adjustment speeds of 47.4%, 28.4%, and 45.1% respectively. Like the market leverage results, this specification generates results that are economically stronger than our baseline free cash flow measure, potentially pointing to this measure being a more accurate assessment of the likelihood that firms' cash flow positions correctly assign them to the right adjustment group. Similar estimates are generated when we also adjust free cash flow for lagged dividend payments (FCF2), the results of which are reported in the final three columns of Table IV. The estimated coefficients of 42.7%, 25.1%, and 46.9% respectively are once again consistent with adjustment costs importantly affecting convergence toward target capital structure.

Our final measure for dividing the sample is FCF1A which adds the beginning of year cash position of the firm to the free cash flow generated throughout the fiscal year. Since

internal liquidity can be used to offset negative cash flow outcomes and may be stockpiled during high cash flow periods, it is important to demonstrate that our results are robust to such an alternative specification. These results, provided in Table V, are consistent with the other measures of free cash flow in that the firms that are likely to incrementally incur greater adjustment costs do indeed move toward their target capital structure. Similar results occur for both the market leverage ratios and the book leverage ratios. The estimated speeds are 46.2% for those with low beginning of period cash positions combined with low or negative cash flow generation during the fiscal year, 50.4% for those likely to be distributing funds, and 27.7% for firms in the middle. Using the same cutoffs but instead looking at book leverage adjustment speeds, we find estimates of 37.5%, 29.3%, and 52.3% respectively. Once again, we find that cross-sectional variation in likely adjustment costs do have significant effects, both statistically and economically, on the extent to which firms close the gap between their current and target capital structures.

[Insert Table V]

IV.A Estimated Cash Flow

So far, we have used contemporaneous realized cash flows to assign each firm-year to a group that proxies for expected adjustment costs. However, the cash flow that is generated during the fiscal year may also be endogenous and therefore not a proper ex ante measure. To address this concern, we use our first alternative free cash flow measure (FCF1, which includes deductions for interest expense and maturing debt), for the *prior* year to assign firms to the three groups. Although all free cash flow definitions yield similar results, FCF1 appears to give the cleanest identification strategy. We then test whether adjustment speeds similarly vary across the three groups using this lagged cash flow measure to separate the groups.

Even after addressing the potential endogeneity of the adjustment, we still find results consistent with our earlier findings, as demonstrated by the estimates found in Table VI.

[Insert Table VI]

Firms that were in the most negative subsample of the cash flow distribution make adjustments to their capital structure in the following fiscal year that close 39.5% of the gap between the beginning of year market leverage ratio and the target (column 3). For those in the highest cash flow group, they close 63.4% of the gap in the subsequent fiscal year (column 1). Compare this to those in the middle 70 percent who are estimated to only adjust 20.0% (column 2). The results are again similar when we examine book leverage ratios (columns 4 to 6). These results demonstrate that even after removing the potential endogeneity between contemporaneous cash flow and capital structure changes, it is still the case that for firms in which the costs of adjustment are most likely to be sunk move towards their target capital structure faster than for those firms for which the adjustment costs are likely to be incremental.

As a visual demonstration of the robustness of our results across the free cash flow specifications and measures of leverage we have so far discussed, Figure 2 plots the adjustment speed for the three cash flow groups across the different measures. As can be seen by the graph, the tails of the cash flow distribution consistently generate adjustment speeds well above the middle cash flow group, highlighting the extent to which the cost of altering a firm's capital structure appears to affect estimated adjustment speeds.

IV.B Financial Constraints

Implicit in the analysis conducted so far is that firms could fully adjust to their target capital structure each year but adjustment costs prevent them for quickly reaching their targets. However, adjustment could also be incomplete if firms cannot issue the type of security required to move them to their target capital structure. We therefore further break firms into constrained and unconstrained firms by following Faulkender and Petersen (2006), Almeida, Campello, and Weisbach (2004), and Faulkender and Wang (2006) and look at whether the firm has a credit rating in the corresponding fiscal year. Because such data

is only sparsely available for firms in COMPUSTAT beginning in 1985 and more reliably available starting in 1986, the regressions in this section are limited to the 1986 to 2004 time period.

Allowing for differential access to capital in the specification generates results, located in Table VII, that are largely similar to those already documented earlier in the paper.

[Insert Table VII]

Regardless of whether firms are likely to have difficulty accessing external capital, we still find differences in adjustment speeds based upon the extent to which adjusting would generate an incremental cost. The firms distributing cash are likely to adjust their market leverage ratio the fastest, with low cash flow generating firms adjusting at a slightly slower pace, and the firms in the middle closing the gap between current and target capital structure the least. However, we also find adjustment speeds to be faster among those firms with better access to external capital. Likely capital raisers adjust 52.7% of the way in a single fiscal year if they have access to public debt markets versus 40.7% for non-rated firms. This asymmetry also carries over to those most likely distributing, with estimated speeds of 57.9% relative to 45.2%. At first, one may have only expected to find differences between rated and unrated firms when the adjustment would come from raising capital. However, one could interpret the result for capital distributors as consistent with a greater reluctance to distribute cash when lacking access to external markets.

As with all of our other results, we also estimate the effects of capital market access on adjustment speeds using book leverage, the results of which are located in Table VIII.

[Insert Table VIII]

As with the market leverage results, the firm-years in which adjustment costs are likely to be incremental adjust more slowly and adjustment speeds are faster for firms with improved capital market access. Rated firms in years in which adjustment costs are likely sunk close

an estimated 53.1% of the gap between beginning of year and target leverage relative to approximately 48.1% of the distance for firms lacking access to public markets. While this difference is smaller than what we documented when we used market leverage, these estimated adjustment speeds differ statistically and are consistent with firms sometimes not closing as much of their leverage gap because a financial constraint is likely to be binding.

IV.C Distance from Target

For our identification strategy to generate the interpretation that we provide, it requires convincing readers that our partitioning of the groups is capturing differences in incremental adjustment costs, not differences in other firm characteristics that may alter the desired speed of adjustment. This section performs one final set of robustness checks to reject another alternative explanation, that the magnitude of the firm's free cash flow is correlated with the distance from its target. Below, we estimate the firm's distance from its target and separately estimate adjustment speeds for the three free cash flow groups for those firm-years close and far from their target. Our results still emerge once we control for the estimated distance from target.

We first use the results from our baseline regression in Table II to estimate the firm-year's target leverage ratio and then calculate the difference between that estimate and its current leverage ratio. We then categorize firms as either within ten percentage points of its target or greater than 10% away from its target. Following that first division of the data, we then further partition the data based upon our three free cash flow measures, resulting in a total of six subgroups. The results of our analysis of adjustment speeds for these groups using the market leverage ratio measure appear in Table IX while Table X contains reults for the book value of leverage.

[Insert Table IX]

[Insert Table X]

Even after controlling for distance from target, we find that the firm-years with cash flows relatively close to zero have significantly lower market leverage adjustment speeds (34.3% and 36.1% for the "Greater than 10% from Target" and "Within 10% of Target" groups respectively) than firm-years with either significantly positive or negative levels of free cash flow (45.6%, 41.8%, 56.7%, and 65.9% respectively). The results for book leverage are nearly identical. Interestingly, the firms close to their target leverage ratio have faster estimated adjustment speeds than those further away. Recall though that we are estimating the percentage of the gap that is closed and since the firm-years in the first three columns are at least 10% from their target, a slower adjustment speed may still correspond to a larger magnitude change in the firm's leverage ratio in a given fiscal year. Further, in unreported robustness analysis, we also estimate the adjustment speed for each free cash flow group for the overlevered and underlevered firms separately. Within each subsample, we find the same pattern of adjustment that is documented throughout the paper. Overall, the results demonstrate that our finding is not driven by differences in the distance from the target capital structure for the three free cash flow groups and instead is consistent with the variation in adjustment speeds arising from the extent to which adjustment costs are incremental.

V Conclusion

We find that cross-sectional variation in likely adjustment costs are associated with differences in adjustment speeds toward a target capital structure. Years in which firms are likely to be raising or distributing capital, as a result of their cash flow realization, close significantly more of the gap between current and target capital structure than those firm-years with cash flow realizations closer to zero, i.e. firm-years for which adjustment costs are likely to be incremental. These results hold for both market and book leverage ratios, multiple cash flow specifications, numerous cash flow cutoffs, and after controlling for financing con-

straints and distance from target leverage. We argue that these results are consistent with costs associated with modifying firms' capital structures having material effects on observed capital structure. We view these results as an important contribution to the findings of Flannery and Rangan (2006) because we are able to actually link partial adjustment to ex ante measures of likely adjustment costs. Most importantly, these results further substantiate the presence of target leverage ratios, consistent with the trade-off theory of capital structure.

References

Almeida, H., M. Campello, and M. Weisbach, 2004, The cash flow sensitivity of cash, *Journal of Finance* 59, 1777–1804.

Baker, Malcolm, and Jeffrey Wurgler, 2000, The equity share in new issues and aggregate stock returns, *Journal of Finance* 55, 2219–2257.

Baker, M., and J. Wurgler, 2002, Market timing and capital structure, *Journal of Finance* 57, 1–32.

Baltagi, Badi H., 2005, *Econometric Analysis of Panel Data* (John Wiley and Sons) 1 edn.

Blundell, Richard, and Stephen Bond, 1998, Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics* 87, 115–143.

Bruno, Giovanni S.F., 2005, Approximating the bias of the lsdvc estimator for dynamic unbalanced panel data model, *Economics Letters* 87, 361–366.

Butler, Alex, Gustavo Grullon, and James Weston, 2005, Stock market liquidity and the cost of issuing equity, *Journal of Financial and Quantitative Analysis* 40, 331–348.

Byoun, Soku, 2008, How and when do firms adjust their capital structure toward targets?, Forthcoming *Journal of Finance*.

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

Faulkender, M., and M. Petersen, 2006, Does the source of capital affect capital structure?, *Review of Financial Studies* 19, 45–79.

Faulkender, M., and R. Wang, 2006, Corporate financial policy and the value of cash, *Journal of Finance* 60, 931–962.

Flannery, Mark, and Kasturi Rangan, 2006, Partial adjustment toward target capital structures, *Journal of Financial Economics* 79, 469–506.

Frank, Murray, and Vidhan Goyal, 2003, Testing the pecking order theory of capital structure, *Journal of Financial Economics* 67, 217–248.

———, 2006, Capital structure decisions: Which factors are reliably important?, Working Paper.

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

———, Michael Lemmon, and James Schallheim, 1998, Debt, leases, taxes, and the endogeneity of corporate tax status, *Journal of Finance* 53, 131–161.

Hahn, Jinyong, Jerry Hausman, and Guido Kuersteiner, 2007, Long difference instrumental variables estimation for dynamic panel models with fixed effects, *Journal of Econometrics* 140, 574–617.

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

Huang, Rongbing, and Jay R. Ritter, 2007, Testing theories of capital structure and estimating the speed of adjustment, Forthcoming *Journal of Financial and Quantitative Analysis* pp. 1–49.

Judson, Ruth A., and Ann L. Owen, 1999, Estimating dynamic panel data models: A guide for macroeconomists, *Economics Letters* 65, 9–15.

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

Lemmon, Michael, Michael Roberts, and Jamie Zender, 2008, Back to the beginning:persistence and the cross-section of corporate capital structure, Forthcoming Journal of Finance.

Myers, Stewart, 1984, Capital structure puzzle, *Journal of Finance* 39, 575–592.

Nickell, Stephen, 1981, Biases in dynamic models with fixed effects, *Econometrica* 49, 1417–1426.

Shyam-Sunder, L., and Stewart Myers, 1999, Testing static tradeoff against pecking order models of capital structure, *Journal of Financial Economics* 51, 219–244.

Strebulaev, Ilya A., and Bayzhong Yang, 2006, The mystery of zero-leverage firms, Working Paper pp. 1–59.

Titman, Sheridan, and Roberto Wessels, 1988, The determinants of capital structure choice, *Journal of Finance* 43, 1–18.

Welch, I., 2004, Capital structure and stock returns, *Journal of Political Economy* pp. 106–131.

Wooldridge, Jeffrey M., 2002, *Econometric Analysis of Cross Sectional and Panel Data* (The MIT Press) 1 edn.

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

Notes

[1]Hahn, Hausman, and Kuersteiner (2007) show that the short panel bias also can be addressed by using long (multi-period) differences in the dependent and independent variables. This technique is applied to capital structure estimation by Huang and Ritter (2007). However, the performance of long differencing has not been econometrically established for unbalanced panels.

[2]To estimate the bias, LSDVC requires an initial matrix be specified. For the starting matrix, we use either the GMM_{BB} initial estimator or a matrix based on earlier coefficient estimates. Sensitivity analysis shows that the LSDVC estimation is robust to the initial matrix selection. LSDVC corrects the panel length bias up to order NT^2.

[3]In unreported regressions we look at cutoffs other than 5% and we also examine issuances normalized by the market value of assets and find similar results, available upon request.

[4]Allowing the same firm to have differing sensitivities to firm covariates depending on whether the firm is in a particular cash flow regime that year is suboptimal. However, forcing the fixed effect to remain constant across regimes is misspecified since the adjustment speed interacts with each fixed effect. We are not aware of an econometric specification that would enable simultaneous estimation of different adjustment speeds across the three groups while forcing the coefficients on the covariates to be the same. Here, we report results where the coefficients corresponding to firm characteristics are allowed to differ across the three groups, but the results are consistent across both methods and available upon request.

Table I: Summary Statistics

	Mean	Median	St. Dev.	Low	High
$MVLEV_t$	0.258	0.196	0.244	0.000	1.000
$BVLEV_t$	0.236	0.216	0.194	0.000	1.000
$EBITTA_t$	0.017	0.084	0.632	-1.212	10.657
MB_t	1.720	1.050	3.068	0.004	11.281
$DEPTA_t$	0.049	0.038	0.068	0.000	8.599
$LN(BASSET)_t$	18.141	17.996	2.122	13.314	25.440
$FATA_t$	0.313	0.260	0.229	0.000	1.577
$RDDUMMY_t$	0.461	0.000	0.498	0.000	1.000
$RDTA_t$	0.041	0.000	0.126	0.000	17.972
IND $MVLEV_t$	0.220	0.215	0.139	0.000	0.806
IND $BVLEV_t$	0.200	0.211	0.087	0.000	0.537
	Mean	Median	St. Dev.	15%	85%
FCF0	-0.039	0.029	0.029	-0.114	0.092
FCF1	-0.119	-0.043	-0.043	-0.254	0.046
FCF2	-0.123	-0.053	-0.053	-0.251	0.034
FCF1A	0.025	0.029	0.029	-0.150	0.233

Table I characterizes the mean, median, standard deviation, low, and high values of the control variables. In addition, the mean, median, standard deviation, 15%, and 85% breaks are presented for the four different free cash flow definitions. Recall that 15% and 85% are the break points used to decide when a firm is severely cash constrained or has excess cash, respectively.

Table II: Market and Book Leverage Adjustment Speeds

	Baseline		Market Value		Book Value	
	Mkt Value	Bk Value	Access	No Access	Access	No Access
LEV_t	0.775***	0.769***	0.687***	0.829***	0.682***	0.937***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	0.000	-0.002*	0.017***	-0.006***	0.022***	-0.004
	(0.780)	(0.100)	(0.000)	(0.001)	(0.000)	(0.140)
MB_t	0.001***	0.000	0.001**	0.000	0.000	-0.001*
	(0.009)	(0.530)	(0.013)	(0.960)	(0.150)	(0.060)
$DEPTA_t$	-0.102***	-0.031**	0.018	0.024	0.005	0.037***
	(0.000)	(0.031)	(0.350)	(0.500)	(0.810)	(0.008)
$LN(BASSET)_t$	0.018***	0.009***	0.016***	0.059***	-0.007***	0.032***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
$FATA_t$	0.109***	0.099***	0.119***	0.199***	0.097***	0.198***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$RDDUMMY_t$	0.138***	0.068***	0.150***	0.090***	0.167***	-0.030
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.130)
$RDTA_t$	-0.018*	-0.033**	0.054***	-0.037*	0.050***	-0.067**
	(0.100)	(0.035)	(0.000)	(0.067)	(0.001)	(0.011)
IND LEV_t	0.053***	-0.047**	0.094***	-0.157***	0.034	-0.232***
	(0.000)	(0.018)	(0.000)	(0.000)	(0.330)	(0.000)
N	124995	125391	69597	55398	68578	56813
# Firms	14133	14152	12126	12581	12069	12705

Significance levels : $***$: 1% $**$: 5% $*$: 10%

Table II presents the results from a GMM_{BB} analysis where the dependent variable is the market value of leverage in the next period, $MVLEV_{t+1}$ in columns (1), (3), and (4) and book value of leverage in the next period, $BVLEV_{t+1}$ in columns (2), (5), and (6) . Recall that the adjustment speed is $1 - \beta_{\text{LEV}_t}$. The baseline analysis presents the results found in Flannery and Rangan (2006). Free cash flow is defined as operating income before depreciation less taxes less capital expenditures. Market access is defined and an issuance of debt or equity or a reduction of a debt or equity in excess of 5% of the book value of assets. P-values are reported in parenthesis.

Table III: Free Cash Flow Break Adjustment Speed: Market Leverage

	FCF0			FCF1			FCF2		
	High	Med	Low	High	Med	Low	High	Med	Low
$MVLEV_t$	0.661***	0.793***	0.781***	0.522***	0.739***	0.583***	0.558***	0.765***	0.581***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	-0.106***	0.010***	-0.016***	0.002	0.009***	-0.006**	-0.002	0.046***	0.000
	(0.000)	(0.000)	(0.000)	(0.740)	(0.000)	(0.021)	(0.800)	(0.000)	(0.980)
MB_t	0.002*	0.003***	0.000	0.002***	0.003***	0.000**	0.003***	0.002***	0.000**
	(0.084)	(0.000)	(0.230)	(0.004)	(0.000)	(0.035)	(0.000)	(0.000)	(0.020)
$DEPTA_t$	-0.452***	-0.170***	-0.002	-0.027	-0.117***	-0.022	-0.062*	-0.053	-0.017
	(0.000)	(0.001)	(0.890)	(0.450)	(0.003)	(0.180)	(0.086)	(0.220)	(0.330)
$LN(BASSET)_t$	-0.019***	0.033***	0.040***	0.024***	0.037***	0.053***	0.029***	0.031***	0.061***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$FATA_t$	0.148***	0.082***	0.152***	0.166***	0.116***	0.074***	0.229***	0.106***	0.071***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$RDDUMMY_t$	0.180***	0.123***	0.056***	0.032*	0.062***	0.100***	0.118***	0.052***	0.028***
	(0.000)	(0.000)	(0.000)	(0.073)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$RDTA_t$	-0.128***	0.029	-0.020*	0.006	-0.012	-0.013	0.012	0.041	-0.011
	(0.000)	(0.340)	(0.060)	(0.750)	(0.650)	(0.310)	(0.660)	(0.120)	(0.320)
IND $MVLEV_t$	0.077***	0.038***	-0.149***	0.012	0.067***	0.089***	-0.019	0.054***	0.082***
	(0.001)	(0.003)	(0.000)	(0.590)	(0.000)	(0.000)	(0.490)	(0.000)	(0.001)
N	18424	86073	18411	17983	83868	17903	17402	81204	17333
# Firms	5763	11556	6785	5233	11602	6590	5471	11383	6607

Significance levels : $***$: 1% : $**$: 5% $*$: 10%

Table III presents the results from a GMM_{BB} analysis where the dependent variable is the market value of leverage in the next period, $MVLEV_{t+1}$. Recall that the adjustment speed is $1 - \beta_{\text{LEV}_t}$. FCF0 is defined as operating income before depreciation less taxes less capital expenditures. FCF1 is

defined as free cash flow less interest expense and debt in current liabilities. FCF2 is defined as FCF1 less the previous period's dividends. All free cash flow variables are normalized by the book value of assets. High is classified as greater than the 85% in free cash flow relative to book assets. Medium is defined as between 85% and 15% in free cash relative to book assets. Low is defined as less than 15% in free cash flow relative to book assets. P-values are reported in parenthesis.

Table IV: Free Cash Flow Break Adjustment Speed: Book Leverage

	FCF0			FCF1			FCF2		
	High	Med	Low	High	Med	Low	High	Med	Low
$BVLEV_t$	0.713***	0.801***	0.668***	0.526***	0.716***	0.549***	0.573***	0.749***	0.531***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	-0.114***	0.007***	-0.017***	-0.011	0.008***	0.002	-0.004	0.044***	0.004
	(0.000)	(0.000)	(0.000)	(0.130)	(0.000)	(0.310)	(0.580)	(0.000)	(0.260)
MB_t	0.001	0.002***	-0.001**	0.001	0.003***	-0.001**	0.001**	0.002***	-0.001*
	(0.280)	(0.001)	(0.026)	(0.210)	(0.000)	(0.030)	(0.046)	(0.004)	(0.085)
$DEPTA_t$	-0.435***	-0.143***	0.006	-0.081***	-0.054*	-0.002	-0.070**	0.034	-0.010
	(0.000)	(0.000)	(0.610)	(0.007)	(0.085)	(0.900)	(0.036)	(0.260)	(0.550)
$LN(BASSET)_t$	-0.034***	0.018***	0.031***	0.030***	0.026***	0.043***	0.036***	0.021***	0.051***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$FATA_t$	0.065**	0.077***	0.199***	0.167***	0.121***	0.147***	0.195***	0.104***	0.152***
	(0.037)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$RDDUMMY_t$	0.097***	0.076***	0.127***	-0.008	0.043***	0.046***	0.060**	0.045***	0.025
	(0.000)	(0.000)	(0.000)	(0.680)	(0.000)	(0.000)	(0.019)	(0.000)	(0.160)
$RDTA_t$	-0.154***	0.090***	-0.019***	0.061**	-0.001	-0.025*	0.072***	0.047	-0.012
	(0.000)	(0.005)	(0.006)	(0.025)	(0.980)	(0.066)	(0.006)	(0.120)	(0.450)
IND $BVLEV_t$	0.253***	-0.065***	-0.344***	-0.031	-0.040*	0.001	-0.064	-0.030	0.006
	(0.000)	(0.007)	(0.000)	(0.420)	(0.088)	(0.970)	(0.130)	(0.180)	(0.810)
N	18484	86262	18484	17635	82296	17635	17432	81355	17432
# Firms	5780	11576	6794	5169	11551	6527	5479	11401	6622

Significance levels : $***$: 1% : $**$: 5% $*$: 10%

Table IV presents the results from a GMM_{BB} analysis where the dependent variable is the book value of leverage in the next period, $BVLEV_{t+1}$. Recall that the adjustment speed is $1 - \beta_{\text{LEV}_t}$. FCF0 is defined as operating income before depreciation less taxes less capital expenditures. FCF1 is

defined as free cash flow less interest expense and debt in current liabilities. FCF2 is defined as FCF1 less the previous period's dividends. All free cash flow variables are normalized by the book value of assets. High is classified as greater than the 85% in free cash flow relative to book assets. Medium is defined as between 85% and 15% in free cash relative to book assets. Low is defined as less than 15% in free cash flow relative to book assets. P-values are reported in parenthesis.

Table V: Alt. FCF Plus Beg. of Period Cash

	Market Value of Leverage			Book Value of Leverage		
	High	Med	Low	High	Med	Low
LEV_t	0.496***	0.723***	0.538***	0.625***	0.707***	0.477***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	-0.005	0.004**	0.007	-0.010**	0.002	0.001
	(0.330)	(0.025)	(0.150)	(0.014)	(0.180)	(0.780)
MB_t	0.000	0.001**	0.000	-0.001***	0.001	0.000
	(0.140)	(0.034)	(0.820)	(0.007)	(0.190)	(0.390)
$DEPTA_t$	0.039	-0.057	0.052***	0.024	-0.010	0.023**
	(0.130)	(0.160)	(0.001)	(0.330)	(0.740)	(0.039)
$LN(BASSET)_t$	0.014***	0.035***	0.063***	0.020***	0.028***	0.045***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$FATA_t$	-0.038**	0.141***	0.037**	-0.115***	0.139***	0.111***
	(0.044)	(0.000)	(0.016)	(0.000)	(0.000)	(0.000)
$RDDUMMY_t$	0.099***	0.106***	0.037*	0.010	0.076***	0.118***
	(0.000)	(0.000)	(0.092)	(0.350)	(0.000)	(0.000)
$RDTA_t$	0.028*	-0.052*	-0.003	-0.017	-0.018	0.006
	(0.057)	(0.094)	(0.810)	(0.320)	(0.650)	(0.740)
IND LEV_t	-0.133***	0.060***	0.080***	0.009	-0.107***	-0.188***
	(0.000)	(0.000)	(0.000)	(0.670)	(0.000)	(0.000)
N	17895	83486	17822	17547	81890	17547
# Firms	5281	11462	6335	5213	11398	6287

Significance levels : $***$: 1% $**$: 5% $*$: 10%

Table V presents the results from a GMM_{BB} analysis where the dependent variable is the market value of leverage in the first three columns and book value of leverage in the next three columns. Beginning of the period cash has been added to the FCF1 definition used to determine the break points. Recall that the adjustment speed is $1 - \beta_{\mathrm{BVLEV}_t}$. P-values are reported in parenthesis.

Table VI: Previous Period Alt. Free Cash Flow Break

	Market Value of Leverage			Book Value of Leverage		
	High	Med	Low	High	Med	Low
LEV_t	0.366***	0.800***	0.605***	0.572***	0.817***	0.591***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	0.011	0.003	0.007***	-0.022***	0.007***	0.010***
	(0.190)	(0.110)	(0.008)	(0.002)	(0.000)	(0.000)
MB_t	0.002***	0.001	0.000*	0.001	0.003***	0.000
	(0.000)	(0.180)	(0.083)	(0.390)	(0.000)	(0.730)
$DEPTA_t$	0.279***	-0.292***	0.006	0.155***	0.025**	-0.007
	(0.000)	(0.000)	(0.750)	(0.002)	(0.035)	(0.680)
$LN(BASSET)_t$	0.046***	0.008***	0.043***	0.037***	0.000	0.022***
	(0.000)	(0.005)	(0.000)	(0.000)	(0.970)	(0.000)
$FATA_t$	-0.183***	-0.032**	0.033***	-0.217***	-0.036***	0.102***
	(0.000)	(0.045)	(0.000)	(0.000)	(0.006)	(0.000)
$RDDUMMY_t$	0.036*	0.186***	0.076***	0.037*	0.069***	0.029***
	(0.067)	(0.000)	(0.000)	(0.056)	(0.000)	(0.000)
$RDTA_t$	0.116**	-0.007	-0.007	0.043	-0.071**	-0.033***
	(0.021)	(0.790)	(0.590)	(0.230)	(0.018)	(0.008)
IND LEV_t	0.107***	0.003	0.101***	0.035	0.036	-0.051***
	(0.000)	(0.830)	(0.000)	(0.350)	(0.110)	(0.002)
N	16383	76422	16263	15797	73720	15797
# Firms	4788	10710	5914	4695	10589	5807

Significance levels : $***$: 1% $**$: 5% $*$: 10%

Table VI presents the results from a GMM_{BB} analysis where the dependent variable is the market value of leverage in the next period, $MVLEV_{t+1}$ and FCF1 is for the *previous* period. Recall that the adjustment speed is $1 - \beta_{\text{LEV}_t}$. FCF0 is defined as operating income before depreciation less taxes less capital expenditures. FCF1 is defined as free cash flow less interest expense and debt in current liabilities. FCF2 is defined as FCF1 less the previous period's dividends. All free cash flow variables are normalized by the book value of assets. High is classified as greater than the 85% in free cash flow relative to book assets. Medium is defined as between 85% and 15% in free cash relative to book assets. Low is defined as less than 15% in free cash flow relative to book assets. P-values are reported in parenthesis.

Table VII: Financial Constraint: Rated (Market Leverage)

	Unconstrained			Constrained		
	High	Med	Low	High	Med	Low
$MVLEV_t$	0.421***	0.692***	0.473***	0.548***	0.741***	0.593***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	-0.093***	0.050***	0.005	0.013	0.044***	-0.002
	(0.000)	(0.000)	(0.150)	(0.120)	(0.000)	(0.730)
MB_t	0.007***	0.000	0.000	0.003**	0.002*	-0.002***
	(0.000)	(0.990)	(0.960)	(0.019)	(0.097)	(0.003)
$DEPTA_t$	0.480***	-0.080**	0.008	0.056	0.030	-0.002
	(0.000)	(0.032)	(0.530)	(0.230)	(0.550)	(0.970)
$LN(BASSET)_t$	0.022***	0.026***	0.098***	0.038***	0.030***	0.048***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$FATA_t$	0.038***	0.055***	0.008*	0.147***	0.115***	0.058***
	(0.000)	(0.000)	(0.075)	(0.000)	(0.000)	(0.000)
$RDDUMMY_t$	0.026***	-0.014	-0.133***	0.092***	0.061***	0.101***
	(0.000)	(0.210)	(0.000)	(0.000)	(0.000)	(0.000)
$RDTA_t$	-0.542***	-0.113	0.051***	0.059	0.026	-0.013
	(0.000)	(0.190)	(0.002)	(0.160)	(0.500)	(0.560)
IND $MVLEV_t$	0.188***	0.154***	0.035***	0.030	0.071***	0.077***
	(0.000)	(0.000)	(0.000)	(0.250)	(0.000)	(0.000)
N	1514	7075	1506	13865	64673	13814
# Firms	620	1717	765	4541	10072	5637

Significance levels : $***$: 1% $**$: 5% $*$: 10%

Table VII presents the results from a GMM_{BB} analysis where the dependent variable is the market value of leverage in the first three columns represent unconstrained firms and the last three represent constrained firms. Following Almeida, Campello, and Weisbach (2004), a firm is assigned as financially unconstrained for those firm-years in which the firm has a bond rating and reports positive debt. Similarly, a firm is designated as constrained if there is no bond rating, but the firm reports positive debt. Recall that the adjustment speed is $1 - \beta_{\text{MVLEV}_t}$. P-values are reported in parenthesis.

Table VIII: Financial Constraint: Rated (Book Leverage)

	Unconstrained			Constrained		
	High	Med	Low	High	Med	Low
$BVLEV_t$	0.479***	0.702***	0.469***	0.510***	0.730***	0.519***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	-0.111***	0.069***	-0.015***	0.015	0.059***	0.008
	(0.000)	(0.000)	(0.000)	(0.180)	(0.000)	(0.130)
MB_t	-0.003***	0.003**	0.004***	0.000	0.000	0.000
	(0.000)	(0.022)	(0.000)	(0.850)	(0.750)	(0.910)
$DEPTA_t$	0.167***	0.065***	0.002	-0.196***	0.100**	0.075**
	(0.000)	(0.001)	(0.530)	(0.002)	(0.011)	(0.020)
$LN(BASSET)_t$	0.026***	0.005***	0.037***	0.019***	0.025***	0.044***
	(0.000)	(0.007)	(0.000)	(0.000)	(0.000)	(0.000)
$FATA_t$	-0.138***	0.072***	0.159***	0.204***	0.110***	0.169***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$RDDUMMY_t$	0.079***	-0.012**	0.012***	-0.009	0.028***	-0.064***
	(0.000)	(0.043)	(0.000)	(0.590)	(0.009)	(0.000)
$RDTA_t$	-0.419***	-0.296***	-0.023*	0.126***	0.185***	-0.047***
	(0.000)	(0.000)	(0.098)	(0.001)	(0.000)	(0.003)
$IND\ BVLEV_t$	0.088***	0.102***	0.410***	-0.032	-0.030	0.084***
	(0.000)	(0.000)	(0.000)	(0.400)	(0.230)	(0.001)
N	1483	6925	1483	12274	57282	12274
# Firms	615	1704	764	3259	6940	4104

Significance levels : $***$: 1% $**$: 5% $*$: 10%

Table VIII presents the results from a GMM_{BB} analysis where the dependent variable is the book value of leverage in the first three columns represent unconstrained firms and the last three represent constrained firms. Following Almeida, Campello, and Weisbach (2004), a firm is assigned as financially unconstrained for those firm-years in which the firm has a bond rating and reports positive debt. Similarly, a firm is designated as constrained if there is no bond rating, but the firm reports positive debt. Recall that the adjustment speed is $1 - \beta_{\mathrm{BVLEV}_t}$. P-values are reported in parenthesis.

Table IX: Distance from Target Capital Structure (Market Leverage)

	Greater than 10% from Target			Within 10% of Target		
	High	Med	Low	High	Med	Low
$MVLEV_t$	0.544***	0.657***	0.582***	0.433***	0.639***	0.341***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	-0.012	0.003	-0.008***	0.006**	0.024***	0.002
	(0.340)	(0.330)	(0.001)	(0.011)	(0.001)	(0.140)
MB_t	0.004**	0.002	0.000	0.001***	0.002***	0.000
	(0.016)	(0.130)	(0.170)	(0.000)	(0.001)	(0.560)
$DEPTA_t$	-0.099*	-0.097*	0.018	-0.021	-0.046	-0.091***
	(0.073)	(0.091)	(0.270)	(0.170)	(0.170)	(0.000)
$LN(BASSET)_t$	0.047***	0.054***	0.049***	0.010***	0.037***	0.048***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$FATA_t$	0.199***	0.139***	0.058***	0.163***	0.178***	0.071***
	(0.000)	(0.000)	(0.007)	(0.000)	(0.000)	(0.000)
$RDDUMMY_t$	0.057**	-0.210***	0.059***	0.036***	0.164***	0.207***
	(0.031)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
$RDTA_t$	0.129	-0.473***	-0.068	-0.008	0.103***	0.008**
	(0.220)	(0.000)	(0.180)	(0.240)	(0.000)	(0.038)
IND $MVLEV_t$	0.032	0.025	-0.028	0.008	0.113***	0.353***
	(0.240)	(0.120)	(0.330)	(0.220)	(0.000)	(0.000)
N	12556	58574	12473	5049	23562	5049
# Firms	4053	9608	5453	1995	7007	2446

Significance levels : $***$: 1% $**$: 5% $*$: 10%

Table IX presents the results from a GMM_{BB} analysis where the dependent variable is the market value of leverage. The first three columns represent the firm years in which the distance from target leverage is greater than 10%. The last three columns represent the firm years in which the distance from target leverage is within 10%. Recall that the adjustment speed is $1 - \beta_{\mathrm{MVLEV}_t}$. P-values are reported in parenthesis.

Table X: Distance from Target Capital Structure (Book Leverage)

	Greater than 10% from Target			Within 10% of Target		
	High	Med	Low	High	Med	Low
$BVLEV_t$	0.544***	0.691***	0.594***	0.464***	0.647***	0.389***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EBITTA_t$	-0.018**	0.012***	0.002	-0.014***	0.030***	-0.007***
	(0.024)	(0.000)	(0.450)	(0.000)	(0.000)	(0.000)
MB_t	0.005***	0.005***	-0.002***	-0.001***	0.000	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.790)	(0.000)
$DEPTA_t$	-0.095*	-0.067	0.035**	0.007	0.040	-0.047***
	(0.068)	(0.120)	(0.033)	(0.220)	(0.200)	(0.000)
$LN(BASSET)_t$	0.058***	0.027***	0.035***	0.009***	0.026***	0.039***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$FATA_t$	0.185***	0.123***	0.153***	0.136***	0.126***	0.155***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$RDDUMMY_t$	0.090***	-0.054***	0.108***	0.049***	0.097***	0.180***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$RDTA_t$	0.191***	-0.039	0.054*	-0.009*	0.010	-0.042***
	(0.004)	(0.590)	(0.071)	(0.070)	(0.570)	(0.000)
IND $BVLEV_t$	-0.148***	-0.014	-0.325***	-0.036***	0.199***	0.229***
	(0.002)	(0.600)	(0.000)	(0.000)	(0.000)	(0.000)
N	13016	60747	13016	4618	21551	4618
# Firms	4239	9810	5547	1864	5980	2429

Significance levels : $***$: 1% $**$: 5% $*$: 10%

Table X presents the results from a GMM_{BB} analysis where the dependent variable is the book value of leverage. The first three columns represent the firm years in which the distance from target leverage is greater than 10%. The last three columns represent the firm years in which the distance from target leverage is within 10%. Recall that the adjustment speed is $1 - \beta_{\mathrm{BVLEV}_t}$. P-values are reported in parenthesis.

Figure 1: Issuance and Distribution Free Cash Flow Quantiles.

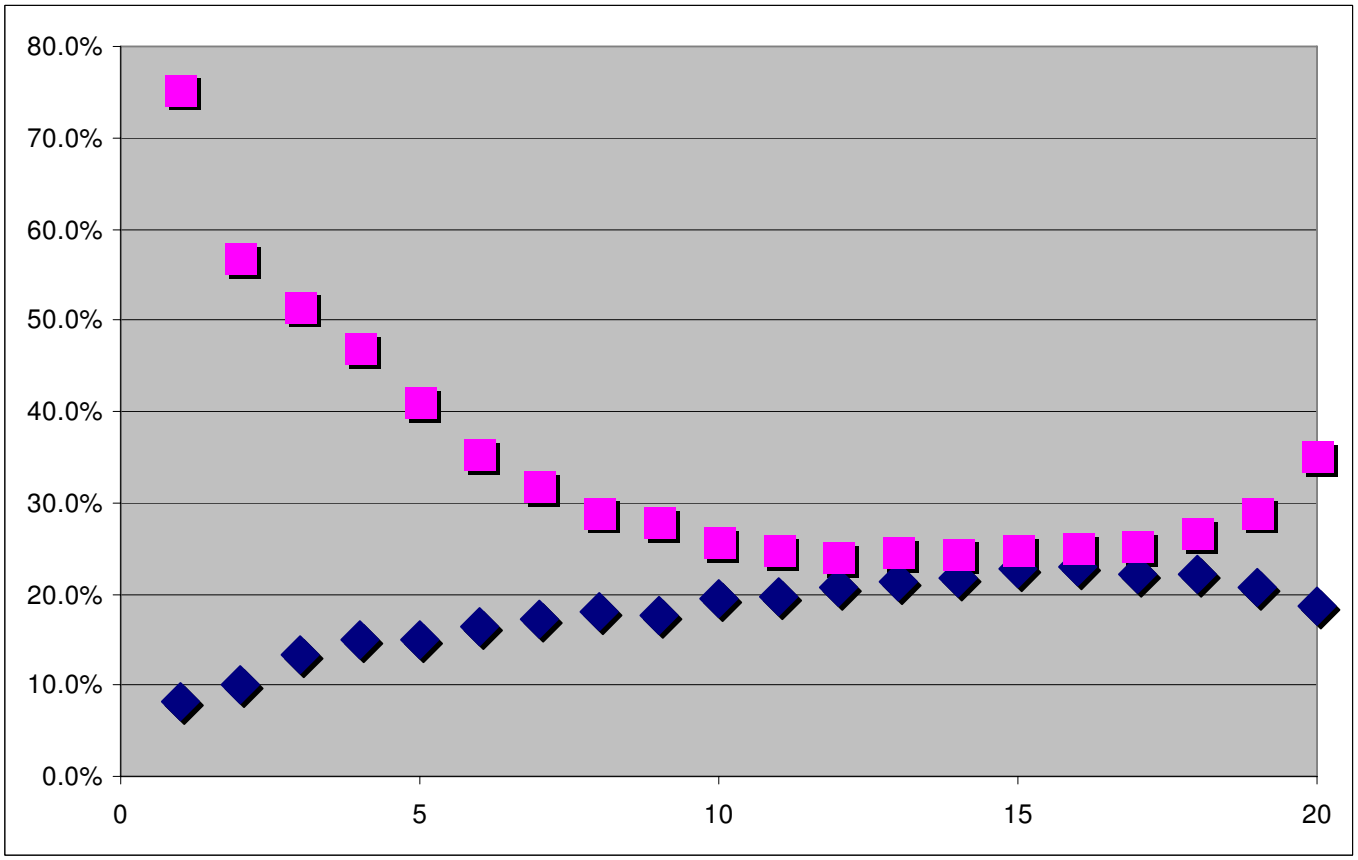

Figure 1 plots issuance and distribution for the 20 five percentage quantile breakpoints of free cash flow (FCF0). The resulting percentages correspond to the percent of firm-year observations where issuance or distribution occurred within that particular free cash flow quantile. Pink squares represent issuance through the various quantiles while blue diamonds represent distribution through the various quantiles.

Figure 2: Adjustment Speeds.

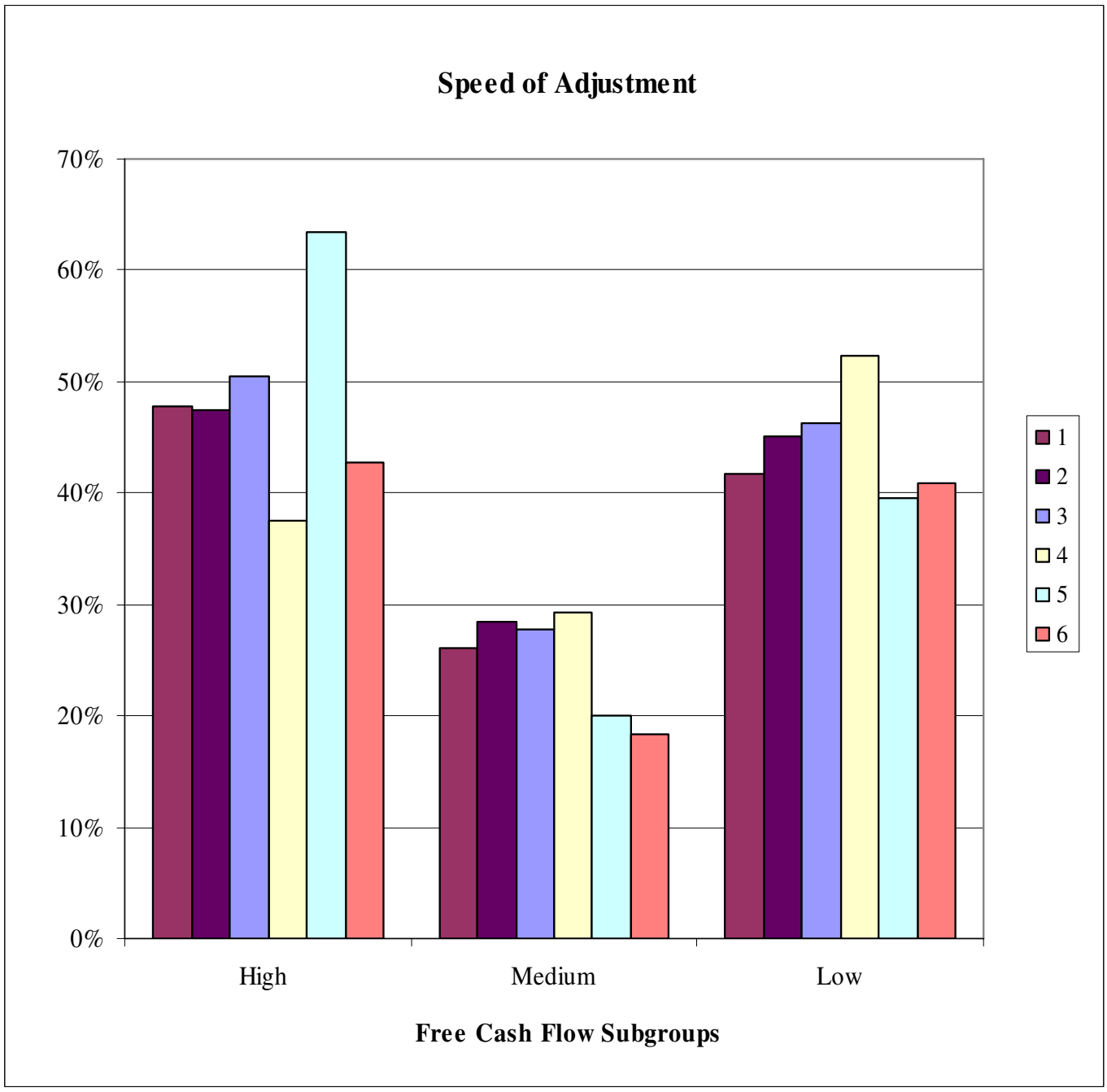

Figure 2 plots the adjustment speed, λ. For conciseness, only six specifications are reported. The high, medium, and low subgroups are defined using (1) FCF1 with market value of leverage, (2) FCF1 with book value of leverage, (3) FCF1A with market value of leverage, (4) FCF1A with book value of leverage, (5) prior period FCF1 with market value of leverage, and (6) prior period FCF1 with book value of leverage.