Equity mispricing and leverage adjustment costs

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Abstract

We find that equity mispricing impacts the speed at which firms adjust to their target leverage and does so in predictable ways depending on whether the firm is over- or underlevered. For example, firms that are above their target leverage and should therefore issue equity (or retire debt), adjust more rapidly to their target when their equity is overvalued. However, when a firm is undervalued, but needs to reduce leverage, the speed of adjustment is much slower. Our findings support the role of equity mispricing as an important factor that alters the cost of making adjustments within the dynamic trade-off theory.

JEL classification: G30; G32

Keywords: Dynamic Trade-off; Target Leverage; Residual Income Model; Capital Structure; Equity Mispricing; Market timing

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Abstract

We find that equity mispricing impacts the speed at which firms adjust to their target leverage and does so in predictable ways depending on whether the firm is over- or underlevered. For example, firms that are above their target leverage and should therefore issue equity (or retire debt), adjust more rapidly to their target when their equity is overvalued. However, when a firm is undervalued, but needs to reduce leverage, the speed of adjustment is much slower. Our findings support the role of equity mispricing as an important factor that alters the cost of making adjustments within the dynamic trade-off theory.

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I. Introduction

The tradeoff theory of capital structure states that a firm selects an optimal leverage target that trades off the relative costs and benefits of debt. Empirically however, it is well documented that firms deviate from their target leverage ratios, and do not rapidly adjust back to their target if they face costs to do so.[1] Over twenty-five years ago Stewart Myers noted in his 1984 Presidential Address to the AFA:

> "If adjustment costs are large, so that some firms take extended excursions away from their targets, then we ought to give less attention to refining our static tradeoff stories and relatively more to understanding what the adjustment costs are, why they are so important, and how rational managers would respond to them."

We find strong empirical evidence for one such adjustment cost, namely the temporary deviation of a firm's share price from its fundamental value and the resulting impact on the cost of equity. If equity is overvalued in the market, the firm's cost of issuing equity is reduced, while, conversely, undervalued equity results in a higher cost of equity. If the cost of issuing equity is altered in this fashion, and the firm exploits or faces these costs, then the rate at which the firm adjusts toward a target debt ratio will depend on the degree of equity mispricing. While the previous literature has debated the permanence of the market timing effects of mispriced equity, our study models equity mispricing as a factor that alters the cost of making capital structure adjustments within a dynamic trade-off theory.

[1] The growing literature that studies the effects of adjustment costs on the speed of adjustment to target leverage includes work by Hovakimian, Opler and Titman (2001), Leary and Roberts (2005), Flannery and Rangan (2006) and Strebulaev (2007) among others.

We hypothesize that when equity is overvalued in the market (and thus the overall cost to issue equity is low), the firm will more rapidly adjust toward its target leverage when that adjustment can be achieved by issuing equity. Correspondingly, when the firm's stock is undervalued and issuing equity is relatively expensive, adjustments that call for equity issuance will be made more slowly. The corollary should also exist when the adjustment calls for repurchasing stock. For a firm below its target leverage, the dynamic trade-off model suggests that the firm should issue debt, repurchase equity, or do both through an exchange offer. If equity is undervalued, the cost to repurchase equity is lower and we expect the firm to move back to its target leverage more quickly than a firm with overvalued equity in the same situation.

Table 1 graphically presents our hypotheses. In this table, firms are divided into four quadrants depending on whether they are above or below their leverage targets and whether they are over- or undervalued. If equity mispricing affects the speed of adjustment, then the speed in the top left quadrant (overlevered and overvalued) will be higher than the speed in the top right quadrant (overlevered and undervalued). Furthermore the speed in the bottom right quadrant (underlevered and undervalued) will be higher than the speed in the bottom left quadrant (underlevered and overvalued).

To estimate mispricing we use the equity value as determined by the residual income model scaled by the market price. This approach, developed by Rhodes-Kropf, Robinson and Viswanathan (2005), separates mispricing effects from growth options. We use two versions of the residual income model; one that uses forward-looking realized earnings and one that uses analyst's forecasted earnings. Any mispricing captured by the forward-looking model could be due to asymmetric information between managers and shareholders or irrationality on the part of shareholders. Mispricing captured by the analyst data model on the other hand, suggests only investor irrationally. In our study, the root cause of mispricing is not important, so long as managers are aware of the mispricing and use it to the firm's advantage when altering capital structure.

We find that within the context of the trade-off theory, equity mispricing costs have a significant impact on the rate at which firm's adjust their capital structure. More specifically, overvalued firms with leverage ratios above their target adjust back toward their target more rapidly than undervalued firms. The opposite effect is found for firms that are below their target – the overvalued firms adjust more slowly than the undervalued firms.

This finding is consistent with managers exploiting equity mispricing to time the market. When the cost to issue equity is low (because stock is overvalued), managers exploit this mispricing to the benefit of existing shareholders and more rapidly return to their leverage target. Likewise, when the firm's equity is undervalued, the firm will adjust more slowly if adjustment calls for equity issuance as such an issuance would be value destroying to existing shareholders.

We interpret this as evidence that an equity mispricing cost exists in the context of the dynamic tradeoff model. We check the robustness of our results with several additional tests. First, we substitute the ex-post data used to estimate the equity mispricing with analyst earnings forecasts. This change should reduce any potential endogeneity in our mispricing measure. Using analyst forecasts significantly reduces the size of our sample; however, our results are not qualitatively altered. Secondly, we differentiate between firms with positive cash flow and negative cash flow as in Faulkender, Flannery, Hankins and Smith (2009) who explicitly examine cash flow effects on adjustment speeds. Consistent with our expectations, firms with negative cash flow that need to raise capital will adjust to their target rapidly when equity is overvalued and the firm is overlevered (in effect, a situation where all the financial planets are aligned in favor of equity issuance). A similar effect is found when firms have a cash surplus and rapidly repurchase equity when their equity is undervalued. Our third robustness test examines whether our method is somehow 'hard coded' to find a result in favor of the mispricing effect. To do this we randomize our valuation measure and re-run our tests. We find that our results completely disappear, as we would expect. Finally, in addition to different valuation models, we use both market and book debt ratios and estimate leverage targets using two different empirical methods.

We also find that the rate of adjustment for overlevered firms is significantly greater than that of underlevered firms. This result is consistent with previous findings and is robust to alternative measures of debt ratio. Because of a positive relationship between expected bankruptcy costs and leverage, differential adjustment rates may occur between under- and overlevered firms. Overlevered firms are likely to face a 'hard' boundary due to increased probability of bankruptcy.[2] However, when a firm is below its optimal target, and may benefit from an increase in leverage, it is not as critical that it move back to its target. Thus the underlevered firm faces a 'soft' boundary.[3] We confirm the under- overlevered differential and condition our data on this effect prior to analyzing the equity mispricing effects.

The paper proceeds as follows: Section II discusses previous literature and provides the motivation for our study, Section III presents the data, Section IV presents the results and Section V concludes.

[2] Differential rates of adjustment based upon over- or underleverage, are explored in other recent work (Hovakimian et al. (2001), Flannery and Hankins (2007), Faulkender , Flannery, Hankins, and Smith (2009), and Byoun (2008)).
[3] Byoun (2008) also discusses a possible differential adjustment rate and Strebulaev and Yang (2007) document that on average 9% of large firms have zero debt. Nearly 23% have less than 5% quasi-market leverage ratio. Clearly, given this evidence, the lower boundary is very soft indeed.

II. Literature Review and Motivation

A. The Rate of Adjustment to a Leverage Target

The dynamic trade-off theory of capital structure states that firms have an optimal target capital structure. If the costs of adjustment were zero, the firm would have no incentive to deviate from its optimal target and adjustments would be instantaneous. However, because of market imperfections such as asymmetric information and financing costs (which in part, drive discreet and lumpy security issuance), firms may temporarily deviate from their optimal target leverage. While this phenomenon is documented in other empirical studies, the speed at which reversion to a target occurs remains a topic of debate in the literature.

The standard partial adjustment model measures the rate at which the firm adjusts its debt ratio to a target capital structure. A typical representation of the the basic model is as follows:

(1) $$DR_{t+1} - DR_t = \lambda\left[TL_{t+1} - DR_t\right] + e_{t+1}$$

Where DR_{t+1} is the debt to assets ratio in period t+1, and TL_{t+1} is the target debt ratio in period $_{t+1}$. The distance $[TL_{t+1} - DR_t]$ is the total amount that the debt ratio must change to bring the firm back to its target debt ratio. We refer to this quantity as *"Distance"*. Fama and French (2002) find that firms adjust to target capital structures quite slowly (7-18% annually). Later studies by Leary and Roberts (2005), Alti (2006), Flannery and Rangan (2006), and Lemmon et al. (2008) suggest that the rate of adjustment is somewhat faster than that reported by Fama and French. For example, using an instrumental approach to estimate target leverage Flannery and Rangan report a rate of adjustment of 35.5% per year. They argue that the lower rate found by Fama and French is due to noise in the estimation of target leverage.[4]

[4] Huang and Ritter (2009) contend that previous studies fail to adjust for biases in the data caused by "short panel". When they adjust the number of years that a firm is in their data set they find that the rate of adjustment also changes.

Several studies have examined the rate of adjustment as a function of whether the firm is above or below the target and whether the firm has a financing deficit or surplus. For example, Roberts (2001) finds that the rate of reversion depends on the current position of the firm in relation to its target. He divides the sample into four adjustment quartiles and shows that slow adjusting firms have more long-term debt in their capital structure. He concludes that the rate of adjustment for overlevered firms is faster than for underlevered firms, probably due to higher agency costs. Faulkender et al. (2009) argue that the rate of adjustment is a function of the adjustment cost associated with moving toward the optimal debt ratio. They report varying rates of adjustment based on sunk and incremental costs such that in firm years where adjustment costs are higher, the firm moves more slowly toward its target leverage. Byoun (2008) finds that most adjustments occur when firms have above-target debt with a financial surplus or when they have below-target debt with a financial deficit.

B. Equity Market Timing

The market timing theory of capital structure as proposed by Baker and Wurgler (2002) states that the capital structure of a firm is the cumulative result of attempts to time the equity market. Baker and Wurgler find that the long-term debt ratio is directly related to the "external finance weighted-average" market-to-book ratio, and conclude that low leverage firms raised capital when equity valuations (market-to-book ratios) were high and high leverage firms raised capital when equity valuations were low. The results of Baker and Wurgler are supported by the survey evidence of Graham and Harvey (2001) and by Huang and Ritter (2009), who, using aggregate measures of market valuation, find evidence of a long lasting market timing effect on capital structure. Leary and Roberts (2005) also find that shocks to equity valuation can persist for varying lengths of time. Elliott, Koëter-Kant and Warr (2007, 2008) find that market timing helps to explain the security issuance decision, as firms with overvalued equity tend to favor equity issuances over debt issuances. The market timing theory has, however, drawn criticism from Alti (2006), Flannery and Rangan (2006), and Butler et. al. (2009), among others, who question the longevity and overall economic significance of market timing.

To date, the literature has not directly addressed the effect of mispricing on the rate of adjustment to the target capital structure. Flannery and Rangan (2006) include market to book as a proxy for market timing and find it is significant. However, the rate of adjustment is largely unaffected by its inclusion and they conclude that the trade off model still prevails.[5] In our study we view market timing as altering the cost of adjusting to a target, and the presence of market timing behavior by firms does not preclude the tradeoff theory. Instead, we argue that market timing influences the rate at which firms adjust toward their optimal capital structure. We further develop our hypotheses in the next section.

C. Hypothesis Development

Rather than view market timing as a stand alone explanation of capital structure patterns (as in Baker and Wurgler (2002)), we model market-timing as altering adjustment costs within the tradeoff theory. In this context, market timing is a secondary effect, and hence it would be inappropriate, for example to run a horse race between the market timing theory and the trade off theory. By altering the cost of adjustment, market timing may impact the speed at which the firm moves towards its target leverage.

We conjecture that the speed of adjustment to target leverage is a function of the firm's equity valuation conditioned on the current leverage position in relation to the target. When

[5] In an early study, Jalilvand and Harris (1984) report that firms move back rather quickly to their previous debt level (56% per year), and that stock valuation seems to impact the speed of adjustment.

equity mispricing and target leverage effects are aligned (i.e. both effects suggest issuance or repurchase of the same security, either debt or equity), we expect the rate of adjustment to be faster than when the equity mispricing affect is in opposition to the target leverage affect. For example, when the firm is overlevered (needs to issue equity or reduce debt) and equity is overvalued, we expect the firm to adjust more rapidly than when equity is undervalued. Correspondingly, when a firm is underlevered and equity is undervalued, we would expect the firm to adjust more rapidly by repurchasing equity (or selling debt). Lastly, we conjecture that the rate of adjustment will depend on whether the firm is above or below its target leverage, and thus whether the firm faces a hard or soft leverage boundary. Our hypothesis is presented graphically in Table 1.

III. Data and Method

A. Sample Selection

Our initial sample comprises all firms on Compustat during the period 1971 to 2008. We exclude financial firms and utilities (SIC codes 4900 to 4999 and 6900 to 6999) due to the regulatory environment they operate in. In addition, we drop firms with format codes 4, 5 or 6 and following Faulkender et al (2009), we winsorize all ratios at the first and ninety-ninth percentile to minimize the contamination of our sample by miscoded observations and outliers. Following previous studies, we do not require that firms be continuously listed in the data set, but the residual income model does impose a minimum four-year survival bias in our sample. Because of the data requirements for the residual income model, we have valuation estimates from 1971 through 2005 resulting in a total of 46,984 firm-year observations. We augment the data set with data from CRSP for estimating costs of capital (used in the valuation model) and I/B/E/S for analyst earnings forecasts.

B. Measuring Equity Valuation

We measure equity value as the intrinsic value computed using the residual income model. This model has its origins in the accounting literature (see Ohlson (1991, 1995)), and has been applied in a number of finance applications. For example, D'Mello and Shroff (2000) find that undervaluation measured by the residual income model reliably predicts share repurchase activity. Dong, Hirschleifer and Teoh (2002) use the model to explain the method that firms use to pay for acquisitions. Lee, Myers and Swaminathan (1999) demonstrate that the model has predictive ability for the returns of the Dow 30 stocks, and support the findings of Frankel and Lee (1998) and Penman and Sougiannis (1998) who also find support for the valuation performance of the residual income model in the cross section of stock returns in domestic and international markets. In their study of equity mispricing and mergers, Rhodes-Kropf, Robinson, and Viswanathan (2005) decompose book-to-market into two components; the ratio of (intrinsic) value to market price and the ratio of book value to (intrinsic) value. Rhodes-Kropf, Robinson and Viswanathan interpret the first component (value-to-price) as a measure of mispricing and the second component (book-to-value) as a measure of growth opportunities. They show that a value to price ratio (using the residual income model to estimate value) better captures mispricing than the book-to-market ratio. Elliott, Koëter-Kant and Warr (2007, 2008) use the model to capture capital structure decisions such as the choice between debt and equity (equity is favored when it appears overvalued) and the method of funding the financing deficit (again, use equity when it is overvalued).

It is worth discussing further why we do not use market-to-book as our measure of equity mispricing as market-to-book is frequently used as a proxy for equity valuation in corporate finance. In prior capital structure studies, market-to-book performs poorly as a proxy for valuation (the notable exception being Baker and Wurgler (2002)). For example, Flannery and Rangan (2006) find little effect of market-to-book on adjustment rates and Hovakimian (2006) argues that any relationship between market-to-book and leverage is due to growth opportunities not market timing.

Market-to-book is a poor proxy for valuation for at least two reasons. First, it is frequently used as a proxy for other effects such as growth options and debt overhang problems, and untangling these effects creates its own challenges. Second, the relationship of market-to-book with other variables is not stable across different time periods. For example, the premise that high market-to-book firms underperform low market-to-book firms (La Porta, 1996; Frankel and Lee, 1998) appears to be time dependent, as Kothari and Shanken (1997) find that market-to-book ratios have some predictive power over the 1926–1991 period, but that power is substantially reduced during the 1946–1991 sub-period. Lee, Myers, and Swaminathan (1999) find that market-to-book ratios predict only about 0.33% of the variation in real stock returns, and conclude that market-to-book is a weak measure of mispricing.

Turning back to our method of estimating firm value, the residual income model is estimated by adding to book value, the discounted expected earnings in excess of normal return on book value (this is similar to economic value added [EVA]). Equations 2 and 3 are a formal representation of the model.

(2) $$V_0 = B_0 + \sum_{t=1}^{n} \frac{\left(E_t - r \times B_{t-1}\right)}{\left(1+r\right)^t} + \frac{TV}{\left(1+r\right)^n \times r}$$

where the terminal value, TV, is calculated as;

(3) $$TV = \frac{\left(E_t - r \times B_{t-1}\right) + \left(E_{t+1} - r \times B_t\right)}{2}$$

V_0 is the value of the firm's equity at time zero, B_0 is the book value at time zero, r is the cost of equity, and E_t are the expected future earnings for year t at time zero. Time zero is the end of the fiscal year, and n equals two years.

We use two versions of the residual income model, one that uses realized earnings (perfect foresight model) and the other that uses analyst's forecasted earnings.[6] In both models B_0 (book equity) is Compustat item data60. In the perfect foresight model, E_t (income before extraordinary items) is item data18, while in the analyst forecast model, E_t is the appropriate median I/B/E/S analyst forecast made as close to the year end as possible. Both approaches have advantages and disadvantages. The perfect foresight model allows us to use a much larger sample stretching back to 1971, while the analyst forecast model is only viable from 1980 onwards (when the I/B/E/S earnings data becomes available). Furthermore the I/B/E/S data covers only a subset of the Compustat universe in a given year. The perfect foresight model does suffer the fact that it uses information that is unknown at the time of the capital structure decision and therefore we are implicitly assuming that managers possess an unbiased expectation of future earnings. As we are not testing a trading rule, the use of forward looking data should not bias our results, however, the analyst forecast valuation uses only data that is publicly known prior to the capital structure decision, and thus does not suffer from a look forward bias.

The rest of the inputs to the residual income model are estimated using the approach of Lee, Myers and Swaminathan (1999). We use Fama and French's (1997) three factor model to calculate the industry cost of equity, r, with the short-term T-bill as a proxy for the risk-free rate of interest.[7] Lee, Myers and Swaminathan (1999) report that both the short-term T-Bill rates and

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[6] D'Mello and Shroff (2000), Lee, Myers and Swaminathan (1999), Dong, Hirshleifer, Richardson, and Teoh (2006), and Elliott, Koëter-Kant and Warr (2007) also use analyst forecast data as a robustness check.
[7] We also use a fixed risk premium approach as in Lee, Myers and Swaminathan (1999) and a simple one factor model. The results are qualitatively the same.

the long-term Treasury bonds rates are useful proxies, however estimates of the intrinsic value V_0, based on the short-term Treasury Bill outperform those based on the long-term Treasury Bond because they have a lower standard deviation and a faster rate of mean reversion. TV is calculated as the average of the last two years of the finite series and is restricted to be nonnegative, as a negative TV implies that the firm would continue to invest in negative NPV projects in perpetuity.

The estimated intrinsic value of the stock $E(V_0)$ is compared to the market value of the stock to determine the valuation error. Estimated mispricing is measured as:

$$VP_0 = \frac{V_0}{P_0} \tag{4}$$

Where VP_0 is the mispricing at time zero, P_0 is the market price of the stock at time zero, and V_0 is the intrinsic value of the stock at time zero. VP should equal 1 in the absence of mispricing. A VP of less than one implies overvaluation, while a VP greater than one implies under-valuation. Because the valuation model requires earnings through year t+3, we implicitly impose a four-year survival bias in our sample.[8]

C. Implementation of the Partial Adjustment Model

We use two different approaches for estimating speeds of adjustment. In both cases, our focus is on the relative rates of adjustment across different valuation environments rather than the absolute rate of adjustment. The two approaches are based on the methods of Fama and French (2002) and Faulkender, Flannery, Hankins and Smith (2009). Fama and French use two distinct steps; first they estimate the target leverage using annual leverage regressions and in a

[8] The analyst forecast valuations are more heavily distributed during the 1990s, a time during which market valuations were relatively high. Therefore, we treat the median analyst V/P as the boundary for over and undervaluation. Our results are robust to using 1 as with the perfect foresight model.

separate model, the target is used to estimate the speed of adjustment. Faulkender et. al. simultaneously estimate the target and the speed of adjustment using the Blundell and Bond (1998) system GMM method.

Chang and Dasgupta (2009) argue that partial adjustment models in general may fail to reject the null of no speed of adjustment. Hovakimiam and Li (2009) extend the work of Chang and Dasgupta and outline precautions that users of partial adjustment models should take to avoid spurious results when analyzing historical data with fixed effects. These include using only historical fixed effects, and in the case of the single step approach, using the GMM method of Blundell and Bond (1998). Our implementations of the Fama and French method and the Blundell and Bond approach employ their recommendations. Hovakimiam and Li also address the issue of mechanical mean reversion, which we will come back to in Section IV A.

We base our choice of variables for the target debt prediction regression on Hovakimiam, Opler and Titman (2001) and Hovakimiam and Li (2009) and include firm size, asset tangibility, market-to-book, research and development expense and median industry leverage. Firm size is the log of Sales (Compustat data12) adjusted for inflation. Research and Development expense (data46) is scaled by sales. We also include a dummy variable for firms that report non-zero R&D. Tangibility is net property, plant, and equipment (data8) scaled by total assets. Market-to-book is computed as book debt plus the market value of equity over book assets ([data9+data34+data10+data199*data25]/data6).

We compute both book debt ratios and market debt ratios. While anecdotal evidence suggests managers pay closer attention to book ratios, market ratios have more theoretical basis when computing optimal costs of capital. The book debt ratio (BDR) is computed as (data9+data34)/data6 and the market debt ratio (MDR) as (data9+data34)/(data9+data34+(data199*data25)). We drop from the sample all firms that have zero book debt.

Table 2 presents the summary statistics for the full sample for which we can estimate the residual income model. The average book debt ratio for all firms is about 25%, compared to a market debt ratio of approximately 30%.[9] The average sales (in 1983 dollars) are $1.480 billion. The mean market-to-book ratio is 1.31. The mean value to price ratio for the perfect foresight model is 0.97 implying that firms in the sample are slightly overvalued, as a VP of 1 implies no mispricing. For the analyst forecast earnings version of the model, the mean value to price ratio is 0.783.

For the Fama-French method, target leverage is estimated using the Fama-Macbeth (1973) approach, in which cross-sectional leverage regressions are estimated each year. We estimate the target leverage for both the book debt ratio and the market debt ratio. The predictive values from these regressions are used as the variable TL (target leverage) in the estimation of Equation 1.

In Table 3 we present the coefficient estimates from the Fama French approach. The slope coefficients reported are the average of the annual coefficients. We report time series standard errors, which are the standard deviation of the n slope estimates divided by $\sqrt{n}$. These regressions indicate that firms with more intangible assets and greater amounts of R&D tend to have lower levels of debt. Larger firms tend to have higher market debt ratios. These findings are broadly consistent with those of other researchers.[10] The fitted values from these regressions are our estimates of the firms target leverage and are used in the next section to determine whether or not the firm is over- or underlevered.

[9] Flannery and Rangan (2006) also report market debt ratios higher than book debt ratios using this approach to computing market debt.
[10] The notable exception being Korteweg (2009), who uses a different method for estimating the target leverage.

Flannery and Rangan (2006) show that inclusion of firm fixed effects along with lagged dependent variables necessitates careful choice of the estimation method and they offer an instrumental panel regression as a solution. However, Huang and Ritter (2009) demonstrate the problem of a short panel bias. In unpublished work, Flannery and Hankins (2007) evaluate several dynamic panel estimators and conclude that the Blundell and Bond (1998) method is least prone to dynamic panel bias. Lemmon, Roberts and Zender (2008) and Faulkender, Flannery, Hankins and Smith (2009) and others employ the Blundell and Bond (1998) approach in their studies of adjustment speeds.

The Blundell Bond method employs a system GMM to simultaneously estimate the target and the adjustment speed. For our purposes, we extract an explicit estimate of the target and use it to bifurcate the data into over- and underlevered groups. The approach is as follows:[11] First the basic adjustment model is specified as:

(5) $$DR_{t+1} - DR_t = \lambda(\beta X_t + F - DR_t) + e_{t+1}$$

Where DR is the debt ratio, X contains the determinants of leverage discussed above. F contains unobserved firm attributes. Equation 5 is identical to Equation 1 except that $\beta X + F$ is used as the instruments for the unknown TL (target leverage). Equation 5 can be rearranged to isolate the future debt ratio, and also provide an explicit estimate of the speed of adjustment, λ:

(6) $$DR_{t+1} = (\lambda\beta)X_t + (1-\lambda)DR_t + \lambda F + \mathrm{e}_{t+1}$$

Using the actual DR_t and the estimated speed of adjustment (λ) we can extract the predicted target leverage TL_{t+1} as the predicted value of Equation 7.

(7) $$\beta X_t + F = \left(\frac{1}{\lambda}\right)(DR_{t+1} - (1-\lambda)DR_t) + e_{t+1}$$

[11] This method is drawn from an unpublished working paper of Flannery and Hankins (2007), page 20.

Graphically, we present the results of the target leverage estimation in Figures 1-4. We find that both the Fama and French method as well the Blundell and Bond method produce some target estimates that are less than 0 or exceed 1. Figures 1 and 2 show the distribution of target estimates from the Fama and French method for MDR (market debt ratio) and BDR (book debt ratio), respectively. For the MDR targets, a substantial portion of the estimates are less than zero, although none of the estimates exceed 100% debt. Unfortunately, as Figures 3 and 4 indicate, the Blundell and Bond estimates are not nearly as well behaved as the Fama French estimates. The MDR debt ratios are particularly problematic. As we shall see in Section IV C the poorer performance of the Blundell and Bond method may contribute to the slightly weaker (although still significant) results that we observe using these estimates.

IV. Results

A. Estimation of Adjustment Speeds

Table 4 presents the baseline speeds of adjustment for our sample. Since $TL_{t+1} - DR_t$, or *Distance,* is calculated as the predicted debt ratio minus the observed, overlevered firms have a negative *Distance* and underlevered firms have a positive distance. If the firm returns to its target debt ratio in the following year, the value of λ will equal 1. The results presented in column A appear to be broadly in line with the prior research, with adjustment speeds being in the 22-33% range. Recall that Fama and French (2002) found adjustment speeds of 7-18%, and Flannery and Rangan (2006) found speeds of around 35%.

Shyam-Sunder and Myers (1999), among others (Chen and Zhao [2007], Chang and Dasgupta [2009], and Hovakimian and Li [2009]), argue that mechanical mean reversion can lead to an upward bias in the speeds of adjustment that may prevent the model from rejecting the null hypothesis that the speed of adjustment is zero. They suggest that leverage observations greater than 90% and less than 10% be dropped to mitigate this issue as for these firms a leverage change is more likely to be to the mean. In column B we drop these extreme observations and re-run the tests. Surprisingly, we observe virtually no change in the estimated speeds of adjustment. In fact, in all but one case the speeds without these high and low leverage firms are actually higher than for the full sample.

Therefore, we are reluctant to accept that in our sample; high and low leverage firms are causing an upward bias in the estimates. Furthermore, dropping these firms comes at a cost. The filter results in 14,091 observations dropped because the BDR<0.1 and 16,420 observations dropped because the MDR<0.1. The number of high leverage firms dropped is much smaller (around 389 for MDR>0.9 and actually zero for BDR>0.9). Recall that prior to using this filter we have already culled the sample for firms with debt ratios equal to zero, thus we are not just removing zero debt firms. Because of the significant number of observations lost, and the lack of evidence of a significant bias, we pursue our main tests using the full sample.

B. Over Versus Underlevered Rate of Adjustment Regressions

While our primary focus is the effect of valuation on the speed of adjustment, we first examine adjustment speeds for over- and underlevered firms and present the results in Table 5. We find that overlevered firms more quickly adjust toward their target. This result is independent of how we measure the debt ratio (i.e. book-value or market-value) and the method used to estimate the target debt ratios (Fama and French or Blundell and Bond). For example, using the Fama and French method to estimate targets and market debt ratios, nearly two fifths the distance (coefficient estimate equal to 0.41) from the target is erased in one year for overlevered firms, while underlevered firms only make up less than one fifth of the distance (coefficient equals 0.19). Put a different way; an adjustment coefficient of 0.41 implies that the firm would take 1.3 years to close half of the distance to its target, while an adjustment coefficient of 0.19 implies that the firm would take 3.3 years to close half of the distance.

On average across the four different estimates, overlevered firms make up one-third of the deviation from target in one year and underlevered firms move nearly 19%. For the full sample, the differential between over- and underlevered firms adjustment speeds ranges between 55 and 32 percent (i.e. underlevered firms adjust up to 55% more slowly than overlevered firms). We interpret this as evidence consistent with our hypothesis that there is a 'hard' boundary from above and a relatively 'soft' boundary from below (indeed, many firms carry no long-term debt at all).[12]

The above result holds across the two-step and single-step models, market and book debt ratios, as well as for the full and reduced (analyst forecast) samples. All but one of the differences is significant at the one percent level (the exception is significant at the ten percent level). We further note that the concern that mechanical mean reversion may be driving the results appears to be unwarranted, as this would disproportionately affect the low leverage firms.

C. Examining the Effect of Valuation on Adjustment Speeds

To examine the effect of valuation on adjustment speeds, we create dummy variables that correspond with the four quadrants presented in Table 1 which are then interacted with *Distance.* Thus we are able to estimate speeds of adjustment for each quadrant. We also allow for four separate intercepts. Table 6 shows the coefficients on the interacted Distance variable (in this table we use the perfect foresight model to determine mispricing). This regression is implemented with standard errors clustered at the firm level.

[12] These firms have been removed from our sample.

We first discuss Panels A and B which report results from the Fama-French method using the market debt ratio and book debt ratio, respectively. The first row of Panel A compares the rate of adjustment between over- and undervalued firm for firms that are overlevered. The second row shows the same comparison for underlevered firms.[13] The coefficients on *Distance* are significant at the one-percent level in all cases and lie within the 15% - 37% range. These adjustment speeds seem broadly plausible given prior research.

For firms that are above there target leverage, we expect overvalued firms to adjust back toward their targets more rapidly than undervalued firms.[14] Using the Fama and French method and market debt ratios, we find that the overvalued firms have an adjustment speed of about 37%, while the undervalued firms have a lower adjustment speed of 30%. The difference between these two estimates is highly significant with an F-value of 15.71. The difference in the adjustment speeds is not only statistically significant, but also economically significant. Overvalued firms adjust to their target in about 2.7 years, while undervalued firms take almost 3.5 years.

Likewise, for underlevered firms, we expect those firms whose share price is above fundamental value, to adjust more slowly than those firms whose share price is below fundamental value. Again, just focusing on the market debt results using the Fama French method, we find that underlevered overvalued firms adjust very slowly at a rate of 14.6% per year, while underlevered undervalued firms adjust more rapidly at 28% per year. This difference is highly significant with an F statistic of 55.05. Furthermore, the overvalued firms are adjusting at close to half the speed of the undervalued firms.

[13] Firms are allowed to move in and out of a group temporally (i.e. a firm may be overlevered during one year and underlevered in the next).
[14] We do not directly compare the quadrants of Table 1 vertically (i.e. holding valuation constant and comparing by leverage) as the baseline rate of adjustment for overlevered firms is higher than that for underlevered firms (see Table 5).

Panel B re-runs these tests using the book debt ratio (and the Fama French method) and finds a significantly faster rate of adjustment for overvalued firms that are above their target leverage (at the five percent level) and for undervalued firms that are below their target leverage (at the ten percent level).

Panels C and D, present the results when we employ the Blundell and Bond method. All but the last result in Panel D are qualitatively similar to those of the Fama and French method. Table 6, in total, provides strong evidence that equity mispricing is an important factor in the rate at which firms adjust to a capital structure target. A firm's rate of adjustment of its leverage to its target is heavily moderated by the degree to which it is favorable to issue or repurchase equity securities. In other words, when market conditions are favorable, the firm adjusts much more rapidly.

D. Valuation Measure Robustness

Tables 7 and 8 present evidence of the robustness of our primary results. In Table 7 we repeat the analysis of Table 6, but instead of using the perfect foresight model we use analyst forecast earnings in the valuation model. To ensure consistency between the valuation estimates and the target leverage estimates, we re-estimate the target debt ratios for the analyst sub sample. Again we find that firms appear to adjust more rapidly to their target leverage when it is more favorable from an equity valuation standpoint. In all but one case (that case is significant at the five percent level), the differences in the coefficients for the under and overvalued firms are significant at the one percent level.

E. Robustness Check for Spurious Results

We are effectively testing a joint hypothesis that we have correctly estimated the target and the mis-pricing of the equity. Chang and Dasgupta (2009), among others, have found target adjustment models are unable to reject alternative hypotheses. While our tests primarily focus on the differential in adjustment rates rather than the absolute level, our mispricing result may still be spurious. To this end, we use a simulation to show that our tests have the power to reject alternative hypotheses. In the spirit of the tests used by Chang and Dasgupta, we use two simulations. The first substitutes a randomly generated dummy variable (a coin toss is used to determine over- or undervaluation) for the actual valuation dummy variable used in Tables 6 and 7. We then estimate the regressions described in Section IV C. This process is replicated 500 times. Table 8 presents the average coefficients and F-statistics. We find no evidence of a difference between the simulated under- and overvalued firms. Further, for example, only 7.6% of the F-statistics are significant at the 10% level for the Fama French Book Debt Ratio adjustment tests. Similar results hold for the other methods (market debt; Blundell Bond).

In a second simulation sample, we use the actual proportion of under- and overvalued firms to create the randomized dummy variable. Each firm is randomly assigned either as under- or overvalued, based on the proportion in the actual sample. Again, we replicate this process 500 times and report the results in Table 8. On average, there is no significant difference between the speed of adjustment for under- and overvalued firms.

In sum, the empirical evidence is consistent with our conjectures. The results are not sensitive to the method of estimating target leverage, the method of measuring debt ratios or the method of measuring under- or overvaluation.

F. Cash Flow, Mispricing and Adjustment speed

Faulkender, Flannery, Hankins and Smith (2009) find that the level of free cash flow of the firm impacts the adjustment speed. Firms with either very low (negative) free cash flow or very high free cash flow are more likely to need to take bolder steps to deal with their cash flow positions. Firms with negative cash flow must raise more cash in the capital markets. Firms with positive cash flow will seek to distribute cash via stock or debt buy backs. These observations generate predictions in the context of our valuation method. Firms that are above their target leverage, overvalued (these are the top left quadrant of Table 1) and have low or negative cash flow, should be most likely to issue equity. In essence, all the planets are aligned; the firm is overlevered – therefore needs to increase equity; equity is overvalued – the cost of equity is cheap; and cash flow is negative – so security issuance is necessary. We expect this type of firm to adjust very rapidly. Conversely a firm that is overlevered and overvalued, but has positive cash flow (i.e. needs to disburse cash to stakeholders) has less incentive to repurchase stock. Thus we expect this type of firm to adjust more slowly than similar low cash flow firms.

A similar story applies to firms that are underlevered and have undervalued equity (the bottom right quadrant of Table 1). For the firms with excess free cash flow, the planets are aligned for the firm to engage in a stock repurchase. However, for those with negative cash flow, the firm cannot repurchase stock so must, instead issue a security. Thus we might expect underlevered, undervalued firms with positive free cash flow to adjust more rapidly than those similar firms with negative free cash flow.

We test for these effects by creating dummy variables for high and low free cash flow. We use the Faulkender et al. (2009) method to compute their FCF0, where $FCF0_{t+1}$ = [Operating

Income before depreciation$_t$ – taxes$_t$ – capital expenditures$_t$]/book assets$_t$. We classify low cash flow firms as being in the bottom 25%, while high cash flow firms are in the top 75%.[15] We also repeat the tests using Faulkender et al.'s FCF1 (deduct interest expense) and FCF2 (deduct dividends) and using 33% and 66% cutoffs and find qualitatively similar results.

For simplicity we just analyze the low cash – high cash adjustment speed differences for the two quadrants of interest (top left and bottom right of Table 1). In Table 9 we observe that firms with low cash flow that should issue equity, and have overvalued equity adjust significantly faster than those firms that have high cash flow (they have a positive difference). This result holds for 3 of the 4 models. Furthermore those firms that have high cash flow and should buy back equity and also have undervalued equity also adjust more rapidly than those firms which don't have surplus cash flow (difference is negative). This result is significant in 2 of 4 models. Overall these results confirm our existing results and demonstrate that valuation is even more significant when cash flow and the need to repurchase equity is considered.

V. Conclusion

We hypothesize that equity mispricing will impact the firm's rate of adjustment toward a leverage target. We expect to find that firms above their leverage target (i.e. firms that need to issue equity and/or repurchase debt) and whose equity is overpriced will adjust more rapidly toward their target than firms with underpriced equity. They will do so by issuing overvalued equity. Correspondingly, firms that are below their leverage target (i.e. firms that need to issue debt and/or repurchase equity) and whose equity is overpriced, will adjust more slowly toward

[15] Faulkender et al. use 15% and 85% cutoffs for their cash flow variables, however, we find that such cutoffs reduce significantly reduce our sample. As we are already cutting the sample by leverage target and valuation, further cuts result in relatively fewer firms in each quadrant.

their target than firms with underpriced equity. In this case, the firms with underpriced equity will more aggressively repurchase shares.

The results of our empirical tests support our hypothesis: the difference in the rate at which under- versus overvalued firms adjust their leverage averages more than 17% for the full sample (and across the various estimation methods employed) and reaches a maximum of just over 50%. Our results are robust to different methods of measuring equity mispricing, different models of target leverage, and both market and book leverage ratios.

The effect of equity mispricing on adjustment speeds becomes even more important when the firm's cash flow position is considered. In particular, firms that need to raise capital and have overvalued equity and are overlevered adjust more rapidly to their target than those firms with undervalued equity. Our findings show that equity mispricing is an important component of a dynamic trade-off model that incorporates non-zero costs of adjustment.

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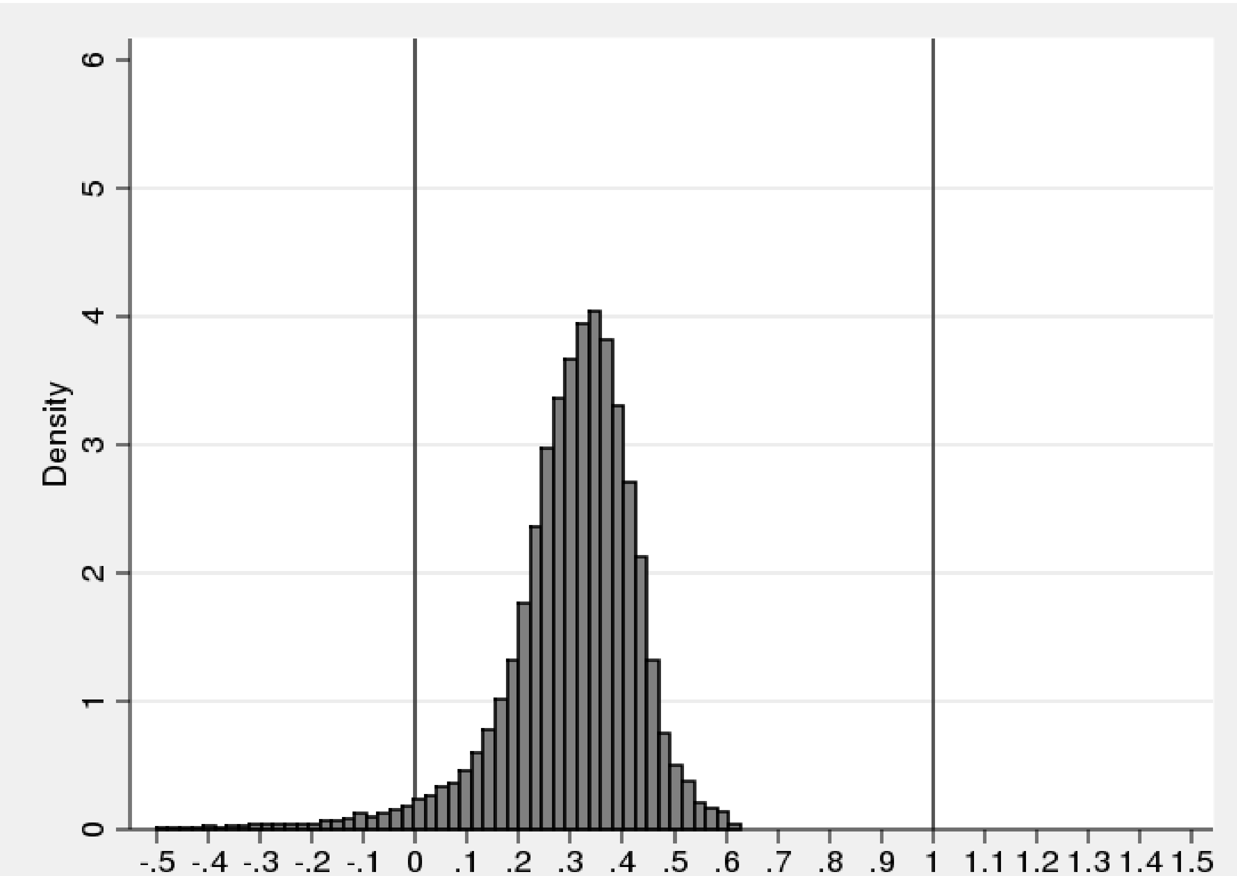

Figure 1. Target MDR using the Fama French Method

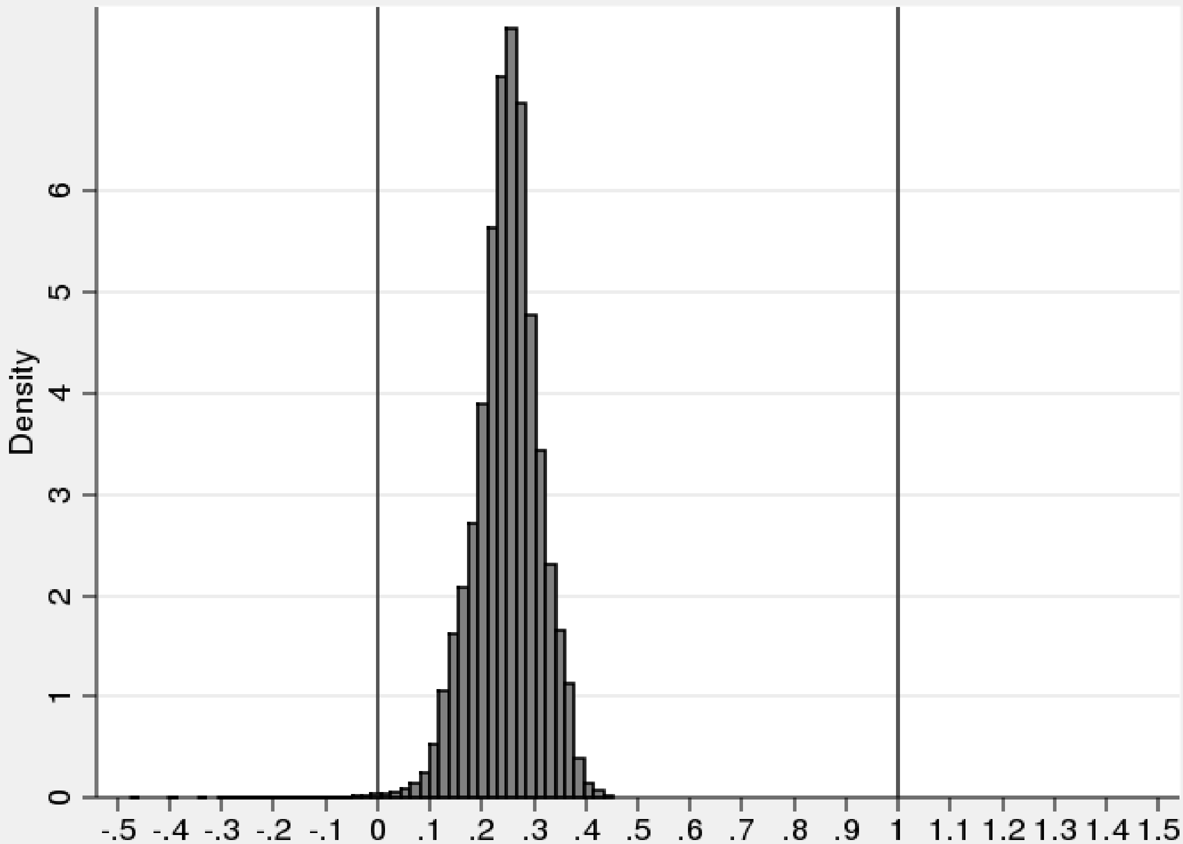

Figure 2. Target BDR using the Fama French Method

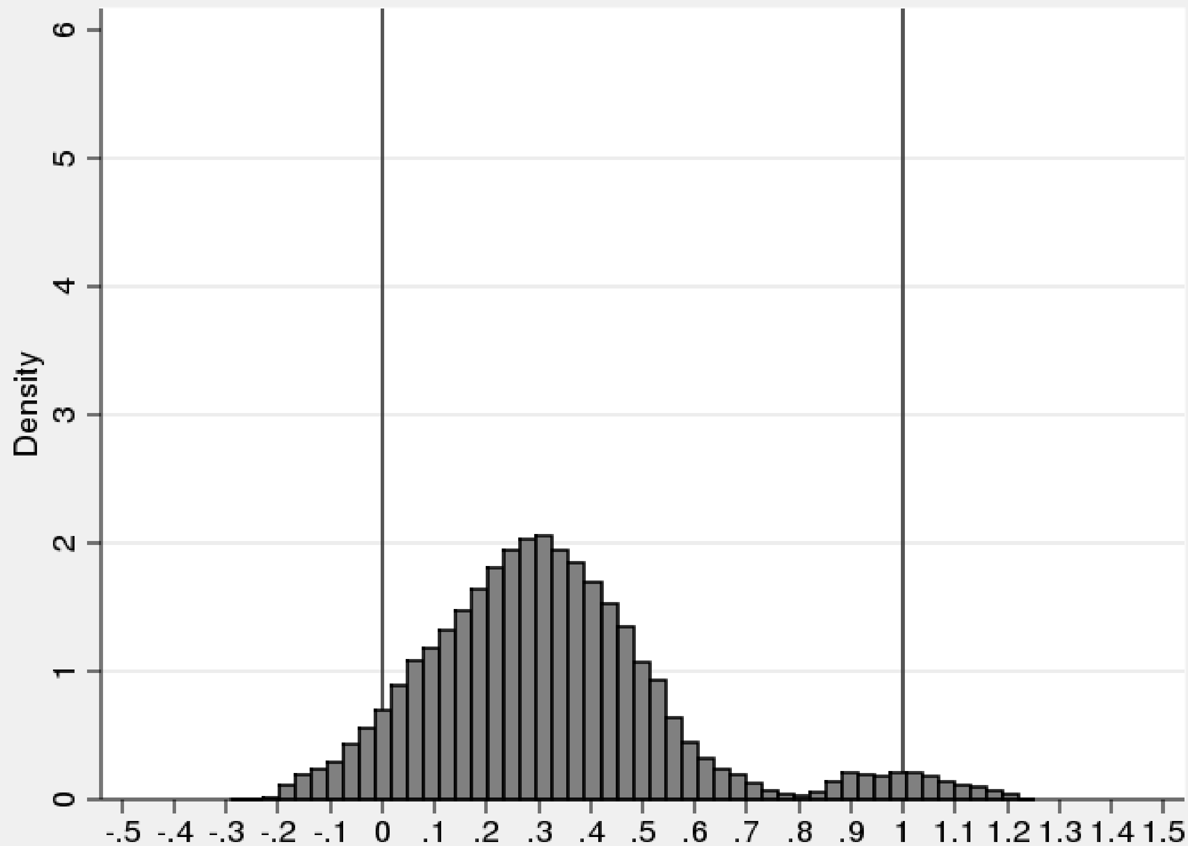

Figure 3. Target MDR using the Blundell and Bond Method

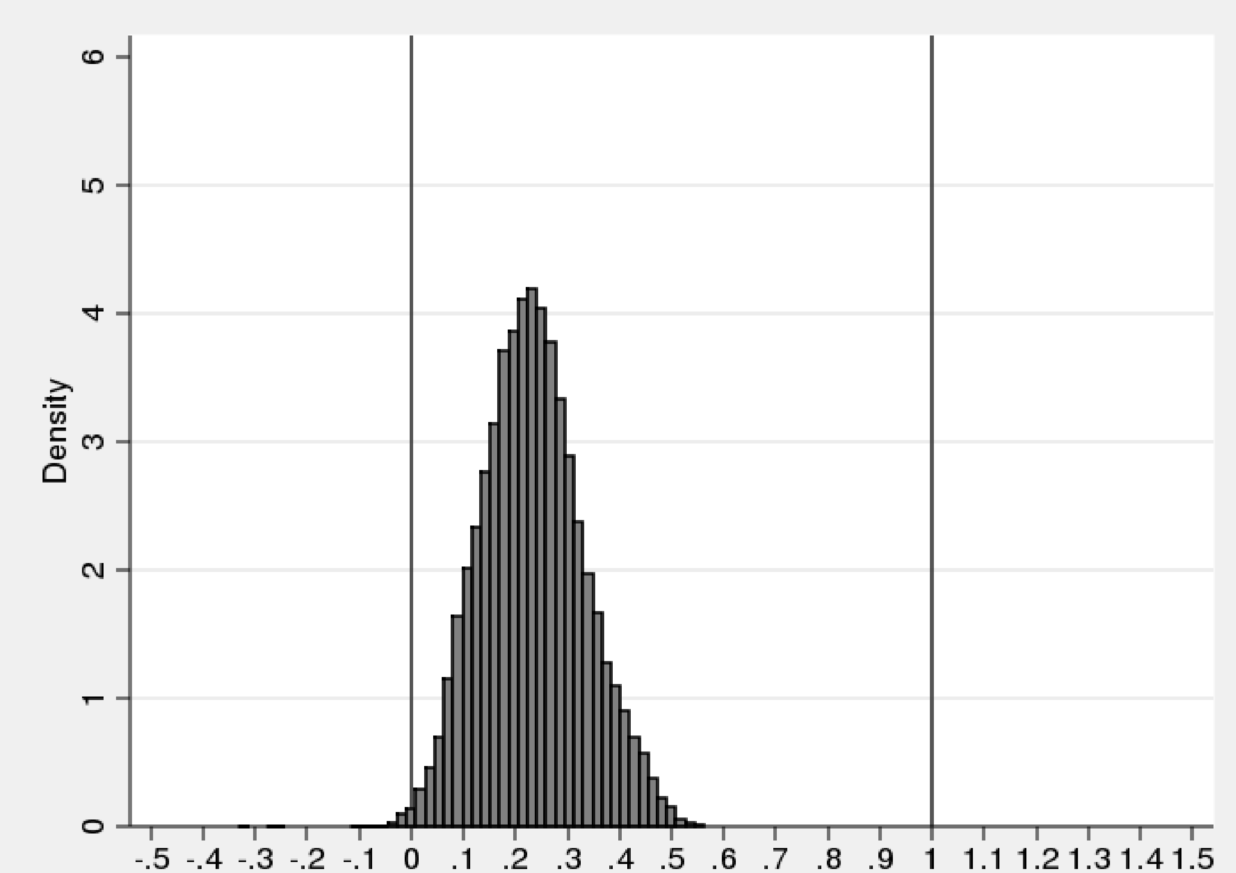

Figure 4. Target BDR using the Blundell and Bond Method

TABLE 1
Predictions of the Impact of Equity Mispricing on the Rate of Adjustment to Leverage Targets

	Equity overvalued *(Equity Mispricing: increase equity)*	**Equity undervalued** *(Equity Mispricing: repurchase equity)*
Firm overlevered *(Trade-off theory: increase equity and/or decrease debt)*	Rapid rate of adjustment	Slower rate of adjustment
Firm underlevered *(Trade-off theory: increase debt and/or decrease equity)*	Slower rate of adjustment	Rapid rate of adjustment

TABLE 2
Sample Summary Statistics

All the variables are computed using data from Compustat. BDR is the book debt ratio: (Data9+Data34)/Data6. MDR is the market debt ratio: (Data9+Data34)/(Data9+Data34+Data199*Data25). Asset Tangibility is the ratio of fixed assets (property plant and equipment) to total assets (Data8/Data6). MB is market-to-book: (Data9+Data34+Data10+Data199*Data25)/Data6. R & D to sales is R&D expense divided by sales: Data46/Data12. RDDUM is a dummy that takes the value 1 when the firm reports R&D expense, zero otherwise. Value to Price is the Residual Income Valuation Model Valuation divided by the stock price (see Section III B for full details).

Variable	Mean	Median	Standard Deviation
BDR *(Book Debt Ratio)*	0.248	0.230	0.170
MDR *(Market Debt Ratio)*	0.299	0.250	0.224
Sales (Millions)	1,480.837	97.837	7,831.432
Asset Tangibility	0.350	0.302	0.229
Market-to-book	1.309	0.914	1.468
R & D Expense to sales	0.055	0.000	0.369
R&D Dummy	0.430	0.000	0.495
Median Industry BDR	0.213	0.218	0.084
Median Industry MDR	0.298	0.268	0.194
VP (Value / Price) (n=46,984)	0.970	0.774	0.708
Analyst Forecast VP (Value / Price) (n=28,239)	0.783	6.316	0.578

TABLE 3
Average Coefficients from Annual Leverage Regressions.

This table presents the results from annual leverage regressions where the dependent variable is the book debt ratio in year t+1, (Data9+Data34)/Data6. EBITTA is earnings before interest and taxes divided by total assets: (Data18+Data15+Data16)/Data6. DEPTA is depreciation expense divided by total assets: Data14/Data6. RDTA is R&D expense divided by total assets: Data46/Data6. RDDUM is a dummy that takes the value 1 when the firm reports R&D expense, zero otherwise. The mean slope coefficient is the average of the slopes for the 34 annual regressions. Time series standard error is the time series standard deviation of the regression coefficient divided by $(34)^{1/2}$, as in Fama and French (2002). T(Mean) is the mean slope coefficient divided by the time series standard error. Significance at the 1, 5 or 10 percent levels are shown with 3, 2, or 1 asterisk, respectively.

Variable	BDR_{t+1}	MDR_{t+1}
Intercept	0.1579***	0.3052***
	(31.29)	*(25.49)*
ln(Sales)	-0.0005	0.0013**
	(-0.43)	*(2.10)*
Asset Tangibility	0.1143***	0.0607***
	(15.96)	*(5.53)*
Market-to-book	-0.0187***	-0.0791***
	(-14.47)	*(-9.15)*
R&D Dummy	-0.0283***	-0.0421***
	(-10.11)	*(-12.34)*
R&D/Sales	0.0309	-0.0908**
	(0.83)	*(-2.22)*
Industry Median DR	0.4139***	0.2988***
	(15.61)	*(20.31)*
N	46,666	46,666
Average R^2	0.138	0.217

TABLE 4
Baseline Speeds of Adjustment and potential for Mechanical Mean Reversion.

This table presents baseline speed of adjustment regressions using the Fama and French and Blundell and Bond methods for estimating the target book debt ratio (BDR) computed as (Data9+Data34)/(Data6) and market debt ratio (MDR) computed as (Data9+Data34)/(Data9+Data34+Data199*Data25). Column A presents the full sample results. Column B presents the results for the subset which excludes firms with debt ratios less than 0.1 and greater than 0.9. T statistics (in parenthesis) are corrected for heteroskedasticity and firm level clustering. Significance at the 1, 5 or 10 percent levels are shown with 3, 2, or 1 asterisk, respectively.

	A. Full Sample	B. 0.1 < DR < 0.9
Panel A. Ex-post earnings value to price ratio		
Fama French MDR	0.3293***	0.3726***
	(42.49)	*(40.69)*
	N=46,984	N=34,812
Fama French BDR	0.3024***	0.3138***
	(37.78)	*(34.35)*
	N=46,984	N=36,928
Blundell and Bond MDR	0.2193***	0.2405***
	(73.19)	*(70.53)*
	N=46,984	N=34,812
Blundell and Bond BDR	0.2661***	0.2674***
	(43.42)	*(39.17)*
	N=46,984	N=36,928
Panel B. Analyst forecast earnings value to price ratio		
Fama French MDR	0.3335***	0.4181***
	(24.06)	*(25.83)*
	N=22,638	N=15,317
Fama French BDR	0.3106***	0.3253***
	(24.67)	*(22.93)*
	N=22,638	N=17,094
Blundell and Bond MDR	0.2414***	0.2819***
	(40.86)	*(38.95)*
	N=22,638	N=15,317
Blundell and Bond BDR	0.2637***	0.2619***
	(27.80)	*(24.76)*
	N=22,638	N=17,094

TABLE 5
Comparing Speeds of Adjustment for Firms Above and Below Their Targets

This table presents baseline speed of adjustment regressions using the Fama and French and Blundell and Bond methods for estimating the target book debt ratio (BDR) computed as (Data9+Data34)/(Data6) and market debt ratio (MDR) computed as (Data9+Data34)/(Data9+Data34+Data199*Data25). Column A presents the results for firms that are below their target leverage. Column B presents results for firms that are above their target leverage. T statistics (in parenthesis) for the adjustment speeds are corrected for heteroskedasticity and firm level clustering. Column C presents the F test statistic for the difference between the pairs and the p value of the statistic in parenthesis. Significance at the 1, 5 or 10 percent levels are shown with 3, 2, or 1 asterisk, respectively.

	A. Underlevered *(Distance > 0)*	B. Overlevered *(Distance < 0)*	C. F test of Difference
Panel A. Ex-post earnings value to price ratio			
Fama French MDR	0.1879 ***	0.4124 ***	139.68 ***
	(14.27)	*(30.14)*	*(<0.001)*
Fama French BDR	0.2226 ***	0.3321 ***	27.55 ***
	(13.66)	*(26.21)*	*(<0.001)*
Blundell and Bond MDR	0.1413 ***	0.2821 ***	314.83 ***
	(30.06)	*(46.39)*	*(<0.001)*
Blundell and Bond BDR	0.1944 ***	0.2907 ***	38.95 ***
	(15.69)	*(30.60)*	*(<0.001)*
Panel B. Analyst forecast earnings value to price ratio			
Fama French MDR	0.1404 ***	0.4616 ***	113.83 ***
	(6.89)	*(20.38)*	*(<0.001)*
Fama French BDR	0.2332 ***	0.3531 ***	12.20 ***
	(8.40)	*(18.16)*	*(0.001)*
Blundell and Bond MDR	0.1442 ***	0.3327 ***	166.55 ***
	(16.37)	*(28.41)*	*(<0.001)*
Blundell and Bond BDR	0.2374 ***	0.2799 ***	2.79 *
	(11.95)	*(18.65)*	*(0.094)*

TABLE 6
Speed of Adjustment Regressions Using Ex-post Earnings Value-to-Price Ratio.

Distance = Target Leverage - Debt Ratio. Target Leverage is the predicted value from the annual leverage regressions shown in Table 4. Debt Ratio is the Market Debt Ratio computed as (Data9+Data34)/(Data9+Data34+Data199*Data25). Distance < 0 represents a firm being overlevered as Target Leverage < Debt Ratio. Distance > 0 represents underlevered. VP is the value to price ratio computed by the Residual Income Model using perfect foresight earnings. VP > 1 implies undervaluation, i.e. V > P and VP < 1 implies overvaluation, i.e. V < P. The third column presents the F test statistic (p-value) for the difference between the coefficients in the first two columns. Significance at the 1, 5 or 10 percent levels are shown with 3, 2, or 1 asterisk, respectively.

	Over-valued (VP<1)	*Under-valued (VP>1)*	*F-stat (p-value)*
Panel A: Market debt ratios using Fama-French method.			
Overlevered (*Distance < 0*)	0.3698 ***	0.2976 ***	15.71 ***
	(21.96)	*(18.81)*	*(<0.001)*
Underlevered (*Distance > 0*)	0.1460 ***	0.2800 ***	55.05 ***
	(10.85)	*(15.85)*	*(<0.001)*
Panel B: Book debt ratios using Fama-French method.			
Overlevered (*Distance < 0*)	0.3432 ***	0.3103 ***	4.36 **
	(23.72)	*(20.66)*	*(0.037)*
Underlevered (*Distance > 0*)	0.2092 ***	0.2495 ***	3.39 *
	(12.19)	*(10.98)*	*(0.066)*
Panel C: Market debt ratios using Blundell and Bond method.			
Overlevered (*Distance < 0*)	0.2725 ***	0.2359 ***	9.76 ***
	(26.81)	*(32.55)*	*(0.002)*
Underlevered (*Distance > 0*)	0.1269 ***	0.1594 ***	11.89 ***
	(24.47)	*(19.07)*	*(0.001)*
Panel D: Book debt ratios using Blundell and Bond method.			
Overlevered (*Distance < 0*)	0.2990 ***	0.2709 ***	4.78 **
	(25.45)	*(24.54)*	*(0.029)*
Underlevered (*Distance > 0*)	0.1912 ***	0.1883 ***	0.02
	(14.25)	*(10.25)*	*(0.879)*

TABLE 7

Speed of Adjustment Regressions Using the Analyst Earnings Forecast Value-to-Price Ratio.

Distance = Target Leverage - Debt Ratio. Target Leverage is the predicted value from the annual leverage regressions shown in Table 4. Debt Ratio is the Market Debt Ratio computed as (Data9+Data34)/(Data9+Data34+Data199*Data25). Distance < 0 represents a firm being overlevered as Target Leverage < Debt Ratio. Distance > 0 represents underlevered. VP is the value to price ratio computed by the Residual Income Model using analyst forecast earnings. VP > 1 implies undervaluation, i.e. V > P and VP < 1 implies overvaluation, i.e. V < P. The third column presents the F test statistic (p-value) for the difference between the coefficients in the first two columns. Significance at the 1, 5, or 10 percent levels is shown with 3, 2, or 1 asterisk(s), respectively.

	Over-valued (VP<1)	*Under-valued (VP>1)*	*F-stat (p-value)*
Panel A: Market debt ratios using Fama-French method.			
Overlevered (*Distance < 0*)	0.5582 ***	0.4135 ***	18.39 ***
	(17.15)	*(16.66)*	*(<0.001)*
Underlevered (*Distance > 0*)	0.1005 ***	0.2187 ***	13.94 ***
	(4.81)	*(7.75)*	*(<0.001)*
Panel B: Book debt ratios using Fama-French method.			
Overlevered (*Distance < 0*)	0.3872 ***	0.3050 ***	11.02 ***
	(16.47)	*(14.11)*	*(0.001)*
Underlevered (*Distance > 0*)	0.1903 ***	0.3120 ***	11.44 ***
	(5.51)	*(13.79)*	*(<0.001)*
Panel C: Market debt ratios using Blundell and Bond method.			
Overlevered (*Distance < 0*)	0.3951 ***	0.3149 ***	12.92 ***
	(18.66)	*(24.56)*	*(<0.001)*
Underlevered (*Distance > 0*)	0.1268 ***	0.2162 ***	26.87 ***
	(13.38)	*(13.70)*	*(<0.001)*
Panel D: Book debt ratios using Blundell and Bond method.			
Overlevered (*Distance < 0*)	0.3052 ***	0.2588 ***	5.79 **
	(15.73)	*(16.34)*	*(0.016)*
Underlevered (*Distance > 0*)	0.2058 ***	0.2933 ***	10.75 ***
	(8.41)	*(14.42)*	*(0.001)*

TABLE 8

Speed of Adjustment Regressions Using Randomized Data for the Equity Mis-Pricing Dummy

Distance = Target Leverage - Debt Ratio. Target Leverage is the predicted value from the annual leverage regressions shown in Table 4. Debt Ratio is the Market Debt Ratio computed as (Data9+Data34)/(Data9+Data34+Data199*Data25). Distance < 0 represents a firm being overlevered as Target Leverage < Debt Ratio. Distance > 0 represents underlevered. VP is the value to price ratio computed by a coin toss (50% chance) for the first row and randomly computed using the same proportions as found in the actual sample. VP > 1 implies undervaluation, i.e. V > P and VP < 1 implies overvaluation, i.e. V < P. The third column presents the F test statistic (p-value) for the difference between the coefficients in the first two columns. Significance at the 1, 5 or 10 percent levels are shown with 3, 2, or 1 asterisk, respectively.

	Over-valued (VP<1)	*Under-valued (VP>1)*	*F-stat (p-value)*
Panel A: Market debt ratios using Fama-French method.			
Overlevered (*Distance < 0*)			
Coin toss	0.4123	0.4125	0.85 *(0.543)*
Proportional to sample	0.4125	0.4123	0.90 *(0.519)*
Underlevered (*Distance > 0*)			
Coin toss	0.1880	0.1878	0.77 *(0.541)*
Proportional to sample	0.1880	0.1878	0.85 *(0.528)*
Panel B: Book debt ratios using Fama-French method.			
Overlevered (*Distance < 0*)			
Coin toss	0.3319	0.3323	0.85 *(0.528)*
Proportional to sample	0.3321	0.3320	0.78 *(0.536)*
Underlevered (*Distance > 0*)			
Coin toss	0.2228	0.2225	0.82 *(0.527)*
Proportional to sample	0.2228	0.2225	0.79 *(0.536)*
Panel C: Market debt ratios using Blundell and Bond method.			
Overlevered (*Distance < 0*)			
Coin toss	0.2818	0.2823	0.83 *(0.533)*
Proportional to sample	0.2818	0.2825	0.84 *(0.512)*
Underlevered (*Distance > 0*)	0.1416	0.1410	0.91 *(0.535)*
Coin toss	0.1416	0.1408	0.82 *(0.551)*
Proportional to sample			
Panel D: Book debt ratios using Blundell and Bond method.			
Overlevered (*Distance < 0*)			
Coin toss	0.2905	0.2908	0.86 *(0.519)*
Proportional to sample	0.2906	0.2907	0.78 *(0.539)*
Underlevered (*Distance > 0*)			
Coin toss	0.1948	0.1941	0.83 *(0.516)*
Proportional to sample	0.1946	0.1941	0.88 *(0.509)*

TABLE 9

Test of the difference between adjustment speeds for low and high cash flow firms.

This table reports the difference in adjustment speeds for low and high cash flow firms. Cash flow is defined as FCF0 = (Operating income before depreciation (data13)-taxes (data16)-capital expenditures (data128))/Book Assets (data6). High cash flow firms are above the top 75 percentile of cash flows, low cash flow firms are in the bottom 25 percentile. The difference in the table is the speed of adjustment for low cash flow firms – the speed of adjustment of high cash flow firms. We present the differences for just the upper left quartile of Table 1 (below target leverage and overvalued) and the lower right quartile (above target leverage and undervalued). Significance at the 1, 5 or 10 percent levels are shown with 3, 2, or 1 asterisk, respectively.

		Above target leverage, overvalued	Below target leverage, undervalued
Fama French MDR	Difference	0.10220	-0.16321
	F statistic	5.19	9.16
	P value	0.0228**	0.0025***
Fama French BDR	Difference	0.08406	-0.18282
	F statistic	5.12	9.74
	P value	0.0237**	0.0018***
Blundell and Bond MDR	Difference	0.0010	-0.0070
	F statistic	0.00	0.05
	P value	0.9852	0.8203
Blundell and Bond BDR	Difference	0.05796	-0.05764
	F statistic	2.81	1.08
	P value	0.0938*	0.2983