

“Target Debt ratios: The impact of equity mis-pricing”

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Abstract

Previous studies disagree on the rate of speed with which firms adjust their leverage toward a target leverage. We argue that a portion of this variance is caused by two factors. First, firms face a ‘hard’ boundary when over levered. This is due to the present value of bankruptcy costs increasing at an increasing rate. These firms will adjust toward a target debt ratio more rapidly than under levered firms which face a ‘soft’ boundary. Second, if a firm’s equity is mis-priced, the cost of issuing equity may be reduced/increased. Our empirical findings support the above conjectures. The findings are robust to various means of measuring leverage and mis-pricing.

Key words: Dynamic Trade-off, Target leverage, Residual Income Model, Capital Structure, Market Timing, Financing Deficit.

JEL Classifications: G30, G32

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1 Introduction

Survey evidence indicates that more than 80% of firms consider some form of target debt ratio when making financing decisions (Graham and Harvey, 2001). In the dynamic trade-off model of capital structure the rate of adjustment towards the target depends on the costs. Because of adjustment costs and the discreet nature of security issuances, firms are seldom at their optimal debt ratio and, presumably, constantly moving toward some optimal range. Thus, a finding of movement toward an optimal debt ratio, suggests that the dynamic trade-off model correctly describes firm behavior. Current empirical evidence on the rate of adjustment is inconsistent and is a topic of debate among researcher. We find that equity mis-pricing is an important factor in the rate of adjustment toward an optimal debt ratio.

Equity mis-pricing must be viewed in the context of whether the subject firm is above or below it's optimal debt ratio. Differential rates of adjustment based upon over or under leverage, is explored in other recent work (Hovakimian et al. [2001], Flannery and Hankins [2007], and Faulkender, Flannery, Hankins, and Smith [2007]). The intuition behind this effect is that the present value of the bankruptcy cost is increasing at an increasing rate as a firm moves above it's optimal target debt ratio. This creates what we call a 'hard' boundary from above. While a firm below it's optimal target may benefit from an increase in leverage, however, it is not as critical that it move back to it's target as for a firm that is above it's target. When a firm is below it's target, it faces a 'soft' boundary.¹ Thus, we expect to see more rapid rates of adjustment for firms above their target, relative to those below their target. In short, we allow the rate of adjustment to vary depending upon whether the firm is above or below it's target debt ratio.

¹ Strebulaev and Yang (2006) 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.

Equity mis-pricing, is a second order factor (relative to the over/under leverage differential). Equity over-valuation (under-valuation) can potentially reduce (increase) the cost of issuing equity. If the cost of issuing equity is reduced/increased, this will clearly have an impact on the rate at which firms adjust toward a target debt ratio. We use the residual income model to estimate a fundamental valuation for the firm and then scale that value by the market price. When this ratio is less than one, it indicates over-valuation and vice versa.

We find that a firm's speed of adjustment is related to the mis-pricing of its equity. For over (under) levered firms, the adjustment speed is higher (lower) if the firm's equity is over-valued and vice versa for under-valued equity. The adjustment speeds differ by a factor of no less than 70%. This difference may help to explain the previously inconsistent evidence. We also find that the rate of adjustment for over levered firms is significantly greater than that of under levered firms. This is consistent with previous findings and is robust to alternative measures of debt ratio.

The paper proceeds as follows: Section 2 discusses previous literature and provides the motivation for our study, Section 3 presents the data, Section 4 presents the results and Section 5 concludes.

2 Literature review and motivation

The dynamic trade-off theory of capital structure states that firms make gradual adjustments over time toward an optimal target capital structure. If the cost of adjustment is zero, the firm would have no incentive to deviate from its optimal target and any adjustment would be instantaneous. However, because of market imperfections such as asymmetric information and financing costs, firms may temporarily deviate from their optimal target. Many empirical studies

have observed this phenomenon and agree that over time firms seem to move back to a (time varying) target leverage ratio. The speed at which mean reversion happens is currently still a topic of debate.

Fama and French (2002) find that firms adjust to target capital structures quite slowly. Flannery and Rangan (2006) report a faster rate and argue that the lower rate found by Fama and French is due to noise in the estimation of target leverage. Rather than estimating target leverage directly, they use an instrumental variable approach. Ritter and Huang (2006) contend that previous studies fail to adjust for biases in the data caused by “short panel” bias. When they adjust the number of years that a firm is in their data set they find that the rate of adjustment also changes. 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 over-levered firms is faster than for under-levered firms probably due to higher agency costs. Faulkender et al. (2007) 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 incremental the firm moves more slowly toward its target leverage.

The above studies, however, do not explicitly address the effect market timing may have on the rate of adjustment to the target capital structure. Firms with mis-valued equity face differential costs of equity and thus may have varying rates of adjustment. Flannery and Rangan (2006) include the Baker and Wurgler (2002) market timing measure, market-to-book ratio, as a right hand side variable and find it is significant. However, the rate of adjustment is largely unaffected by its inclusion. They conclude that the trade off model still prevails. Our paper

specifically tests whether the rate of adjustment is tempered by the opportunity that the firm has to market time.

Using a partial adjustment model 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. Fama and French (2002) also report mean reverting behavior toward a leverage target although, at a very slow pace (7-18% annually). This contrary to the evidence presented by Leary and Roberts (2005), Alti (2006) and Lemmon et al. (2007) which suggest that the rate of adjustment is much faster than reported by Fama and French.

Flannery and Rangan (2006) and Huang and Ritter (2007) shed some light on these varying results by addressing some of the econometric issues related to estimating the speed of adjustment. 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 low rate of adjustment in Fama and French (2002) is due to noise in estimating target leverage. Huang and Ritter (2007) find that if they adjust the number of years that a firm is in their data the rate of adjustment also changes. They argue 'short panel' bias may have influenced the results of previous studies.

In short, the above mentioned studies all agree that firms have some sort of leverage target in mind when making financing decision. However, the factors that determine the rate of adjustment and their effect on the firm's capital structure are still unresolved. Our study strives to solve a part of this puzzle by specifically looking at the affect of market timing on the rate of adjustment. To show the impact of market timing on the rate of adjustment to target leverage we use an earnings-based valuation model to calculate equity misvaluation and incorporate this measure directly into the partial adjustment model of capital structure. We seek to determine how equity valuation impacts the rate of adjustment to target leverage. More specifically, we

conjecture that the speed of adjustment to target leverage is a function of the firm's equity valuation conditioned on the leverage position in relation to the target. For example, when market timing results in an outcome that would be aligned with the needed direction of leverage adjustment we expect the rate of adjustment to be faster than when the opportunity of market timing moves the firm away from its target. Table 1 presents the hypotheses.

3 Data and Method

3.1 Sample selection

Our initial sample comprises all firms on Compustat during the period 1971–2004 and have relevant data available on CRSP. We exclude financial firms and utilities (SIC codes 4900–4999 and 6900–6999) due to the regulatory environment they operate in. In addition, we drop firms with format codes 4, 5 or 6 and to minimize the contamination of our sample by miscoded observations and outliers we do not include extreme Compustat observations. 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. Table 2 presents the distribution of the observations through time. Note that because of the data requirements for the residual income model, we have valuation estimates from 1971 through 2001. We have 4,568 firms that are on average 15 years in our sample which results in a total of 68,886 firm-year observations.

3.2 Measuring equity valuation

We measure equity valuation with the ratio the intrinsic value to current market price. To calculate the intrinsic value we use the residual income model.² The basic model calculates the intrinsic value by adding to book value the discounted expected earnings in excess of normal return on book value, which is similar to economic value added. Equations 1 and 2 are a formal representation of the model.

$$E(V_0) = B_0 + \sum_{i=1}^T (1+r)^{-i} E_0[X_i - r * B_{i-1}] + \frac{(1+r)^{-T}}{r} TV \quad (1)$$

where TV is calculated as;

$$TV = E_0[(X_T - r * B_{T-1}) + (X_{T+1} - r * B_T)] / 2 \quad (2)$$

$E(V_0)$ 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 $E_0(X_i)$ are the expected future earnings for year i at time zero. Time zero is the time at the end of the fiscal year immediately preceding the file date, and T equals two years.

Our primary tests use a perfect foresight version of the Residual Income Model. Later in the paper, we use analyst earnings forecasts for expected future earnings.³ In this implementation, B_0 (book equity) is Compustat item d60, and X_i (income before extraordinary items) is item d18. 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.⁴ Lee, Myers and Swaminathan (1999) report that both the short-term T-Bill rates and 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

² This model has been used in studies by D'Mello and Shroff (2000), Dong, Hirshleifer and Teoh (2002), Elliott, Koeter-Kant and Warr (2007) among others and is generally accepted to be a better measure of firm valuation than market-to-book ratios.

³ D'Mello and Shroff (2000), Lee, Myers and Swaminathan,(1999), Dong, Hirshleifer, Richardson, and Teoh (2006), and Elliott, Koeter-Kant and Warr (2007) also use analyst forecast data as a robustness check.

⁴ We also use a fixed risk premium approach as in Lee, Myers and Swaminathan (1999) and a simple one factor. The results are qualitatively the same.

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 misvaluation is measured as:

$$VP_0 = \frac{E(V_0)}{P_0} \quad (3)$$

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

3.3 *The partial adjustment model*

We closely follow the approach of Fama and French (2002) in estimating the partial adjustment model. The partial adjustment model measures the rate at which the firm adjusts its debt ratio to a target capital structure. The basic model is as follows:

$$DR_{t+1} - DR_t = \alpha_0 + \alpha_1 [TL_{t+1} - DR_t] + e_{t+1} \quad (4)$$

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 $t+1$. We refer to $[TL_{t+1} - DR_t]$ as the Distance. Distance is the total distance that the debt ratio must change to bring the firm back to its target debt ratio. Equation (4) is estimated using a two stage approach. First the target leverage must be estimated. The target leverage is the predicted value from the following regression.

$$DR_{t+1} = b_0 + b_1 \frac{V_t}{A_t} + b_2 \frac{ET_t}{A_t} + b_3 \frac{Dep_t}{A_t} + b_4 RDD_t + b_5 \frac{RD_t}{A_t} + b_6 \ln(A_t) + \varepsilon_{t+1} \quad (5)$$

Where V_t/A_t is the market to book ratio, ET_t/A_t pre-tax operating income to assets, Dep_t/A_t is depreciation expense to assets, RDD_t is a dummy variable for the existence of R&D expenses, RD_t/A_t is R&D expense to assets, and $\ln(A_t)$ is the log of assets. Equation (5) is estimated annually using the book debt to assets ratio and later using the market debt to assets ratio. The predictive values from these regressions are used as TL in the subsequent estimation of equation 4. Equation 4 is estimated using the Fama and Macbeth (1973) method.

4 Results

4.1 Descriptive statistics

Table 3 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 23%, compared to a market debt ratio of approximately 28%. The average asset size (in 1983 dollars) is \$1.198 billion. The mean market-to-book ratio is 1.53. On average, sample firms had earnings 6.7% of assets, before interest and taxes. The mean value to price ratio is 0.9292 implying that firms in the sample are slightly overvalued, as a VP of 1 implies no misvaluation.

In Table 4 we present the results of the estimation of Equation 5. Equation 5 is estimated annually over 31 years for all firms for which we have data. The reported slope coefficients are the average of the annual coefficients. We use the approach of Fama and French (2002) and report time series standard errors which are the standard deviation of the 31 slope estimates divided by $31^{1/2}$. These regressions indicate that more profitable firms with greater amounts of R&D tend to have lower levels of debt. Larger firms tend to have higher debt ratios. These findings are broadly consistent with those of other researchers. The fitted values from these regressions are our estimates of the firms leverage target and are used in the next section to determine whether or not the firm is over or underlevered.

4.2 *Over versus under levered rate of adjustment regression results*

The primary rate of adjustment regression result from the estimation of Equation 4 is presented in Table 5. Since Distance is calculated as the predicted debt ratio minus the observed, over (under) levered firms have a negative (positive) value for Distance. If the firm returns to its target debt ratio in the following year, the coefficient on Distance would equal 1.

In Panel A, the sample is bifurcated based upon whether the firm is above or below its target debt ratio. The first row presents the regression results for only those firms that are over levered. The coefficient on D is significant at the one-percent level and indicates that firms reduce the distance from their target leverage by about 10% in one year. Likewise, for under levered firms, D is significant at the one-percent level. However, under levered firms adjust toward their target leverage at less than half the rate (they reduce the distance from their target leverage by slightly more than 4% per year) of over levered firms. The difference between the adjustment rates for over versus under levered firms is significant at the 1% level. This is consistent with our conjecture that firms above their optimal target hit a ‘hard’ boundary and those that are below their target face a ‘soft’ boundary. The role of equity mis-pricing depends on whether the firm is above or below the target, and as such, it is a secondary effect. For this reason, we analyze the rate of adjustment with respect to equity mis-pricing separately for over versus under levered firms independently.

4.3 *Valuation effects*

The evidence presented in Table 5, Panel A suggests that over levered firms more rapidly revert to a target debt ratio. Layered on top of the leverage effect, we expect that equity mis-pricing will impact the rate at which firms adjust toward their target. We conjecture that over-

valued firms face a lower cost of equity, and therefore will prefer equity to debt, irrespective of whether they are above or below their targets.

Panel B presents the empirical evidence of equity mis-pricing on over levered firms. Over-valued firms reduce 11.6% of the distance from their target per year. This figure is significantly different from zero at the one-percent level. Consistent with our conjecture, under-valued firms only reduce their leverage by 6.7% per year (significant at the one-percent level). The difference in the rate of adjustment between over- and under-valued firms is significant at the one-percent level.

For firms that are below their target debt ratio, Panel C summarizes the evidence for the valuation effect. For these firms, the predicted effect of valuation is similar to that of over levered firms.⁵ However, the impact of valuation on under levered firms is the opposite, since under levered firms should increase their debt ratio, over-valuation of equity will potentially slow that adjustment. Empirically, over-valued firms have a rate of adjustment of only 2.2%, while under-valued firms adjust at a rate of nearly 7% (both are significantly different from zero and different from one another at the one-percent level).

In sum, the empirical evidence is consistent with our conjectures. However, the evaluation is sensitive to the means by which we estimate target leverage as well as the means by which we measure mis-pricing. In Section 4.4 we test the robustness of our result to different measures of target leverage and mis-pricing.

⁵ That is, over-valued firms face a lower cost of equity financing and therefore are more likely to use equity over debt. However, we evaluate the two situations independently because the primary rate of adjustment varies across over and under levered firms.

4.4 *Robustness tests*

In the previous tests, we measured debt ratio using the book value of equity. However, it's not clear that the book debt ratio is the appropriate measure. In Table 6, we re-estimate the regressions from Table 5 using market debt ratio. Panel A presents the empirical results for over and under levered firms. Similar to the primary results, over levered firms appear to adjust at a faster rate (13.3%) than under levered firms (1.8%). In fact, it seems that the leverage effect is more distinct than when we use book debt ratio. Panels B and C present the results of the valuation effect for over and under levered firms, respectively. Again, the result is qualitatively similar to the primary analysis.

Table 7 presents evidence using an alternative measure for mis-pricing. In the primary analysis we have used ex- post earnings to estimate fundamental value. To remove the potential of endogeneity, possibly caused by managers manipulating earnings, we use analysts forecast earnings in the residual income model. There are two potential weaknesses to this approach. First, our sample size is reduced significantly and this could weaken the result. Second, noise may be introduced into our value estimates, as we use the most recent mean analyst estimate. Both issues could reduce the significance of the result. These issues notwithstanding, the outcome is not qualitatively different from the primary analysis. Over levered firms adjust toward their target at approximately twice the rate of under levered firms (9.7% versus 4.7%, respectively). Over levered firms whose equity is over-valued (under-valued) adjust at a rate of 11.9% (5.9%). For under levered firms, those with over-valued (under-valued) equity adjust at a rate of 4.1% (8.9%).

5 Conclusion

We contend that our evidence makes two primary contributions to the literature. First, we predict that over and under levered firms will adjust toward their target leverage at different rates. In particular, over levered firms face a ‘hard’ boundary from above, while under levered firms face a ‘soft’ boundary. We argue that this is due primarily to the bankruptcy cost to which over levered firms are exposed. Presumably the present value of bankruptcy costs increases at an increasing rate (i.e. the probability of bankruptcy increases at an increasing rate) as firms exceed their target debt ratio. Therefore, firms that are above their target debt will more quickly adjust toward their target than those that are below their target debt ratio.

The empirical evidence supports our contention that over levered firms adjust toward their target more rapidly than do under levered firms. This result is robust to different means of estimating the target debt ratio.

Second, we claim that regardless of a firms distance from its target debt, the potential mispricing of its equity will alter the rate of adjustment. In the case of firms that are above their target debt, over-valued firms (i.e. cost of equity is low) will adjust more rapidly toward their target than under-valued firms. Conversely, for firms below their target debt, over-valued firms will adjust more slowly toward the target than under-valued firms. We test this prediction separately for over and under levered firms. Empirically, we find evidence that supports our predicted valuation effect. This result is also robust to different methods of measuring equity valuation.

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Table 1
Predictions of the impact of market timing on the rate of adjustment to leverage targets

| | Equity overvalued <i>(Market timing: issue equity)</i> | Equity undervalued <i>(Market timing: issue debt)</i> |
|--|---|--|
| Firm over levered <i>(Trade-off theory: issue equity)</i> | Rapid rate of adjustment. | Slower rate of adjustment |
| Firm under levered <i>(Trade-off theory: issue debt)</i> | Slower rate of adjustment | Rapid rate of adjustment |

Table 2
Number of observations by year

| <i>Year</i> | <i>Observations</i> | <i>Total Assets (1993 dollars)</i> | <i>Book Debt Ratio</i> |
|-------------|---------------------|------------------------------------|------------------------|
| 1971 | 1,329 | 930.68 | 0.2568 |
| 1972 | 1,851 | 756.29 | 0.2551 |
| 1973 | 2,068 | 746.25 | 0.2623 |
| 1974 | 2,227 | 714.53 | 0.2773 |
| 1975 | 2,141 | 782.68 | 0.2707 |
| 1976 | 1,994 | 791.83 | 0.2576 |
| 1977 | 1,864 | 830.43 | 0.2587 |
| 1978 | 1,891 | 833.98 | 0.2593 |
| 1979 | 2,076 | 755.27 | 0.2691 |
| 1980 | 2,064 | 775.89 | 0.2535 |
| 1981 | 2,269 | 667.07 | 0.2405 |
| 1982 | 2,126 | 733.75 | 0.2361 |
| 1983 | 2,052 | 750.04 | 0.2130 |
| 1984 | 2,112 | 865.49 | 0.2112 |
| 1985 | 2,110 | 959.59 | 0.2103 |
| 1986 | 2,186 | 987.56 | 0.2135 |
| 1987 | 2,332 | 1,001.00 | 0.2174 |
| 1988 | 2,383 | 1,194.49 | 0.2289 |
| 1989 | 2,385 | 1,285.98 | 0.2343 |
| 1990 | 2,411 | 1,334.38 | 0.2328 |
| 1991 | 2,456 | 1,399.66 | 0.2203 |
| 1992 | 2,444 | 1,479.09 | 0.2116 |
| 1993 | 2,482 | 1,488.51 | 0.1978 |
| 1994 | 2,447 | 1,508.18 | 0.1985 |
| 1995 | 2,414 | 1,533.19 | 0.2009 |
| 1996 | 2,462 | 1,379.76 | 0.1897 |
| 1997 | 2,439 | 1,313.34 | 0.1956 |
| 1998 | 2,331 | 1,599.26 | 0.2064 |
| 1999 | 2,442 | 1,774.51 | 0.2106 |
| 2000 | 2,599 | 2,206.25 | 0.2113 |
| 2001 | 2,499 | 2,646.23 | 0.2101 |
| Total | 68,886 | | |

This table presents the distribution of the total sample of all U.S. non-financial firms with data available on CRSP and COMPUSTAT between January 1962 and December 2001 for which we are able to compute the valuation metric. Total Assets are deflated by the Consumer Price Index for December 1983. Book Debt Ratio is (Long-Term Debt (Data9) + Debt in Current Liabilities (Data34))/ Total Assets (Data6).

Table 3
Sample summary statistics

| <i>Variable</i> | <i>Mean</i> | <i>Median</i> | <i>Std. Dev</i> |
|--|-------------|---------------|-----------------|
| BDR (<i>Book Debt Ratio</i>) | 0.2274 | 0.2034 | 0.1915 |
| MDR (<i>Market Debt Ratio</i>) | 0.2762 | 0.2147 | 0.2547 |
| MB (<i>Market to Book</i>) | 1.5274 | 0.9258 | 2.9163 |
| EBITTA (<i>EBIT/Total Assets</i>) | 0.0673 | 0.0895 | 0.1719 |
| DEPTA (<i>Depreciation Expense/Total Assets</i>) | 0.0418 | 0.0351 | 0.0645 |
| RDDUM (<i>R&D Dummy</i>) | 0.4026 | 0.0000 | 0.4904 |
| RDTA (<i>R&D Expense/Total Assets</i>) | 0.0276 | 0.0000 | 0.0634 |
| TA (<i>Total Assets (1983 Dollars)</i>) | 1198.45 | 65.85 | 7958.87 |
| VP (<i>Value / Price</i>) | 0.9292 | 0.7586 | 0.6823 |

All the variables are computed from data from Compustat. BDR is the book debt ratio: $(Data9+Data34)/Data6$. MDR is the market debt ratio: $(Data9+Data34)/(Data9+Data34+Data199*Data25)$. MB is market to book: $(Data9+Data34+Data10+Data199*Data25)/Data6$. 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. Value to Price is the Residual Income Valuation Model Valuation divided by the stock price (see the text for full details).

Table 4. Average Coefficients from Annual Leverage Regressions.

| <i>Variable</i> | <i>Mean Slope Coefficient</i> | <i>Time Series Standard Error</i> | <i>T(Mean)</i> |
|-----------------|-------------------------------|-----------------------------------|----------------|
| MB | 0.0000 | 0.0028 | 0.0000 |
| EBITTA | -0.2709 | 0.0480 | -5.6385 |
| DEPTA | -0.0493 | 0.0396 | -1.2442 |
| RDDUM | -0.0432 | 0.0040 | -10.7360 |
| RDTA | -0.3660 | 0.0301 | -12.1700 |
| Ln(TA) | 0.0172 | 0.0007 | 23.8889 |

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 31 annual regressions. Time series standard error is the time series standard deviation of the regression coefficient divided by $(31)^{1/2}$, as in Fama and French (2002). $T(Mean)$ is the mean slope coefficient divided by the time series standard error.

Table 5
Speed of adjustment regressions using ex-post value-to-price ratio and book debt ratio

| | <i>Intercept</i> | <i>Distance</i> | R^2 | N |
|---|--------------------|--------------------|-------|--------|
| <i>Panel A: Data bifurcated based upon whether the firm is above or below target debt ratio</i> | | | | |
| Over levered (<i>Distance</i> < 0) | 0.0023 (1.10) | 0.1004 (14.01) | 0.024 | 26,932 |
| Under levered (<i>Distance</i> > 0) | 0.0091 (4.67) | 0.0414 (6.34) | 0.005 | 29,010 |
| Difference between Over and Under Levered | | 0.0590 (6.08) | | |
| <i>Panel B: Only over levered firms (Distance < 0). Data bifurcated based upon whether the firm is over- or under-valued.</i> | | | | |
| Over-valued (<i>VP</i> < 1) | 0.0115 (4.87) | 0.1159 (12.08) | 0.031 | 15,991 |
| Under-valued (<i>VP</i> > 1) | -0.0129 (-6.14) | 0.0675 (9.09) | 0.015 | 10,941 |
| Difference between Over- and Under-valued | | 0.0485 (4.00) | | |
| <i>Panel C: Only under levered firms (Distance > 0). Data bifurcated based upon whether the firm is over- or under-valued.</i> | | | | |
| Over-valued (<i>VP</i> < 1) | 0.0149 (7.52) | 0.0223 (2.83) | 0.003 | 20,010 |
| Under-valued (<i>VP</i> > 1) | -0.0005 (-0.22) | 0.0690 (6.12) | 0.013 | 9,185 |
| Difference between Over- and Under-valued | | -0.0467 (-3.39) | | |

This table presents speed of adjustment regressions using the Fama and MacBeth (1973) method. T statistics using Fama Macbeth standard errors are reported in parenthesis. Distance = Target Leverage - Debt Ratio. Target Leverage is the predicted value from the annual leverage regressions in Table 4. Debt Ratio is the Book Debt Ratio computed as (Data9+Data34)/Data6. Distance < 0 represents a firm being over-levered as Target Leverage < Debt Ratio. Distance > 0 represents under-levered. VP is the value to price ratio computed by the Residual Income Model. VP > 1 implies undervaluation, i.e. V > P and VP < 1 implies overvaluation, i.e. V < P. Difference tests are t tests assuming unequal variances.

Table 6
Speed of adjustment regressions using ex-post value-to-price ratio and market debt ratio

| | <i>Intercept</i> | <i>Distance</i> | R^2 | N |
|--|--------------------|--------------------|-------|--------|
| <i>Panel A: Data bifurcated based upon whether the firm is above or below target debt ratio</i> | | | | |
| Over levered ($Distance < 0$) | 0.0143 (1.54) | 0.1331 (15.59) | 0.025 | 22,426 |
| Under levered ($Distance > 0$) | 0.0225 (3.03) | 0.0183 (1.10) | 0.010 | 33,381 |
| Difference between Over and Under Levered | | 0.1148 (6.14) | | |
| <i>Panel B: Only over levered firms ($Distance < 0$). Data bifurcated based upon whether the firm is over- or under-valued.</i> | | | | |
| Over-valued ($VP < 1$) | 0.0415 (4.26) | 0.1257 (9.98) | 0.023 | 10,138 |
| Under-valued ($VP > 1$) | -0.0281 (-3.04) | 0.0625 (6.39) | 0.010 | 12,288 |
| Difference between Over- and Under-valued | | 0.0632 (3.96) | | |
| <i>Panel C: Only under levered firms ($Distance > 0$). Data bifurcated based upon whether the firm is over- or under-valued.</i> | | | | |
| Over-valued ($VP < 1$) | 0.0363 (4.40) | -0.0205 (-1.03) | 0.011 | 25,826 |
| Under-valued ($VP > 1$) | -0.0112 (-1.60) | 0.1073 (5.39) | 0.028 | 7,810 |
| Difference between Over- and Under-valued | | -0.1277 (-4.55) | | |

This table presents speed of adjustment regressions using the Fama and MacBeth (1973) method. T statistics using Fama Macbeth standard errors are reported in parenthesis. Distance = Target Leverage - Debt Ratio. Target Leverage is the predicted value from the annual leverage regressions in Table 4. Debt Ratio is the Market Debt Ratio computed as $(Data9+Data34)/(Data9+Data34+Data199*Data25)$. Distance < 0 represents a firm being over-levered as Target Leverage < Debt Ratio. Distance > 0 represents under-levered. VP is the value to price ratio computed by the Residual Income Model. VP > 1 implies undervaluation, i.e. V > P and VP < 1 implies overvaluation, i.e. V < P. Difference tests are t tests assuming unequal variances.

Table 7
Speed of adjustment regressions using analyst forecast value-to-price ratio and book debt ratio

| | <i>Intercept</i> | <i>Distance</i> | R^2 | N |
|---|--------------------|--------------------|--------|-------|
| <i>Panel A: Data bifurcated based upon whether the firm is above or below target debt ratio</i> | | | | |
| Over levered (<i>Distance</i> < 0) | -0.0036 (-1.12) | 0.0968 (7.73) | 0.0328 | 4,811 |
| Under levered (<i>Distance</i> > 0) | 0.0030 (1.02) | 0.0474 (4.97) | 0.008 | 7,642 |
| Difference between Over and Under Levered | | 0.0494 (5.27) | | |
| <i>Panel B: Only over levered firms (Distance < 0). Data bifurcated based upon whether the firm is over- or under-valued.</i> | | | | |
| Over-valued (<i>VP</i> < 1) | -0.0051 (-1.26) | 0.1194 (7.73) | 0.044 | 3,313 |
| Under-valued (<i>VP</i> > 1) | -0.0014 (-0.51) | 0.0590 (3.29) | 0.020 | 1,498 |
| Difference between Over- and Under-valued | | 0.0604 (4.28) | | |
| <i>Panel C: Only under levered firms (Distance > 0). Data bifurcated based upon whether the firm is over- or under-valued.</i> | | | | |
| Over-valued (<i>VP</i> < 1) | 0.0036 (1.23) | 0.0411 (3.87) | 0.007 | 6,342 |
| Under-valued (<i>VP</i> > 1) | -0.0028 (-2.31) | 0.0894 (3.51) | 0.036 | 1,306 |
| Difference between Over- and Under-valued | | -0.0483 (-2.94) | | |

This table presents speed of adjustment regressions using the Fama and MacBeth (1973) method. T statistics using Fama Macbeth standard errors are reported in parenthesis. Distance = Target Leverage - Debt Ratio. Target Leverage is the predicted value from the annual leverage regressions in Table 4. Debt Ratio is the Book Debt Ratio computed as (Data9+Data34)/Data6. Distance < 0 represents a firm being over-levered as Target Leverage < Debt Ratio. Distance > 0 represents under-levered. VP is the value to price ratio computed by the Residual Income Model using Analyst earnings forecasts for future earnings. VP > 1 implies undervaluation, i.e. V > P and VP < 1 implies overvaluation, i.e. V < P. Difference tests are t tests assuming unequal variances.

