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Abstract

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JEL Classification: G32, C23

Keywords: market leverage; book leverage; capital structure; adjustment speed

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Asymmetries in the Firm's Use of Debt to Changing Market Values

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Using a large sample of U.S. firms over the period, 1984 to 2013, this study examines the relation between market and book leverage ratios. Unlike Welch (2004) who contends that changes in market leverage do not induce adjustments in book leverage, we find an asymmetric effect. That is, firms adjust their book leverage relative to market leverage only when the changes in market leverage are due to increases in the value of the firm's equity. No adjustment is observed when firm equity values decrease. We observe a number of interesting differences between those firms that make large and small capital structure adjustments in response to changing equity prices. Our results are consistent with Barclay, Morellec and Smith (2006) who argue that the optimal level of debt decreases in the presence of corporate growth options.

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Asymmetries in the Firm's Use of Debt to Changing Market Values

1. Introduction

Corporate finance scholars as well as practitioners employ two measures to assess the extent to which firms make use of leverage.¹ Many researchers use market leverage ratios (e.g., Hovakimian et al., 2001; Fama and French, 2002; Welch, 2004; Leary and Roberts, 2005) while others elect to estimate book leverage ratios (e.g., Roberts and Sufi, 2009; Cai and Zhang, 2011; DeAngelo, DeAngelo, and Whitted, 2011; DeAngelo and Roll, 2015). Although these measures do track each other closely, stock returns through their effect on the value of equity, introduces divergence between these values over the life of a firm. Welch (2004) reports, however, that firms do little to respond to the effect of these stock price changes on their market measured capital structures. That is, managers do not take measurable efforts to align market and book leverage ratios, resulting in corporate debt-equity ratios varying closely with fluctuations in a firm's stock price.

This study provides a deeper examination of this relation between market and book leverage ratios. More specifically we investigate under what conditions changes in market leverage are accompanied by changes in book leverage. We investigate if there might exist circumstances that trigger managers to balance market and book leverage ratios. We also model and estimate the speed of capital structure adjustments when they occur.

We use quarterly data for U.S.firms from 1984 to 2013 to undertake our analysis. We find, unlike Welch (2004), that there is a corporate response to equity market driven changes in

¹ Market leverage is defined as the value of debt divided by the market value of the firm's assets; book leverage is measured as total debt divided by the book value of assets.

capital structure. Contrary to his conclusion that stock returns are the primary component in explaining capital structure and capital structure changes, we find that firms do readjust to stock market prices rather than simply let their debt ratios fluctuate. Importantly, we determine that this response is asymmetric. That is, firms adjust their book leverage only when the change in market leverage is due to an increase in the value of a firm's equity. Rising equity prices have the effect of lowering market leverage relative to its book counterpart. Further, we estimate the speed of adjustment of the firm's book leverage to its corresponding market ratio to be 31% per quarter. This is considerably higher than the speed of adjustment to the target leverage (26.5%).^{2,3} By contrast, there is no significant adjustment to book leverage when the market leverage increases due to a decline in corporate equity values. This behavior is most consistent with Barclay, Morellec and Smith (2006) who contend that the optimal level of debt decreases when the firm enjoys more growth opportunities.

Since the observed adjustment in book leverage is asymmetric, it is difficult to reconcile such actions with mechanical mean reversion (Shyam-Sunder and Myers, 1999; Chen and Zhao, 2007) or other predictable effects that arise when firms do not follow target behavior (Chang and Dasgupta, 2009). This asymmetry in adjustment implies a systematic behavior that cannot be explained by random changes in book leverage ratios.

We further examine firm financing choices as suggested by Chang and Dasgupta (2009) to better understand the process by which book leverage ratios are adjusted. We sort our sample based on the relative position of market to book leverage and then analyze the firm's subsequent

² Target leverage is often referred to as the 'optimal debt ratio' and denotes the target ratio a firm is trying to reach.

³ The estimated speed of adjustment between actual and target leverage ratios for the typical firm in our sample is about 26.5% per quarter for market leverage and 26.6% for book leverage. The similarity between book and market leverage partial adjustment speed is well documented in the literature (see Flannery and Rangan, 2006; Flannery and Hankins, 2013). This quarterly speed of adjustment is lower than the annual speed of adjustment (36.6–40.5%) reported by Flannery and Rangan (2006). This might be due to the use of quarterly data that are more volatile, resulting in more frequent adjustments.

financing choices. We find that firms are more likely to issue equity over the subsequent period if their market leverage is lower than their book leverage.

Our study makes an important contribution to our understanding of capital structure choices and their dynamics over time. We determine that Welch's (2004) conclusion that firms do little to counteract the influence of stock price changes on their capital structure is only partially supported by the data. We find from a thirty-year analysis of corporate debt usage, that book leverage ratios follow an asymmetric adjustment process when responding to share price movement. We discover that increases in a firm's equity value flow through to its market leverage ratio and then ultimately into its book leverage. Decreases in firm equity values, however, trigger no significant adjustment in book leverage ratios. These results provide support for the view that when stock market fluctuations are high, book leverage is a more conservative measure of corporate debt utilization. We also establish that a firm's market and book leverage ratios demonstrate very similar evolution patterns and track each other quite closely.

We organize our study into the following sections. In section 2 we discuss our data and sample construction process. In section 3 we briefly describe the co-evolution of book and market leverage. Section 4 contains our most important analysis and examines how market and book leverage ratios differ in response to changes in the firm's equity values. We present a comparative analysis of financial and accounting characteristics between high and low adjustment firms in Section 5. Section 6 provides a set of robustness tests where we examine the possibility of mechanical adjustments to changes in the value of market leverage as well as alternative definitions of leverage. Section 7 contains a brief summary of our results and our discussion of how these findings contribute to a fuller understanding of the dynamics of corporate capital structure.

2. Data and Sample Description

We construct our sample using Compustat North America and the St. Louis Federal Reserve Economic Data (FRED) over the period 1984Q1 to 2013Q4. The resulting dataset contains 419,713 firm-quarter observations. Consistent with much of the literature, we require each firm to have a fully consolidated accounting statement and be incorporated in the U.S. To avoid distortions due to regulation, financial firms (SICs 6000–6999) and regulated utilities (SICs 4900–4999) are excluded from the sample.

We analyze fiscal quarters because quarterly financial statements are an important communication mechanism between managers and the capital markets. The quarterly statements are reviewed, and corporate officers must attest to the quality of these statements since the adoption of the Sarbanes-Oxley Act. These quarterly statements are widely studied by investors in the capital markets to assess a firm's prospects for growth or value appreciation. Further, CEOs tend to emphasize quarterly results since their bonus payments are often linked to them (Matsunaga and Park, 2001). Therefore, we focus on the firm's quarterly results to observe the timing of a leverage adjustment.

We follow Lemmon, Roberts, and Zender (2008), Leary and Roberts (2014), and DeAngelo and Roll (2015) for the identification and construction of our major regressors. *Book Leverage_t* is calculated as total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the book value of total assets (ATq), all at time t . *Market Leverage_t* is total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the market value of total assets. The market value of total assets is the stock price (PRCCq) times the number of shares outstanding (CSHPRq) plus total debt plus preferred stock (PSTKq or PSTKRq if missing) minus deferred

taxes and the investment tax credit (TXDITCq). *Firm Size* is calculated as the log of sales (SALEq) deflated by the GDP deflator, where the deflated index is base lined to 100 for the year 2009. The GDP deflator is collected from the St. Louis FRED.

We calculate several performance and value variables. *Profitability* is calculated as operating income before depreciation (OIBDPq) divided by the book value of total assets (ATq). *Cash Flow Volatility* is the standard deviation of historical operating income before depreciation (OIBDPq), scaled by total assets over the past 12 quarters. The *Market-to-Book* ratio is calculated as market equity plus total debt plus preferred stock redeemable (PSTKRQ), or (PSTKQ) if missing, minus deferred taxes and investment tax credits (TXDITCQ), and then scaled by the book value of total assets (ATq). *Tangibility* is net PPE (PPENTq) scaled by the book value of total assets (ATq).

Industry Median Book (Market) Leverage is the median book (market) leverage estimated for the 2-digit SIC code each quarter. We require at least 5 companies in that industry and quarter. Lastly, the variable *Recession* indicates a recession in the economy as defined by NBER's Business Cycle Dating Committee.

Panel A of Table 1 provides summary descriptive statistics for our variables. We observe that the representative firm from our sample has an average book leverage ratio of 22.3%, which is almost identical to the market leverage ratio of 22%. The medians of these ratios indicate some differences, with the corresponding book leverage ratio being 19.1% ,while the market leverage ratio is 14.3%. The standard deviation and various percentiles indicate comparable distributions for both ratios. The average quarterly firm sales are approximately 28.5 million USD, a profitability ratio of 1.4%, with 29.3% of the book value of its assets backed by tangible property, plant and equipment. A *Market-to-Book* ratio for the representative firm is 1.776.

These descriptive statistics are comparable to those reported in prior studies such as Flannery and Rangan (2006) and Lemmon, Roberts, and Zender (2008).

Panel B contains the time-series distribution of our sample. We have the greatest coverage, with 18,892 observations in 1997. The narrowest coverage occurs in 2013 with 8,977 observations. On average, there are 13,990 observations annually.

3. The Co-Evolution of Market and Book Leverage

To begin our analysis of the relation and adjustment pattern between book and market leverage ratios we present Figure 1. This figure plots the mean book and market leverage ratios over our sample period, 1984 to 2013. An immediate observation is that the leverage ratios move together and closely track each other. Market leverage, however, is slightly more volatile than its book counterpart. Our analysis clearly supports the findings of Bowman (1980) and Bessler, Drobetz and Kazemieh (2011) that there is a strong correlation between the market and book measures of financial leverage.

In Figure 2 we plot the median difference between the market and book leverage ratios. We find that, on average, market leverage is greater than book leverage around recessions due to the effect of depressed equity values. Book leverage, however, is on average, greater than market leverage during the non-recessionary periods. At the same time, the median of the difference between market and book leverage ratios tends to fluctuate around zero.⁴ Figure 2 also shows that the difference between market and book leverage moves in waves and peaks during recessions.

⁴ Note that zero leverage firms are excluded from the sample.

4. The Connection Between Book and Market Leverage

4.1 A Partial Adjustment Methodology

In this section we examine the extent to which market and book leverage ratios are linked. That is, we investigate whether a firm adjusts its book leverage following changes in its market leverage. The obvious link between these ratios is the market value of the firm's equity. If the value of the firm's equity changes, then the market leverage ratio should adjust immediately. Book leverage adjustment is likely to occur later with the issuance of new securities.

To determine whether there is any relation between changes in market leverage and subsequent book leverage, we reformulate the partial adjustment model which is developed in the Appendix. We accomplish this by modelling the difference between market and book leverage as specified below:

$$d_{it}^B - d_{it-1}^B = \lambda(d_{it-1}^M - d_{it-1}^B) + \delta X_{it-1} + v_{it}, \quad (1)$$

where $d_{it}^B - d_{it-1}^B$ is the difference between book leverage at time t and $t-1$ for a firm i , $d_{it-1}^M - d_{it-1}^B$ represents the difference between market and book leverage ratios at time $t-1$ for firm i , and λ is the speed of the adjustment coefficient. Vector X_{it-1} contains firm-specific control variables. The full model also accounts for the potential differences in the speed of adjustment in recession periods, different fiscal quarters, and for cyclical companies.

$$\begin{aligned} d_{it}^B - d_{it-1}^B = & \lambda(d_{it-1}^M - d_{it-1}^B) + \lambda_{recession}(d_{it-1}^M - d_{it-1}^B) * recession_D \\ & + \lambda_{cyclical}(d_{it-1}^M - d_{it-1}^B) * cyclical_D \\ & + \lambda_{quarter}(d_{it-1}^M - d_{it-1}^B) * quarter_D + \delta X_{it-1} + v_{it} \end{aligned} \quad (2)$$

Further, we investigate whether firms exhibit different adjustment behavior depending on the difference between market and book leverage. We calculate the difference between market and book leverage for each of our sample firms. A negative difference, when the market leverage ratio is lower than the corresponding book-based ratio, suggests that the market value of the firm is higher than its book value. A positive difference, when the market leverage is higher than its corresponding book leverage, implies the opposite. Our resulting model is as follows:

$$\begin{aligned}
d_{it}^B - d_{it-1}^B &= \lambda_{up}(d_{it-1}^M - d_{it-1}^B) \times D(MLev > BLev)_{t-1} + \\
&+ \lambda_{down}(d_{it-1}^M - d_{it-1}^B) \times D(MLev < BLev)_{t-1} + \\
&+ \delta X_{it-1} + v_{it}
\end{aligned} \tag{3}$$

In equation (3), $D(MLev > BLev)_{t-1}$ is equal to 1 if the firm's market leverage is greater than its book leverage and 0 otherwise. Similarly, $D(MLev < BLev)_{t-1}$ is equal to 1 when the firm's market leverage is lower than its book leverage and 0 otherwise. These relationships are measured at time $t-1$. The vector of firm-specific control variables (X_{it-1}) includes firm size, profitability, cash flow volatility, market-to-book, and asset tangibility. We also control for industry median book (market) leverage. To address potential endogeneity and dependent variable persistence problems, we estimate the model by GMM (see e.g., Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998; Flannery and Hankins, 2013).

4.2 Empirical Findings

Table 2 presents our empirical findings of whether changes in a firm's market leverage ratio are accompanied by changes in its book leverage. If this is true, then λ (equation 1), the coefficient of interest, should be statistically significant. Model 1 contains the estimation results when all the dummy variables are set to zero. The estimated partial adjustment speed, λ , is 12.6%

per quarter. This means that the discrepancy between the market and book leverage ratios in the current period is associated with an adjustment in book leverage during the following period. Model 2 tests for potential differences in adjustment speed during a recession. During economic downturns, we observe that the estimated adjustment speed decreases to about 9% per quarter. Interestingly, the leverage adjustment behavior of cyclical companies differs significantly from the rest of the sample (Model 3). The book and market leverage for these firms move in different directions since the estimated adjustment speed is -29%.

One possible explanation for this observed pattern is that cyclical firms enjoy higher revenues during periods of economic prosperity, but suffer reduced sales levels during economic downturns or contraction. The equity value of these firms is likely to drop significantly during a recession, resulting in a mechanical increase in their market leverage. To reduce the costs of financial distress, cyclical firms might focus on repaying their debt to reduce their book leverage.

Models 4 through 6 focus on quarterly, cyclical, and economic downturn effects. Model 4 accounts for this quarterly variation in the speed of adjustment. The difference between the market and book leverage in the fourth quarter has a slightly reduced effect on book leverage during the upcoming (first) quarter. Model 5 controls for economic recession and cyclical firms while Model 6 is the fully specified model and includes controls for recession, cyclical firms, and individual quarter effects. The results for this comprehensive specification is are similar to those of the more limited models.

The capital structure strategies of a firm can differ depending on the market perception of a firm's value and risk. For example, an increase in the value of the firm's equity can lead to a decrease in market leverage. It then becomes interesting to examine whether there is a corresponding change in the firm's book leverage. We examine this issue under two different

conditions: (1) when the market leverage ratio of a firm exceeds its book leverage ratio (denoted as *UP*) and (2) when the market leverage ratio is less than its book leverage ratio (denoted as *DOWN*).

Table 3 summarizes our results from this analysis, incorporating relative differences in the leverage ratios. Model 1 demonstrates that the speed of adjustment is dependent on the relative position of the market to the book leverage ratio. When the market leverage is greater than the book leverage (*UP*) very little adjustment is observed. While the coefficient is statistically significant, this result becomes statistically weaker in subsequent specifications and disappears when all relevant factors are included (see Model 6).

When the market leverage is lower than the book leverage (*DOWN*), the estimated partial adjustment speed varies between 31.3% and 32.1% per quarter. The coefficients are uniformly positive and highly significant. Their magnitude is about ten times larger than those observed for the opposite case (i.e., *UP*).

In aggregate, Models 1 through 6 show that the adjustment in leverage is asymmetric. When the market leverage is greater than the book leverage (*UP*), the estimated coefficient is, about a tenth the size of the coefficients for those observations when the market leverage is less than its book counterpart (i.e., *DOWN*). We conclude that firms adjust their book leverage ratios only when their market leverage is lower than its book counterpart.

This pattern might be explained with a discussion of how changing equity prices influence both market and book leverage ratios. Decreasing equity values mechanically increase the market leverage ratio. But decreasing share prices are generally accompanied by negative earnings, which reduce retained earnings and consequently book equity. Book leverage will correspondingly increase. Increasing equity values are driven more by expectations of future

positive earnings that are not yet reflected in the book value of equity. Therefore, adjustments in book leverage occur in subsequent periods through the firm's financing activity.

We further test these results by examining a subsample of firms that are over-leveraged compared to their industry median leverage.⁵ We expect over-leveraged firms to have lower debt capacity and be more eager to adjust their book leverage in response to a change in their market leverage.

Table 4 presents our results. Overall, they are similar to those reported for the full sample reported in the preceding table. That is, firms adjust their book leverage ratios only when their market leverage is lower than its book counterpart. We do observe, however, that this asymmetric adjustment in leverage is more pronounced for these over-leveraged firms. The estimated partial adjustment speed is 39.7% per quarter in the full model compared to 32.1% for the entire sample reported in Table 3.

5. Characteristics of Asymmetrically Responding Firms

In this section we examine more critically the characteristics of those firms that elect to asymmetrically adjust their capital structure in response to equity price changes. We focus on the characteristics of those firms which exhibit the highest and lowest degree of asymmetric leverage adjustment behavior. We measure this asymmetric response as the residuals from the partial adjustment model of book leverage estimated in model 6 of Table 3. Those firms with the most positive residuals are the ones which exhibit the highest degree of asymmetric leverage adjustments. Those firms with the most negative residuals respond the least to changes

⁵ The results for under-leveraged companies are not reported, but are available upon request.

in market equity values. We examine the upper and lower quartile of residuals as well as the top and bottom decile. Results from this analysis are contained in Table 5.⁶

We observe a number of interesting differences between those firms that make large and small capital structure adjustments in response to changing equity prices. We find that firms making the largest adjustments are significantly smaller based on GDP deflated sales and total assets. They also report lower profitability, perhaps due to their higher selling expenses. These firms, however, have significantly higher levels of cash and hold more tangible assets in the form of property, plant and equipment as well as inventory. These firms also have higher cash flow volatility and market-to-book ratios. This suggests that these firms are unwilling to finance their growth with debt when their market leverage drops below their book leverage. This finding is consistent with the predictions of Barclay, Morellec and Smith (2006). We conclude that the asymmetric leverage adjustments of firms is not random and firms making such adjustments exhibit distinctive characteristics.

6. Robustness of the Empirical Findings

6.1 Mechanical Adjustment

Chang and Dasgupta (2009) argue that the existing models of target leverage behavior cannot distinguish deliberate from random financing. They suggest that researchers should look at financing choices to test their theories. We undertake such an analysis in this section.

We begin by sorting firms into two groups at time $t-1$: (1) firms whose market leverage is greater than its book leverage; (2) firms whose market leverage is lower than its book leverage. Then at time t we examine the financing behavior of the firm. We expect that when market leverage is less than book leverage, a firm should decrease its book leverage by: (1) decreasing

⁶ Results from other percentile-based subsamples show comparable results.

net debt issuance, (2) increasing net equity issuance or, (3) a combination of both.⁷ Since our focus is on leverage adjustments, we exclude observations where the market and book leverage ratios are equal to each other within a 2.5%, 5%, or 10% band.

Table 6 presents our empirical findings. Using a 2.5% exclusion band, 83.6% of our sample firms decrease net debt issuance, increase net equity issuance, or some combination of both when market leverage is lower than its corresponding book value. The difference is statistically significant when compared to the opposite group. Among our sample firms, 36.7% simultaneously reduce net debt issuance and increase net equity issuance when their market leverage is less than their book leverage. Again, the difference is statistically significant. As shown in Table 5, using our alternative exclusion bands of 5% and 10% yields comparative results.

6.2 Alternative Definitions for Market Leverage

In this section, we test the robustness of our results to an alternative measure of leverage. Therefore, we redefine market leverage according to that used by Lemmon, Roberts, and Zender (2008) and DeAngelo and Roll (2015). Specifically, we estimate Market Leverage ($\text{Market}^{\text{ALT}}$) as total debt divided by total debt plus the market value of equity all at time t . Market Equity is estimated as the stock price (PRCCQ) times the number of shares outstanding (CSHPRQ). We re-estimate our major findings using this alternative definition and present our results in Table 7.

Panel A in Table 7 contains our findings, which align with those reported in Table 2. The estimated coefficients and levels of statistical significance are comparable to those originally

⁷ Consistent with Lemmon, Roberts, and Zender (2008), we define Net Debt Issuance as the change in total debt from $t-1$ to quarter t divided by the $t-1$ book value of total assets. Net Equity Issuance is similarly defined as the split-adjusted change in shares outstanding ($\text{CSHO}_{q_t} - \text{CSHO}_{q_{t-1}} * (\text{ajex}_{q_{t-1}} / \text{ajex}_{q_t})$) times the split-adjusted average stock price ($\text{PRCCQ}_t + \text{PRCCQ}_{t-1} * (\text{ajex}_{q_t} / \text{ajex}_{q_{t-1}})$) divided by the $t-1$ book value of total assets.

reported. The partial adjustment speed approximates 17% per quarter, indicating that book leverage seeks convergence towards its market leverage counterpart.

Panel B corresponds to results we report in Table 3. These findings are consistent with our initial results reported in Table 3. Models 1 through 6 show that the book leverage adjustment is dependent on the difference between market and book leverage in the previous period. The asymmetry in the book leverage adjustment continues to hold. Very little or no adjustment in book leverage is observed if the market leverage exceeds book leverage ratio. The partial adjustment speed in book leverage, however, is about 30% if market leverage is less than book leverage.

In Panel C we present the results for the subsample of firms that are over-leveraged compared to the industry median book leverage. This analysis parallels that reported in Table 4. Again, our original findings are confirmed. That is, firms adjust their book leverage ratios only when their market leverage is lower than their book counterpart. This asymmetric adjustment in leverage, however, is even more pronounced when firms are over-leveraged.

7. Conclusion and Discussion

Using a large sample of U.S. firms over the period from 1984 to 2013, we find, contrary to Welch (2004), that firms do adjust their book leverage ratios in response to changes in market leverage that are driven by share price appreciation. Interestingly, these observed adjustments in the book leverage are asymmetric. That is, firms adjust their book leverage relative to market leverage only when the changes in market leverage are due to increases in firm value. No adjustment is observed when firm values decrease.

We find a number of significant differences between firms making large and small capital

structure adjustments in response to changing equity prices. We find that firms making the largest adjustments are significantly smaller, report lower profitability, and experience higher selling expenses. These firms, however, have significantly higher levels of cash and hold more tangible assets. These firms also have higher cash flow volatility and market-to-book ratios. We conclude that the asymmetric leverage adjustments of firms is not random and firms making such adjustments exhibit distinctive characteristics.

One potential explanation for these results is that book and market leverage ratios are connected through the value of a firm (assets in place versus growth opportunities) as discussed by Barclay, Morellec and Smith (2006). The equity value of a firm increases with additional growth options even if there is no change in the value of assets in place. This increase in equity value leads to a mechanical decrease in market leverage. This results in the firm's market leverage being lower than its book leverage. We find that firms narrow the difference between these two ratios over subsequent periods by decreasing the book leverage. They can accomplish this by retiring existing debt, issuing new equity, or some combination of both. No adjustment in book leverage is observed, however, when the change in market leverage is due to a decrease in equity value.

The importance of these findings is that they challenge the notion that stock returns are the only determinant or the major determinant of leverage dynamics. We show that share price movements explain capital structure patterns only when corporate equity values are declining. When share prices increase and decrease market leverage ratios, firms actively seek to readjust their book leverage. Thus, managers actively manage their capital structures with stock price movements explaining only a portion of the corporate leverage dynamic.

Appendix: Leverage Partial Adjustment Model

A standard partial adjustment model is defined as follows:

$$\Delta d_{it} = \lambda(d_{it}^* - d_{i,t-1}) + v_{it} \quad (1)$$

where d_{it} stands for the leverage of company i in the period t , Δd_{it} denotes an actual change in leverage between period t and period $t-1$, and d_{it}^* represents firm target leverage. Assuming that target leverage is a function of industry- and firm-level characteristics, denoted as x_{it} , we obtain the following specification:

$$d_{it}^* = \beta x_{it} + \mu_i. \quad (2)$$

We can estimate the model in a one-step approach. Following Flannery and Rangan (2006) and substituting equation (2) into (1), we obtain the following (FE) model:

$$\begin{aligned} d_{it} - d_{i,t-1} &= -\lambda d_{i,t-1} + \lambda d_{it}^* + v_{it} \\ d_{it} &= (1 - \lambda)d_{i,t-1} + \lambda d_{it}^* + v_{it} \\ d_{it} &= \varphi d_{i,t-1} + \beta^* x_{it} + v_{it}, \end{aligned} \quad (3)$$

where the speed of adjustment is $\lambda = 1 - \varphi$ and $\beta^* = \lambda\beta$. To allow for the differences in the speed of adjustment during a recession period, for cyclical industries, or for different financial reporting quarters, we modify the model as below:

$$\Delta d_{it} = \lambda(d_{it}^* - d_{i,t-1}) + \lambda_{change_D}(d_{it}^* - d_{i,t-1}) * change_D + v_{it}, \quad (4)$$

where $change_D$ is a dummy variable equal to one for the specific period or subsample with a potentially different speed of adjustment ($\lambda + \lambda_{change_D}$), such as a recession or for a cyclical

firm. Therefore, a specific model that allows us to estimate the adjustment speed during a recession is defined as follows:

$$\begin{aligned}
d_{it} &= d_{it-1} + \lambda d_{it}^* - \lambda d_{i,t-1} + \lambda_{change_D} d_{it}^* change_D - \lambda_{change_D} d_{i,t-1} change_D + v_{it} \\
d_{it} &= (1 - \lambda) d_{i,t-1} - \lambda_{change_D} d_{i,t-1} change_D + \lambda \beta x_{it} + \lambda_{change_D} \beta x_{it} change_D + v_{it} \\
d_{it} &= \varphi d_{i,t-1} + \varphi_1 d_{i,t-1} change_D + \beta^* x_{it} + \beta_{change_D}^* x_{it} change_D + v_{it} \quad (5)
\end{aligned}$$

As before, the partial speed of adjustment is equal to $\lambda = 1 - \varphi$, while the partial speed of adjustment in the recession period or for cyclical firms is $\lambda_{change_D} = 1 - \varphi - \varphi_{change_D}$, $\beta^* = \lambda \beta$ and $\beta_{change_D}^* = \lambda_{change_D} \beta$.

The final model accounts for potential differences in the speed of adjustment in the recession period (denoted as $recession_D$), for cyclical firms ($cyclical_D$) and in different reporting quarters (a set of three quarterly dummies, which for simplicity we denote as $quarter_D$). The model is specified as follows:

$$\begin{aligned}
d_{it} &= \varphi d_{i,t-1} + \varphi_{recession} d_{i,t-1} * recession_D + \varphi_{cyclical} d_{i,t-1} * cyclical_D \\
&\quad + \varphi_{quarter} d_{i,t-1} * quarter_D + \beta^* x_{it} + \beta_{recession}^* x_{it} \\
&\quad * recession_D + \beta_{cyclical}^* x_{i,t} * cyclical_D \\
&\quad + \beta_{quarter}^* x_{i,t} * quarter_D + v_{it} \quad (6)
\end{aligned}$$

Where d_{it} and $d_{i,t-1}$ stand for the leverage of company i in the period t and $t-1$, respectively.

Similarly to (), we get $\lambda = 1 - \varphi$, $\lambda_{recession} = 1 - \varphi - \varphi_{recession}$, $\lambda_{cyclical} = 1 - \varphi - \varphi_{cyclical}$, $\lambda_{quarter} = 1 - \varphi - \varphi_{quarter}$. Finally, x_{it} is a vector of firm-specific control variables that are *Firm Size*, *Profitability*, *Cash Flow Volatility*, *Market-to-Book*, and *Tangibility*. We also control for an *Industry Median Book (Market) Leverage*

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Figure 1

Evolution of Market and Book Leverage

This figure shows the evolution of average book and market leverage ratios from 1984 quarter 1 to 2013 quarter 4. *Book Leverage* is calculated as total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by book assets (ATq), all at time t. *Market Leverage* is total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the market value of assets. Market value of assets is stock price (PRCCq) times shares outstanding (CSHPRq) plus total debt plus preferred stock (PSTKq or PSTKRq if missing) minus deferred taxes and investment tax credit (TXDITCq). We exclude zero-leverage firms. The shaded area represents recessions as defined by the NBER.

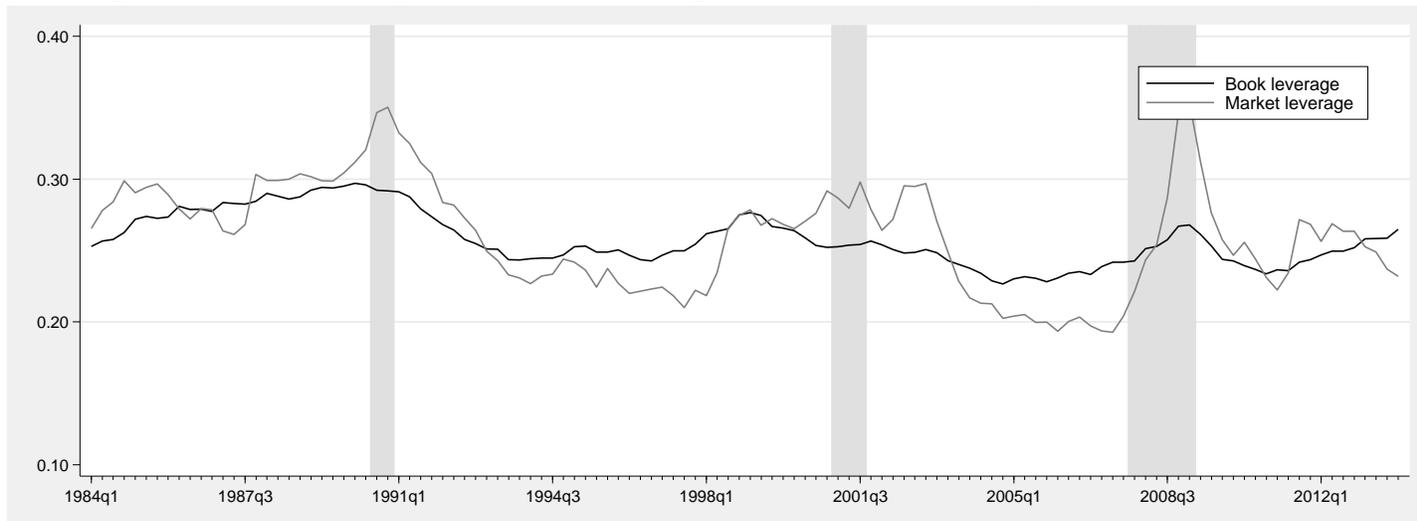


Figure 2

Mean and Median Differences between Market and Book Leverage

This figure plots the difference (mean and median) between market and book leverage from 1984 quarter 1 to 2013 quarter 4. *Book Leverage* is calculated as total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the book value of total assets (ATq), all at time t. *Market Leverage* is total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the market value of total assets. The market value of total assets is the stock price (PRCCq) times the number of shares outstanding (CSHPRq) plus total debt plus preferred stock (PSTKq or PSTKRq if missing) minus deferred taxes and the investment tax credit (TXDITCq). We exclude zero-leverage firms. The shaded area represents recessions as defined by the NBER.

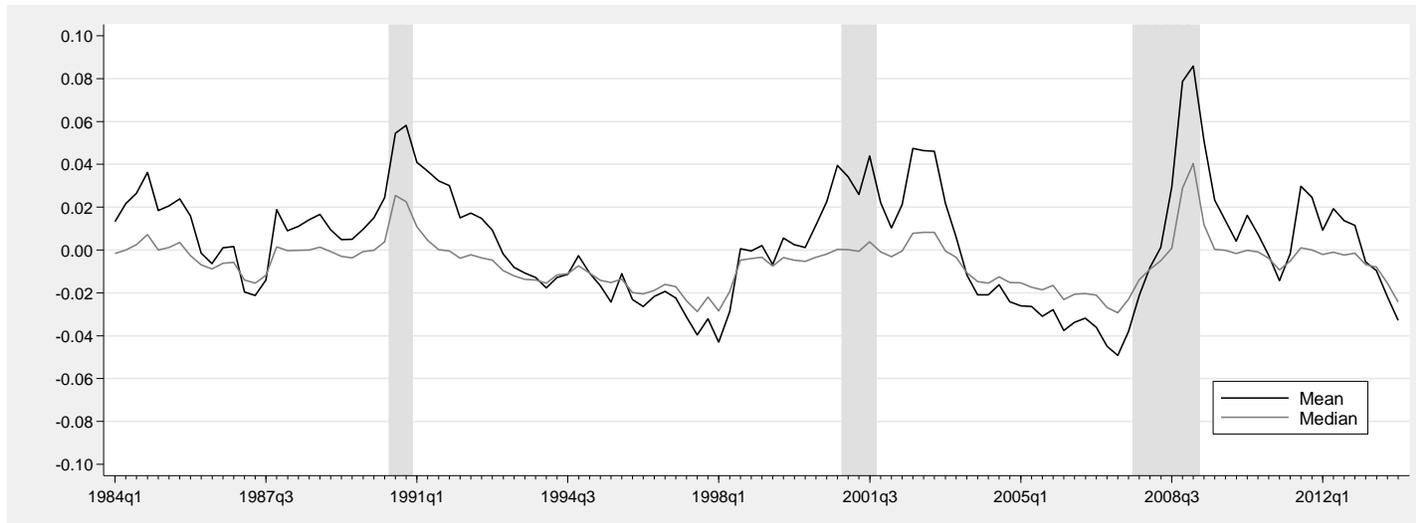


Table 1
Sample Summary Statistics and Annual Distribution

This table presents the summary statistics for the entire sample, which spans the first quarter of 1984 through the last quarter of 2013. Panel A shows the descriptive statistics. Panel B shows the number of observations by year. *Book Leverage* is calculated as total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by book assets (ATq), all at time t. *Market Leverage* is total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the market value of assets. Market value of assets is stock price (PRCCq) times shares outstanding (CSHPRq) plus total debt plus preferred stock (PSTKq or PSTKRq if missing) minus deferred taxes and investment tax credit (TXDITCq). *Firm Size* is calculated as the log of sales (SALEq) deflated by the GDP deflator with a base value of 100 for the year 2009. *Profitability* is calculated as operating income before depreciation (OIBDPq) divided by the book value of total assets (ATq). *Cash Flow (CF) Volatility* is calculated as the standard deviation of historical operating income before depreciation (OIBDPq) scaled by total assets over the past 12 quarters, *Market-to-Book* is calculated as the market value of equity plus total debt plus preferred stock redeemable (PSTKRQ), or (PSTKQ) if missing, minus deferred taxes and investment tax credits (TXDITCQ). Everything is then scaled by the book value of total assets (ATq). *Tangibility* is calculated as net PPE (PPENTq) scaled by the book value of total assets (ATq).

Panel A: Summary statistics

Variable	<i>N</i>	Mean	Median	Std. Dev	5th	10th	90th	95th
Book Leverage	419,713	0.223	0.191	0.203	0.000	0.000	0.509	0.610
Market Leverage	419,713	0.220	0.143	0.235	0.000	0.000	0.586	0.712
Firm Size	419,713	3.349	3.366	2.533	-0.855	0.208	6.535	7.445
Profitability	419,713	0.014	0.028	0.087	-0.105	-0.048	0.066	0.082
CF Volatility	419,713	0.027	0.016	0.063	0.004	0.005	0.056	0.084
Market-to-Book	419,713	1.776	1.159	2.426	0.480	0.585	3.379	4.892
Tangibility	419,713	0.293	0.225	0.237	0.028	0.046	0.677	0.792

Panel B: Observations by year

Year	<i>N</i>	Year	<i>N</i>
1984	10,839	1999	17,424
1985	11,141	2000	17,600
1986	11,344	2001	16,670
1987	12,516	2002	15,596
1988	13,231	2003	14,756
1989	13,264	2004	14,460
1990	13,069	2005	14,374
1991	13,089	2006	14,216
1992	13,596	2007	13,836
1993	14,499	2008	13,527
1994	15,892	2009	12,222

1995	16,471	2010	11,405
1996	17,653	2011	10,550
1997	18,892	2012	9,922
1998	18,682	2013	8,977
<hr/>			
<i>Total</i>	<i>419,713</i>		
<hr/>			

Table 2**Partial Adjustment of Book Leverage to Market Leverage**

This table presents the GMM regression results for equations (2) estimating the partial adjustment models for changes in book leverage with respect to the book-market leverage position. We control for a possible correlation between fixed effects and the lagged dependent variable (Baltagi, 2008). We correct any biases using a GMM system estimation procedure, introduced by Blundell and Bond (1998). Interactions with recession, cyclical industries, and different quarters provide estimates of the respective speed of adjustment. *Book Leverage* is calculated as total debt (short-term debt (DLC_q) + long-term debt (DLTT_q)) divided by the book value of total assets (AT_q), all at time t. *Market Leverage* is total debt (short-term debt (DLC_q) + long-term debt (DLTT_q)) divided by the market value of assets. The market value of assets is stock price (PRCC_q) times the number of shares outstanding (CSHPR_q) plus total debt plus preferred stock (PSTK_q or PSTKR_q if missing) minus deferred taxes and the investment tax credit (TXDITC_q). *Firm Size* is calculated as the log of sales (SALE_q) deflated by the GDP deflator, where the deflated index is baselined to 100 for the year 2009. Profitability is calculated as operating income before depreciation (OIBDP_q) divided by the book value of total assets (AT_q). *Cash Flow (CF) Volatility* is calculated as the standard deviation of historical operating income before depreciation (OIBDP_q) scaled by the value of total assets over the past 12 quarters. *Market-to-Book* is calculated as the market value of equity plus total debt plus preferred stock redeemable (PSTKR_q), or (PSTK_q) if missing, minus deferred taxes and investment tax credits (TXDITC_q). Everything is then scaled by the book value of total assets (AT_q). *Tangibility* is calculated as net PPE (PPENT_q) scaled by the book value of total assets (AT_q). *Industry Median Book Leverage* is the median book leverage at 2 digit SIC industry level in the respective quarter. Estimated coefficients for firm controls are not reported but are available upon request. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Independent Variables	$\Delta Book Leverage_t$					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Leverage Diff _{t-1} (Market-Book)	0.126*** (0.009)	0.139*** (0.010)	0.164*** (0.013)	0.128*** (0.009)	0.177*** (0.014)	0.177*** (0.014)
Leverage Diff _{t-1} × Recession _{t-1}		-0.051*** (0.010)			-0.051*** (0.010)	-0.046*** (0.010)
Leverage Diff _{t-1} × Cyclical _{t-1}			-0.460*** (0.146)		-0.469*** (0.146)	-0.439*** (0.150)
Leverage Diff _{t-1} × q1 _{t-1}				-0.007* (0.004)		-0.007* (0.004)
Leverage Diff _{t-1} × q2 _{t-1}				0.001 (0.004)		-0.000 (0.004)
Leverage Diff _{t-1} × q4 _{t-1}				-0.012*** (0.004)		-0.012*** (0.004)
Firm Controls _{t-1}	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Interacted with Recession _{t-1}		Incl.			Incl.	Incl.
Interacted with Cyclical _{t-1}			Incl.		Incl.	Incl.
Interacted with Quarters _{t-1}				Incl.		Incl.
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	374,036	374,036	374,036	374,036	374,036	374,036

Table 3**Partial Adjustment of Book Leverage to Market Leverage Given Book-Market Difference**

This table presents the GMM regression results for equation (3) which estimates the partial adjustment models for changes in the book value of leverage with respect to the difference in book-market leverage ratios. We control for a possible correlation between fixed effects and the lagged dependent variable (Baltagi, 2008) with a GMM system estimation procedure (Blundell and Bond, 1998). *UP(DOWN)* is a dummy variable equal to 1 when *MrktLev* > *BookLev* (*MrktLev* < *BookLev*). Interactions with recession, cyclical industries and different quarters provide estimates of the respective speed of adjustment. *Book Leverage* is calculated as total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the book value of total assets (ATq), all at time t. *Market Leverage* is total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the market value of total assets. The market value of total assets is stock price (PRCCq) times shares outstanding (CSHPRq) plus total debt plus preferred stock (PSTKq or PSTKRq if missing) minus deferred taxes and investment tax credit (TXDITCq). *Firm Size* is calculated as the log of sales (SALEq) deflated by the GDP deflator where the deflated index is baselined to 100 in 2009. *Profitability* is calculated as operating income before depreciation (OIBDPq) divided by the book value of total assets (ATq). *Cash Flow (CF) Volatility* is calculated as the standard deviation of historical operating income before depreciation (OIBDPq) scaled by total assets over the past 12 quarters. *Market-to-Book* is calculated as the market value of equity plus total debt plus preferred stock redeemable (PSTKRq), or (PSTKq) if missing, minus deferred taxes and the investment tax credits (TXDITCQq). All are then scaled by the book value of total assets (ATq). *Tangibility* is calculated as net PPE (PPENTq) scaled by the book value of total assets (ATq). *Industry Median Book Leverage* is the median book leverage at 2 digit SIC industry level in the respective quarter. The estimated coefficients for firm controls are not reported, but are available upon request. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Independent Variables	Δ Book Leverage _t					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Leverage Diff _{t-1} (Market -Book) × UP	-0.036*** (0.012)	-0.045*** (0.015)	-0.030* (0.018)	-0.028** (0.013)	-0.039* (0.020)	-0.033 (0.021)
Leverage Diff _{t-1} (Market -Book) × DOWN	0.313*** (0.018)	0.318*** (0.019)	0.315*** (0.019)	0.314*** (0.019)	0.319*** (0.020)	0.321*** (0.020)
Leverage Diff _{t-1} × Recession _{t-1}		0.009 (0.011)			0.008 (0.011)	0.013 (0.011)
Leverage Diff _{t-1} × Cyclical _{t-1}			0.058 (0.153)		0.064 (0.153)	0.087 (0.157)
Leverage Diff _{t-1} × q1 _{t-1}				-0.013*** (0.004)		-0.014*** (0.004)
Leverage Diff _{t-1} × q2 _{t-1}				-0.006 (0.004)		-0.006 (0.004)
Leverage Diff _{t-1} × q4 _{t-1}				-0.011*** (0.004)		-0.012*** (0.004)
Firm Controls _{t-1}	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Interacted with Recession _{t-1}		Incl.			Incl.	Incl.
Interacted with Cyclical _{t-1}			Incl.		Incl.	Incl.
Interacted with Quarters _{t-1}				Incl.		Incl.
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	374,036	374,036	374,036	374,036	374,036	374,036

Table 4**Partial Adjustment of Book to Market Leverage for Overleveraged Firms**

This table presents the GMM regression results for equation (3) which estimates the speed of adjustment models for changes in book leverage with respect to book-market leverage position. The sample contains firms which are overleveraged in comparison to the median industry level. We control for a possible correlation between fixed effects and the lagged dependent variable (Baltagi, 2008) by using a GMM system estimation procedure (Blundell and Bond, 1998). *UP(DOWN)* is a dummy variable equal to 1 when $MrktLev > BookLev$ ($MrktLev < BookLev$). Interactions with recession, cyclical industries and different quarters provide estimates of the respective speed of adjustment. *Book Leverage* is calculated as total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the book value of total assets (ATq), all at time t. *Market Leverage* is total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the market value of total assets. The market value of total assets is the stock price (PRCCq) times the number of shares outstanding (CSHPRq) plus total debt plus preferred stock (PSTKq or PSTKRq if missing) minus deferred taxes and the investment tax credit (TXDITCq). *Firm Size* is calculated as the log of sales (SALEq) deflated by the GDP deflator where the deflated index is based lined to 100 for 2009. *Profitability* is calculated as operating income before depreciation (OIBDPq) divided by the book value of total assets (ATq). *Cash Flow (CF) Volatility* is calculated as the standard deviation of historical operating income before depreciation (OIBDPq) scaled by total assets over the past 12 quarters. *Market-to-Book* is calculated as the market value of equity plus total debt plus preferred stock redeemable (PSTKRq), or (PSTKq) if missing, minus deferred taxes and investment tax credits (TXDITCq). All are then scaled by the book value of total assets (ATq). *Tangibility* is calculated as net PPE (PPENTq) scaled by the book value of total assets (ATq). *Industry Median Book Leverage* is the median book value of leverage at 2 digit SIC industry level in the respective quarter. The estimated coefficients for firm controls are not reported, but are available upon request. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Independent Variables	$\Delta Book Leverage_t$					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Leverage Diff _{t-1} (Market -Book) × UP	-0.024 (0.018)	-0.052** (0.021)	-0.000 (0.022)	-0.017 (0.019)	-0.035 (0.026)	-0.036 (0.027)
Leverage Diff _{t-1} (Market -Book) × DOWN	0.350*** (0.029)	0.363*** (0.029)	0.367*** (0.030)	0.367*** (0.030)	0.377*** (0.030)	0.397*** (0.031)
Leverage Diff _{t-1} × Recession _{t-1}		0.044** (0.019)			0.044** (0.019)	0.061*** (0.020)
Leverage Diff _{t-1} × Cyclical _{t-1}			-0.214 (0.210)		-0.129 (0.210)	-0.128 (0.209)
Leverage Diff _{t-1} × q1 _{t-1}				-0.020*** (0.006)		-0.021*** (0.006)
Leverage Diff _{t-1} × q2 _{t-1}				-0.011** (0.005)		-0.012** (0.005)
Leverage Diff _{t-1} × q4 _{t-1}				-0.018*** (0.006)		-0.021*** (0.006)
Firm Controls _{t-1}	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Interacted with Recession _{t-1}		Incl.			Incl.	Incl.
Interacted with Cyclical _{t-1}			Incl.		Incl.	Incl.
Interacted with Quarters _{t-1}				Incl.		Incl.
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	173,329	173,329	173,329	173,329	173,329	173,329

Table 5
Comparative Characteristics for Asymmetrically Responding Firms

This table presents the summary sample statistics for firms who exhibit the highest and lowest degree of asymmetric leverage adjustment behavior. Specifically, we save the residuals from Model 6 in Table 3, equation 3 in text, and analyze the biggest positive and negative residuals. The cutoffs are 25% and 10%. *Firm Size* is calculated as the log of sales (SALEq) deflated by the GDP deflator with a base value of 100 for the year 2009. *Profitability* is calculated as operating income before depreciation (OIBDPq) divided by the book value of total assets (ATq). *Cash* is calculated as Cash and Short-Term Investments (CHEq) scaled by book assets (ATq). *Tangibility* is calculated as net PPE (PPENTq) scaled by the book value of total assets (ATq). *Cash Flow (CF) Volatility* is calculated as the standard deviation of historical operating income before depreciation (OIBDPq) scaled by total assets over the past 12 quarters. *Market-to-Book* is calculated as the market value of equity plus total debt plus preferred stock redeemable (PSTKRQ), or (PSTKQ) if missing, minus deferred taxes and investment tax credits (TXDITCQ). Everything is then scaled by the book value of total assets (ATq). *Log (Book Assets)* is the log of book assets which are deflated by the GDP deflator (from FRED), deflated index 100=2009. *Collateral* is calculated as inventory (INVTq) plus net PPE (PPENTq) scaled by book assets. *Selling Expense* is calculated as Selling, General and Administrative Expenses (XSGAq) scaled by sales (SALEq). *Book Leverage* is calculated as total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by book assets (ATq), all at time t. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Variable	Top Quartile	Bottom Quartile	Difference of Means	Top Decile	Bottom Decile	Difference of Means
Firm Size	2.213	4.294	-2.081***	2.960	4.166	-1.206***
Profitability	-0.008	0.026	-0.034***	0.001	0.020	-0.019***
Cash	0.204	0.080	0.124***	0.126	0.073	0.053***
Tangibility	0.212	0.481	-0.269***	0.262	0.531	-0.269***
CF Volatility	0.040	0.021	0.019***	0.035	0.023	0.012***
Market-to-Book	2.321	1.189	1.132***	1.911	1.165	0.746***
Log (Book Assets)	3.887	5.822	-1.935***	4.304	5.826	-1.522***
Collateral	0.374	0.606	-0.232***	0.437	0.644	-0.207***
Selling Expense	1.962	0.393	1.569***	2.266	0.551	1.715***

Table 6
Financing Choices

The table presents financing choices for two groups of firms at time t . The first group are those firms whose market leverage is lower than the book leverage at time $t-1$; The second group are those firms whose market leverage is greater than the book leverage at time $t-1$. We exclude observations where market leverage and book leverage are equal to each other within a 2.5%, 5%, and 10% band. *Book Leverage* is calculated as total debt (short-term debt (DLC $_t$) + long-term debt (DLTT $_t$)) divided by the book value of total assets (AT $_t$), all at time t . *Market Leverage* is total debt (short-term debt (DLC $_t$) + long-term debt (DLTT $_t$)) divided by the market value of total assets. The market value of total assets is the stock price (PRCC $_t$) times the number of shares outstanding (CSHPR $_t$) plus total debt plus preferred stock (PSTK $_t$ or PSTKR $_t$ if missing) minus deferred taxes and the investment tax credit (TXDITC $_t$). Net Debt Issuance is calculated as the change in total debt from quarter $t-1$ to quarter t divided by the $t-1$ book value of total assets. Net Equity Issuance is calculated as the split-adjusted change in the number of shares outstanding (CSHO $_t - \text{CSHO}_{t-1} * (\text{AJEX}_{t-1} / \text{AJEX}_t)$) times the split-adjusted average stock price (PRCC $_t + \text{PRCC}_{t-1} * (\text{AJEX}_t / \text{AJEX}_{t-1})$) divided by the book value of total assets at $t-1$.

Variable	2.5% Exclusion Band			5% Exclusion Band			10% Exclusion Band		
	BL > ML	BL < ML	Z-statistic for difference	BL > ML	BL < ML	Z-statistic for difference	BL > ML	BL < ML	Z-statistic for difference
(-) Debt Issuance	120,096 53.6%	89,825 55.8%		116,583 53.6%	85,917 55.9%		110,116 53.7%	77,605 56.1%	
(+) Equity Issuance	149,552 66.8%	79,070 49.2%		145,784 67.0%	74,898 48.8%		138,445 67.5%	66,383 48.0%	
Either	187,348 83.6%	124,771 77.6%	47.3	182,145 83.8%	119,001 77.5%	48.0	172,251 84.0%	106,876 77.3%	49.3
Both	82,300 36.7%	44,124 27.4%	60.6	80,222 36.9%	41,814 27.2%	61.7	76,310 37.2%	37,112 26.8%	63.3
TOTAL number	224,046 100.0%	160,861 100.0%		217,481 100.0%	153,562 100.0%		205,173 100.0%	138,324 100.0%	

Robustness Table 7

Alternative Definition of Market Leverage and Partial Adjustment Analysis

This table presents the GMM regression results using the market leverage definition from Leary and Michaely (2014). We control for a possible correlation between fixed effects and the lagged dependent variable (Baltagi, 2008) by using a GMM system estimation procedure (Blundell and Bond, 1998). The interactions with recession, cyclical industries, and different quarters provide estimates of the respective speed of adjustment. *Book Leverage* is calculated as total debt (short-term debt (DLCq) + long-term debt (DLTTq)) divided by the book value of total assets (ATq), all at time t . *Market Leverage* ($Market^{ALT}$) is calculated as total debt divided by total debt plus the market value of equity, all at time t . The market value of equity is the stock price (PRCCQ) times the number of shares outstanding (CSHPRQ). *UP(DOWN)* is a dummy variable that equals 1 when $MrktLev > BookLev$ ($MrktLev < BookLev$). *Firm Size* is calculated as the log of sales (SALEq) deflated by the GDP deflator, where the deflated index 100 is base lined to 100 for the year 2009. *Profitability* is calculated as operating income before depreciation (OIBDPq) divided by the book value of total assets (ATq). *Cash Flow (CF) Volatility* is calculated as the standard deviation of historical operating income before depreciation (OIBDPq) scaled by total assets over the past 12 quarters. *Market-to-Book* is calculated as the market value of equity plus total debt plus preferred stock redeemable (PSTKRq), or (PSTKq) if missing, minus deferred taxes and investment tax credits (TXDITCq). Everything is then scaled by book value of total assets (ATq). *Tangibility* is calculated as net PPE (PPENTq) scaled by the book value of total assets (ATq). *Industry Median Book Leverage* is the median book leverage at 2 digit SIC industry level in quarter $t-1$. Panel A contains GMM regression results for equation (2) and relates to Table 3. Panel B presents the GMM regression results for equation (3) and relates to Table 4. Panel C is analogous to Table 5. The sample in Panel C contains firms which are overleveraged relative to the median industry (book) leverage. The estimated coefficients for firm controls are not reported, but are available upon request. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

Panel A: Partial Adjustment of Book Leverage to Market Leverage

Independent Variables	$\Delta Book Leverage_t$					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Leverage Diff _{t-1} (Market ^{ALT} -Book)	0.132*** (0.010)	0.146*** (0.011)	0.169*** (0.014)	0.135*** (0.010)	0.184*** (0.015)	0.183*** (0.015)
Leverage Diff _{t-1} × Recession _{t-1}		-0.053*** (0.011)			-0.056*** (0.011)	-0.049*** (0.010)
Leverage Diff _{t-1} × Cyclical _{t-1}			-0.430*** (0.150)		-0.456*** (0.151)	-0.424*** (0.154)
Leverage Diff _{t-1} × q1 _{t-1}				-0.008* (0.004)		-0.008* (0.004)
Leverage Diff _{t-1} × q2 _{t-1}				0.002 (0.004)		0.000 (0.004)
Leverage Diff _{t-1} × q4 _{t-1}				-0.014*** (0.004)		-0.013*** (0.005)
Firm Controls _{t-1}	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Interacted with Recession _{t-1}		Incl.			Incl.	Incl.
Interacted with Cyclical _{t-1}			Incl.		Incl.	Incl.
Interacted with Quarters _{t-1}				Incl.		Incl.
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	374,745	374,745	374,745	374,745	374,745	374,745

Panel B: Partial Adjustment of Book Leverage to Market Leverage Given Book-Market Difference

Independent Variables	Δ Book Leverage _t					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Leverage Diff _{t-1} (Market ^{ALT} -Book) × UP	-0.036*** (0.013)	-0.045*** (0.016)	-0.031* (0.019)	-0.025* (0.013)	-0.040* (0.022)	-0.033 (0.022)
Leverage Diff _{t-1} (Market ^{ALT} -Book) × DOWN	0.301*** (0.018)	0.306*** (0.018)	0.304*** (0.019)	0.302*** (0.019)	0.308*** (0.019)	0.310*** (0.020)
Leverage Diff _{t-1} × Recession _{t-1}		0.007 (0.011)			0.005 (0.011)	0.011 (0.011)
Leverage Diff _{t-1} × Cyclical _{t-1}			0.080 (0.158)		0.087 (0.160)	0.105 (0.163)
Leverage Diff _{t-1} × q1 _{t-1}				-0.014*** (0.004)		-0.015*** (0.004)
Leverage Diff _{t-1} × q2 _{t-1}				-0.005 (0.004)		-0.005 (0.004)
Leverage Diff _{t-1} × q4 _{t-1}				-0.013*** (0.004)		-0.014*** (0.004)
Firm Controls _{t-1}	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Interacted with Recession _{t-1}		Incl.			Incl.	Incl.
Interacted with Cyclical _{t-1}			Incl.		Incl.	Incl.
Interacted with Quarters _{t-1}				Incl.		Incl.
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	374,745	374,745	374,745	374,745	374,745	374,745

Panel C: Partial Adjustment of Book Leverage to Market Leverage for Overleveraged Firms Given Book-Market Difference

Independent Variables	Δ Book Leverage _t					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Leverage Diff _{t-1} (Market ^{ALT} -Book) × UP	-0.012 (0.020)	-0.043* (0.023)	0.006 (0.024)	-0.003 (0.020)	-0.033 (0.028)	-0.035 (0.029)
Leverage Diff _{t-1} (Market ^{ALT} -Book) × DOWN	0.336*** (0.029)	0.349*** (0.029)	0.355*** (0.029)	0.352*** (0.029)	0.365*** (0.030)	0.383*** (0.031)
Leverage Diff _{t-1} × Recession _{t-1}		0.043** (0.020)			0.041** (0.019)	0.059*** (0.020)
Leverage Diff _{t-1} × Cyclical _{t-1}			-0.140 (0.216)		-0.048 (0.217)	-0.031 (0.215)
Leverage Diff _{t-1} × q1 _{t-1}				-0.020*** (0.006)		-0.022*** (0.006)
Leverage Diff _{t-1} × q2 _{t-1}				-0.010* (0.005)		-0.011** (0.005)
Leverage Diff _{t-1} × q4 _{t-1}				-0.021*** (0.006)		-0.023*** (0.006)
Firm Controls _{t-1}	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Interacted with Recession _{t-1}		Incl.			Incl.	Incl.
Interacted with Cyclical _{t-1}			Incl.		Incl.	Incl.
Interacted with Quarters _{t-1}				Incl.		Incl.
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	17,3927	17,3927	17,3927	17,3927	17,3927	17,3927