Accepted Manuscript

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PII: S0929-1199(17)30215-8
DOI: doi: 10.1016/j.jcorpfin.2017.04.008
Reference: CORFIN 1185

To appear in: *Journal of Corporate Finance*

Received date: 29 June 2016
Revised date: 1 April 2017
Accepted date: 8 April 2017

Please cite this article as: Erik Devos, Shofiqur Rahman, Desmond Tsang , Debt covenants and the speed of capital structure adjustment. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Corfin(2016), doi: 10.1016/j.jcorpfin.2017.04.008

Debt Covenants and the Speed of Capital Structure Adjustment

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April 2017

ABSTRACT

This paper examines the impact of debt covenants on the speed of capital structure adjustment. Overall, we find that covenants lower the speed of adjustment by 10-13%, relative to the speed of adjustment of firms without covenants. The speed of adjustment is significantly lower, by 40-50%, for firms with the most intense covenant provisions. In particular, we find that capital covenants, as opposed to performance covenants, appear to be the main mechanism that lowers the speed of adjustment, delaying the speed of capital structure adjustment by 86%. We find that the speed of adjustment is reduced more for strict capital covenant than for strict performance covenants. We also show that, for firms that are cash and financially constrained, covenants impede the speed of adjustment even more. Lastly, we show that the negative relationship between covenants and the speed of adjustment is more pronounced for firms that are over-levered.

JEL classification: G32

Keywords: Capital Structure, Debt Covenants, Speed of Adjustment, Capital Covenants, Performance Covenants

[#] Corresponding author: desmond.tsang@mcgill.ca. We thank Bill Elliott, DJ Fairhurst (FMA discussant), Bahar Ulupinar (SWFA discussant), and seminar participants at FMA and SWFA Meetings for comments. We thank Ming Liu for her able research assistance. The authors retain responsibility for any remaining errors.

Debt Covenants and the Speed of Capital Structure Adjustment

I. Introduction

A large body of literature has developed, investigating the speed of adjustment of debt ratios towards an optimal ratio.[1] One of the main ideas behind this literature is that, based on trade off theory, market imperfections create a link between leverage ratios and firm value. Therefore, there exists an optimal debt ratio (or capital structure) that maximizes firm value and, when firms deviate from this optimum, they will make adjustments to move back to the target capital structure. However, this adjustment is not costless. In an ideal world where adjustment costs are zero, all firms should be at their target leverage ratio. The typical partial adjustment studies such as Hovakimian, Opler, and Titman (2001) and Flannery and Rangan (2006) assume a constant speed of adjustment. However, the literature has suggested that there are several costs and/or firm characteristics that may affect the speed at which firms move towards their optimal (or target) capital structure, making the capital structure adjustment dynamic in nature and the adjustment speed surprisingly slow. Prior studies have investigated the overall impact of such transaction costs on the speed of adjustment (e.g., Korajczyk and Levy 2003; Strebulaev 2007; Shivadasani and Stefanescu 2010; Faulkender, Flannery, Hankins, and Smith 2012). Other studies examine specific opportunity costs that affect leverage adjustment, such as equity issuance costs (e.g., Altinkilic and Hansen 2000), corporate governance (e.g., Chang, Chou, and Huang 2014), investment opportunities (Elsas, Flannery, and Garfinkel 2014), cost of equity (e.g., Zhou, Tan, Faff, and Zhu 2016), equity overvaluation (e.g., Frank and Goyal 2004;

[1] Examples of studies examining this issue include Leary and Roberts (2005), Flannery and Rangan (2006), Lemmon, Roberts, and Zender (2008), Huang and Ritter (2009), Frank and Goyal (2009), and DeAngelo and Roll (2015).

Flannery and Rangan 2006; Liu 2009; Warr, Elliott, Koeter-Kant, and Oztekin 2012), acquisitions (e.g., Uysal 2011), and the availability of credit lines (e.g., Lockhart 2010). Recent studies have also examined how macroeconomic factors (e.g., Cook and Tang 2010; Drobetz, Schilling, and Schröder 2015; Antzoulatos, Koufopoulos, Lambrinoudakis, and Tsiritakis 2016) and country institutional features (e.g., Elsas and Florysiak 2011; Öztekin and Flannery 2012; An, Li, and Yu 2015; Öztekin 2015) affect the speed of adjustment.

In this paper, we investigate a different variable that may impact the speed of adjustment: debt covenants. Covenants are common features that are integral parts of most debt contracts and serve mainly to protect debt holders against wealth transferring activities by imposing restrictions on issuing firms.[2] A common covenant is that a firm is forbidden to issue new debt if net working capital or the interest coverage ratio is too low. Other covenants could include restrictions on dividend payout and investment activity. Sometimes, covenants impose actions on firms such as the acceleration of debt payments (Smith and Warner 1979).[3] Normally, the violation of a covenant transfers the control rights of the firm to the debt holders which can significantly impact borrowing firms' investment and financing policies (e.g., Chava and Roberts 2008). Although a number of studies investigate capital structure and debt covenants, to the best of our knowledge, no research exists that looks into the impact that covenants may have on the speed of adjustment. The lack of literature relating covenants with the speed of adjustment is surprising. Given that covenants do have serious effects on the behavior of firms and their managers (as they have the ability to impede a number of activities, including debt issuance), it is likely that they have an effect on the speed of adjustment.

[2] Garleanu and Zwiebel (2009) suggest that covenants are tight at inception and are sometimes waived after a fruitful renegotiation.
[3] Also, see Smith (1993), and Bradley and Roberts (2015).

Consistent with this expectation, our results show that covenants do indeed have an impact on the speed of firms adjusting their capital structure to their target level.[4] Overall, the speed of adjustment is statistically lower when a firm has debt contracts that include covenants, ceteris paribus. Economically, the speed of capital structure adjustment for firms with covenants is about *10-13%* lower than that for firms without covenants. To illustrate, firms without covenants take approximately 5.5 years to move towards their target debt ratios and firms with covenants take 7-8 months longer. Because the existence of covenant in a debt contract exerts a significant but small impact on a firm's speed of leverage adjustment, we next investigate instances in which the speed of adjustment could be substantially impeded by covenants. We follow Billett, King, and Mauer (2007) and construct a covenant index,[5] where high index values suggest more restrictions, and find that firms readjust their capital structure towards the target significantly slower when firms have higher covenant index values (i.e., more covenant restrictions). Economically, higher covenant index values lower the speed of adjustment by *40-50%*, implying that firms with the highest covenant index values take approximately 26-31 months longer to move towards their target debt ratios, compared to firms with no covenants. These results suggest that, while the imposition of debt covenants generally lower the speed of capital structure adjustment, it is the intensity of covenant provisions that matters the most to adjustment speed. Overall, these findings imply that debt covenant provisions, despite being a useful feature in debt contracts, impose an additional cost to firms' financing policies, by reducing their flexibility to issue new debt and their flexibility to adjust their capital structure.

[4] Note that, in our main analyses, in order to calculate speed of adjustment we use target debt ratios calculated using methodologies from both Fama and MacBeth (1973) and Byoun (2008). We also adopt alternative methodologies to estimate target leverage and discuss the results obtained from those methodologies in the robustness section.
[5] We identify 15 different covenant restrictions in loan contracts. For each firm in a particular year, we sum the total number of covenants and divided the total by 15.

We next explore the underlying mechanism in which debt covenant affects leverage adjustment. To do so, it is important to distinguish different types of debt covenants. We follow Christensen and Nikolaev (2012) and classify debt covenants into capital and performance covenants. While performance covenants are often set as *"tripwires"* that transfer control rights temporarily to the debtholders, capital covenants impose direct restrictions on a firm's capital structure. Though performance covenants that typically focus on firm profitability and performance also affect firms' equity capital, it is expected they should have less direct impact on firms' capital structure. Consistent with our expectation, we find that capital covenants exert a very significant impact in reducing the speed of capital adjustment. Economically, the speed of capital structure adjustment for firms with capital covenants is about *86%* lower than that of firms without covenants, implying an adjustment speed of 54-57 months longer for firms with capital covenants. On the other hand, we do not find that performance covenants significantly lower the speed of adjustment. Additionally, we find that when covenants are set relatively strict, they do impede the speed of adjustment more, and this effect is more apparent for the most commonly used capital covenant ratio (i.e., leverage ratio), compared to the most commonly used performance covenant ratio (i.e., debt to EBIDTA). These findings indicate it is the imposition of capital covenants that poses large adjustment costs to leverage adjustment. Not only does this provide insight in how covenants affect the speed of adjustment, the difference also appears to be economically substantial.

Van Binsbergen, Graham, and Yang (2010) and Korteweg (2010) show that the importance of capital structure decisions varies across firms. Relatedly, Elsas and Florysiak (2011) show that the speeds of adjustment are heterogeneous. Zhou et al. (2016) and Frank and Goyal (2009) posit that trade off theory may better explain firms' capital structure choices, when leverage is more relevant to the firm. We next investigate instances where debt covenants could represent a larger impediment to adjusting the capital structure. Faulkender et al. (2012) show that cash flows of a firm are significantly associated with the speed of adjustment. We conjecture that covenants impose further restrictions on firms that are already cash or financially constrained in adjusting their capital structure. Our findings confirm this expectation and show that covenants reduce the speed of adjustment more for firms that have low free cash flow and firms that are financially constrained.

Finally, the pecking order theory suggests that the speed of capital adjustment is asymmetric because firms that are over-levered face more costly financing choices than firms that are under-levered (e.g., Byoun 2008). We argue that debt covenants introduce additional adjustment costs to debt financing and could affect over-levered firms more than under-levered firm. We test whether there are differences between firms that are over- or under-levered, and our findings show that the negative relation between covenants and the speed of capital structure adjustment is more pronounced for firms that are over-levered.

We conduct a series of additional analyses to ensure the robustness of our findings. Given that reliable estimation of the target leverage level is vital to our study, we adopt several alternative methodologies to estimate target leverage. Our results are robust to the use of these alternative measures of target leverage, calculated using (1) the Blundell-Bond GMM two-step estimator (Blundell and Bond 1998), (2) yearly cross-sectional regressions (Uysal 2011; Zhou et al. 2016), (3) a fixed effect model with robust standard errors (Flannery and Ragan 2006), and (4) the Hendricks' group coefficient estimators (Hendricks and Smith 2015). We also include the covenant dummy, and an alternative set of leverage determinants to estimate target leverage (e.g., Frank and Goyal 2009; Cook and Tang 2010). Lastly, we acknowledge that the capital adjustment process is affected by firms' net income, by adopting a methodology that introduces active capital adjustment (Faulkender et al. 2012). Our main findings, that covenants represent a significant impediment to the speed of adjustment, remain intact.

Our paper presents convincing evidence, suggesting that covenants reduce the speed of capital structure adjustment, and the intensity and the types of covenants are major determinants of adjustment speed. By doing so, our paper contributes to at least two important streams of literature. First, our paper adds to the literature that investigates the speed of adjustment towards an optimal capital structure. Although a number of factors have been identified that have an effect on the speed of adjustment, our findings of debt covenants lowering the speed of adjustment are new to the literature. More importantly, the economic significance of our findings on covenant intensity and on capital covenants suggests that these are important factors that impede capital structure adjustment and they should not be overlooked. We also document the heterogeneity in speeds of adjustment across firms and evaluate circumstances in which covenants exert the largest impact on capital structure adjustment. Second, we extend the covenant literature. A growing literature investigates the effects that covenants may have on firm behavior (e.g., Chava and Roberts 2008), or how covenant violations may influence firm behavior (e.g., Nini, Smith, and Sufi 2009). We investigate the effects of covenants on firm financing policy, by analyzing the impact of covenants on the speed of capital structure adjustment. Not only do we investigate the impact of covenants, but also distinguish between capital and performance covenants and show a differential impact.

The rest of the paper is presented as follows: In section 2 we discuss the relevant literature. Section 3 discusses our data, and presents summary statistics and research design.

Section 4 discusses our hypotheses, followed by the empirical results. We present some robustness tests in Section 5. Finally, section 6 provides our concluding remarks.

2. Relevant literature

2.1. Speed of capital structure adjustment

Traditional finance research suggests that there exists an optimal debt ratio (or capital structure) that maximizes firm value and therefore, firms readjust their debt levels to their optimal levels. However, empirical research (e.g., Fama and French 2002) shows that the speed of adjustment is typically low. Hence, the speed of adjustment towards an optimal debt ratio has been the subject of a substantial amount of academic research.[6] Under the trade off theory, firms have a target level of capital structure and slowly adjust to this optimal level in the presence of adjustment costs. In their seminal work, Fischer, Heinkel, and Zechner (1989) propose a model of dynamic capital structure when adjustment costs exist. These costs can be a simple security issuance cost and/or opportunity cost. Altinkilic and Hansen (2000) provide estimates of the security issuance costs. Faulkender et al. (2012) find varying rates of adjustment based on sunk and incremental costs. Some studies (e.g., Korajczyk and Levy 2003; Strebulaev 2007; and Shivadasani and Stefanescu 2010) try to model the impact of such adjustment costs on observed leverage adjustment behavior. They generally argue that a firm will adjust its leverage ratio only if the benefits outweigh the adjustment costs. Recent studies have focused on examining the heterogeneities in the speed of adjustment across firms, conditional on specific opportunity costs

[6] For example, see Jalilvand and Harris (1984), Mehrotra, Mikkelson, and Partch (2003), Kayhan and Titman (2007), and Hennessy, Livdan, and Miranda (2010). Also see Graham and Leary (2011) for a review of empirical capital structure research that includes papers published after 2005.

that affect leverage adjustment (e.g., Chang et al. 2014; Elsas et al. 2014; and Zhou et al. 2016). For instance, Chang et al. (2014) find that firms with weak governance adjust slowly to their target capital structure. Elsas et al. (2014) focus on firms facing major investment decisions, and find that firms issue securities to finance such investments and move towards their target debt ratio. Zhou et al. (2016) show that the sensitivity of cost of equity influences the speed of adjustment, with firms whose cost of equity is more sensitive to leverage deviation exhibit a faster speed of adjustment. The main insight of these studies is that adjustment speed is lower when adjustment costs are higher.

Relatedly, others have suggested that over or undervaluation of firm equity matters as different market timing can also affect the cost of debt adjustment (e.g., Frank and Goyal 2004; Flannery and Rangan 2006; Liu 2009; and Warr et al. 2012). When a firm has overvalued equity, financing is more likely through equity instead of debt, and this policy may have significant consequences, preventing firms moving towards their target debt ratios. Flannery and Rangan (2006) include the market-to-book ratio as their proxy for market timing and find explanatory power in their regression model. They, however, conclude that inclusion of this variable does not affect the adjustment speed. Liu (2009) finds that the historical market-to-book ratio has a significant impact on the leverage ratio in years when firms do not engage in market timing activities. Warr et al. (2012) find that market timing does affect the costs of adjustment and, thus, the speed at which firms move towards their optimal capital structure.

There are also other corporate decisions that affect the cost of debt adjustment. Uysal (2011) demonstrates the interdependence of capital structure and acquisitions, showing that firms deviate from their target capital structure when planning and structuring acquisitions. Demand for liquidity and access to credit lines can also affect adjustment costs. Lockhart (2010) presents estimates of cross-section adjustment speeds to the target, based on the relative distance between current leverage and the target ratio, the firm's demand for liquidity, and access to a credit line. He finds that under-levered firms with access to a credit line exhibit higher speeds, when compared with firms who have no access to credit lines.

Lastly, adjustment costs may also relate to the macroeconomic and institutional environment a firm is operating in. Macroeconomic factors affect debt adjustment costs because firms adapt their financing policies to the business cycle (Hackbarth, Miao, and Morellec 2006). Cook and Tang (2010) provide empirical support for this conjecture by showing that firms adjust their leverage faster in good economic states. Drobetz et al. (2015) further show differences in adjustment speeds across financial systems are attributable to differences in adjustment costs. Antzoulatos et al. (2016) explore the effect of financial development on capital structure, and show economic-wide factors are a significant determinant of capital structure. In particular, leverage decisions seem to be related to the secular trends with financial development.

Firms in a better institutional environment also enjoy lower adjustment costs. Therefore, there is a link between capital structure adjustment speed and institutional features. Elsas and Florysiak (2011) find that environments with high expected bankruptcy costs and high default risks are related to the highest speed of capital structure adjustment. Öztekin and Flannery (2012) also find that legal and institutional traditions correlate with capital structure adjustment speed. They argue that such associations are consistent with dynamic speed of capital structure adjustment. An et al. (2015) investigate the effect of crash risk on the speed of leverage adjustment across 41 countries, and they find that firms in countries with higher crash risk exposure tend to adjust their leverage more slowly. Öztekin (2015) examines the international determinants of capital structure across 37 countries and finds that high quality institutions are related to faster leverage adjustment.

An alternative explanation for differential speeds of capital structure adjustment is related to adverse selection under the pecking order theory (Myers and Majluf 1984). Here, adverse selection causes firms to prefer internal funds. If firms prefer internal funds, adjustment of capital structure will likely be affected by firms' financial deficits or surpluses. Facing adverse selection and higher costs for equity financing, a firm with a financial surplus will tend to reduce the level of debt first, thus saving the borrowing capacity for future investment opportunities. The speed of adjustment will then be asymmetric and be lower when the debt level is below the debt target. This idea is theoretically supported by the dynamic pecking order models of Viswanath (1993) and Chang and Dasgupta (2003). Lemmon and Zender (2011) empirically test this theory and find that if external funds are required and firms have no concerns about debt capacity, debt appears to be the preferred source of financing. They also posit that capital structure decisions depend on firms' financial deficits and the distance between current debt levels and debt capacity. Byoun (2008) also finds that there are differential speeds for firms depending on their capital structure position in terms of under- or over-leverage and surplus or deficit in financial slack.

2.2. Covenants

Covenants have become a popular feature in debt contracts and they exist in almost all financial contracts, such as private debt (Bradley and Roberts 2015) and private equity (Kaplan and Stromberg 2003). The goal of covenants is to protect debt holders against wealth transferring activities. In the event of a covenant violation, the control rights of the firm are transferred to the debt holders. The debt holders can impose additional restrictions on the firms' dividend, investment, and financing policies, or they could demand early debt repayment. Early research on debt covenants (e.g., Smith and Warner 1979) demonstrates how covenants on debt contracts are written to minimize potential conflicts between creditors and stockholders, yet acknowledges that imposing extensive restrictions on firms is costly. There are many empirical studies (e.g., Billett et al. 2007; Graham, Li and Qiu 2008; Denis and Wang 2014; Bradley and Roberts 2015) that show covenants can mitigate debt agency problems. However, covenant violations represent significant costs to firms and include surrender of control rights to debt holders. Beneish and Press (1993) find that average costs of technical violation of covenants range between 1.2 to 2 percent of the market value of equity. Dichev and Skinner (2002) find that private lenders set covenants that are tight and are used as "trip wires" for borrowers, that covenants are often breached, and that covenant violations are not necessarily associated with firms' financial distress. Aghion and Bolton (1992) and Dewatripont and Tirole (1994) also show that covenant thresholds are important to creditors to control borrowers' activities in terms of shift in control rights and bargaining power.

While strengthening covenants after violations is rare in practice (Beneish and Press 1993; Sweeney 1994; and Beneish and Press 1995), recent literature on covenants suggests there are real consequences for firms after covenant violations. For instance, Chava and Roberts (2008) show that a firm's capital investment declines sharply following a breach of covenants. Nini et al. (2009) find that violation of debt covenants is followed by a reduction in investment, resulting from the inclusion of new covenants that restrict investment spending. Both Whited (1992) and Hennessy (2004) use a structural econometric approach to examine the impact of financial frictions on investment activities. Their findings suggest that there exists a significant association between financing frictions and investment. Lang, Ofek, and Stulz (1996) show that firms with higher leverage ratios tend to invest less, a phenomenon that can be attributed to financing frictions in the debt market. Roberts and Sufi (2009) find that technical default leads to a reduction of debt issuance and lower leverage. Chava, Nanda, and Xiao (2015) show that corporate innovation declines sharply following covenant violations. Acharya, Almeida, Ippolito, and Perez-Orive (2014) show that following a covenant violation, banks restrict the use of lines of credit by raising spreads, shortening maturities, reducing loan size, or even by cancelling the line of credit. Finally, Bhaskar, Krishnan, and Yu (2016) show that firms after covenant violations face higher audit fees, a greater likelihood of receiving a going concern opinion, and a greater likelihood of auditor resignation.

3. Data, summary statistics, and research design

3.1. Sample selection

Our initial sample consists of 286,755 firm-year observations, obtained from Compustat for the 1982-2011 time period. Table 1 describes our sample selection criteria in more detail. We first exclude firms in financial and regulated industries because these firms operate in a different regulatory environment. The SIC codes that identify these firms are 6000-6799 and 4800-4999. This screen reduces our sample of firm-years by 89,829 observations. We require each firm-year to have positive assets. In addition, for sales, price per share, and number of common shares outstanding, we require non-missing values. This reduces our sample by 58,349 firm-years. We then delete 8,313 observations for which we are not able to calculate target leverage caused by missing values. When we merge the remaining observations with Dealscan, from which we obtain covenant information, we lose an additional 44,887 firm-year observations. Finally, the regression specification for calculating the speed of capital structure adjustment requires a lead value of leverage. We find this value is not available for 10,156 firm-years. As a result, after imposing all these filters, our final sample consists of 75,221 firm-year observations.

We collect covenant information from the Dealscan database provided by the Loan Pricing Corporation. In merging Dealscan loan data with Compustat, we follow two steps. First, from Dealscan, we identify the years a covenant is associated with a loan (e.g., if a loan has covenant and is issued in 2004 and matures in 2007, the relevant covenant years are 2004, 2005, 2006, and 2007), for a given firm. Second, we identify the same firm-years for the same firm in Compustat and label these years as years with covenant. Following Demerjian and Owens (2016), we further classify the covenants in Dealscan loan contracts into 15 distinct classes. Panel A of Table 2 presents a list of these 15 covenants and the number of firm-years associated with each of these covenants, for our sample firm-years. Consistent with extant studies (e.g., Chava and Roberts 2008; Demerjian and Owens 2016), “Max. Debt to EBITDA”, “Min. Fixed Charge Coverage”, and “Min. Interest Coverage” are found to be the most prevalent covenant provisions, with 12,388, 9,508, and 8,861 firm-years, respectively. We use all 15 covenants to calculate the covenant index. Because it is possible that a loan contract has more than one covenant, we present, in Panel B of Table 2, covenant frequencies. We find a total of 21,913 firm-year observations (29.13% of the final sample) have covenants of any type, and most of the sample firm-years have more than one covenant (i.e., 6,636 firm-year observations have two covenants, 6,443 firm-year observations have three covenants, and 6,074 firm-year observations have more than three covenants). We also follow a similar strategy as Christensen and Nikolaev

(2012) and classify covenants into capital versus performance covenant ratios.[7] We find that, while both types of covenants are used by firms, it is relatively more common for firms to use performance covenant ratios. There are a total of 18,647 firm-year observations (24.79% of the final sample) with performance covenants, and 15,922 firm-year observations (21.17% of the final sample) with capital covenants. It is also most common for firms with performance covenants to have two such covenants in place (10.86% of the total sample), and firms with capital covenants predominantly have only one such covenant (10.93% of the total sample). Our primary measure of covenant is whether firms have at least one covenant of any type in a given year. In supplementary analyses, we also look into covenant intensity (i.e., the number of covenants), as well as performance vs. capital covenants.

3.2. Summary statistics

In Table 3, we present the summary statistics for the main variables used in our empirical analyses. We report means and medians for the full sample of 75,221 firm-years, as well as means and medians for the subsamples for firms with and without covenants.[8] For the full sample, the total debt ratio (*TDBA*) has a mean (median) value of 0.22 (0.20) and the vast majority of this debt is long term, as shown by a long term debt ratio (*LDBA*) with a mean (median) of 0.19 (0.16). For our subsamples, firms with covenants have a mean (median) total debt ratio of 0.25 (0.23) and firms without covenants have a mean (median) debt ratio of 0.21

[7] We group “Max. Debt to EBITDA”, “Min. Fixed Charge Coverage”, Min. Interest Coverage”, Min. Debt Service Coverage”, “Max. Senior Debt to EBIDTA”, Min. Cash Interest Coverage” as performance covenants, and “Tangible Net Worth”, “Net Worth”, “Max. Leverage Ratio”, Max. Debt to Tangible Net Worth”, Min. Current Ratio”, Min. Quick Ratio”, Max. Debt to Equity”, Max. Loan to Value”, “Max. Senior Leverage” as capital covenants.

[8] Note that all variables that are scaled by total assets are winsorized at 1% and 99%.

(0.19), and the mean and median differences are both significant at the 1% levels. These findings are consistent with the expectation that larger loans typically require the protection of covenants (e.g., Demiroglu and James 2010). We also find significant differences (at the 1% levels) in long term debt ratios, as firms with covenants report a mean (median) of 0.23 (0.21) and firms without covenants report a mean (median) of only 0.18 (0.14).

We include control variables (Byoun 2008) in our multi-variate analyses to estimate target leverage and to estimate the speed of adjustment. We present summary statistics for these variables also in Table 3. We measure T*ax* as the marginal tax rate, which is equal to the statutory tax rate if the firm reports no net operating tax loss carry forward (from Compustat) and positive pre-tax income.[9] We find a mean (median) value for *Tax* of 0.06 (0.00) for our full sample. Firms with covenants have a somewhat higher tax rate (the mean is 0.08) than those that have no covenant (the mean is 0.05). Earnings (*OI*) are defined as operating income (mnemonic *OIBDP*) divided by total assets. The reason this variable is used is because higher earnings increase firm's ability to pay interest (Byoun 2008). We find mean (median) values of 9.7% (12.3%) for the without-covenant subsample and 11.8% (12.5%) for the with-covenant subsample. The higher earnings for the covenant subsample could imply firms' willingness to accept more performance covenants. Growth options are proxied for with the market-to-book ratio (*MB*). The market-to-book ratio is calculated as the market value of assets divided by the book value of assets, where the market value is defined as total assets minus total equity (mnemonic *SEQ*) minus deferred taxes (mnemonic *TXDITC*) plus the market value of equity, which is the number of shares (mnemonic *CSHO*) times the price (mnemonic *PRCC_f*) per share. The ratio is slightly higher for firms without covenants, evidence by a mean (median) of 1.84

[9] The tax rates we use varies by year. Specifically, they are 48% for 1971 to 1978, 46% for 1979 to 1986, 40% for 1987, 34% for 1988 to 1992, and 35% for 1993 to 2009.

(1.37).[10] We measure size by log of total assets (*LnA*). Firms with covenants (the mean and median values are both 6.1) are larger than firms without covenants (with mean and median values of 5.0 and 4.7, respectively). This could be due to the fact that larger firms tend to issue larger loans, which typically would include covenants (Demiroglu and James 2010). We include *DEP*, depreciation expense (mnemonic: *DP*) scaled by total assets, and *FA*, property, plant and equipment (mnemonic *PPENT*) scaled by total assets. These measures have similar mean and median (albeit statistically different) values for the subsamples. There seems to be a significant difference across our subsamples in R&D expenses (*RND*, defined as research and development expense (mnemonic: *XRD*), scaled by net sales (mnemonic: *SALE*) and when *RND* is missing, a value of zero is assigned). Means of *RND* are about 7.4% for the subsample without covenants as compared to 3.5% for the subsample with covenants. Chang and Song (2014) show that firms with high R&D investment have lower leverage, which could imply lower use of covenants in the covenant subsample. We also include a dummy variable that equals one if the firm reports missing *RND*, zero otherwise (*D_RND*). Firms without covenants have higher dividends (*DIV*, calculated as common stock dividend (mnemonic: *DV*) scaled by total assets), with a mean of 0.01, as compared to a mean of 0.006 for firms with covenants. Fama and French (2002) discuss the possible tradeoff between debt and dividends in reducing agency costs, which could imply lower debt (as well as lower use of covenants) in high dividend paying firms. We include the Altman Z-score in our regressions. The Altman Z-scores have a slightly higher mean and median for firms with covenants, consistent with the idea that lenders are more likely to demand covenant protection when bankruptcy risk is higher. Finally, we include industry median values of the debt ratios (*MedianTDBA* and *MedianLDBA*) in our regressions, where industry is defined

[10] While Bradley and Roberts (2015) show that growth firms include more restrictive covenants in their debt issues, Nash, Netter, and Poulsen (2003) find that public debt contracts of high growth firms are less likely to include restrictive covenants.

by the first two digit SIC code of the firm. The industry median values of the long term debt ratio are significantly different across the subsamples.

3.3. Definition of leverage

Capital structure studies are not clear on whether to use book values or market values of debt in calculating leverage ratios of firms. Fama and French (2002) and Thies and Klock (1992) suggest that leverage ratios should be calculated using book values of debt because book debt is not affected by factors that are not under direct control of firms. In contrast, Welch (2004) argues that market leverage ratios better represent the agency problem between creditors and equity holders. In our paper, we use book leverage ratios in our leverage adjustment analysis because covenant ratios are based on numbers from financial statements (e.g., income statements and balance sheets) and these tend to be in book values. For example, after analyzing Tearsheets that provide detailed loan information, Demerjian and Owens (2016) present standard definitions for all 15 covenant classes which can be measured using financial statement (book values) data. We, therefore, use book debt ratios in all of our analyses. Specifically, we measure the total debt ratio as:

$$TDBA_{i,t} = \frac{SD_{i,t} + LD_{i,t}}{TA_{i,t}} \tag{1}$$

where total debt to book assets (*TDBA)* is the total debt to book assets, measured as the sum of firm *i*'s short term (*SD*, Compustat mnemonic *DLCC*) and long term debt (*LD,* mnemonic *DLCC*) at time *t*, scaled by the book value of total assets (*TA*, mnemonic *AT*).

We measure long term debt ratio as:

$$LDBA_{i,t} = \frac{LD\ due\ in\ one\ year_{i,t} + LD_{i,t}}{TA_{i,t}} \tag{2}$$

where, long term debt to book assets (*LDBA)* is the total of long term debt to book assets, measured as the sum of firm *i*'s long term debt (*LD*) and long term debt due in one year excluded from long term debt (mnemonic *DD1)* at time *t*, scaled by the book value of total assets (*TA*).

3.4. Estimating target leverage

The simplest panel estimator for target leverage is based on a pooled OLS regression in which firm leverage is regressed on some firm-specific variables. However, this method may be subject to omitted variable bias. Existing literature has proposed many different ways of estimating target debt ratios.[11] Given different approaches in calculating the target debt ratios, we follow existing literature (e.g., Rajan and Zingales 1995; Fama and French 2002; Kayhan and Titman 2007; Byoun 2008; Warr et al. 2012) and employ a two-step estimation procedure using the Fama and MacBeth's (1973) cross-sectional regressions in our main analysis. This approach first adopts the implied target estimator (Welch 2004), using the Fama-Macbeth method based on a specific economic identification to estimate Eq. (3).

$$Lev_{i,t+1} = \beta X_{i,t} + \varepsilon_{i,t} \tag{3}$$

[11] For instance, Blundell and Bond (1998) develop the GMM (Blundell-Bond) estimator. Uysal (2011) and Zhou et al. (2016) use yearly cross-sectional regressions with robust standard errors. Flannery and Ragan (2006) use a fixed-effect model. Henricks and Smith (2015) develop a grouped coefficient estimate to reduce the bias in dynamic panel models. We replicate our main analysis using these alternative methodologies to estimate target leverage and we discuss the findings in the robustness test section of the paper.

where, $Lev_{i,t+1}$ represents the forward looking target leverage ratio for both total debt to book assets (*TDBA)* and long term debt to book assets (*LDBA)*. *X* is a vector of firm and industry characteristics that are included in the regressions to estimate the target.

The estimation of Eq. (3) is based on non-missing data and variables that are winsorized at the 1st and 99th percentile. For each year, we run cross-sectional regressions. For our sample period of 1982-2011, we end up with 30 estimates for each independent variable. The mean slope coefficient is the average of the slopes of these 30 annual regressions. The time-series standard error is the time-series standard deviation of the regression coefficients divided by $\sqrt{(30)}$, as in Fama and French (2002). In Panel A of Table 4, we present the mean coefficient estimates, mean adjusted R-square, and t-statistics for the variables. All the coefficients are statistically significant at the 1% levels, except for tax rate (*Tax*). Market-to-book ratio, depreciation, research and development expenses, dividend, and the Altman Z-scores have a negative effect on total and long term debt ratios. All other variables have a positive effect on debt ratios. The coefficients for the industry median are positive for both debt ratios, which is consistent with the results in Frank and Goyal (2004), Byoun (2008), and Warr et al. (2012). The mean adjusted R-squares are 0.1556 and 0.1484 for the total debt and the long term debt regressions, respectively. [12]

In the second step, we use the estimated target leverage ratio from Eq. (3) and estimate a partial adjustment model to analyze firm's rebalancing decisions in the presence of debt covenants. Eq. (4) presents our estimation in the second step.

$$Lev_{i,t+1} - Lev_{i,t} = \lambda\,(\widehat{Lev}_{i,t+1} - Lev_{i,t}) + \tilde{\varepsilon}_{i,t+1} \qquad (4)$$

[12] Some studies (e.g., Cook and Tang 2010) also include the main variable of interest in estimating target leverage. We conduct sensitivity analysis by including covenant as a determinant of target leverage. Our results remain qualitatively unchanged with the inclusion of covenant dummy as an additional determinant of target leverage.

where, $Lev_{i,t+1}$ represents a firm's book leverage ratio at time *t+1*, $Lev_{i,t}$ represents the firm's book leverage ratio at time *t*, $\widehat{Lev}_{i,t+1}$ represents forward looking leverage target for the firm, $(\widehat{Lev}_{i,t+1} - Lev_{i,t})$ represents the leverage deviation, and λ is the average annual leverage adjustment speed to the target. In our empirical analysis, we examine leverage deviations, *LevDev*, and the presence of covenants, *CovDummy* (i.e., a dummy variable that equals one in the presence of any covenant for a particular firm-year, zero otherwise), as an interaction variable.

3.5. Post-target estimation summary

Panel B of Table 4 presents the post-target estimation summary of leverage targets and leverage deviations for the full sample and conditional on whether the firm has covenants. For the 75,221 observations in the full sample, we find that the estimated target leverage for total debt ratio is 0.225, which is very close to the actual debt ratio (i.e., the value of *LevDev* is 0.006). Estimated target leverage for long term debt is also 0.225, but is a bit further from the actual debt ratio (i.e., the value of *LevDev* is 0.035). We split the sample into the two subsamples, with and without covenants. We find leverage deviations are smaller for firms with covenants for both debt ratios (-0.016 and 0.002, respectively) when compared to firms without covenants (0.015 and 0.048, respectively).

4. Hypothesis development, and empirical findings

4.1. Debt covenants and leverage adjustment

We first conjecture that debt covenants represent an important adjustment cost that impedes the speed of capital structure adjustment. We present our first hypothesis:

H_1: Debt covenants are negatively related to the speed of capital structure adjustment.

In order to examine the adjustment of leverage ratios in the presence of debt covenants, we categorize companies with covenants and without covenants, in each year.[13] Equation (5) is used to examine the impact of debt covenants on leverage adjustment.

$$\Delta Lev_{i,t+1} = \propto_0 + \beta_1 LevDev_{i,t} + \beta_2 CovDummy_{i,t} + \beta_3 LevDev_{i,t} \times CovDummy_{i,t} + \varepsilon_{it} \quad (5)$$

where, *LevDev* is the difference between the target leverage ratio and the actual leverage ratio (i.e., the leverage gap), and *CovDummy* equals one if there exists any type of covenant (and zero otherwise). Since having a covenant in a loan contract could impose restrictions on financing policies, we expect the presence of covenants to lower the adjustment speed. We, therefore, expect the coefficient on the interaction between the covenant dummy and the leverage deviation to be negative ($\beta_3 < 0$).

Table 5 presents the results of estimating Eq. (5). In Panel A, we use total debt ratio as the test variable and the results in column (1) show that, when we do not include the covenant dummy and its interaction with *LevDev*, the coefficient on *LevDev* is 0.177. This implies that it takes an average of 5.65 years for a sample firm to adjust to its target leverage. More importantly, when we do include the dummy and its interaction in column (2), the interaction has a coefficient that is negative and significant at the 1 percent level. The coefficient of -0.019

[13] If a company has at least one covenant restriction in a particular year, it is categorized as a company with covenant. When a company does not have any covenant in a particular year, it is categorized as a company with no covenant.

suggests that covenants lower the speed of adjustment to the target. Economically, the reduction in the speed of adjustment is about 10% (0.019/0.182). Comparing to the average adjustment of about 5.5 years in this model specification, it takes about 7 months longer for firms with a covenant to adjust to their target leverage. We include additional variables used in the estimation of target leverage as controls and we report the results in column (3). We continue to find that covenants exert a significant negative impact on leverage adjustment, with a reduction in the speed of adjustment of about 12% (0.021/0.182), or 8 months longer adjustment time for firms with covenants. In Panel B, we perform a similar analysis using the long term debt ratio. We find similar results in columns (2) and (3), with the economic effects at about 12% (0.024/0.193) and 13% (0.026/0.193), respectively. Overall, these results confirm our hypothesis that firms with covenants have a lower speed of capital structure adjustment, relative to firms without covenants.

4.2. Covenant intensity and leverage adjustment

While the presence of covenants lowers the speed of capital structure adjustment, the economic impact is small, albeit statistically significant. We expect its impact to be greater with the increase in the number of covenant provisions, or in other words, with greater covenant intensity. Hence, we present our next hypothesis:

H_2: Covenant intensity is negatively related to the speed of capital structure adjustment.

We measure covenant intensity using a covenant index based on the number of covenant provisions in place and we estimate the impact of covenant intensity on the speed of adjustment. Gompers et al. (2003) initially developed the covenant index. Bradley and Roberts (2015) use it to measure covenant protection intensity in private debt contracts. In addition, Chava and

Roberts (2008) and Billett et al. (2007) implement the same measure, while employing FISD data. Following this literature, we create 15 covenant indicator variables, each of which equals one if the loan in a particular year has the given covenant and zero otherwise. Then, we sum these indicator variables and divide the total by the number of covenant categories (i.e., 15). The values of the index range from zero (i.e., no covenant protection) to one (i.e., complete covenant protection). It is important to note that this index methodology has some caveats. First, a covenant in one loan provides protection for all other loans in the same year.[14] Second, this index gives equal weight to all covenant categories. We hypothesize that a higher index lowers the speed of adjustment and test this hypothesis by introducing the covenant index as an interaction term in our regression model. We expect the coefficient on this term to be negative since having more covenant restrictions hinders the capital structure adjustment process. We re-estimate Eq. (5) by replacing the covenant dummy variable with the covenant index. The results are reported in Table 6. Consistent with our expectation, we find that the interaction terms between *LevDev* and the covenant index are negative in all regression specifications reported in Panels A and B. These results suggest that higher intensity in covenant protection lowers the speed of capital structure adjustment. Moreover, the economic impact of having more covenant provisions is substantial. For instance, the coefficients of the interaction terms in column (2) are -0.073 and -0.087 in Panel A and in Panel B respectively, implying reductions in the speed of adjustment by 40% (0.073/0.182) and 45% (0.087/0.191). We observe an even bigger reduction in the speed of adjustment in column (3), of 46% (0.083/0.181) and 50% (0.095/0.191) for the total debt and long term debt ratios, respectively. Economically, these findings imply firms with the most covenant provisions take about 26-31 months longer than firms without covenants to adjust to their target level.

[14] If more than one loan has the same covenant in a particular year, we keep only the most restrictive one.

4.3. Performance vs. capital covenants on leverage adjustment

Christensen and Nikolaev (2012) argue that capital covenants directly restrict the level of debt in a firm's capital structure, while performance covenants act more as a *"trip wire"*, which facilitates the contingent allocation of control to lenders. While both types of covenants signify adjustment costs to leverage adjustment, we conjecture that capital covenants have a more significant impact on the speed of adjustment. Capital covenants typically require firms to maintain a certain level of equity capital, thereby exerting a direct impact on firms' capital structure adjustment. On the contrary, performance covenants focus on firm profitability and performance. While culmination of profits or losses should eventually affect firms' equity capital, a single period of over- or under-performance should have less impact on long term financing policies. Therefore, we present the next hypothesis:

H_3: Capital covenants are more negatively related to the speed of capital structure adjustment than performance covenants.

As shown in Table 2, firms are more likely to have performance covenants than capital covenants, and most firms with performance covenants have two such covenants, while firms with capital covenants mostly have only one such covenant. Because different covenant intensities associated with performance and capital covenants might bias the comparison between the two, we measure the impact of performance and capital covenants (*P-Covenants* and *C-Covenants*) by the number of each type of covenant, scaled by the total number of covenants in each category. We test our hypothesis by introducing *P-Covenants* and *C-Covenants* as interaction terms with leverage deviation in the regression model. We expect the coefficients on the interaction terms to both be negative, since having either covenant hinders the capital structure adjustment process. Importantly, we expect the coefficient estimates to be larger (smaller) in magnitude for *C-Covenants* (*P-Covena*nts). The results are reported in Table 7. We find confirming evidence in that the interaction terms between *LevDev* and both types of covenants are negative in both Panel A and Panel B. The coefficients on the interaction terms for *C-Covenants* are significant for both total debt (-0.156) and long term debt (-0.165) ratios. Economically, they both imply drastic reductions in the speed of adjustment of about 86%, which translates into an adjustment period of 54-57 months longer than firms without capital covenants. On the other hand, the coefficients on the interaction terms for *P-Covenants* are insignificant.

Relatedly, firms should be more concerned when covenants are close to being violated, and the speed of capital structure adjustment should be more (less) affected when capital (performance) covenants are binding. Hence, covenant slack, the gap between the threshold level of the covenant measures and the borrower's actual value of these financial measures, should be related to the speed of capital structure adjustment, and the impact should be more significant for capital covenants when compared to performance covenants. Specifically, slack for minimum (maximum) threshold covenants represents how much the underlying financial ratio can decrease (increase) without violating the underlying covenant. At loan initiation, higher slack for maximum threshold covenants allows a firm to adjust the underlying ratio (e.g., max leverage ratio) more easily than when there is less slack (i.e., a lower ratio). Given that capital covenants exert a more significant impact on the speed of capital structure adjustment, compared to performance covenants, we expect that the speed of adjustment will be *higher* for firms with high capital covenant slack than for firms with high performance covenant slack. We present the hypothesis:

H_4: Capital covenant slack is more positively related to the speed of capital structure adjustment than performance covenant slack.

The interpretation of covenant slack depends on whether the covenant imposes a minimum or a maximum threshold. We follow Demerjian and Owens (2016) and measure covenant slack as the ratio of the actual value to the threshold (i.e., actual value as a percentage of threshold value). Because slack calculations require firms' actual ratios to match the covenant ratio definition in the Tearsheets, we are only able to calculate slacks for "Max. Debt to EBITDA" and "Max. Leverage Ratio" with sufficient number of observations, as these two ratios are consistently defined and calculable using data from Compustat. Moreover, the two ratios are the most frequently used covenant ratios in loan contracts (see Table 2). We re-estimate Eq. (5) with *CovSlack* and expect the coefficient on the interaction of *LevDev* and *CovSlack* to be *positive*. Table 8 presents the results of this analysis. Once again, in Panel A we use total debt and in Panel B we use long term debt. We find consistent evidence that higher covenant slack increases the speed of adjustment for both covenant ratios. Moreover, for "Max. Leverage Ratio" in column (2), we find that the coefficients on the interaction variable are positive and highly significant at the 1% levels (0.074 for total debt and 0.080 for long term debt). The economic effect of covenant slack of the "Max. Leverage Ratio" on the speed of total (long term) debt adjustment is a whopping 53% (60%). The coefficients are also significant, but much smaller (0.002 for total debt and 0.001 for long term debt) for "Max. Debt to EBITDA" in column (1), implying an economic effect on the speed of adjustment of only 1% and 0.5%, respectively, for the two debt ratios. Overall, we show that capital covenants represent the most important mechanism imposing additional restrictions on capital structure, and the imposition of these covenants drastically lowers the speed of adjustment. Covenant slack seems to have a pronounced positive effect on the covenant-speed of adjustment relation, and the effect is again significantly stronger for capital covenants.

4.4. Cash and financial constraints on leverage adjustment

Capital structure adjustment is affected not only by transaction costs but also by the financial condition of the firm. In this section, we investigate the influence of cash and financial constraint on the relation between debt covenants and the speed of adjustment. Faulkender et al. (2012) find that cash flows of a firm have a first-order effect on the adjustment speed. Firms with lower cash flows have a lower speed of adjustment. Given that debt covenants slow capital structure adjustment, a poor financial situation should have a compounding effect. To be precise, we expect the impact of debt covenants on capital structure adjustment speed to be more pronounced for firms in relatively poor financial health. We present the hypothesis:

H_5: Debt covenants are more negatively related to the speed of capital structure adjustment at firms in relatively poor financial health.

To measure financial health, we first use firm free cash flows. We re-estimate Eq. (5) for both high and low free cash flows. To do so, we split the sample by the median cash flow ratio, where cash flow is measured as operating income minus tax and capital expenditure, scaled by book value of assets, and the median is based on the two digit SIC code and firm-year. If cash flow constraint has an effect on the relation between covenants and the speed of adjustment, we expect the interaction between *LevDev* and the covenant dummy to be more negative and significant for the low free cash flow subsample. From Panel A of Table 9, it is clear that this is indeed the case. For the high free cash flow subsample the coefficient on the interaction is not significant, whereas it is significantly negative (at the 1% level) for the low free cash flow subsample, with a coefficient of -0.035. The economic significance of covenants is about 19% (0.035/0.188) for the low free cash flow subsample. In Panel B, we examine long term debt and find that the interaction for the low free cash flow subsample is again negatively significant. However, the coefficient for the high free cash flow subsample is also negative and marginally significant at the 10% level, but with a much lower coefficient (-0.014 versus -0.036). The economic significance of covenants in the high and low free cash flow subsamples are 7.5% (0.014/0.187) and 18% (0.036/0.199), respectively. Overall, we conclude that low free cash flow has a pronounced effect on the speed of adjustment.

The adjustment of capital structure can also be impeded by a firms' financial constraint. Since financially constrained firms face difficulty in raising external funds, either through issuance of debt or equity, capital structure adjustment by financially constrained firms is likely to be slower. We, therefore, expect the impact of debt covenants on the speed of capital structure adjustment to be more pronounced among financially constrained firms. We use the KZ index (Kaplan and Zingales, 1997) as our proxy of financial constraint and we split the sample by the median KZ index value, where the median is based on two digits SIC code and firm-year.[15] We present the results in Table 9, also. Consistent with our expectation, we find that firms with high financial constraints have significant negative coefficients on the interaction variable. The coefficients are -0.050 when we use total debt (Panel A) and -0.058 when we use long term debt (Panel B), with respective economic significance of 25% (0.05/0.204) and 26% (0.058/0.223).

[15] We also use WW index (Whited and Wu 2006) as the alternative proxy for financial constraint and find consistent results.

We do not find negative signs and any statistical significance for the same coefficient for firms that exhibit low levels of financial constraints.

4.5. Over- and under-levered firms with debt covenants

Among the firms that have covenants in their loan contracts, one would expect there to be differences in the speed of adjustment, conditional on whether they are above or below their target leverage. Existing capital structure studies on the pecking order theory suggest that over-levered firms have a greater speed of adjustment in comparison to under-levered firms because being over-levered is more costly (e.g., Byoun 2008). One example of these costs includes the lack of financial flexibility, as over-levered firms may have to forgo attractive investment opportunities simply because of high costs of issuing debt or of high costs of equity arising from the possibility of a wealth transfer to debt holders. Most of the debt covenants in Dealscan are associated with credit lines and revolving loans. Over-levered firms can, therefore, de-lever using credit lines or revolving loans, adjusting back to their targets. However, over-levered firms may not want to adjust back to the targets by de-levering for various reasons. First, repurchasing public debt by over-levered firms can sometimes be interrupted by holdout problems (e.g., Houston and James 1996). Second, covenant violations (i.e., especially net worth and cash flow covenants) affect the size and availability of credit lines more than the possibility of loan being called (e.g., Smith and Warner 1979; Sufi 2009). Firms needing funds right after the negative liquidity shock are in danger of violating covenants. Therefore, over-levered firms with credit line availability have an incentive to preserve cash instead of using cash to de-lever. Moreover, Sufi (2009) finds that one of the determinants of firms ending up with reduced credit lines is because they violate net worth covenants and/or cash flow covenants. Since over-levered firms have a higher probability of violating net worth covenants, these firms face higher transaction costs of reducing debt using cash and, thus, may choose to remain over-levered or move further away from their target debt. Finally, Myers (1984) argues that an over-levered firm can issue further debt when the transaction cost savings are greater than the marginal costs of deviation from the target. Specifically, if the sunk cost of credit lines (e.g., underwriting and loan fees) with associated covenants are important to the firm, issuing further debt to finance investment opportunities by an over-levered firm will become attractive. However, trade off theory predicts that over-levered firms that need external funds for investment will adjust back to the target by issuing more equity, rather than debt. Based on these arguments, we test the following hypothesis:

H_6: Debt covenants are more negatively related to the speed of capital structure adjustment for over-levered firms.

We use the following model to analyze the differential in speed of adjustment of over- and under-levered firms.

$$
\begin{aligned}
\Delta Lev_{i,t+1} = \propto_0 &+ \beta_1 LevDev_{i,t} + \beta_2 CovDummy_{i,t} + \beta_3 LevDev_{i,t} \times CovDummy_{i,t} \\
&+ \beta_4 OverLevDummy_{i,t} + \beta_5 LevDev_{i,t} \times OverLevDummy_{i,t} \\
&+ \beta_6 CovDummy_{i,t} \times OverLevDummy_{i,t} \\
&+ \beta_7 LevDev_{i,t} \times CovDummy_{i,t} \times OverLevDummy_{i,t} \\
&+ \varepsilon_{it} \qquad (6)
\end{aligned}
$$

where, the dependent variable is the change in debt. *LevDev* is the difference between the target leverage ratio and the actual leverage ratio (i.e., the leverage gap). *CovDummy* equals one if the firm-year observation has any type of covenants and zero otherwise. A positive (negative) value for *LevDev* is considered over- (under)-levered. *OverLevDummy* equals one, if the target leverage is greater than actual leverage and zero otherwise.

In a frictionless world, we expect that a firm, following a deviation from the target, will move back to its target. However, in the presence of adjustment costs, the coefficients will be smaller than one. Differences in speed among under- and over-levered firms can be explained by the asymmetry in the costs of issuing debt and equity. If the adjustment cost of equity is higher than that of debt, as is the case for debt covenants as explained above, we would expect the sign for β_7 to be negative. In Table 10, we present the results of estimating eq. (6). Consistent with our expectation, we find that the coefficient of interest is negative and highly significant. When we examine total debt, in the first column, we find a coefficient of -0.117 and when we use long term debt the coefficient is -0.121. Clearly, being over-levered seems to impede the speed of adjustment considerably. Though covenants represent an important adjustment cost that makes firms trade off debt with equity financing, the existence of covenants does not contradict with the alternative pecking order theory of capital structure adjustment. In fact, our findings highlight the complementarity of the two theories, showing that covenants increases the asymmetry in the speed of adjustment between over- and under-levered firms.

5. Robustness tests[16]

We conduct a series of additional analysis to ensure the robustness of our findings. As reliable estimation of the target leverage level is vital to our study, we adopt several alternative methodologies to estimate target leverage. As a first robustness check, we use a two-step system generalized method of moments (GMM) (Blundell and Bond, 1998) and analyze speed of adjustment in a dynamic panel setting. We modify Eq. (4) to include firm characters as a vector of variables (i.e., $X_{i,t}$) that determines the leverage target as:

$$Lev_{i,t+1} = (1-\lambda)LagLev_{i,t} + \lambda(\beta X_{i,t} + v_i) + \tilde{\varepsilon}_{i,t+1} \qquad (7)$$

where, $\beta X_{i,t} + v_i$ is the leverage target. Estimating Eq. (7) via Blundell and Bond's (1998) system

GMM estimator, returns estimates of $(1-\lambda)$. The baseline speed of adjustment, λ, can then be calculated by subtracting the coefficient of *LagLev* from one. We investigate whether covenants matter by splitting the sample in firm-years with and without covenants. For both subsamples, we find positive and significant coefficients at 1 percent level on the *LagLev* variable. When total debt (*TDBA*) is used as dependent variable, the coefficients are 0.772 for the subsample without covenants and 0.848 for the subsample with covenants. When long term debt (*LDBA*) is used as dependent variable, the coefficients are 0.768 for the subsample without covenants and 0.837 for the subsample with covenants. We also test the difference between the coefficients in two subsamples by using the interaction term (*LagLev*×*CovDummy*). The interaction terms for *LagLev* and *CovDummy* have coefficients that are positive and significant at the 1 percent level

[16] We do not tabulate the results in this section to keep the paper in manageable length. The results are available upon request from the authors.

for both the total (0.097) and the long term (0.116) debt ratio, suggesting that covenant lowers the adjustment speed.

We also include an alternative set of leverage determinants, including our main variable of interest (i.e., covenant), to estimate for target leverage (e.g., Frank and Goyal 2009; Cook and Tang 2010). The other variables include industry median leverage, profitability, market-to-book, size, tangibility, inflation, and GDP growth rate. We follow the yearly cross-sectional regression framework (Uysal 2011; Zhou et al. 2016) to re-estimate Eq. (4). The interaction terms for *LevDev* and *CovDummy* continue to have coefficients that are negative and significant at the 1 percent level for both the total (-0.018) and the long term (-0.022) debt ratio.

We next estimate the target debt ratio using the partial adjustment model of Flannery and Rangan (2006) with robust standard errors. The coefficients of the interaction terms for *LevDev* and *CovDummy* are once again negative and significant at the 1 percent level for both debt ratios (-0.014 for total debt and -0.020 for long term debt).

Finally, we also follow Hendricks and Smith (2015) and examine the effect of covenants on leverage adjustment using the Hendricks' group coefficient estimators. It is possible that the coefficient heterogeneity and cross-sectional dependence causes bias in the estimation of our dynamic panel model. In order to reduce this bias in small-T dynamic panels, we use a grouped coefficients estimator. We follow the same methodology for group type estimators, which estimate group-specific regressions and average the estimated coefficients across groups. We assign firms into groups based on two-digit SIC codes and estimate the outlier-robust mean of the coefficients across groups. The coefficients on the interaction terms of *LevDev* and *CovDummy* are positive and significant at the 1 percent levels for both the total (0.019) and the long term (0.027) debt ratios. Overall, our main findings that covenants represent a significant impediment to the speed of adjustment remain. All these robustness analyses reinforce the idea that covenants exert a negative impact on speed of capital structure adjustment despite using different measures of target leverage.

Lastly, our leverage adjustment model assumes that a firm's leverage adjustment starts from the debt ratio of the previous period. One potential problem with this method is that, absent any net capital market activity, a firm's leverage adjustment can be observed only when annual net income is posted to its equity account. This adjusted process can be categorized as passive adjustment. However, active leverage adjustment requires that a firm accesses the capital market in some way. Since firms incur transaction costs only for active leverage adjustment, Faulkender et al. (2012) argue that tests of capital structure adjustment should consider active adjustment. We do so by disentangling passive from active adjustment with the inclusion of future net income to total assets. Specifically, we define leverage ratio as follows:

$$Leverage_{i,t} = \frac{SD_{i,t} + LD_{i,t}}{TA_{i,t} + NI_{i,t+1}} \tag{8}$$

Then, if we use this as the alternative leverage ratio, the left hand side will represent a firm's active adjustment toward their target debt ratio. We re-estimate Eq. (5) to analyze the impact of covenants on the adjustment speed. We find that the coefficient on the interaction between *LevDev* and the covenant dummy is negative and significant, suggesting that covenants do slow down active adjustment.

6. Summary and conclusions

This paper examines the speed of capital structure adjustment, conditional on the existence of covenants related to the debt structure of a firm. Our results are important and show that the speed of adjustment is impeded by debt covenants. We report that the speed of adjustment towards the optimal debt ratio of the firm is about 10-13% lower when a firm has covenants, compared to firms that do not have covenants. When we examine covenant intensity using the covenant index, the speed of adjustment is lowered by 40-50% for firms with a high covenant intensity. We examine the mechanism by which covenants may affect the speed of adjustment, and we find that capital covenants exert a much more significant impact than performance covenants in impeding the speed of adjustment. Economically, the adjustment speed is lowered by 86% for firms with any kind of capital covenants, when compared to firms without such covenants. Relatedly, we show that, when firms have more slack in their capital covenants, these covenants are less likely to have a material effect on the speed of adjustment. We also report that, for firms that have low free cash flow and firms that are financially constrained, covenants create more serious impediments to capital structure adjustment. While our findings support the tradeoff theory of capital adjustment, we also provide interesting findings related to the pecking order theory. We show that covenants affect over and under-levered firms asymmetrically, and the speed of adjustment of over-levered firms are more significantly affected by covenants. Lastly, our findings are robust to various estimation techniques of target leverage, and to the account of active leverage adjustment. Overall, our study highlights the importance of debt covenants, in particular the pervasiveness of covenant provisions in place and the use of capital covenants, in the process of capital structure adjustment.

REFERENCES

Acharya, V. V., Almeida, H., Ippolito, F., Perez-Orive, A., 2014. Bank lines of credit as contingent liquidity: A study of covenant violations and their implications. Working Paper. New York University.

Aghion, P., Bolton, P., 1992. An incomplete contracts approach to financial contracting. Review of Economic studies 59, 473-94.

Altinkilic, O., Hansen, S., 2000. Are there economies of scale in underwriting fees? Evidence of rising external costs. Review of Financial Studies 13, 191-218.

An, Z., Li, D., Yu, J., 2015. Crash risk, corporate reporting environment, and speed of leverage adjustment. Journal of Corporate Finance 31, 132-151.

Antzoulatos, A. A., Koufopoulos, K., Lambrinoudakis, C., Tsiritakis, E., 2016. Supply of capital and capital structure: The role of financial development. Journal of Corporate Finance 38, 166-195.

Beneish, M. D., Press, E., 1993. Cost of technical violation of accounting-based debt covenants. Accounting Review 68, 233-257.

Beneish, M. D., Press, E., 1995. The resolution of technical default. Accounting Review 70, 337-353.

Bhaskar, L. S., Krishnan, G. V. and Yu, W., 2016. Debt covenant violations, firm financial distress, and auditor actions. Contemporary Accounting Research, published online Sep 20.

Billett, M., King, T. D., Mauer, D., 2007. Growth opportunities and the choice of leverage, debt maturity, and covenants. Journal of Finance 62, 697-730.

Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87, 115-143.

Bradley, M. and Roberts, M. R., 2015. The structure and pricing of corporate debt covenants. Quarterly Journal of Finance 5, 1550001.

Byoun, S., 2008. How and when do firms adjust their capital structures toward targets? Journal of Finance 63, 3069-3096.

Chang, X., Dasgupta, S., 2003. Capital structure theories: Some new tests. Working paper. Hong Kong University of Science and Technology.

Chang, Y. K., Chou, R. K., Huang, T. H., 2014. Corporate governance and the dynamics of capital structure: New evidence. Journal of Banking and Finance 48, 374–385.

Chang, H., Song, F.M., 2014. R&D investment and capital structure. Working Paper. The University of Hong Kong.

Chava, S., Nanda, V. K., Xiao, S. C., 2015. Impact of covenant violations on corporate R&D and innovation. Working Paper. Georgia Institute of Technology.

Chava, S., Roberts, M. 2008. How does financing impact investment? The role of debt covenants. Journal of Finance 5, 2085-2121.

Christensen, H. B., Nikolaev, V. V., 2012. Capital versus performance covenants in debt contracts. Journal of Accounting Research 50, 75-116.

Cook, D. O., Tang, T., 2010. Macroeconomic conditions and capital structure adjustment speed. Journal of Corporate Finance 16, 73-87.

DeAngelo, H., Roll, R., 2015. How stable are corporate capital structures? Journal of Finance 70, 373-418.

Demerjian, P. R., Owens, E. L., 2016. Measuring financial covenant strictness in private debt contracts. Journal of Accounting and Economics 61, 2-3.

Demiroglu, C., James, C. M., 2010. The information content of bank loan covenants. Review of Financial Studies 23, 3700-3737.

Denis, D. J., Wang, J., 2014. Debt covenant renegotiations and creditor control rights. Journal of Financial Economics 113, 348-367.

Dewatripont, M., Tirole, J., 1994. A theory of debt and equity: Diversity of securities and manager-shareholder congruence. Quarterly Journal of Economics 109, 1027-54.

Dichev, I. D., Skinner, J. D., 2002. Large-sample evidence on the debt covenant hypothesis. Journal of Accounting Research 40, 1091-1123.

Drobetz, W., Schilling, D. C., Schröder, H., 2015. Heterogeneity in the speed of capital structure adjustment across countries and over the business cycle. European Financial Management 21, 936-973.

Elsas, R., Flannery, M. J., Garfinkel, J. A., 2014. Financing major investments: information about capital structure decisions. Review of Finance 18, 1341-1386.

Elsas, R., Florysiak, D., 2011. Heterogeneity in the speed of adjustment toward target leverage. International Review of Finance 11, 181-211.

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

Fama, E., MacBeth, J. D., 1973. Risk, return, and equilibrium: Empirical tests. Journal of Political Economy 81, 607-636.

Flannery, M., Rangan, K., 2006. Partial adjustment toward target capital structures. Journal of Financial Economics 79, 469-506.

Faulkender, M., Flannery, M. J., Hankins, K. W., Smith, J. M., 2012. Cash flows and leverage adjustments. Journal of Financial Economics 103, 632-646.

Fischer, E., Heinkel, R., Zechner, J., 1989. Dynamic capital structure choice: Theory and tests. Journal of Finance 44, 19-40.

Frank, M., Goyal, V., 2004. The effect of market conditions on capital structure adjustment. Finance Research Letters 1, 47-55.

Frank, M., Goyal, V., 2009. Capital structure decisions: Which factors are reliably important? Financial Management 38, 1-37.

Garleanu, N., Zwiebel, J., 2009. Design and renegotiation of debt covenants. Review of Financial Studies 22, 749-780.

Gompers, P. A., J. L. Ishii, Metrick, A., 2003. Corporate governance and equity prices. Quarterly Journal of Economics 118, 107-155.

Graham, J., Leary, M., 2011. A review of capital structure research and directions for the future. Annual Review of Financial Economics 3, 309-345.

Graham, J., Li, S., Qiu, J., 2008. Corporate misreporting and bank loan contracting. Journal of Financial Economics, 89, 44-61.

Hackbarth, D., Miao, J., Morellec, E., 2006. Capital structure, credit risk, and macroeconomic conditions. Journal of Financial Economics 82, 519-550.

Hendricks, N. P., Smith, A., 2015. Grouped coefficients to reduce bias in heterogeneous dynamic panel models with small T. Applied Economics 47, 4335-4348.

Hennessy, C. A., 2004. Tobin's Q, debt overhang, and investment. Journal of Finance 59, 1717-1742.

Hennessy, C., Livdan, D., Miranda, B., 2010. Repeated signaling and firm dynamics, Review of Financial Studies 23, 1981-2023.

Houston, J., James, C., 1996. Bank information monopolies and the mix of private and public debt claims. Journal of Finance 51, 1863-1889.

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

Huang, R., Ritter, J., 2009. Testing theories of capital structure and estimating the speed of adjustment. Journal of Financial and Quantitative Analysis 44, 237-271.

Jalilvand, A., Harris, R., 1984. Corporate behavior in adjusting to capital structure and dividend targets: An econometric study. Journal of Finance 39, 127-145.

Kaplan, S., Stromberg, P., 2003. Financial contracting theory meets the real world: Evidence from venture capital contracts. Review of Economic Studies 70, 281-315.

Kaplan, S. N., Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? Quarterly Journal of Economics 112, 169-215.

Kayhan, A., Titman, S., 2007. Firms' histories and their capital structures. Journal of Financial Economics, 1-32.

Korajczyk R. A., Levy, A., 2003. Capital structure choice: macroeconomic conditions and financial constraints. Journal of Financial Economics 68, 75-109.

Korteweg, A., 2010. The net benefits to leverage. Journal of Finance 65, 2137-2170.

Lang, L., Ofek, E., Stulz, R., 1996. Leverage, investment, and firm growth. Journal of Financial Economics 40, 3-30.

Leary, M., Roberts, M., 2005. Do firms rebalance their capital structures? Journal of Finance 60, 2575-2619.

Lemmon, M., Roberts, M., Zender, J., 2008. Back to the beginning: Persistence and the cross-section of corporate capital structure. Journal of Finance 60, 1575-1608.

Lemmon, M., Zender, J., 2011. Debt capacity and tests of capital structure theories. Journal of Financial and Quantitative Analysis 45, 1161-1187.

Liu, X. L., 2009. Historical market-to-book and past returns in a target partial adjustment model. Journal of Corporate Finance 15, 602-612.

Lockhart, G. B., 2010. Adjusting to target capital structure: The effect of credit lines. Working paper. University of Florida.

Mehrotra, V., Mikkelson, W., Partch, M., 2003. The design of financial policies in corporate spin-offs. Review of Financial Studies 16, 1359-1388.

Myers, S. C., 1984. The capital structure puzzle. Journal of Finance 39, 574-592.

Myers, S. C, Majluf, N. S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187-221.

Nash, R. C., Netter, J. M. and Poulsen, A. B., 2003. Determinants of contractual relations between shareholders and bondholders: investment opportunities and restrictive covenants. Journal of Corporate Finance 9, 201-232.

Nini, G., Smith, C. D., Sufi, A. 2009. Creditor rights and firm investment policy. Journal of Financial Economics 92, 400-420.

Öztekin, Ö., 2015. Capital structure decisions around the world: Which factors are reliably important? Journal of Financial and Quantitative Analysis 50, 301-323.

Öztekin, Ö., Flannery, M., 2012. Institutional determinants of capital structure adjustment speeds. Journal of Financial Economics 31, 88-112.

Rajan, R. G., Zingales, L. 1995. What do we know about capital structure? Some evidence from international data. Journal of Finance 50, 1421-1460.

Roberts, M. R., Sufi, A., 2009. Control rights and capital structure: An empirical investigation. Journal of Finance 66, 1657-1695.

Shivdasani, A., Stefanescu, I., 2010. How do pensions affect capital structure decisions? Review of Financial Studies 23, 1287-1323.

Smith, C. W., 1993. A perspective on accounting-based covenant violations. Accounting Review 68, 289-303

Smith, C. W., Warner, J. B., 1979. On financial contracting: An analysis of bond covenants. Journal of Financial Economics 7, 117-161.

Strebulaev, I. A., 2007. Do tests of capital structure theory mean what they say? Journal of Finance 62, 1747-1787.

Sufi, A., 2009. Bank lines of credit in corporate finance: An empirical analysis. Review of Financial Studies 22, 1057-1088.

Sweeney, A. P., 1994. Debt covenant violations and managers' accounting responses. Journal of Accounting and Economics 17, 281-308.

Thies, C., Klock, M., 1992. Determinants of capital structure. Review of Financial Economics 1, 40–52.

Uysal, V. B., 2011. Deviation from the target capital structure and acquisition choices. Journal of Financial Economics 102, 602-620.

Van Binsbergen, J. H., Graham, J. R., Yang, J., 2010. The cost of debt. Journal of Finance 65, 2089-2136

Viswanath, P. V., 1993. Strategic considerations, the pecking order hypothesis, and market reactions to equity financing. Journal of Financial and Quantitative Analysis 28, 213-234.

Warr, R. S., Elliott, W. B., Koëter-Kant, J., and Öztekin, Ö., 2012. Equity mispricing and leverage adjustment costs. Journal of Financial and Quantitative Analysis 47, 589-616.

Welch, I., 2004. Capital structure and stock returns. Journal of Political Economy 112, 106-131.

Whited, T., 1992. Debt, liquidity constraints and corporate investment: Evidence from panel data. Journal of Finance 47, 425-460.

Whited, T. M., Wu, G., 2006. Financial constraints risk. Review of Financial Studies 19, 531-559.

Zhou, Q., Tan, K. J. K., Faff, R., Zhu, Y., 2016. Deviation from target capital structure, cost of equity and speed of adjustment. Journal of Corporate Finance 39, 99-120

Table 1
Sample selection criteria

This table provides the sample selection criteria. The sample includes US public firms, from COMPUSTAT and covers 75,221 observations for the period between 1982 and 2011.

Selection process		**# of observations**
Number of firm-year observations in COMPUSTAT between 1982 and 2011		286,755
Less:		
Financial & regulated industries (SIC 6000-6799) and (SIC 4800-4999)	89,829	
Negative assets or missing sales, share price, and number of shares outstanding	58,349	
Missing values for variables used in target leverage estimation	8,313	
Missing observations in merged Dealscan and COMPUSTAT	44,887	
Missing values for lead leverage ratios	10,156	
Total number of firm-years excluded from the sample	211,534	
Final sample over 1982-2011		**75,221**

Table 2
Summary of covenant restrictions

This table presents a list of covenant restrictions found in loans to nonfinancial and non-utility firms, in the intersection of the Dealscan and Compustat databases, during the 1982-2011 period. Since a loan may have more than one covenant, a firm-year observation can be associated with more than one covenant. Hence, the number of firm-year observations does not necessarily add up to the total sample of 75,221 firm-years. Panel A presents the frequencies of each type of covenant. Panel B reports total covenant frequencies, as well as the frequencies of performance and capital covenants.

Panel A: Covenant types

Types of covenant	Firm-year observations	Percentage of total
Max. Debt to EBITDA	12,388	16.47
Min. Fixed Charge Coverage	9,508	12.64
Min. Interest Coverage	8,861	11.78
Tangible Net Worth	6,821	9.07
Net Worth	5,913	7.86
Max. Leverage Ratio	4,290	5.70
Max. Debt to Tangible Net Worth	4,192	5.57
Min. Current Ratio	3,864	5.14
Min. Debt Service Coverage	3,073	4.09
Max. Senior Debt to EBITDA	2,275	3.02
Min. Quick Ratio	1,203	1.60
Max. Debt to Equity	358	0.48
Min. Cash Interest Coverage	349	0.46
Max. Loan to Value	47	0.06
Max. Senior Leverage	36	0.05

Panel B: Covenant frequencies

	Firm-year observations	Percentage of total
Total Covenants		

With covenant of any type	21,913	29.13
Only one covenant	2,760	3.67
Two covenants	6,636	8.82
Three covenants	6,443	8.57
More than three covenants	6,074	8.07
Performance Covenants		
With covenant of any type	18,647	24.79
Only one covenant	6,179	8.21
Two covenants	8,171	10.86
Three covenants	3,324	4.42
More than three covenants	973	1.29
Capital Covenants		
With covenant of any type	15,922	21.17
Only one covenant	8,218	10.93
Two covenants	5,118	6.80
Three covenants	2,140	2.84
More than three covenants	446	0.59

Table 3
Sample summary statistics

This table presents the summary statistics for the full sample used to estimate leverage targets along with the subsamples by covenant status. *TDBA* refers to total debt, scaled by book value of assets. *LDBA* refers to long term debt, scaled by book value of assets. Marginal tax rate (*Tax*) equals to the statutory tax rate if the firm reports no net operating tax loss carry forward and positive pre-tax returns. *OI* is the operating income scaled by book value of assets. *MB* is the market-to-book ratio of the assets. Market value of assets is calculated by total asset minus total equity minus deferred taxes plus market value of equity. *LnA* is the log of total assets. *DEP* is depreciation expense and *FA* is plant, property, and equipment, both scaled by total assets. *RND* is research and development expense, scaled by sales. *D_RND* is a dummy variable that equals one if the firm reports missing *RND*, zero otherwise. *DIV* is common stock dividend, scaled by total assets. Altman Z-score is company's likelihood of bankruptcy. Industry median debt ratio is calculated as the median debt ratio of the industry where industry is defined by the first two digit SIC code of the firm. All variables that are scaled by total assets are winsorized at 1st and 99th percentile.

Variables	Full sample (*N=75,221*)		Without Covenant (*N=53,308*)		With Covenant (*N=21,913*)		Differences	
	Mean	Median	Mean	Median	Mean	Median	Mean (*t*-value)	Median (*z*-value)
TDBA	0.219	0.201	0.209	0.186	0.245	0.233	-25.64***	-24.15***
LDBA	0.191	0.162	0.176	0.142	0.226	0.212	-37.06***	-33.92***
Tax	0.062	0.000	0.053	0.000	0.083	0.000	-27.84***	-29.47***
OI	0.103	0.123	0.097	0.123	0.118	0.125	-27.81***	-3.14***
MB	1.790	1.359	1.838	1.367	1.675	1.342	15.51***	3.76***
LnA	5.315	5.161	4.983	4.725	6.122	6.121	-68.89***	-68.20***
DEP	0.047	0.041	0.047	0.041	0.048	0.041	-2.58***	-1.31*
FA	0.302	0.245	0.301	0.250	0.304	0.232	-1.80*	-8.09***
RND	0.063	0.000	0.074	0.000	0.035	0.000	22.10***	21.96***
D_RND	0.410	0.000	0.397	0.000	0.441	0.000	-11.24***	-11.23***
DIV	0.009	0.000	0.010	0.000	0.006	0.000	23.36***	14.30***
AZ	1.737	2.000	1.703	2.047	1.820	1.898	-7.53***	-13.21***
MedianTDBA	0.199	0.195	0.199	0.197	0.198	0.190	1.15	6.73***
MedianLDBA	0.162	0.153	0.160	0.152	0.168	0.158	-12.13***	-7.67***

Table 4

Panel A: Parameter estimates from cross-sectional regressions on determinants of debt ratio

This table presents the mean and the standard deviation of parameter estimates from the yearly regressions on a sample of 75,221 firm-year observations. The dependent variables are total debt and long term debt. See Table 3 for variable definitions. The significance levels of 10%, 5%, and 1% are represented by *, **, and *** respectively.

	(1)		(2)	
Independent Variable	TDBA		LDBA	
	Coeff	*p*-Value	Coeff	*p*-Value
Constant	0.137***	0.000	0.098***	0.000
Tax	0.007	0.343	0.010	0.212
OI	0.075***	0.000	0.124***	0.000
MB	-0.023***	0.000	-0.021***	0.000
LnA	0.012***	0.000	0.014***	0.000
DEP	-0.383***	0.000	-0.315***	0.000
FA	0.088***	0.000	0.119***	0.000
RND	-0.080***	0.000	-0.046***	0.000
D_RND	0.022***	0.000	0.022***	0.000
DIV	-1.117***	0.000	-1.157***	0.000
AZ	-0.023***	0.000	-0.021***	0.000
Ind. Median debt ratio	0.461***	0.000	0.403***	0.000
Average adjusted-R^2	0.1556		0.1484	
Number of observations	75,221		75,221	

Panel B: Post-target estimation summary statistics

This table presents means of leverage targets and leverage deviations, estimated from yearly regressions by covenant status. Leverage target (*LEV**) is the predicted value from leverage regression and leverage deviation (*LevDev*) is the difference between target leverage ratio and actual leverage ratio, or the leverage gap. A positive residual from target leverage estimation is considered over-levered and a negative residual is considered under-levered.

	Full sample			Without Covenant			With Covenant		
	N	*Lev**	*LevDev*	*N*	*Lev**	*LevDev*	*N*	*Lev**	*LevDev*
TDBA	75,221	0.225	0.006	53,308	0.224	0.015	21,913	0.229	-0.016
LDBA	75,221	0.225	0.035	53,308	0.224	0.048	21,913	0.228	0.002

Table 5
Effect of covenants on leverage adjustment

This table presents the impact of covenant restrictions on the speed of adjustment. The dependent variable is the change in total or long term debt, scaled by book value of assets. *LevDev* is the difference between the target leverage ratio and the actual leverage ratio (i.e., the leverage gap). *CovDummy* equals one if the firm-year observation has any type of covenants, zero otherwise. Column (1) shows the baseline speed of adjustment, column (2) shows the effect of covenants as the interaction variable, and column (3) includes additional control variables (i.e., variables used in the estimation of target leverage). Control variables are not reported for brevity. Panel A (B) presents regression results when target leverage is estimated using total debt (long term debt), scaled by book value of assets. *P*-values reported in column (3) are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by *, **, and *** respectively.

Panel A: Total debt scaled by book value of assets

	(1)		(2)		(3)	
	SOA-Unconditional		SOA-Covenant		SOA-Covenant	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.005***	0.000	0.005***	0.000	0.008***	0.000
LevDev	0.177***	0.000	0.182***	0.000	0.182***	0.000
CovDummy			-0.001	0.142	0.002***	0.009
LevDev* × *CovDummy			**-0.019*****	**0.000**	**-0.021*****	**0.000**
Controls	No		No		Yes	
Adjusted-R^2	0.0750		0.0751		0.0793	
N	75,221		75,221		75,221	

Panel B: Long term debt scaled by book value of assets

	(1)		(2)		(3)	
	SOA-Unconditional		SOA-Covenant		SOA-Covenant	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.004***	0.000	0.004***	0.000	0.006***	0.000

LevDev	0.185***	0.000	0.193***	0.000	0.193***	0.000
CovDummy			0.001	0.306	0.003***	0.000
LevDev* × *CovDummy			**-0.024***	**0.000**	**-0.026***	**0.000**
Controls	No		No		Yes	
Adjusted-R^2	0.0793		0.0796		0.0823	
N	75,221		75,221		75,221	

Table 6
Effect of covenant index on leverage adjustment

This table presents the impact of the covenant index on the speed of adjustment. The dependent variable is the change in total or long term debt, scaled by book value of assets. *LevDev* is the difference between the target leverage ratio and the actual leverage ratio (i.e., the leverage gap). *Cov-index* is measured as the ratio of total covenants a firm-year has to the total available covenants (i.e., 15 different types). Column (1) shows the baseline speed of adjustment, column (2) shows the effect of covenant index as the interaction variable, and column (3) includes additional control variables (i.e., variables used in the estimation of target leverage). Control variables are not reported for brevity. Panel A (B) presents regression results when target leverage is estimated using total debt (long term debt), scaled by book value of assets. *P*-values reported in column (3) are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by *, **, and *** respectively.

Panel A: Total debt scaled by book value of assets

	(1)		(2)		(3)	
	SOA-Unconditional		SOA-Covenant		SOA-Covenant	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.005***	0.000	0.005***	0.000	0.009***	0.000
LevDev	0.177***	0.000	0.182***	0.000	0.181***	0.000
Cov-index			-0.002	0.551	0.011***	0.004
LevDev* × *Cov-index			**-0.073*****	**0.001**	**-0.083*****	**0.001**
Controls	No		No		Yes	
Adjusted-R^2	0.0750		0.0751		0.0793	
N	75,221		75,221		75,221	

Panel B: Long term debt scaled by book value of assets

	(1)		(2)		(3)	
	SOA-Unconditional		SOA-Covenant		SOA-Covenant	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.004***	0.000	0.004***	0.000	0.006***	0.000

LevDev	0.185***	0.000	0.191***	0.000	0.191***	0.000
Cov-index			0.006*	0.104	0.016***	0.004
LevDev* × *Cov-index			**-0.087*****	**0.000**	**-0.095*****	**0.001**
Controls	No		No		Yes	
Adjusted-R^2	0.0793		0.0796		0.0823	
N	75,221		75,221		75,221	

Table 7

Effect of capital and performance covenants on leverage adjustment

This table presents the impact of capital and performance covenants on the speed of adjustment. The dependent variable is the change in total or long term debt, scaled by book value of assets. *LevDev* is the difference between the target leverage ratio and the actual leverage ratio (i.e., the leverage gap). *P-Covenants (C-Covenants)* is measured as the number of performance (capital) covenants divided by the total available covenants (i.e., 15 different types). Control variables (i.e., variables used in the estimation of target leverage) are not reported for brevity. Panel A (B) presents regression results when the target leverage is estimated using total debt (long term debt), scaled by book value of assets. *P*-values are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by *, **, and *** respectively.

Panel A: Total debt scaled by book value of assets

	(1)		(2)	
	P-Covenants		C-Covenants	
	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.009***	0.000	0.009***	0.000
LevDev	0.176***	0.000	0.182***	0.000
P-Covenants or C-Covenants	0.000	0.987	0.025***	0.000
LevDev × P-Covenants (C-Covenants)	**-0.030**	**0.570**	**-0.156***	**0.000**
Controls	Yes		Yes	
Adjusted-R^2	0.0790		0.0796	
N	75,221		75,221	

Panel B: Long term debt scaled by book value of assets

	(1)		(2)	
	P-Covenants		C-Covenants	
	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.006***	0.000	0.006***	0.000

LevDev	0.185***	0.000	0.193***	0.000
P-Covenants or C-Covenants	0.007	0.319	0.034***	0.000
LevDev × P-Covenants (C-Covenants)	**-0.053**	**0.328**	**-0.165*****	**0.000**
Controls	Yes		Yes	
Adjusted-R^2	0.0818		0.0827	
N	75,221		75,221	

Table 8
Effect of capital and performance covenant slack on leverage adjustment

This table presents the impact of covenant slack on the speed of adjustment. The dependent variable is the change in total or long term debt, scaled by book value of assets. *LevDev* is the difference between the target leverage ratio and the actual leverage ratio (i.e., the leverage gap). *Cov-slack* is measured as the difference between the covenant threshold and the actual accounting ratio, scaled by the covenant threshold. Control variables (i.e., variables used in the estimation of target leverage) are not reported for brevity. Panel A (B) presents regression results when the target leverage is estimated using total debt (long term debt), scaled by book value of assets. *P*-values are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by *, **, and *** respectively.

Panel A: Total debt scaled by book value of assets

	(1)		(2)	
	Max. Debt to EBIDTA		Max. Leverage Ratio	
	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.014***	0.012	0.036***	0.001
LevDev	0.162***	0.000	0.140***	0.000
Cov-slack	0.001***	0.001	0.001	0.873
LevDev* × *Cov-slack	**0.002*****	**0.005**	**0.074*****	**0.014**
Controls	Yes		Yes	
Adjusted-R^2	0.0744		0.0916	
N	12,388		4,290	

Panel B: Long term debt scaled by book value of assets

	(1)		(2)	
	Max. Debt to EBIDTA		Max. Leverage Ratio	
	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.013**	0.017	0.032***	0.004
LevDev	0.171***	0.000	0.133***	0.000
Cov-slack	0.001*	0.069	0.008	0.158

LevDev* × *Cov-slack	**0.001***	**0.102**	**0.080*****	**0.007**
Controls	Yes		Yes	
Adjusted-R^2	0.0802		0.0930	
N	12,388		4,290	

Table 9

Effect of covenants on leverage adjustment: conditional on free cash flows and financial constraints

This table presents the impact of covenants on the speed of adjustment when the sample is partitioned by the levels of free cash flows and by financial constraints. The dependent variable is change in total or long term debt, scaled by book value of assets. *LevDev* is the difference between the target leverage ratio and the actual leverage ratio (i.e., the leverage gap). *CovDummy* equals to one if the firm-year observation has any type of covenants and zero otherwise. Free cash flow is measured as operating income minus tax and capital expenditure, scaled by book value of assets. The *KZ* index represents the firm's financial constraint. A higher (lower) value of KZ index indicates higher (lower) financial constraints. Control variables (i.e., variables used in the estimation of target leverage) are not reported for brevity. Panel A (B) presents regression results when target leverage is estimated using total debt (long term debt) scaled by book value of assets. *P*-values are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by *, **, and *** respectively.

Panel A: Total debt scaled by book value of assets

	Free cash flow				Financial constraints			
	(1)		(2)		(3)		(4)	
	High		Low		High		Low	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.002***	0.000	0.007***	0.007	0.015***	0.000	0.006**	0.026
LevDev	0.174***	0.000	0.188***	0.000	0.204***	0.000	0.184***	0.000
CovDummy	0.002**	0.030	-0.002	0.319	-0.002*	0.083	0.002	0.281
LevDev* × *CovDummy	**-0.005**	**0.484**	**-0.035*****	**0.000**	**-0.050*****	**0.000**	**0.007**	**0.510**
Controls	Yes		Yes		Yes		Yes	
Adjusted-R^2	0.0801		0.0793		0.0705		0.0623	
N	37,710		36,814		38,043		37,142	

Panel B: Long term debt scaled by book value of assets

	Free cash flow				Financial constraints			
	(1)		(2)		(3)		(4)	
	High		Low		High		Low	
	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.009**	0.047	0.003	0.223	0.015***	0.000	0.002	0.444
LevDev	0.187***	0.000	0.199***	0.000	0.223***	0.000	0.191***	0.000
CovDummy	0.004***	0.010	0.002	0.153	-0.001	0.496	0.003*	0.073
LevDev × CovDummy	**-0.014***	**0.086**	**-0.036*****	**0.000**	**-0.058*****	**0.000**	**0.011**	**0.346**
Controls	Yes		Yes		Yes		Yes	
Adjusted-R^2	0.0853		0.0804		0.0856		0.0637	
N	37,710		36,814		38,043		37,142	

Table 10

Effect of covenants on leverage adjustment: conditional on being over- or under-levered

This table presents the impact of covenants on the speed of adjustment conditional on whether the firm is over- or under-levered. The dependent variable is the change in total or long term debt, scaled by the book value of assets. *LevDev* is the difference between the target leverage ratio and the actual leverage ratio (i.e., the leverage gap). *CovDummy* equals one if the firm-year observation has any type of covenants, and zero otherwise. A positive (negative) value for *LevDev* is considered over (under)-levered. *OverLevDummy* equals one if the target leverage is greater than the actual leverage and zero otherwise. Control variables (i.e., variables used in the estimation of target leverage) are not reported for brevity. Model 1 (2) presents regression results when target leverage is estimated using total debt (long term debt), scaled by book value of assets. *P*-values are calculated based on robust standard errors. The significance levels of 10%, 5%, and 1% are represented by *, **, and *** respectively.

Independent variables	(1)		(2)	
	TDBA		LDBA	
	Coeff.	*p*-value	Coeff.	*p*-value
Constant	0.013***	0.000	0.008***	0.000
LevDev	0.154***	0.000	0.174***	0.000
CovDummy	-0.005***	0.003	-0.002	0.209
LevDev × *CovDummy*	0.050***	0.001	0.039**	0.019
OverLevDummy	-0.000	0.933	0.003**	0.060
LevDev × *OverLevDummy*	0.050***	0.000	0.046***	0.000
CovDummy × *OverLevDummy*	0.001	0.659	-0.003	0.178
LevDev* × *CovDummy* × *OverLevDummy	**-0.117*****	**0.000**	**-0.121*****	**0.000**
Controls	Yes		Yes	
Adjusted-R^2	0.0799		0.0830	
N	75,221		75,221	

Highlights

- The imposition of debt covenants affects the speed of capital structure adjustment by 10-13%.
- Capital structure adjustment is significantly lower by 40-50% when firms have the most intense covenant provisions.
- Capital covenant is the major mechanism that impedes capital structure adjustment speed.
- Covenants impede the speed of adjustment more for cash constrained, financially constrained, and over-levered firms.