# International Evidence on the Heterogeneity of Capital Structure Adjustment Speeds

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**Abstract**

This study analyzes the heterogeneity in the speed of adjustment of leverage ratios subsequent to shocks. Using a sample of firms from the G-7 countries, we estimate capital structure adjustment speeds using a wide range of different dynamic panel methodologies. The mean estimated speed of adjustment is 20% per year, which corresponds to a shock's half-life of about three years. We compare adjustment speeds in both market- and bank-based economies and show that firms from market-based countries rebalance faster after leverage shocks. Investigating the firm-level determinants of adjustment speed, our findings indicate that highly over-leveraged firms, firms with a higher financing deficit, and constrained firms exert adjustment with a faster speed. Finally, the macroeconomic environment has an impact on the speed of adjustment. Firms adjust more slowly during bad macroeconomic states, and the adjustment dynamics exhibit managerial market-timing behavior.

*Keywords*: Capital structure, partial adjustment, financial constraints, business-cycles

JEL Classification Codes: G30, G32

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# 1 Introduction

One of the main research questions in modern corporate finance is how fast firms adjust back to their target capital structure subsequent to leverage shocks. Huang and Ritter (2009) even call it "the most important issue in capital structure research." An estimate of the speed of adjustment helps to sort out theories that explain the dynamics of capital structure. Most important, a positive speed of adjustment may be interpreted as evidence for the existence of a target leverage ratio, or more generally, some dynamic trade-off model of the capital structure. For example, Fischer et al.'s (1989) dynamic trade-off model illustrates that even small adjustment costs can lead to large swings in capital structure. While any variant of the dynamic trade-off model with low or moderate adjustment costs implies a positive adjustment speed, the pecking order theory predicts no measurable speed of adjustment (Fama and French 2002). Leverage changes according to the financing deficit, and hence there is no target leverage ratio (Myers and Majluf 1984). Market-timing theories could even support a negative speed of adjustment. If firms respond to increasing stock prices by issuing equity, the measured speed of adjustment will be lower than zero (Baker and Wurgler 2002; Dittmar and Thakor 2007).

The speed of adjustment depends on two concepts: (i) the costs of deviating from the target and (ii) the costs of adjusting back to the target capital structure. Financial managers must assess the trade-off between the costs of being off the target leverage ratio and the costs of adjustment. On the one hand, the financial status of a firm, such as the degree of target deviation and the magnitude of the financing deficit, is likely to impact the speed of adjustment (Faulkender, Flannery, et al. 2012). On the other hand, both the costs of deviating from the target leverage ratio and the adjustment costs will be affected by a firm's institutional, legal, and financial environment (Antoniou et al. 2008; Öztekin and Flannery 2011). Finally, macroeconomic conditions will impact firms' time-varying abilities to readjust subsequent to a leverage shock, as recession periods are often accompanied by a shortage of capital supply (Cook and Tang 2010; Halling et al. 2011). Taken together, firm-level, country-level, and macroeconomic factors are likely to be responsible for the heterogeneity of capital structure adjustment speeds.

Besides the extensive U.S. research, there has been little research on the adjustment behavior in different countries and under different financial systems.[1] For example, Antoniou et al. (2008) study the adjustment speed in the G-5 countries with a focus on

1 These recent U.S. studies include Flannery and Rangan (2006), Kayhan and Titman (2007), Lemmon, Roberts, et al. (2008), Byoun (2008), Huang and Ritter (2009), and Cook and Tang (2010). They are described in section 2 in more detail.

cross-country differences. Öztekin and Flannery (2011) use a larger international sample and analyze whether institutional cross-country differences explain the variance in the speed of adjustment. Halling et al. (2011) also use an international sample to study the adjustment dynamics over the business cycle.

In our study, we use a comprehensive sample of firms from the G-7 countries and explore the heterogeneity of capital structure adjustment speeds in three ways. First, we compare countries in order to determine whether there are differences between bank- and market-based financial systems with respect to adjustment speed. Firms in countries with a bank-oriented financial system tend to suffer from less liquid capital markets, making it more difficult for them to issue new or to retire outstanding securities and to rebalance after a leverage shock. Second, we examine whether a firm's target leverage deviation, its cash flow needs, and its financial constraints influence the speed of adjustment. Third, we compare the speed of adjustment across different macroeconomic states. Accordingly, our analysis deals with both demand- and supply side considerations of financing decisions and target adjustment dynamics.

In addition to analyzing heterogeneity in the speed of adjustment, we also provide a methodological contribution. By imposing a large set of dynamic panel estimators on international data, our results can be interpreted as an out-of-sample test given that these estimators have been tested mostly for U.S. data. In order to mitigate the biases inherent in virtually all estimators for the speed of adjustment (Chang and Dasgupta 2009; Iliev and Welch 2010), we additionally apply a new estimator for dynamic panel models introduced by Elsas and Florysiak (2010). This estimator exhibits the smallest bias in their U.S. sample and yields adjustment speed estimates that support the trade-off theory of capital structure.

Our empirical analysis delivers important results on capital structure dynamics. Using all sample observations and taking the mean of the different dynamic panel estimators, we report a 20% speed of adjustment per year. The associated half-life of the average shock of about three years supports the economic relevance of the trade-off theory. As expected, the speed of adjustment is significantly faster in market-based countries than in bank-based countries. Analyzing the firm-level determinants of adjustment speed, our results indicate that highly over-leveraged firms, firms with a higher financing deficit, and constrained firms exert adjustment with a faster speed. Furthermore, the macroeconomic environment has an impact on the speed of adjustment. Firms adjust more slowly during bad macroeconomic states, and there is some evidence for market timing behavior in the adjustment dynamics.

The remainder of our study is as follows: Section 2 provides a brief literature overview. Section 3 discusses the econometric problems involved in estimating adjustment speeds in the framework of dynamic panel models. Section 4 describes the data. Section 5 compares the adjustment speed results for different dynamic panel estimators. Section 6 discusses the results for heterogeneity in the speed of adjustment based on country-level (section 6.1) and firm-level characteristics (section 6.2). In addition, it analyzes capital structure dynamics over the business cycle (section 6.3). Section 7 concludes and provides an outlook for future research.

# 2 Literature review

Modigliani and Miller (1958) conclude that capital structure is irrelevant to a firm's value. Their original model is very restrictive and implies no adjustment to a target capital structure. Modigliani and Miller (1963) extend their model to include corporate income taxes, showing how debt can act to shield the negative effect of income taxes. Kraus and Litzenberger (1973) add bankruptcy costs. Their static trade-off model incorporates both the benefits of debt and the costs of bankruptcy resulting from excessive debt. There is an optimal capital structure, which balances bankruptcy costs and the tax shield. Firms are always at their optimal leverage ratio and offset shocks immediately, implying an infinite speed of adjustment.

Fischer et al. (1989) extend this static trade-off theory by incorporating adjustment costs. They analyze the trade-off between the costs of adjustment and the benefits of being at the target capital structure. Even with low adjustment costs, their dynamic trade-off model generates large swings in the debt-to-equity ratio but ultimately predicts a positive speed of adjustment. In the presence of adjustment costs, however, firms can exhibit large deviations from their target leverage ratios. As a result, firms with different size, risk, and tax characteristics exhibit different speeds of adjustment as these factors will influence the cost of deviating from the target. More recently, Hackbarth et al.'s (2006) model predicts that firms align their financing policies to the state of the economy when macroeconomic conditions have an impact on cash flows. Firms exhibit a higher speed of adjustment during good macroeconomic states compared with recessions. Furthermore, there is survey evidence for the existence of a target capital structure and the importance of adjustment speed. Most important, Graham and Harvey (2001) use a sample of 392 surveys among U.S. executives and report that 81% of firms pursue a target debt-to-equity ratio.

Flannery and Rangan (2006) estimate a partial adjustment model and document a high speed of adjustment of 30% per year in the U.S., while Roberts (2002) even estimates a half-life of only about one year by using a state-space framework. Kayhan and Titman (2007) apply an OLS methodology and find a slower 10% speed of adjustment per year for book leverage and 8.3% for market leverage. Based on a GMM methodology, Lemmon, Roberts, et al. (2008) report an annual 25% speed of adjustment for book leverage. Byoun's (2008) results also fall into this range, at about 20% when firms are below and 33% when they are above their target leverage ratio. Most recently, Huang and Ritter (2009) estimate a lower adjustment speed between 11% and 23% by using a long-difference panel estimator.

In an international setting, Antoniou et al. (2008) document that the speed of adjustment differs across the G-5 countries, ranging from annual 11% in Japan to 40% in France. Öztekin and Flannery (2011) use a large sample with firms from 37 countries and show that firms from countries with strong legal institutions, a financial structure based on the effectiveness of capital markets instead of intermediaries, and better functioning financial systems adjust to their leverage targets as much as 50% more rapidly. In countries with weaker institutions (restricted access to capital markets, higher information asymmetries, and limited financial flexibility), issuing debt or equity is more difficult and costly, and thus adjustment speed is lower.[2]

Cook and Tang (2010) relate the speed of adjustment to macroeconomic conditions. They document higher adjustment speeds during stronger macroeconomic states. Depending on the state of the economy, the speed of adjustment ranges from 15% to 50% per year in their U.S. sample. Halling et al. (2011) study the speed of adjustment over the course of the business cycle using a large international sample. They also report lower adjustment speeds during recession states compared with booming states, which is more pronounced for financially constrained firms.

In another strand of the literature, Faulkender, Flannery, et al. (2012) investigate firm-level (rather than country-level) heterogeneity in the speed of adjustment. They document that the benefits and costs of adjustment vary with the sign of the firm's leverage gap, its operating cash flow, its investment opportunities, its access to capital markets, and some elements of market conditions. For example, over-leveraged firms generally adjust more quickly. Firms with large (either positive or negative) operating cash flows make more aggressive changes in their leverage ratios because adjustment costs

2 Drobetz and Wanzenried (2006) study Switzerland and document that the influence of bad macroeconomic states results in slow adjustment speeds between 10% and 20%.

are "shared" with market transactions related to the firm's operating cash flows. This cash flow effect is more pronounced for over-leveraged firms compared to under-leveraged firms. In addition, constrained firms adjust more slowly when they are under-leveraged, but more quickly when they are over-leveraged. All these differences in adjustment speed are economically significant. Similarly, Elsas and Florysiak (2011) document heterogeneity in the speed of adjustment depending on firm size, growth opportunities, and industry classification. They further report that firms with large financing deficits tend to adjust more quickly.[3]

Most prior studies work with different variants of dynamic panel estimators. However, Chang and Dasgupta (2009) formulate a general critique of this class of estimators. Using simulated time series, they show that dynamic panel estimators generally have low power to reject the null of no capital structure adjustment. In fact, comparable estimates are obtained when target behavior in simulation samples is fairly vigorous as when financing is random. In a related study, Iliev and Welch (2010) investigate the different estimators and argue that a mechanical mean reversion effect results in a biased estimate of the speed of adjustment. We explore these issues in more detail in the next section.

# 3 Methodological issues

Most prior studies that estimate the speed of adjustment use the class of dynamic panel models, where today's leverage ratio is dependent on lagged leverage. The econometric specification in the most stylized manner is:

$$L_{i,t} - L_{i,t-1} = \lambda(L^*_{i,t} - L_{i,t-1}) + \epsilon_{i,t}, \tag{1}$$

where the change in leverage depends on the speed of adjustment $\lambda$ and the distance between lagged leverage ($L_{i,t-1}$) and the target leverage ($L^*_{i,t}$). An estimate of $\lambda = 0$ implies no adjustment to leverage shocks (random leverage hypothesis), and an estimate of $\lambda = 1$ indicates an immediate (full) readjustment to the target leverage subsequent to a shock.[4] The target leverage depends linearly on a set of firm characteristics which

3 Using data from the G-5 countries, Dang, Garrett, et al. (2010) also document that firms with above target-leverage and a financing deficit exhibit the fastest speed of adjustment.

4 Flannery and Hankins (2011) provide an overview of different dynamic panel models. Hovakimian and Li (2010) question the standard interpretation of partial adjustment coefficients as economically meaningful measures of the importance of target debt ratios. Most importantly, they document that even at rebalancing points (i.e., years with significant corporate financing activity) the estimated speeds of adjustment are well below one, which is inconsistent with the premise of the partial adjustment model.

are related to the costs and benefits of debt and equity in different capital structures. Rearranging and substituting $\beta X_{i,t-1}$ for the target leverage results in:

$$L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \epsilon_{i,t}, \tag{2}$$

where $X$ is a vector with firm-specific determinants of the target leverage ratio, and $\beta$ is a coefficient vector. However, Nickell (1981) notes that standard OLS estimation is biased because it omits fixed effects (FE). Dividing the error term $\epsilon_{i,t}$ into a firm fixed effect $\mu_i$ and a white noise term $\delta_{i,t}$, we have:

$$L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \delta_{i,t}. \tag{3}$$

Baltagi (2005) shows that introducing a dummy variable for the firm fixed effect controls for the unobserved heterogeneity, but it cannot remove the bias neither. Since leverage is a function of the fixed effect, lagged leverage ($L_{i,t-1}$) is correlated with the portion of the regression residual associated with the firms' fixed effects $\mu_i$ and is also correlated with the error term $\delta_{i,t}$. A within transformation to remove the firm fixed effect yields:

$$L_{i,t} - \overline{L_i} = (1-\lambda)(L_{i,t-1} - \overline{L_{i,}}) + \beta(X_{it-1} - \overline{X_i}) + (\mu_i - \overline{\mu_i}) + (\delta_{i,t} - \overline{\delta_i}). \tag{4}$$

While removing the time-invariant unobserved heterogeneity, this specification leads to another bias. The transformed lagged leverage ($L_{i,t-1} - \overline{L_{i,}}$) is correlated with the transformed error term ($\delta_{i,t} - \overline{\delta_i}$) because the average error ($\overline{\delta_i} = \sum \delta_{it}$) includes the lagged error ($\delta_{t-1}$). The estimated speed of adjustment $\lambda$ is still biased upward ("short panel bias", Hovakimian and Li (2011)).[5] Flannery and Hankins (2011) show that the same kind of bias appears when the equation is first-differenced to remove the fixed effect (rather than applying the within transformation).

One approach to remove the bias of the FE-estimator is to instrument the variables.[6] Arellano and Bond (1991) develop a GMM-estimator with valid instruments, widely known as "difference GMM-estimator" (labeled AB-estimator). Differentiating equation

5 Nickell (1981) shows that this type of bias tends to decline with longer panels. Monte Carlo evidence presented by Judson and Owen (1999) documents a large bias even in panels containing thirty observations over time.

6 Bound et al. (1995) note that good instruments are rare in practice and that weak instruments can result in even worse estimates than those derived from unadjusted variables.

(3) removes the time-invariant fixed effect:

$$\Delta L_{i,t} = (1-\lambda)\Delta L_{i,t-1} + \lambda\beta\Delta X_{i,t-1} + \Delta\delta_{i,t}. \tag{5}$$

The values of all lagged right-hand side variables can be used to instrument the first-differenced lagged dependent variable ($\Delta L_{i,t-1}$). The AB-estimator will not be subject to any biases in the absence of second-order serial correlation in the residuals. However, even this estimator can be problematic if there is little information in the instruments, i.e., when the lagged variables contain little information about changes in leverage. The bias is strongly pronounced when the coefficient on the lagged dependent variable is close to unity, as one would expect for the persistent leverage series (Blundell and Bond 1998; Huang and Ritter 2009). Blundell and Bond (1998) extend the AB-estimator to a system GMM-estimator (BB-estimator). In addition to the equation in first differences, their system includes the level equation:

$$L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \delta_{i,t}, \tag{6}$$

$$\Delta L_{i,t} = (1-\lambda)\Delta L_{i,t-1} + \lambda\beta\Delta X_{i,t-1} + \Delta\delta_{i,t}. \tag{7}$$

For equation (7) in first differences, the lagged levels (such as $L_{i,t-2}, \ldots, L_{i,0}$) are valid instruments. In contrast, for equation (6) in levels the lagged first differences (such as $\Delta L_{i,t-2}, \ldots, \Delta L_{i,1}$) serve as proper instruments. The BB-system estimator remains biased when the coefficient on the lagged dependent variable is close to unity (Huang and Ritter 2009) or when there is second-order correlation in the errors (Flannery and Hankins 2011). This problem is addressed by Hahn et al. (2007), who propose a long-difference estimator (LD-estimator) that uses longer differences ($k$) as follows:

$$\Delta_k L_{i,t} = (1-\lambda)\Delta_k L_{i,t-1} + \lambda\beta\Delta_k X_{i,t-1} + \Delta_k\delta_{i,t}. \tag{8}$$

Hahn et al. (2007) illustrate that the LD-estimator is less biased than both the BB- and the AB-estimator, especially when $\lambda$ is close to 0 (in the case of no adjustment). While Huang and Ritter (2009) use this estimator with lags of 4, 8, 18, and 28 years, Flannery and Hankins (2011) apply it with the maximum available number of lags. As the average firm has data for only eight years in the Compustat Global database, the number of firm-years in our international sample is limited. Therefore, our "4-period differencing" estimator (LD4-estimator) only uses a lag of four years.

As an alternative to using instrumental variables, another approach to remove the correlation between the transformed lagged dependent leverage and the transformed error term is the Least Squares Dummy Variable Correction (LSDV), developed by Kiviet (1995) and Kiviet (1999). He computes an explicit and data-dependent correction for the fixed effect bias in short dynamic panels. The bias-corrected LSDV-estimator approximates the small sample bias of the FE-estimator and removes this estimated bias from the estimator. Based on simulation analysis, Judson and Owen (1999) show that the LSDV-estimator performs better than the GMM-estimator in panels with short time dimensions. Bruno (2005a) derives a bias correction for unbalanced dynamic panels, and hence his methodology can be used for our unbalanced international firm sample. However, it is not possible to correct the standard errors for potential biases, and hence we omit reporting the standard errors for this LSDV-estimator.[7]

Another source for biases in the estimated speed of adjustment is the fact that all estimators presented so far ignore the fact that leverage is a fractional variable that varies between zero and one. Chang and Dasgupta (2009) argue that most econometric estimators are inappropriate because they erroneously attribute the fact that debt ratios are bounded in the interval between zero and one to be due to mean reversion. Accordingly, the estimate for the speed of adjustment can be positive even if financing decisions are purely random. Iliev and Welch (2010) also document that the standard dynamic panel specification represents a poor process for leverage ratios because of the boundedness property and claim that the speed of adjustment has been measured as mean reversion in previous studies. All estimators will attribute the fact that leverage ratios cannot fall below zero or exceed one to active rebalancing, and hence their adjustment speed estimates will be biased upward ("predictability bias").[8] Iliev and Welch (2010) provide a numerical bias adjustment under their embedded leverage process (which they call a "placebo" leverage ratio).[9]

Elsas and Florysiak (2010) also address the problem of mechanical mean reversion and suggest a doubly-censored Tobit estimator (i.e., with censoring the leverage ratio at zero and one), relying on a latent variable approach to account for the fractional nature of the dependent leverage variable. Based on work of Baltagi (2005) and Loudermilk

7 Instead of estimating the target leverage and the speed of adjustment in a single step, Hovakimian and Li (2011) use a two-step approach, estimating the target leverage first and the speed of adjustment second. They document that the choice between the one-step and two-step models does not affect the magnitude of the speed of adjustment, holding other methodological choices constant.

8 Bessler et al. (2012) report that only 5% of all G-7 firms firms pursued a zero-leverage policy in 1989, but this fraction increased to roughly 14% by 2010.

9 Hovakimian and Li (2011) suggest to include the lagged debt ratio as an addition control term in dynamic panel models in order to alleviate the problem of mechanical mean-reversion due to the boundedness of the leverage ratio.

(2007), they extend the fixed effects distribution such that the estimator does not require a balanced panel and is robust to missing data in unbalanced panels. Their dynamic panel specification with a fractional dependent variable (DPF-estimator) is based on a doubly-censored dependent variable:

$$L_{i,t} = \begin{cases} 0 & \text{if } L^+_{i,t} \leq 0 \\ L^+_{i,t} & \text{if } 0 < L_{i,t} < 1 \\ 1 & \text{if } L^+_{i,t} \geq 1 \end{cases} \tag{9}$$

where $L^+_{i,t}$ is the observed leverage ratio, which is set equal to zero when it is below zero, and to one when it is higher than one. The replacement primarily corrects data errors because leverage ratios below zero and above one are unusual. Most important, their specification captures corner solutions and unobserved heterogeneity:

$$L_{i,t} = (1 - \lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}, \tag{10}$$

with

$$\mu_i = \alpha_0 + \alpha_1 L_{i,0} + \alpha_2 E(X_i) + \alpha_i \tag{11}$$

for the unobserved firm fixed effect, which depends on the mean of the firm specific variables, labeled $E(X_i)$, and on the leverage ratio in the initial period (the first available observation), denoted as $L_{i,0}$. Tobit estimation of equation (10) is carried out by using maximum likelihood.[10] Based on simulation analysis for U.S. data, Elsas and Florysiak (2010) conclude that their DPF-estimator exhibits the lowest bias compared with several other dynamic panel estimators.

# 4 Data and summary statistics

We use Standard & Poor's Compustat Global as our main database and obtain data on balance sheet and cash flow items as well as market prices. Economic indicators are taken from Thomson Financial Datastream. Collecting information for the G-7 countries over the time period from 1991 to 2009 delivers 125 982 firm-year observations. Our data cleaning consists of several steps. We exclude all utilities (SIC codes 4900–4949) and financial firms (SIC codes 6000–6999). Missing capital expenditures, research and

10 As explained in Elsas and Florysiak (2010), the estimator can be implemented in Stata using the *xttobit* command. All other estimators presented in this section are also implemented using Stata.

development expenditures, and convertible debt are set to zero. We further exclude firm-years with negative leverage ratios or negative total assets, and we only keep firms with consolidated balance sheets that have not changed their accounting method.[11] All firm-level variables are in local currencies, except for sales (the only level variable), which is measured in 2000 U.S. dollars. All ratios are trimmed at the 1% level.[12]

Our empirical analysis uses the leverage ratio (or debt-to-assets ratio) as the dependent variable. Following Huang and Ritter's (2009) definition, we construct book leverage ($BL$) as total liabilities plus preferred stock, minus deferred taxes, minus convertible debt over total assets ($(LT_t + PSTK_t - TXDI_t - DCVT_t)/AT)$.[13] Market leverage ($ML$) is constructed as the book value of debt (i.e., the same nominator as for book leverage) divided by the market value of equity, plus the book value of debt ($(LT_t + PSTK_t - TXDI_t - DCVT_t)/(MKVAL + LT_t + PSTK_t - TXDI_t)$).

Table I provides an overview of the leverage variables. There is substantial cross-country variation in mean leverage ratios. The mean book leverage ratio ($BL$) in market-based countries ranges from 47% in Canada to 55% in the United Kingdom. It is higher in bank-based countries, ranging from 58% in Japan to 65% in Italy. The yearly standard deviations of book leverage changes range from 22% in Italy to more than 60% in Canada and the United States, indicating substantial time series variation in leverage. Similar to book leverage, market leverage ($ML$) is again lower in market-based countries than in bank-based countries. For example, the United States exhibits a mean market leverage ratio of 34%, while Italy boasts a mean market leverage ratio of 55%. The standard deviations of market leverage changes are in similar ranges as those of book leverage changes.

[Insert Table I here]

Panel A of Figure I depicts the development of book leverage ratios over time. Firms in bank-based countries are more leveraged than those in market-based countries during the entire sample period. This observation that financial traditions in which a firm operates affect the level of debt is consistent with prior evidence in Rajan and Zingales (1995), Antoniou et al. (2008), and Fan et al. (2012). On the one hand, firms with strong banking relationships exhibit relatively higher leverage ratios. Moreover, the laws in bank-based

11 We use code F of Compustat item $CONSOL$ and exclude all mergers (CSTAT=AA), new company formation (AB), accounting changes (AC, AN) and combinations.

12 We further exclude all firm-years with divergent currencies for accounting and market data.

13 All data variable abbreviations identify the respective data item in Compustat Global.

countries tend to be more oriented toward lender protection, and hence firms are able to carry more leverage. As Antoniou et al. (2008) emphasize, firms that operate in a system in which lenders and borrowers have close ties and face lower threat of bankruptcy borrow more.[14] On the other hand, the managerial preference for equity capital in market-based countries due to the dispersed share ownership and the firms' arm's length relationship with their lenders might be responsible for their relatively lower leverage ratios.

In addition, there is some cyclicality in market leverage, as shown in Panel B of Figure I. This pattern looks similar for each country except for Japan, possibly because of its long economic stagnation. The observation that leverage tends to rise during economic downturns is consistent with the findings in Halling et al. (2011). They document strongly counter-cyclical target leverage ratios, and the observed leverage ratios show the same dynamics albeit at much smaller variability. Korajczyk and Levy (2003) also find evidence that book and market target leverage in the U.S. are counter-cyclical for unconstrained firms, but pro-cyclical for constrained firms.

[Insert Figure I here]

In order to estimate target leverage ratios, we use a standard set of capital structure variables (Rajan and Zingales 1995; Frank and Goyal 2009): profitability ($EBIT$), market-to-book ratio ($MB$), depreciation ($DEP$), size ($SIZE$), tangibility ($TANG$), research and development expenditures ($R\&D$), and the median industry leverage ($INDMED$). Using the Compustat Global data item notation, $EBIT$ is defined as income before extraordinary items plus interest expenses plus income taxes over total assets ($(IB + XINT + TXT)/AT$); $MB$ is market value of equity plus book value of debt over total assets ($(MKVAL + LT + PSTK - TXDI)/AT$); $DEP$ is depreciation over total assets ($DP/AT$); $SIZE$ is the natural logarithm of net sales measured in 2000 US$ (deflated by the U.S. consumer price index; $ln(SALE)$); $TANG$ is property, plant, and equipment over total assets ($PPENT/AT$).[15] We use the financing deficit ($DEF$) as one conditioning variable to estimate the speed of adjustment. The financing deficit is the change in net debt ($\Delta(LT + PSTK - TXDI - DCVT)/AT$), plus the change in net equity ($\Delta(AT - LT - PSTK + TXDI + DCVT)/AT$), minus the change in retained earnings $\Delta(RE/AT)$. Table II shows summary statistics of these independent variables.

14 For a detailed analysis of the relationship between bankruptcy codes and leverage see Acharya, Sundaram, et al. (2010) and Acharya, Amihud, et al. (2011).
15 Our industry classification follows Fama and French (1997) and is obtained from Kenneth French's homepage: `http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`.

[Insert Table II here]

In addition to firm-level characteristics, we use the macroeconomic environment to condition the speed of adjustment, and thus we need to define proxy variables for the state of the economy. Most important, we construct a dummy variable as a proxy for recession states. This variable, denoted as $REC1$, is set equal to one if the economy is in a recession, and zero otherwise. Following Halling et al. (2011), we apply the definitions from the Economic Cycle Research Institute.[16] Alternatively, we use the U.S. default spread ($CREDIT$; defined as the difference between the yield on Moody's Baa-rated and Aaa-rated corporate bonds), the U.S. term spread ($TERM$; defined as the difference between the yield on the 10-year Treasury bond and the yield on the 3-month Treasury bill), the TED spread ($TED$; defined as the difference between the Euribor rate and the yield on the 3-month Treasury bill), and the GDP growth rate ($GDP$) for each country in the sample. In order to examine whether the speed of adjustment is influenced by market timing considerations, we use the inflation rate ($INF$), measured as the percentage change in a country's consumer price index, and a proxy for the equity risk premium ($ERP$), calculated as the prior 12-month mean stock market return.[17] Table III shows summary statistics (Panel A) and correlation coefficients (Panel B) of all macroeconomic variables.

[Insert Table III here]

# 5 Comparing different estimators for the speed of adjustment

In a first step, we compare the results for adjustment speed using the different dynamic panel estimators, as described in section 3. Specifically, we analyze whether the theoretical considerations and Monte Carlo simulation results from earlier studies appear in our international sample. Huang and Ritter (2009) and Iliev and Welch (2010) note that the OLS-estimator is biased upward, and hence the estimated speed of adjustment is too

16 Data are available from the Economic Cycle Research Institute website: `www.businesscycle.com`. The recession dummy variable in Table III is set equal to one if a firm's full fiscal year overlaps with a recession, and zero otherwise.

17 We use the S&P 500 for the United States, the FTSE All-Share for the United Kingdom, the Toronto SE 300 for Canada, the SBF 250 for France, the Nikkei 225 for Japan, the BIC All-Share for Italy, and the CDAX for Germany.

low. In contrast, the bias of the fixed effect (FE) model is downward, implying that the estimated speed of adjustment is too high. These biases are severe if the time dimension is short. This issue seems particularly important for our international data, as the mean time period that firms in our sample are contained in the Compustat Global database is only eight years.

The GMM-estimators also suffer from biases. The Arellano and Bond (1991) estimator (AB-estimator) produces a negative small sample bias if the coefficient on the lagged dependent variable is close to unity (Bruno 2005b), which will be the case for persistent leverage ratios. In contrast, the system GMM-estimator is slightly biased upward, as Bruno (2005b) further documents in his Monte Carlo study. Hahn et al. (2007) address the problem of weak instruments for the system estimator and suggest to use longer lags as instruments. Huang and Ritter (2009) use this estimator with a lag of four (LD4), and Flannery and Hankins (2011) apply it with the longest available lag (LD). Comparing different estimators, Flannery and Hankins (2011) suggest that the GMM-estimators and the LSDV-estimator perform best. Taken together, we expect the FE-estimator to deliver the lowest estimate for the coefficient on lagged leverage (and thus the highest for adjustment speed), followed by the AB-, the LD-, the LD4-, the LSDV-, and the fractional dependent variable estimator (DPF-estimator). In contrast, the BB- and the OLS-estimator (in the presence of unobserved heterogeneity) should yield the highest estimates for the coefficient on lagged leverage (and thus the lowest for adjustment speed; Hovakimian and Li (2011)).

Table IV (for book leverage) and Table V (for market leverage) show our results for the different estimators. As expected, the OLS estimate for book leverage is very high with a value for $(1-\lambda)$ of 0.911, implying a very slow adjustment speed $\lambda$ of 8.9% per year. In contrast, a relatively low coefficient of 0.619 is observed for the FE-estimator, which indicates a fast adjustment of 38.1% per year. The coefficient for the AB-estimator is 0.866, and that for the system GMM-estimator is 1.015. The latter estimate implies a negative speed of adjustment. The bias corrected LSDV-estimator produces a coefficient of 0.762, and the remaining coefficients are 0.788 (DPF), 0.843 (LD4), and 0.587 (LD). However, the high number of necessary lags for instrumenting implies that the long-difference estimators lose many observations. Taking the average over all estimates, the mean speed of adjustment is roughly 20% per annum, which is closest in magnitude to the DPF-estimator and corresponds to a half-life of about three years.[18]

18 The half-life can be calculated as $ln(1/2)/ln(1-\lambda)$.

[Insert Tables IV and V here]

Welch (2004) documents that firms do not adjust variations in their market leverage ratio induced by stock price changes. Therefore, one would expect a slower speed of adjustment for market leverage ratios. However, consistent with most of the existing literature, our results in Table V are mixed on whether adjustment speed is higher or lower for market leverage ratios compared to book leverage ratios (Faulkender, Flannery, et al. 2012). For example, the OLS-estimator based on market leverage delivers a marginally lower coefficient (0.911 for book versus 0.895 for market). In contrast, the DPF-estimator generates a higher coefficient (0.788 for book and 0.846 for market) and a slightly slower speed of adjustment for market leverage.[19]

Our estimates fall into the middle of the range documented in recent U.S. studies. For example, Huang and Ritter (2009) report a 0.79 coefficient for book leverage and 0.78 for market leverage using their four-lag difference estimator. Similarly, Faulkender, Flannery, et al. (2012) report a 21.9% speed of adjustment for book leverage using the BB-estimator, and Elsas and Florysiak (2011) a 26.0% speed of adjustment for market leverage using their DPF-estimator. These U.S. studies all imply a 20-25% annual speed of adjustment. Using an international sample, Öztekin and Flannery (2011) report a mean estimated speed of adjustment of 21.11% and 23.45% per year for book leverage using the BB- and the LSDV-estimator, respectively. Against expectations, their corresponding means for market leverage are slightly higher at 24.29% and 30.39%, respectively.

Finally, our regression results allow interpreting the signs of the variables which determine the target leverage ratio. Profitability exhibits a negative effect on leverage, which is usually interpreted as being consistent with the pecking order theory (suggesting that firms have a preference for internal funds). The market-to-book ratio also has a negative sign in most regressions, and hence a high market-to-book ratio is accompanied by lower leverage. As a high market-to-book ratio is associated with higher bankruptcy costs, this observation could be consistent with the trade-off-theory. While depreciation and leverage are negatively related, size, tangibility, R&D, and the median industry leverage all exhibit a positive relationship with leverage. These findings support the trade-off theory of capital structure.

19 Huang and Ritter (2009) argue that the effect described by Welch (2004) is offset by the observation that the leverage ratio sharply increases after stock price declines. There are two possibilities: A firm either declares bankruptcy and is dropped from the sample, or the stock price increases, and the leverage ratio sharply decreases. Our tests can only capture the latter effect and thus potentially overestimate the market leverage speed of adjustment.

# 6 Heterogeneity in the speed of adjustment

A firm has different options to adjust its leverage ratio toward a target ratio. On the one hand, the firm can issue new debt or repurchase shares when it has above-target leverage. On the other hand, it can issue new equity or retire debt when it has below-target leverage. Alternatively, the firm can make leverage adjustments internally by keeping profits as retained earnings or paying them out as dividends. Presumably, country-level influences have an impact on these choices and the speed of adjustment subsequent to leverage shocks (section 6.1). Furthermore, the speed of adjustment is determined by firm-level heterogeneity in adjustment costs and the costs of being off the target leverage (section 6.2). Finally, the macroeconomic environment affects adjustment speeds (section 6.3). This broad scope of our analysis allows us to incorporate both demand- and supply-side considerations of financing decisions and adjustment speed.

## 6.1 Adjustment speed across countries

In a first step, we analyze the heterogeneity in the speed of adjustment across our sample of G-7 countries. In particular, we examine the differences in adjustment speeds between the two archetypes of financial systems, i.e., market-based and bank-based financial systems. As discussed above, the speed of adjustment depends on two concepts: the costs of deviating from the target capital structure and the costs of adjustment back to the target. Therefore, managers must assess the trade-off between the costs of adjustment and the costs of being off the target ratio. Both factors will be affected by country-level characteristics, and thus the speed at which they adjust their capital structure subsequent to a shock will depend on the financial system and the corporate governance tradition in each country.

One would expect that the costs of being off the target leverage ratio relative to the costs of adjustment are lower for firms from bank-based countries. Firms in these countries have close ties with their creditors, house-banks tend to exert control, and deviations from the target leverage ratio can be negotiated instead of being punished immediately by the market (Antoniou et al. 2008). Consequently, the costs of deviating from the target leverage are lower in bank-based countries than in market-based ones, and it is feasible for firms to adjust more slowly toward their leverage target without incurring substantial agency costs. Although firms from bank-based countries may have easier access to (bank) debt capital, they may also need to rely less on debt as a signal of firm quality. In contrast to firms from market-based countries, they are not confronted with a large number of dispersed shareholders and a corporate governance system that operates at arm's length.

Moreover, one expects that the costs of adjustment are higher in bank-based countries than in market-based countries. In countries with impeded access to capital markets and higher information asymmetry, issuing either debt or equity is more difficult and more costly, and thus adjustment speed will be slower (Öztekin and Flannery 2011). Stronger market freezes during recessions may further slow down the adjustment of firms from bank-based countries (Halling et al. 2011). In contrast, firms from market-based countries—with generally more liquid capital markets—may be able to manage their transactions more actively due to their reduced transaction costs.

Using the DPF-estimator, the findings in Tables VI and VII confirm our hypotheses.[20] For book leverage, we observe a 26.8% speed of adjustment for Canada, 26.6% for the U.K, and 21.2% for the U.S. per year. In contrast, bank-based countries tend to exhibit slower adjustment speeds; in Germany it is 21.1%, in France 22.6%, in Japan 14.9%, and in Italy only 8.0% per year. In aggregated subsamples, the average speed of adjustment for market-based countries is 22.5%, while it is 17.6% for bank-based countries. In the last column of Table VI (labeled $\Delta$), we examine whether the difference in adjustment speed is statistically significant by using the full sample and including a dummy variable for the financial system (which is set equal to one if the firm is from a bank-based country, and zero otherwise) that interacts with the lagged leverage ratio. The corresponding coefficient is statistically significant and indicates a 3.1 percentage points slower adjustment speed in bank-based countries. As a result, while it takes about 2.8 years for half of a shock to be adjusted in market-based countries, it takes roughly 3.5 years in bank-based countries.

The corresponding results for market leverage are presented in Table VII. Again, as shown in the last column, the difference in the speed of adjustment between market- and bank-based countries is statistically significant, and at 2.9 percentage points it is in the same range as for book leverage. When comparing the estimates for book leverage with those for market leverage, it is again unclear which one adjusts more quickly. While in Canada the adjustment speeds are very similar, in both the United Kingdom and the United States the adjustment speed after book leverage shocks is approximately 6 percentage points slower compared to market leverage shocks. In Germany and Italy the

20 Given the unbiasedness of the DPF-estimator (Elsas and Florysiak 2010; Elsas and Florysiak 2011), we use this approach to examine the speed of adjustment in partitioned samples. The results based on the other dynamic panel estimators shown in section 3, although possibly biased, do not deliver qualitatively different results with respect to differences across subsamples.

speed of adjustment after market leverage shocks is faster, whereas in France and Japan it is slower compared to book leverage shocks. For the aggregated market- and bank-based subsamples, however, we report that in market-based countries the adjustment speed of market leverage shocks is 5.9 percentage points lower than the adjustment speed of book leverage shocks; in bank-based countries the difference is 6.6 percentage points. The finding that book leverage adjusts more quickly than market leverage is consistent with Welch's (2004) finding that firms do not adjust subsequent to stock price-induced changes in leverage.[21]

[Insert Tables VI and VII here]

Overall, we observe a slower speed of adjustment for firms from bank-based countries compared to market-based countries. Although the difference is not as pronounced as expected, this finding is consistent with our initial conjecture, and it is also in line with other studies. Based on the BB-estimator, Halling et al. (2011) report that firms from common law countries exhibit a faster speed of adjustment than firms from civil law countries. Öztekin and Flannery (2011) document that firms from countries with a financial structure based on the effectiveness of capital markets instead of intermediaries exhibit higher adjustment speeds. They also use the BB-estimator in addition to the LSDV-estimator. Our results, which are based on the DPF-estimator, imply either higher adjustment costs or lower costs of deviating from the target leverage ratio in bank-based countries compared to market-based countries. Although our methodology is unable to discriminate between these two concepts, we observe different capital structure dynamics of firms from market- and bank-based financial systems.

## 6.2 Adjustment speed and financial conditions

Different legal environments and financial systems are one source of heterogeneity in the speed of adjustment. Financial conditions on the firm-level may constitute another source for cross-sectional variation in adjustment speeds. For example, Byoun (2008) documents that firms are likely to make capital structure adjustments more quickly when they face a financing deficit with below-target debt or a financing surplus with above-average debt than when they face a financing surplus with below-target debt or a financing deficit with above-target debt. Presumably, both the adjustment costs and the costs of being away

21 However, this result is contrary to Huang and Ritter (2009), who estimate a higher adjustment speed for market leverage. The difference could be attributable to their longer sample period.

from the target depend on a firm's financial condition. In this section, we investigate the heterogeneity resulting from the deviation from the target leverage ratio, the magnitude of the financing deficit, and the degree of financial constraints.

### 6.2.1 Deviation from the target leverage ratio

A firm's deviation from its target leverage ratio may be an obvious determinant of the speed of adjustment. According to dynamic trade-off theories (Fischer et al. 1989; Goldstein et al. 2001), adjustment toward the target capital structure only occurs when the costs of deviation outweigh the costs of adjustment. With fixed and weakly convex adjustment costs (Leary and Roberts 2005), adjustment becomes relatively cheaper with increasing deviations. As a result, firms that are further off the target leverage ratio should adjust more quickly than those near or at their targets (Elsas and Florysiak 2011). However, as suggested by Faulkender, Flannery, et al. (2012), there is no theoretical reason for a symmetry between under- and over-leveraged firms. Even if the adjustment costs were equal for under- and over-leveraged firms, the benefits may be asymmetrical. Under-leveraged firms forgo tax benefits of leverage, they have little concerns with financial distress costs but—assuming that leverage serves as a disciplining device for managers—perhaps face free cash flow problems (Jensen 1986). In contrast, financial distress costs can become excessive for over-leveraged firms. The net tax benefit plus potential agency costs from free cash flow minus the expected financial distress costs need not be symmetrical around a firm's optimal leverage ratio. All in all, the absolute distance from the target leverage may not fully capture the incentives to adjust.

As in Faulkender, Flannery, et al. (2012), we estimate the speed of adjustment for groups of under- and over-leveraged firms. In order to derive appropriate estimates, it is important to preserve the time-series dynamics of leverage ratios. Therefore, we use an "event-study" approach.[22] In a first step, we compute the target leverage ratio in each firm-year by using the estimated coefficients of the fixed effect regression in Table IV for book leverage and in Table V for market leverage. In a second step, we calculate the deviation from the target leverage ratio by subtracting the observed leverage ratio. This procedure allows classifying firms into leverage quintiles (highly over-leveraged, over-leveraged, at target, under-leveraged, and highly under-leveraged firms) in each given year as well as analyzing the changes of leverage over time subsequent to a deviation from the target. Finally, the conditional speed of adjustment after a deviation is measured by using (for each event firm and each event year, if available) the year preceding the event

22 A similar event-study approach is used by Elsas and Florysiak (2011).

year ($t = -1$) as the initial observation of the dynamic leverage process, the event year ($t = 0$), and the subsequent 5 ($t = +1$ to $t = +5$) observations as inputs for the dynamic panel estimator.

The results for adjustment speeds of the groups of under- and over-leveraged firms based on the DPF-estimator are shown in Table VIII.[23] There is substantial heterogeneity in the estimated adjustment speeds observing that over-leveraged firms tend to exhibit a faster adjustment than under-leveraged firms. In bank-based countries, the estimated annual speed of adjustment (using book leverage) is 52.2% for highly over-leveraged firms and 39.1% for highly under-leveraged firms. Firms deleverage quickly after positive shocks to their capital structure but do not releverage after negative shocks with the same speed. Presumably, bankruptcy costs from excessive leveraging are more expensive than the costs of having too little debt (such as agency conflicts and free cash flow problems). These results for the bank-based subsample are consistent with Faulkender, Flannery, et al. (2012), suggesting that over-leveraged firms have either greater benefits or lower costs of adjustment toward their target leverage.[24]

As expected, the speed of adjustment is higher in market-based countries than in bank-based countries. While it is highest with 58.8% per year for over-leveraged firms in market-based countries, there is only weak evidence for asymmetry between over- and under-leveraged firms in this subsample. In fact, the conditional analysis indicates that adjustment speeds subsequent to book leverage shocks leading to large target deviations follow a U-shaped pattern. Similar to Elsas and Florysiak's (2011) results, both highly over-leveraged and highly under-leveraged firms adjust the fastest, but the estimated adjustment speeds are similar in magnitude (with 58.8% and 54.9%, respectively). The observation that firms from market-based countries adjust faster the farther away they are from their leverage target is consistent with dynamic models with fixed and weakly convex adjustment costs (Leary and Roberts 2005).[25]

[Insert Table VIII here]

23 The event-study methodology leads to a sharp increase in the number of firm-year observations in bank-based countries; in fact, the number of observations more than doubles to over 100 000 compared to Table V. For market-based countries the number of firm-year observations also increases compared to Table VI, but the difference is less pronounced. The reason is that there are many firms in this latter subsample with less than 7 consecutive observations over the $t = -1$ to $t = +5$ period in event time.

24 See also Hovakimian (2004) and Byoun (2008).

25 For the sake of completeness, Table VIII also reports the results for market leverage. However, they do not exhibit clear patterns, and thus it is difficult to come up with economically interesting interpretations.

### 6.2.2 Adjustment speed and financing deficit

A firm pays out dividends, makes net investments, finances changes in net working capital, and it generates cash flows from operating activities. The accumulation of these four positions results in the financing deficit, which can be covered through the issuance of debt or equity. On the one hand, if a firm generates high profits (negative financing deficit or financing surplus), it is in a position to adjust its capital structure by buying back shares or redeeming its long-term debt. On the other hand, firms with investment opportunities and a need to raise external capital (positive financing deficit) can issue either debt or equity, depending on their leverage status. Faulkender, Flannery, et al. (2012) and Hovakimian and Li (2010) conjecture that this combination lowers their cost of adjustment because these firms already transact with the market and incur the associated transaction costs. In contrast, if a firm has no financing gap and lacks profitability and/or investment opportunities, any capital structure activity would only be initiated for rebalancing purposes. This firm is not otherwise transacting with the market, and thus it is subject to the full costs of adjustment. Both high financing deficits and high financing surpluses represent situations when a firm needs to make capital structure decisions. It either issues or repurchases securities, and these capital market activities offer the firm an opportunity to adjust its financial structure, leading to a faster speed of adjustment due to lower marginal costs. Taken together, we expect that firms with a high financing deficit, whether positive or negative, adjust faster than firms with a low financing deficit.

Following Elsas and Florysiak (2011), we tackle this question by grouping firms in deciles according to their mean financing deficit during the full sample period. In a first step, we calculate deciles of the cross-sectional distribution of the financing deficit for each sample year. In a second step, we check for each firm-year to which (annual) decile a firm belongs. We then calculate the (rounded) average decile of all observations of a given firm and assign all observations of the firm to this average decile. In a third step, we estimate the speed of adjustment for each cross-sectional decile. In the worst case, this time-invariant grouping will induce a bias that makes it more likely not to find cross-sectional heterogeneity in the speed of adjustment, and hence this approach seems conservative.[26]

26 As discussed in Elsas and Florysiak (2011), this procedure has the disadvantage that a firm belongs to one group (decile) over the full sample period. The financing deficit changes over time, and thus to some degree misclassification will occur. However, grouping within each firm-year and allowing changes in the decile classification over time leads to a large loss of data (because dynamic panel estimators require a lagged dependent variable) and potentially destroys the panel structure. The latter problem is

Following Huang and Ritter (2009), the financing deficit is defined as the change in net debt ($\Delta(LT + PSTK - TXDI - DCVT)/AT$), plus the change in net equity ($\Delta(AT - LT - PSTK + TXDI + DCVT)/AT$), minus the change in retained earnings $\Delta(RE/AT)$. Figure II shows the results. Panels A and B sort firms by the absolute value of the magnitude of the financing deficit, where 1 (10) denotes the decile with the lowest (highest) financing deficit. The adjustment speed for book leverage of firms with very small deficits is roughly 20% in bank-based countries and 10% in market-based countries. The speed of adjustment remains relatively low up to decile 5 in market-based countries and then increases to more than 35% by decile 10. In bank-based countries adjustment speed first decreases to below 10% and then rises again to above 25% by decile 10 (Panel A). As expected, firms with a large financing deficit use it to effect a faster adjustment. Similar patterns are observable for market leverage (Panel B), but the effect is generally less pronounced. Analyzing only positive financing deficits, we also note that the speed of adjustment increases with the magnitude of the financing deficit. As shown in Panels C and D of Figure II, it is at 10%–20% in the lower and mid-deciles, and it increases to about 25%–35% in the deciles with the highest financing deficits. Finally, firms with negative financing deficits (surpluses) can use these funds to adjust their capital structure by buying back shares or retire debt. For some firms, however, considerations such as dividend payments may have a higher priority. As shown in Panels E and F of Figure II, the speed of adjustment is relatively stable around 10% over the deciles, except for the lowest decile (which contains the firms with the highest profits), where adjustment speed is high at 30%-40% for book leverage and 20%-30% for market leverage.

[Insert Figure II here]

Again, the speed of adjustment is higher in market-based countries than in bank-based countries. The higher issuance activity in the former group of countries makes leverage more flexible, and thus it is relatively cheaper for firms to actively manage and rebalance their leverage ratios. In addition, it may be more costly for these firms to remain off the target leverage ratio as they are confronted with a large number of dispersed shareholders and a corporate governance system that operates at arm's length (Öztekin and Flannery 2011). Taken together, our findings of a U-shaped relationship between the magnitude of the financing deficit and the speed of adjustment confirm Faulkender,

particularly pronounced for the DPF-estimator because it requires a clearly defined initial value of the leverage process (see equation 11). We perform an additional robustness test and group firms according to the financing deficit in each firm-year, and the results (not reported) are qualitatively the same.

Flannery, et al.'s (2012) results. They also document lower adjustment costs and a higher speed of adjustment for U.S. firms with large positive or negative operating cash flow.

Firms with high financing needs or surpluses adjust faster to their target than other firms. In order to examine the combined influence of leverage and the financing deficit, Tables IX and X show the speed of adjustment estimates for intersections of absolute financing deficit quartiles and target leverage deviation quintiles. Conditional estimates are based on the event-study approach, thus using (for each event firm and each event year, if available) the year preceding the event year ($t = -1$) as the initial observation of the dynamic leverage process, the event year ($t = 0$), and the subsequent 5 ($t = +1$ to $t = +5$) observations as inputs for the DPF-estimator.

[Insert Tables IX and X here]

Analyzing book leverage in Panel A, there are two effects. First, the speed of adjustment increases with the magnitude of the financing deficit. Firms with very high deficits or surpluses generally adjust faster than firms with intermediate financing deficits. Second, there is asymmetry as firms with too much leverage adjust faster than firms with too little leverage. Highly over-leveraged firms exhibit the highest estimated adjustment speed; in market-based countries their speed of adjustment is 67.8%, and it decreases to 57.4% per year for the group of highly under-leveraged firms.[27] While the results for bank-based countries are less pronounced, the group of highly over-leveraged firms with very high absolute financing deficits again boast the highest estimated adjustment speed of 57.2% per year (albeit only slightly higher than the 52.5% for the highly under-leveraged firms with very high absolute financing deficits). Overall, the asymmetry for highly over- and under-leveraged firms with high absolute financing deficit is consistent with the more general conjecture that the benefits of increasing leverage may be smaller than the benefits of decreasing it (Faulkender, Flannery, et al. 2012). It is also compatible with the notion that highly over-leveraged firms face detrimental financial distress costs and are forced to revert to the target quickly (Dang, Kim, et al. 2010).

### 6.2.3 Adjustment speed and financial constraints

An implicit assumption of standard capital structure theories is that a firm's leverage is completely a function of its demand for debt. However, sometimes firms are rationed by

27 The high adjustment speed of 63.4% for the highly under-leveraged firms with the lowest financing deficit is not consistent with this interpretation. For the sake of completeness, the results for market leverage are shown in Panel B of Table V. They do not reveal clear and economically interesting patterns.

lenders (Stiglitz and Weiss 1981). Based on surveys, Graham and Harvey (2001) report that an important goal of financial decision makers is to maintain financial flexibility. In fact, one of the major concerns is to be shut out of the capital markets during market downturns, implying that their business needs to shrink. Faulkender and Petersen (2006) emphasize that when estimating a firm's leverage, one should not only include the determinants of a firm's preferred leverage (the demand side) but also the factors that measure the constraints on its ability to increase leverage (the supply side). They further argue that a company's ability to issue public (rated) debt is an indicator of large debt capacity. Firms with a credit rating have easier access to the debt markets than those without a rating.

By definition, financially constrained firms will find it expensive (or even impossible) to issue securities that would move them toward their target leverage ratios. Öztekin and Flannery (2011) argue that the costs of adjustment are higher for constrained firms, potentially implying slower capital structure adjustment.[28] In contrast, over-leveraged firms potentially face debt constraints and suffer from higher bankruptcy and liquidation costs (Dang, Kim, et al. 2010). As a result, constrained firms' costs of deviating from the target leverage ratio may be higher than those for unconstrained firms, and they may even adjust faster after a leverage shock. Faulkender, Flannery, et al. (2012) document that financial constraints change the speed of adjustment in an asymmetrical way. Constrained firms adjust more slowly when they are under-leveraged, but more quickly when they are over-leveraged.

There are several approaches to determine whether a firm is financially constrained. For example, Denis and Sibilkov (2010) apply a firm's credit rating as a measure to determine financial constraints. Lemmon and Zender (2010) criticize the use of the presence or absence of a debt rating as a measure of debt capacity. Firms without a rating might have deliberately chosen to rely on equity financing for reasons other than being excluded from the debt markets. In order to minimize biases that result from firms which possess the debt capacity to issue rated debt but renounce to do so, they estimate rating probabilities for each firm in a given year by using a logistic regression-based predictive model with a number of firm-specific rating predictors. The estimated probability that a firm will be able to access the public debt markets is assumed to proxy for a firm's debt capacity.

Following Lemmon and Zender (2010), we run a logistic regression to estimate a firms' rating probabilities. The dependent variable is a dummy variable which is set equal to

28 This conjecture is consistent with studies documenting that financial constraints affect firms' security issuance choices (Korajczyk and Levy 2003; Erel et al. 2012).

one if the firm has a long-term credit rating, and zero otherwise. We use Standard and Poor's RatingXpress database to construct this variable.[29] The log of total assets, return on assets, tangibility, market-to-book ratio, leverage, age, and the standard deviation of earnings are used as explanatory variables and predictors for rating probability (see Appendix A). Given each firm's estimated rating probability, we sort sample firms into two groups of debt-constrained and unconstrained firms. A firm is considered as constrained if its probability of having a public rating falls into the lower quartile, and unconstrained otherwise.[30] The results of the DPF-estimator for the intersections of these two groups of constrained and unconstrained firms as well as target leverage quintiles are shown in Table XI for book leverage and in Table XII for market leverage.

Table XI reports the highest speed of adjustment after book leverage shocks for highly over-leveraged constrained firms in market-based countries; their adjustment speed estimate is as high as 70.3% per year. This result is consistent with Byoun (2008) and Faulkender, Flannery, et al. (2012). However, the estimated speed of adjustment is higher for constrained firms across all leverage quintiles. Presumably, the high adjustment costs of constrained firms are outweighed by their high costs of deviating from the target leverage ratio. In particular, constrained firms may have to maintain some minimal degree of financial flexibility and avoid being shut of the capital markets. They attempt to be at their target leverage ratio and adjust rapidly subsequent to a leverage shock. Elsas and Florysiak (2011) investigate the influence of a firm's rating on capital structure rebalancing and report the highest speed of adjustment to market leverage targets for CCC+ to D-rated U.S. firms, which are more likely to suffer from financial constraints. They suggest that firms in distress have low adjustment costs because restructuring debt is fairly simple under Chapter 11.

[Insert Tables XI and XII here]

Similarly, constrained firms in bank-based countries exhibit a tendency to exert slightly faster adjustment than unconstrained firms, but our results do not allow clear interpretations. If anything, under-leveraged constrained firms exhibit the fastest estimated adjustment speed. A potential explanation is that relationship banks which specialize

29 The RatingXpress historical rating files contain all historical ratings for all rating levels (entities, maturities, and issues) and rating types (long- and short-term, local, and foreign currency). Coverage of these RatingXpress historical files differs among the countries groups: 34% of the firms in the U.S., the U.K., and Canada, 14% in Germany, France, and Italy, and 9% in Japan.

30 In robustness tests, we replace this 25%-75% classification by an alternative 50%-50% grouping, and the results (not tabulated) remain qualitatively similar.

in collecting information about borrowers and interact with them over time and across different products are able to alleviate the information asymmetry that cause the public debt market's failure and use their privileged information in the credit approval decision.[31]

## 6.3 Adjustment speed and the macroeconomic environment

As shown in prior studies, the macroeconomic environment is an important determinant for firms' financing choices. For example, Korajczyk and Levy (2003) document that book and market leverage are counter-cyclical for financially unconstrained U.S. firms, but pro-cyclical for constrained firms. Erel et al. (2012) report that the business cycle affects the choice of capital, the structure of debt contracts, and the usage of capital. However, most prior studies ignore the impact of the macroeconomic environment on the speed of adjustment. In fact, the availability of financing choices over the business cycle directly impacts adjustment speed. For example, default risk increases during recessions, which will affect the costs of raising debt capital. Furthermore, if financial market liquidity is low and banks tighten their loan activities, firms face high costs of adjustment, and hence they will not find it optimal to make frequent and large adjustments. With limited access to capital markets in recession periods, these arguments suggest that the speed of adjustment is higher in good macroeconomic states than in bad states.

Hackbarth et al. (2006) develop a contingent claim model that predicts that the pace and the size of the adjustment is positively correlated with macroeconomic conditions because the default (or restructuring) threshold selected by shareholders is reduced in bad states, leading to decreased bankruptcy costs. Therefore, the speed of adjustment should be faster in a good macroeconomic environment than in a bad environment. Cook and Tang (2010) confirm this theoretical prediction using U.S. data by documenting that firms adjust their leverage toward the target faster in good macroeconomic states compared to bad states. Using an international sample, Halling et al. (2011) also show that the speed of adjustment slows down in bad macroeconomic conditions.

### 6.3.1 Recession indicators

In order to test the impact of macroeconomic conditions on the speed of adjustment, we use the classification of the Economic Cycle Research Institute as a broad indicator of business cycle states.[32] Specifically, we construct a recession dummy variable, denoted

31 The results for market-leverage in Table XII again do not allow clear interpretations, and thus we omit a detailed discussion.

32 The data are from the Economic Cycle Research Institute website: `www.businesscycle.com`.

as $REC1$, which is set equal to one if a firm's full fiscal year overlaps with a recession, and zero otherwise. Alternatively, we code a firm-year as a recession if a minimum of six months in a given fiscal year are classified as recessions (labeled $REC2$).[33] In addition, we use a broad set of macroeconomic indicators, such as the U.S. credit spread ($CREDIT$), the TED spread ($TED$), the term spread ($TERM$), and the GDP growth rate ($GDP$) to classify recessions. Following the methodology in Cook and Tang (2010), we construct quintiles and compare the good macroeconomic states (the quintile years with the "best" observations) with the bad states (the quintile years with the "worst" observations). More specifically, we classify states as bad if the credit spread is high, the TED spread is high, and the contemporaneous GDP growth rate is low; good states are defined accordingly. A high value of the term spread is taken as a strong predictor for a good economy (Dahlquist and Harvey 2001). Therefore, we lag this variable by one year and expect faster adjustment speed in good macroeconomic conditions, as predicted by a high term spread. For each of these recession indicators, $BADDUM$ denotes a dummy variable, which is set equal to one if the economy is in a bad state, and zero otherwise. Using an additional interaction term ($LBL \times BADDUM$) in our dynamic panel model, we estimate the difference in the speed of adjustment across different macroeconomic environments.

For book leverage in Panel A of Table XIII we observe a higher speed of adjustment during good macroeconomic states than during bad states (based on the recession dummy $REC1$). In market-based countries we estimate an annual 23.0% speed of adjustment during good states, but adjustment speed slows down to 8.6% during bad states. In the joint model that includes good and bad states as well as the additional interaction term ($LBL \times REC1$), the adjustment speed during a bad state is 8.2 percentage points lower. Similar patterns are observable in bank-based countries, i.e., an annual 14.3% adjustment speed during good states, 3.6% during bad states, and a significant difference of 6.8 percentage points in the combined model including the interaction term. The results are similar but less pronounced in Panel B, where a firm-year is coded as a recession if a minimum of six months in the given fiscal year ($REC2$) are recession months.

Analyzing the credit spread in Panel C of Table XIII, we observe that firms from market-based countries are not highly sensitive in their adjustment speed to this macroeconomic variable; the corresponding interaction term is statistically insignificant. In bank-based countries firms adjust more slowly by 4.5 percentage points during bad states, and the

33 Our results are robust even when we code a firm-year as a recession if only at least one month in a given fiscal year is classified as a recession (not tabulated).

difference is statistically significant.[34] Based on the TED spread and the lagged term spread in Panel D and Panel E, respectively, we also document a significant difference between good and bad states in bank-based countries. Finally, as shown in Panel F, the contemporaneous GDP growth rate exerts a strong influence on the speed of adjustment. During years with high GDP growth rates the speed of adjustment is 20.9% and 10.8% in market- and bank-based countries, respectively. The corresponding adjustment speeds are only 12.7% and 4.6% during years with low GDP growth rates. Furthermore, the coefficients on the interaction terms in the combined model (6.1 and 6.4 percentage points for market- and bank-based countries, respectively) are both statistically significant.

[Insert Tables XIII and XIV here]

The results for market leverage are shown in Table XIV. Again, the speed of adjustment is generally slower for market leverage than for book leverage. The results for the recession dummy variables in Panel A ($REC1$) and Panel B ($REC2$) are similar, although the state-dependent differences are smaller in magnitude compared to book leverage. The results for the other macroeconomic variables in Panels C-F are qualitatively the same; they are weaker for bank-based countries but even more pronounced for market-based countries (e.g., as indicated by significantly positive interaction coefficients for the TED spread and the term spread). Taken together, our evidence confirms the results in Cook and Tang (2010) and Halling et al. (2011). Independent of the variable used to measure the business cycle, the speed of adjustment subsequent to leverage shocks is higher during good macroeconomic states than during bad states.

### 6.3.2 Market timing

In a final step, we use the inflation rate ($INF$) and a proxy for the equity risk premium ($ERP$) in order to analyze whether the speed of adjustment is influenced by market timing considerations. Presumably, inflation and the equity risk premium impact the price of risk and thus the costs of adjustment (Huang and Ritter 2009). As shown in Panel G of Tables XIII and XIV, firms tend to adjust more quickly during high-inflation periods (labeled "bad") than during low-inflation periods (labeled "good").[35] This observation

34 Given that the credit spread is a global measure for investor sentiment and the pricing of risk, firms that rely more heavily on debt may be more affected.

35 The distinction between good and bad states in the context of market timing may be blurry and is only kept for consistency with the other Panels in Tables XIII and XIV. In fact, high inflation is often accompanied by periods of economic expansion.

holds for book leverage in both market- and bank-based countries as well as for market leverage in market-based countries. Presumably, high inflation favors borrowers, which in turn results in lower costs of adjustment. Consistent with a market timing explanation, larger amounts of debt tend to lose value during periods of high inflation.

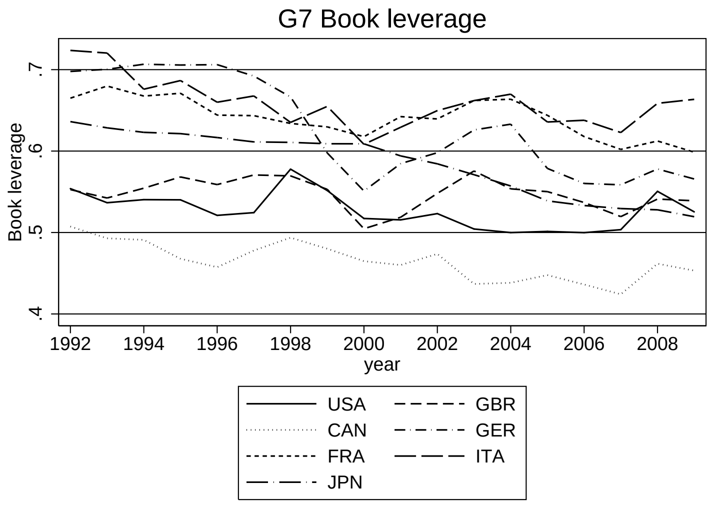
Finally, Panel H of Table XIII and Table XIV investigates the influence of the equity risk premium (approximated by the mean of the previous 12-month stock return in excess of the local stock market index) on the speed of adjustment. Good states are defined as states with a high realized (lagged) mean return and a low expected risk premium. Firms tend to adjust more slowly after periods of rising stock prices, indicating that the speed of adjustment is influenced by market timing considerations (as the equity risk premium tends to be lower after periods of rising stock prices). This effect is most pronounced for market leverage in market-based countries (based on the magnitude of the interaction term $LBL{\times}BADDUM\_ERP$). Rising stock prices reduce the costs of equity issuances, and firms exploit this window of opportunity by issuing equity (market timing), resulting in delayed target adjustment (Welch 2004).[36]

# 7 Conclusions

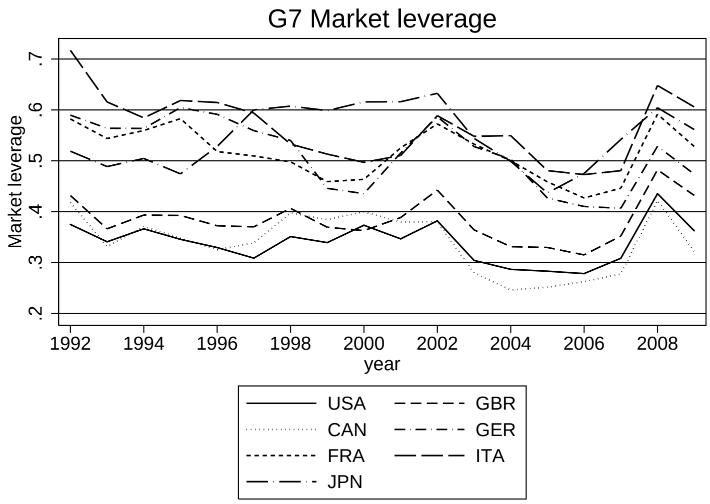
The speed of adjustment of leverage ratios subsequent to shocks varies across firms and over the business cycle. In order to explore the heterogeneity in capital structure rebalancing, we estimate adjustment speeds conditional on the financial system, the financial conditions on the firm-level, and the macroeconomic environment by using a wide range of different dynamic panel estimators. On average, we report a 20% speed of adjustment per year, which corresponds to a shock's half-life of about three years. Adjustment speed is higher in market-based countries than in bank-based countries, providing evidence that the costs of adjustment and the costs of deviating from the target leverage ratio differ across financial systems. Firm-level analyses indicate that firms exploit periods of high financing deficits to adjust faster. Furthermore, highly over-leveraged firms tend to adjust faster than highly under-leveraged firms. There seems to be asymmetry in the costs of deviating from targets, and the costs appear to be higher for over-leveraged firms. Finally, the speed of adjustment is dependent on the state of the economy and slows down during bad macroeconomic states. There is further evidence for

36 This result is consistent with Warr et al. (2012) that equity mispricing constitutes an important capital structure adjustment cost. Related to our findings, they document that firms which are below their target leverage and whose equity is overpriced adjust more slowly than firms with underpriced equity.

market-timing, as firms adjust faster during periods of high inflation and a high equity risk premium.

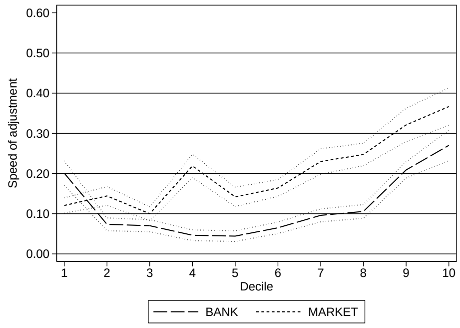



**(A)** Evolution of book leverage

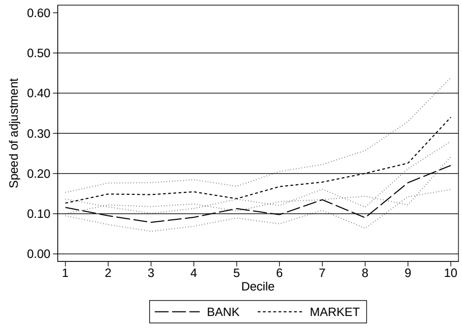



**(B)** Evolution of market leverage

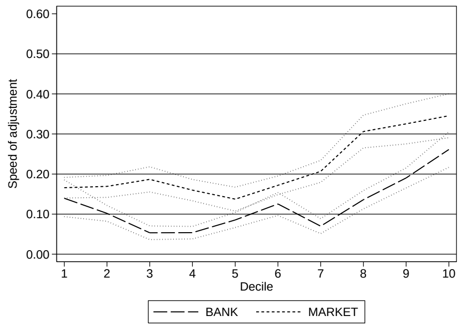
**Figure I** – Leverage ratios across countries and over time
This figure shows the evolution of leverage ratios over time in the G-7 countries. Using the Compustat Global data item notation, book leverage ($BL$) is defined as debt relative to total assets ($(LT_t + PSTK_t - TXDI_t - DCVT_t)/AT_t$) and market leverage ($ML$) as debt relative to debt plus the market value of equity ($(LT_t + PSTK_t - TXDI_t - DCVT_t)/(LT_t + MKVAL_t)$). The data cover the period from 1992 to 2009.



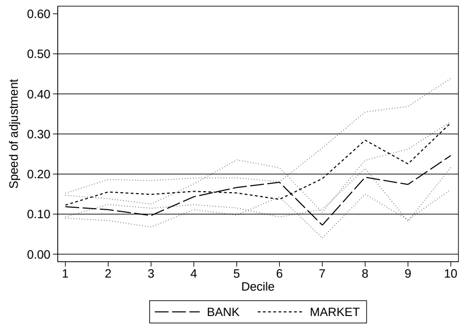

**(A)** Absolute financing deficit (book leverage)



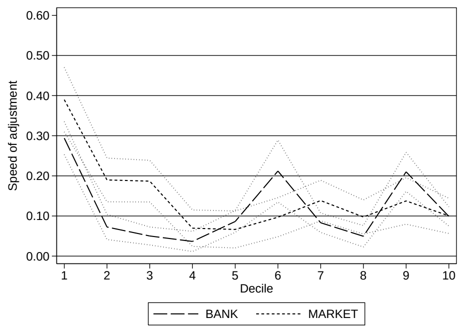

**(B)** Absolute financing deficit (market leverage)



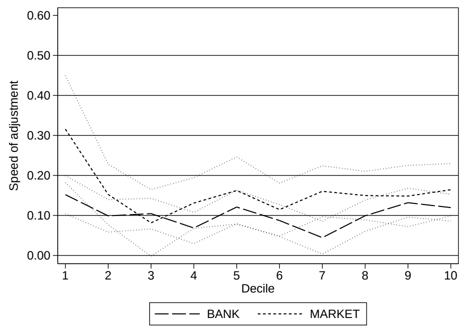

**(C)** Positive financing deficit (book leverage)




**(D)** Positive financing deficit (market leverage)




**(E)** Negative financing deficit (book leverage)




**(F)** Negative financing deficit (market leverage)

**Figure II** – Speed of adjustment and financing deficit
This figure shows the speed of adjustment conditional on the mean financing deficit ($DEF$). Using the Compustat Global data item notation, the financing deficit is calculated as the change in net debt ($\Delta(LT + PSTK - TXDI - DCVT)/AT$), plus the change in net equity ($\Delta(AT - LT - PSTK + TXDI + DCVT)/AT$), minus the change in retained earnings ($\Delta RE/AT$). Panels A and B use the mean of the absolute values of the financing deficit, Panels C and D only firm-years with positive deficits, and Panels E and F only firm-years with negative deficits. Firms are sorted into deciles according to their mean financing deficit during the full sample period, where 1 (10) denotes the decile with the lowest (highest) financing deficit. Estimation is performed decile-wise using the DPF-estimator (see section 3): $L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. The data cover the period from 1992 to 2009. The estimates for both the speed of adjustment and the 95% confidence intervals are shown for bank- and market-based countries.

**Table I** – Leverage in the G-7 countries

| | | $BL$ | $\Delta BL$ | $ML$ | $\Delta ML$ |
|---|---|---|---|---|---|
| Canada | | | | | |
| | Mean | 0.468 | 0.096 | 0.341 | 0.051 |
| | S.D. | 0.265 | 0.620 | 0.250 | 0.511 |
| | N | 5494 | 3460 | 4770 | 2849 |
| Germany | | | | | |
| | Mean | 0.612 | 0.046 | 0.497 | 0.078 |
| | S.D. | 0.238 | 0.494 | 0.254 | 0.426 |
| | N | 8507 | 7081 | 6938 | 5659 |
| France | | | | | |
| | Mean | 0.636 | 0.014 | 0.509 | 0.028 |
| | S.D. | 0.223 | 0.255 | 0.236 | 0.243 |
| | N | 8049 | 6489 | 6606 | 5233 |
| United Kingdom | | | | | |
| | Mean | 0.547 | 0.085 | 0.382 | 0.084 |
| | S.D. | 0.282 | 0.618 | 0.229 | 0.464 |
| | N | 18 882 | 14 625 | 16 562 | 12 426 |
| Italy | | | | | |
| | Mean | 0.651 | 0.012 | 0.552 | 0.033 |
| | S.D. | 0.202 | 0.219 | 0.241 | 0.234 |
| | N | 2446 | 1904 | 2038 | 1570 |
| Japan | | | | | |
| | Mean | 0.579 | 0.001 | 0.549 | 0.028 |
| | S.D. | 0.217 | 0.186 | 0.229 | 0.236 |
| | N | 45 953 | 41 859 | 43 099 | 39 031 |
| United States | | | | | |
| | Mean | 0.530 | 0.069 | 0.342 | 0.044 |
| | S.D. | 0.319 | 0.603 | 0.252 | 0.389 |
| | N | 43 266 | 30 047 | 39 716 | 27 124 |
| Full sample | | | | | |
| | Mean | 0.561 | 0.039 | 0.444 | 0.044 |
| | S.D. | 0.270 | 0.453 | 0.258 | 0.345 |
| | N | 132 597 | 105 465 | 119 729 | 93 892 |

This table shows summary statistics of book ($BL$) and market ($ML$) leverage in terms of mean, standard deviation (S.D.), and number of observations (N). $\Delta BL$ and $\Delta ML$ denote yearly percentage changes. The sample covers the G-7 countries over the time period from 1992 to 2009. Using the Compustat Global data item notation, book leverage is defined as book debt relative to total assets ($(LT_t + PSTK_t - TXDI_t - DCVT_t)/AT_t$), and market leverage is defined as book debt relative to book debt plus the market value of equity ($(LT_t + PSTK_t - TXDI_t - DCVT_t)/(MKVAL + LT_t + PSTK_t - TXDI_t)$).

**Table II** – Firm-level variables

| | N | Mean | Median | S.D. | Minimum | Maximum |
|---|---|---|---|---|---|---|
| $EBIT$ | 111 033 | 0.023 | 0.038 | 0.150 | −1.198 | 0.334 |
| $MB$ | 117 341 | 1.575 | 1.197 | 1.147 | 0.521 | 10.911 |
| $DEP$ | 107 542 | 0.031 | 0.025 | 0.034 | 0.000 | 0.209 |
| $SIZE$ | 130 026 | 5.670 | 5.676 | 1.885 | −1.097 | 10.348 |
| $TANG$ | 132 608 | 0.290 | 0.255 | 0.208 | 0.002 | 0.908 |
| $R\&D$ | 134 052 | 0.025 | 0.000 | 0.061 | 0.000 | 0.568 |
| $NO\_R\&D$ | 134 052 | 0.494 | 0.000 | 0.500 | 0.000 | 1.000 |
| $INDMED$ | 137 692 | 0.447 | 0.458 | 0.160 | 0.032 | 0.918 |
| $DEF$ | 123 650 | 0.217 | 0.019 | 10.623 | −37.332 | 2906.981 |

This table shows summary statistics of all firm-level variables. The standard capital structure variables are: profitability ($EBIT$), market-to-book ratio ($MB$), depreciation ($DEP$), size ($SIZE$), tangibility ($TANG$), research and development expenditures ($R\&D$), and the median industry leverage ($INDMED$). Using the Compustat Global data item notation, $EBIT$ is income before extraordinary items plus interest expenses plus income taxes over total assets ($(IB + XINT + TXT)/AT$); $MB$ is market value of equity over total assets ($(MKVAL + LT + PSTK - TXDI)/AT$); $DEP$ is depreciation over total assets ($DP/AT$); $SIZE$ is the natural logarithm of net sales measured in 2000 U.S. dollars (deflated by the U.S. consumer price index; $ln(SALE)$); $TANG$ is property, plant, and equipment over total assets ($PPENT/AT$); research and development expenditures ($R\&D$) are R&D expenditures divided by total assets ($XRD/AT$), and the $NO\_R\&D$ dummy variable is set equal to one if the firm has no R&D data (and zero otherwise). The industry median market leverage ($INDMED$) is based on the industry classification of Fama and French (1997). $DEF$ is the financing deficit, defined as the change in net debt ($\Delta(LT + PSTK - TXDI - DCVT)/AT$), plus the change in net equity ($\Delta(AT - LT - PSTK + TXDI + DCVT)/AT$), minus the change in retained earnings $\Delta(RE/AT)$. The data cover the period from 1992 to 2009. S.D. denotes the standard deviation and N the number of firm-year observations.

**Table III** – Macroeconomic variables

Panel A: Summary statistics

| | $REC1$ | $CREDIT$ | $TERM$ | $TED$ | $GDP$ | $INF$ | $ERP$ |
|---|---|---|---|---|---|---|---|
| Bank-based system: | | | | | | | |
| Mean | 0.212 | 1.023 | 1.322 | 0.178 | 0.948 | 0.534 | 0.177 |
| Median | 0.000 | 0.870 | 1.336 | 0.084 | 1.584 | 0.299 | −0.753 |
| S.D. | 0.409 | 0.580 | 0.630 | 0.385 | 2.734 | 1.187 | 26.530 |
| Kurtosis | 2.989 | 10.223 | 4.718 | 13.323 | 6.791 | 3.232 | 1.962 |
| Skewness | 1.410 | 2.718 | −0.014 | 2.419 | −1.755 | 0.600 | 0.227 |
| Minimum | 0.000 | 0.540 | −4.030 | −1.240 | −8.670 | −1.629 | −52.850 |
| Maximum | 1.000 | 3.380 | 3.533 | 4.420 | 6.033 | 6.473 | 66.022 |
| Market-based system: | | | | | | | |
| Mean | 0.038 | 0.967 | 1.374 | 0.412 | 2.529 | 2.491 | 4.985 |
| Median | 0.000 | 0.850 | 1.237 | 0.273 | 2.727 | 2.572 | 7.098 |
| S.D. | 0.191 | 0.527 | 1.418 | 0.532 | 2.076 | 1.129 | 18.084 |
| Kurtosis | 24.430 | 15.551 | 1.878 | 11.426 | 5.392 | 19.988 | 2.667 |
| Skewness | 4.840 | 3.459 | −0.002 | 2.637 | −1.216 | 2.007 | −0.450 |
| Minimum | 0.000 | 0.540 | −2.182 | −1.240 | −5.890 | −0.433 | −42.952 |
| Maximum | 1.000 | 3.380 | 4.054 | 4.126 | 7.073 | 18.742 | 57.303 |
| Full sample: | | | | | | | |
| Mean | 0.120 | 0.994 | 1.349 | 0.299 | 1.762 | 1.542 | 2.621 |
| Median | 0.000 | 0.870 | 1.320 | 0.201 | 2.302 | 1.667 | 3.233 |
| S.D. | 0.325 | 0.554 | 1.109 | 0.481 | 2.543 | 1.515 | 22.760 |
| Kurtosis | 6.456 | 12.541 | 2.832 | 12.933 | 7.116 | 6.097 | 2.265 |
| Skewness | 2.336 | 3.060 | 0.043 | 2.653 | −1.628 | 0.494 | −0.054 |
| Minimum | 0.000 | 0.540 | −4.030 | −1.240 | −8.670 | −1.629 | −52.850 |
| Maximum | 1.000 | 3.380 | 4.054 | 4.420 | 7.073 | 18.742 | 66.022 |

Panel B: Correlation matrix

| | $REC$ | $CREDIT$ | $TERM$ | $TED$ | $GDP$ | $INF$ | $ERP$ |
|---|---|---|---|---|---|---|---|
| $REC$ | 1 | | | | | | |
| $CREDIT$ | 0.480*** | 1 | | | | | |
| $TERM$ | 0.006* | 0.075*** | 1 | | | | |
| $TED$ | 0.352*** | 0.532*** | −0.030*** | 1 | | | |
| $GDP$ | −0.579*** | −0.673*** | −0.162*** | −0.248*** | 1 | | |
| $INF$ | −0.146*** | 0.092*** | −0.005 | 0.457*** | 0.055*** | 1 | |
| $ERP$ | −0.589*** | −0.500*** | 0.045*** | −0.339*** | 0.505*** | −0.102*** | 1 |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows summary statistics and the correlation matrix of all macroeconomic variables. The recession dummy variable ($REC1$) is set equal to one if a firm's full fiscal year overlaps with a recession, and zero otherwise. Business cycle data is taken from the Economic Cycle Research Institute. The U.S. default spread ($CREDIT$; defined as the difference between the yield on Moody's Baa-rated and Aaa-rated corporate bonds), the U.S. term spread ($TERM$; defined as the difference between the yield on the 10-year Treasury bond and the yield on the 3-month Treasury bill), the TED spread ($TED$; defined as the difference between the Euribor rate and the yield on the 3-month Treasury bill), and the GDP growth rate ($GDP$) for each country in the sample are taken as alternative business cycle indicators. The inflation rate ($INF$), measured as the percentage change in a country's consumer price index, and a proxy for the equity risk premium ($ERP$), calculated as the prior 12-month mean stock market return, are used to analyze market timing considerations. The stock market indexes are: S&P 500 for the United States, FTSE All-Share for the United Kingdom, Toronto SE 300 for Canada, SBF 250 for France, Nikkei 225 for Japan, BIC All-Share for Italy, and CDAX for Germany. The data cover the period from 1992 to 2009. S.D. denotes the standard deviation. The asterisks for correlations denote a statistically significant difference from zero. This statistic is calculated as: $2 * \tilde{t}(n-2, |\hat{\rho}|\sqrt{(n-2)}/\sqrt{(1-\hat{\rho}^2)})$.

**Table IV** – Comparison of dynamic panel estimators for the speed of adjustment (book leverage)

| | OLS | FE | AB | BB | LSDV | DPF | LD4 | LD |
|---|---|---|---|---|---|---|---|---|
| *LBL* | 0.911*** | 0.619*** | 0.856*** | 1.015*** | 0.762 | 0.788*** | 0.843*** | 0.587*** |
| | (115.381) | (175.230) | (39.853) | (59.995) | | (214.445) | (70.891) | (27.219) |
| SOA (= 1 − *LBL*) | 8.9% | 38.1% | 14.4% | −1.5% | 23.8% | 21.2% | 15.7% | 41.3% |
| | | | | | | | | |
| *EBIT* | −0.093*** | −0.095*** | 0.240*** | 0.266*** | −0.073 | −0.018*** | −0.085*** | −0.191*** |
| | (−9.306) | (−20.904) | (25.497) | (18.194) | | (−4.260) | (−5.497) | (−6.798) |
| *MB* | −0.002 | −0.007*** | −0.012*** | −0.010*** | −0.007 | −0.007*** | −0.004** | 0.009** |
| | (−1.697) | (−11.908) | (−15.606) | (−6.755) | | (−14.493) | (−3.161) | (2.961) |
| *DEP* | 0.095** | −0.051 | −0.074 | −0.047 | −0.113 | −0.208*** | −0.028 | 0.726*** |
| | (3.028) | (−1.752) | (−1.606) | (−0.659) | | (−7.851) | (−0.341) | (10.343) |
| *SIZE* | 0.001* | 0.006*** | −0.039*** | −0.042*** | 0.003 | −0.000 | −0.001 | −0.003** |
| | (2.080) | (6.640) | (−16.109) | (−11.625) | | (−0.100) | (−0.294) | (−2.596) |
| *TANG* | −0.003 | 0.030*** | 0.022 | 0.026 | 0.022 | 0.028*** | 0.029* | −0.011 |
| | (−0.967) | (4.862) | (1.863) | (1.467) | | (5.195) | (2.426) | (−1.279) |
| *NO_R&D* | 0.009*** | 0.004* | −0.001 | 0.003 | 0.004 | 0.004** | −0.001 | −0.004 |
| | (5.366) | (2.349) | (−0.377) | (0.789) | | (2.847) | (−0.487) | (−1.200) |
| *R&D* | 0.001 | 0.090*** | 0.099*** | 0.057 | 0.076 | 0.018 | −0.030 | 0.043 |
| | (0.070) | (5.607) | (3.986) | (1.129) | | (1.305) | (−0.621) | (0.630) |
| *INDMED* | 0.011** | 0.025** | −0.011 | −0.025 | 0.016 | 0.011 | −0.003 | −0.018 |
| | (2.729) | (3.099) | (−0.798) | (−1.739) | | (1.554) | (−0.288) | (−1.582) |
| N | 74 482 | 74 482 | 56 949 | 74 482 | 74 482 | 74 482 | 26 943 | 33 507 |

*t*-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows a comparison of dynamic panel estimators for the speed of adjustment. Book leverage is the dependent variable. Table II contains an explanation of the independent variables. *LBL* denotes lagged book leverage, and SOA is the speed of adjustment per year. OLS is the ordinary least squares estimator; FE the fixed effects estimator; AB the Arellano-Bond difference GMM-estimator; BB the Blundell-Bond system GMM-estimator; LSDV the least squares dummy variable correction, for which standard errors cannot be calculated; DPF the dynamic panel with fractional dependent variable estimator; LD4 the longest lag estimator using lag 4; LD the longest difference estimator with the longest lag. All estimators are described in section 3. Time dummy variables, constants, initial leverage, and mean exogenous variables are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table V** – Comparison of dynamic panel estimators for the speed of adjustment (market leverage)

| | OLS | FE | AB | BB | LSDV | DPF | LD4 | LD |
|---|---|---|---|---|---|---|---|---|
| *LML* | 0.895*** | 0.562*** | 0.873*** | 1.062*** | 0.717 | 0.846*** | 0.932*** | 0.439*** |
| | (233.067) | (149.992) | (44.702) | (77.996) | | (179.518) | (105.789) | (27.631) |
| SOA (= 1 − *LBL*) | 10.5% | 43.8% | 12.7% | −6.2% | 28.3% | 15.4% | 6.8% | 56.1% |
| *EBIT* | −0.029 | −0.056*** | 0.181*** | 0.174*** | −0.032 | 0.026*** | −0.026 | −0.144*** |
| | (−1.690) | (−13.246) | (23.689) | (14.765) | | (5.951) | (−1.828) | (−5.144) |
| *MB* | 0.004** | −0.002*** | 0.043*** | 0.049*** | 0.004 | 0.014*** | 0.015*** | −0.065*** |
| | (3.082) | (−4.015) | (32.389) | (27.465) | | (23.943) | (10.312) | (−13.814) |
| *DEP* | −0.204* | −0.216*** | −0.116* | −0.585*** | −0.224 | −0.272*** | −0.086 | −0.147 |
| | (−2.156) | (−7.866) | (−2.485) | (−9.633) | | (−9.600) | (−1.117) | (−1.441) |
| *SIZE* | 0.000 | 0.023*** | 0.015*** | 0.006* | 0.018 | 0.015*** | 0.012*** | −0.009*** |
| | (0.285) | (26.683) | (6.900) | (2.231) | | (17.175) | (3.627) | (−6.048) |
| *TANG* | 0.005 | 0.014* | −0.033** | −0.035* | 0.001 | −0.004 | −0.013 | −0.006 |
| | (0.581) | (2.402) | (−2.776) | (−2.303) | | (−0.618) | (−1.111) | (−0.454) |
| *NO_R&D* | 0.010*** | 0.005** | 0.002 | −0.005 | 0.008 | 0.008*** | 0.011*** | −0.003 |
| | (4.356) | (2.993) | (0.774) | (−1.141) | | (4.703) | (4.387) | (−0.651) |
| *R&D* | −0.113*** | −0.011 | 0.148*** | 0.098** | 0.012 | 0.003 | 0.014 | 0.187** |
| | (−4.991) | (−0.739) | (5.912) | (2.750) | | (0.232) | (0.320) | (2.603) |
| *INDMED* | 0.024* | 0.021** | −0.140*** | −0.167*** | 0.001 | −0.033** | −0.057*** | 0.140*** |
| | (2.366) | (2.652) | (−9.448) | (−10.076) | | (−4.227) | (−4.744) | (7.735) |
| N | 74 919 | 74 919 | 57 284 | 74 919 | 74 919 | 74 919 | 27 052 | 20 576 |

*t*-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows a comparison of dynamic panel estimators for the speed of adjustment. Market leverage is the dependent variable. Table II contains an explanation of the independent variables. *LML* denotes lagged book leverage, and SOA is the speed of adjustment per year. OLS is the ordinary least squares estimator; FE the fixed effects estimator; AB the Arellano-Bond difference GMM-estimator; BB the Blundell-Bond system GMM-estimator; LSDV the least squares dummy variable correction, for which standard errors cannot be calculated; DPF the dynamic panel with fractional dependent variable estimator; LD4 the longest lag estimator using lag 4; LD the longest difference estimator with the longest lag. All estimators are described in section 3. Time dummy variables, constants, initial leverage, and mean exogenous variables are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table VI** – Speed of adjustment across countries (book leverage)

| | Canada | UK | USA | Germany | France | Italy | Japan | Market-based | Bank-based | Δ |
|---|---|---|---|---|---|---|---|---|---|---|
| *LBL* | 0.732*** | 0.734*** | 0.788*** | 0.789*** | 0.774*** | 0.920*** | 0.851*** | 0.775*** | 0.824*** | 0.773*** |
| | (36.313) | (74.849) | (135.788) | (56.449) | (64.471) | (41.671) | (105.293) | (159.968) | (149.999) | (202.972) |
| SOA ($= 1 - LBL$) | 26.8% | 26.6% | 21.2% | 21.1% | 22.6% | 8.0% | 14.9% | 22.5% | 17.6% | 22.7% |
| *EBIT* | 0.002 | −0.003 | −0.049*** | −0.054*** | −0.024 | 0.168*** | 0.062*** | −0.029*** | 0.018** | −0.019*** |
| | (0.076) | (−0.271) | (−6.363) | (−3.332) | (−1.401) | (4.027) | (7.975) | (−4.790) | (2.875) | (−4.625) |
| *MB* | −0.006 | −0.010*** | −0.009*** | −0.000 | −0.003 | 0.006 | −0.007*** | −0.009*** | −0.004*** | −0.007*** |
| | (−1.776) | (−6.637) | (−9.778) | (−0.179) | (−1.666) | (1.237) | (−9.567) | (−12.503) | (−5.592) | (−14.589) |
| *DEP* | −0.165 | −0.174** | −0.401*** | −0.117 | 0.025 | 0.020 | −96.018** | −0.269*** | −0.063 | −0.199*** |
| | (−1.202) | (−2.694) | (−7.218) | (−1.653) | (0.338) | (0.117) | (−2.671) | (−6.722) | (−1.761) | (−7.511) |
| *SIZE* | 0.007 | 0.002 | 0.002 | 0.002 | 0.007* | −0.014* | −0.012*** | 0.001 | −0.004*** | 0.001 |
| | (1.660) | (0.976) | (1.266) | (0.791) | (2.332) | (−2.500) | (−7.936) | (0.773) | (−3.620) | (1.043) |
| *TANG* | −0.030 | −0.010 | 0.061*** | 0.020 | 0.019 | 0.003 | 0.057*** | 0.022* | 0.045*** | 0.026*** |
| | (−0.988) | (−0.720) | (4.964) | (0.940) | (0.772) | (0.078) | (7.867) | (2.533) | (6.875) | (4.747) |
| *NO_R&D* | −0.004 | 0.013* | −0.007 | −0.015** | −0.008 | 0.011 | 0.005** | 0.003 | 0.001 | 0.004** |
| | (−0.292) | (2.536) | (−1.353) | (−2.577) | (−1.452) | (1.074) | (2.879) | (0.827) | (0.661) | (2.800) |
| *R&D* | −0.294*** | 0.079* | 0.020 | −0.166* | −0.117 | 0.142 | 0.211*** | 0.026 | 0.012 | 0.021 |
| | (−3.626) | (1.995) | (0.886) | (−2.572) | (−1.862) | (0.744) | (5.364) | (1.376) | (0.446) | (1.530) |
| *INDMED* | 0.178*** | −0.006 | 0.044** | −0.029 | −0.077** | 0.034 | 0.007 | 0.041** | −0.015* | 0.013 |
| | (3.670) | (−0.264) | (2.700) | (−1.155) | (−3.077) | (0.882) | (0.810) | (3.185) | (−2.061) | (1.893) |
| *LBL*×*Bank* | | | | | | | | | | 0.031*** |
| | | | | | | | | | | (15.989) |
| N | 1978 | 10340 | 21553 | 5030 | 4724 | 1473 | 29384 | 33871 | 40611 | 74482 |

$t$-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimated adjustment speeds across different countries and capital market systems. All estimates are obtained by using the DPF-estimator (see section 3): $L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. Book leverage is the dependent variable. Table II contains an explanation of the independent variables. *LBL* denotes lagged book leverage, and SOA is the speed of adjustment. In the last column (labeled Δ), *LBL*×*Bank* is an interaction variable between lagged book leverage and the financial system. The *Bank* dummy variable is set equal to one when the financial system is bank-based (and zero otherwise). Time dummy variables, constants, initial leverage, and mean exogenous variables are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table VII** – Speed of adjustment across countries (market leverage)

| | Canada | UK | USA | Germany | France | Italy | Japan | Market-based | Bank-based | $\Delta$ |
|---|---|---|---|---|---|---|---|---|---|---|
| $LML$ | 0.775*** | 0.797*** | 0.849*** | 0.757*** | 0.860*** | 0.895*** | 0.912*** | 0.834*** | 0.890*** | 0.830*** |
| | (33.121) | (68.825) | (130.894) | (41.180) | (84.596) | (49.675) | (270.621) | (151.442) | (100.556) | (172.366) |
| SOA (= $1 - LML$) | 22.3% | 20.3% | 15.1% | 24.3% | 14.0% | 10.5% | 8.8% | 16.6% | 11.0% | 17.0% |
| $EBIT$ | −0.008 | 0.041*** | −0.005 | −0.036 | 0.030 | 0.107* | 0.138*** | 0.013* | 0.078*** | 0.024*** |
| | (−0.314) | (4.136) | (−0.752) | (−1.938) | (1.532) | (2.279) | (15.036) | (2.332) | (9.806) | (5.345) |
| $MB$ | 0.007* | 0.010*** | 0.010*** | 0.013*** | 0.023*** | 0.039*** | 0.022*** | 0.009*** | 0.024*** | 0.014*** |
| | (2.000) | (6.189) | (11.391) | (5.359) | (9.329) | (6.304) | (21.501) | (12.667) | (22.735) | (23.562) |
| $DEP$ | −0.395** | −0.366*** | −0.537*** | −0.149 | −0.144 | 0.121 | −46.208 | −0.439*** | 0.065 | −0.263*** |
| | (−2.825) | (−5.740) | (−10.546) | (−1.853) | (−1.647) | (0.610) | (−0.992) | (−11.527) | (1.432) | (−9.285) |
| $SIZE$ | 0.011** | 0.017*** | 0.012*** | 0.018*** | 0.024*** | 0.001 | 0.019*** | 0.011*** | 0.019*** | 0.016*** |
| | (2.699) | (7.417) | (8.424) | (5.409) | (7.359) | (0.101) | (10.017) | (9.613) | (13.950) | (18.341) |
| $TANG$ | 0.008 | 0.001 | 0.049*** | 0.034 | −0.009 | −0.028 | −0.010 | 0.017 | −0.021* | −0.007 |
| | (0.262) | (0.081) | (4.357) | (1.397) | (−0.328) | (−0.680) | (−1.129) | (1.956) | (−2.526) | (−1.271) |
| $NO\_R\&D$ | 0.025 | 0.008 | −0.012* | −0.014* | 0.002 | 0.017 | 0.006** | −0.003 | 0.007*** | 0.008*** |
| | (1.610) | (1.441) | (−2.480) | (−2.192) | (0.257) | (1.432) | (3.102) | (−0.993) | (4.038) | (5.031) |
| $R\&D$ | −0.230** | 0.053 | −0.021 | −0.123 | −0.006 | 0.078 | 0.128** | 0.002 | 0.031 | 0.005 |
| | (−2.839) | (1.376) | (−0.988) | (−1.672) | (−0.087) | (0.344) | (2.587) | (0.094) | (0.939) | (0.320) |
| $INDMED$ | 0.128* | 0.019 | −0.006 | −0.081** | −0.017 | 0.101* | −0.034** | 0.018 | −0.056*** | −0.030*** |
| | (2.568) | (0.814) | (−0.409) | (−2.836) | (−0.575) | (2.225) | (−3.252) | (1.415) | (−5.874) | (−3.909) |
| $LML \times Bank$ | | | | | | | | | | 0.029*** |
| | | | | | | | | | | (15.580) |
| N | 1995 | 10441 | 21880 | 5022 | 4725 | 1475 | 29381 | 34316 | 40603 | 74919 |

$t$-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimated adjustment speeds across different countries and capital market systems. All estimates are obtained by using the DPF-estimator (see section 3): $L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. Market leverage is the dependent variable. Table II contains an explanation of the independent variables. $LBL$ denotes lagged market leverage, and SOA is the speed of adjustment. In the last column (labeled $\Delta$), $LML \times Bank$ is an interaction variable between lagged market leverage and the financial system. The $Bank$ dummy variable is set equal to one when the financial system is bank-based (and zero otherwise). Time dummy variables, constants, initial leverage, and mean exogenous variables are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table VIII** – Speed of adjustment and target leverage deviation

| | Book leverage | | Market leverage | |
|---|---|---|---|---|
| | Market-based | Bank-based | Market-based | Bank-based |
| Panel A: Highly over-leveraged firms | | | | |
| $LBL/LML$ | 0.412*** | 0.478*** | 0.600*** | 0.687*** |
| | (34.723) | (61.993) | (38.135) | (67.862) |
| SOA ($= 1 - LBL/LML$) | 58.8% | 52.2% | 40.0% | 31.3% |
| N | 8006 | 21838 | 7807 | 18891 |
| Panel B: Over-leveraged firms | | | | |
| $LBL/LML$ | 0.486*** | 0.599*** | 0.555*** | 0.626*** |
| | (41.588) | (77.626) | (40.513) | (72.365) |
| SOA ($= 1 - LBL/LML$) | 51.4% | 40.1% | 44.5% | 37.4% |
| N | 9527 | 22517 | 8975 | 21913 |
| Panel C: At target firms | | | | |
| $LBL/LML$ | 0.509*** | 0.589*** | 0.547*** | 0.623*** |
| | (44.797) | (77.229) | (42.049) | (76.002) |
| SOA ($= 1 - LBL/LML$) | 49.1% | 41.1% | 45.3% | 37.7% |
| N | 9885 | 23448 | 9568 | 22386 |
| Panel D: Under-leveraged firms | | | | |
| $LBL/LML$ | 0.493*** | 0.586*** | 0.505*** | 0.600*** |
| | (43.738) | (76.003) | (37.070) | (72.035) |
| SOA ($= 1 - LBL/LML$) | 50.7% | 41.4% | 49.5% | 40.0% |
| N | 10585 | 22975 | 9471 | 21877 |
| Panel E: Highly under-leveraged firms | | | | |
| $LBL/LML$ | 0.451*** | 0.609*** | 0.570*** | 0.609*** |
| | (36.283) | (71.719) | (43.191) | (71.876) |
| SOA ($= 1 - LBL/LML$) | 54.9% | 39.1% | 43.0% | 39.1% |
| N | 9812 | 21509 | 10159 | 23634 |

$t$-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimated adjustment speeds for the groups of under- and over-leveraged firms using an event-study approach. In a first step, we compute the target leverage ratio in each firm-year by using the estimated coefficients of the fixed effect regression in Table IV for book leverage and in Table V for market leverage. In a second step, we calculate the deviation from the target leverage ratio by subtracting the observed leverage ratio and classify firms into leverage quintiles (highly over-leveraged, over-leveraged, at target, under-leveraged, and highly under-leveraged firms) in each given year. Finally, the conditional speed of adjustment after a deviation is measured by using (for each event firm and each event year, if available) the year preceding the event year ($t = -1$) as the initial observation of the dynamic leverage process, the event year ($t = 0$), and the subsequent 5 ($t = +1$ to $t = +5$) observations as input for the DPF-estimator (see section 3): $L_{i,t} = (1 - \lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. All variables except the coefficients on the lagged leverage ratio ($LBL$ or $LML$ for book leverage and market leverage, respectively) are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table IX** – Speed of adjustment and absolute financing deficit (book leverage)

| | Market-based | | | | Bank-based | | | |
|---|---|---|---|---|---|---|---|---|
| | Q1 (low deficit) | Q2 | Q3 | Q4 (high deficit) | Q1 (low deficit) | Q2 | Q3 | Q4 (high deficit) |
| Panel A: Highly over-leveraged firms | | | | | | | | |
| $LBL$ | 0.486*** | 0.525*** | 0.473*** | 0.322*** | 0.553*** | 0.536*** | 0.536*** | 0.428*** |
| | (17.368) | (20.186) | (20.144) | (15.102) | (30.158) | (30.479) | (34.399) | (31.931) |
| SOA ($= 1 - LBL$) | 51.4% | 47.5% | 52.7% | 67.8% | 44.7% | 46.4% | 46.4% | 57.2% |
| N | 1565 | 1830 | 2195 | 2293 | 4617 | 4937 | 5961 | 6315 |
| Panel B: Over-leveraged firms | | | | | | | | |
| $LBL$ | 0.633*** | 0.496*** | 0.591*** | 0.368*** | 0.622*** | 0.670*** | 0.634*** | 0.532*** |
| | (25.082) | (20.007) | (26.962) | (14.884) | (42.660) | (44.880) | (41.022) | (32.819) |
| SOA ($= 1 - LBL$) | 36.7% | 50.4% | 40.9% | 63.2% | 37.8% | 33.0% | 36.6% | 66.8% |
| N | 2228 | 2463 | 2728 | 1963 | 5503 | 5819 | 6218 | 4972 |
| Panel C: At target firms | | | | | | | | |
| $LBL$ | 0.616*** | 0.549*** | 0.548*** | 0.421*** | 0.654*** | 0.625*** | 0.605*** | 0.535*** |
| | (26.683) | (26.191) | (24.533) | (16.632) | (42.358) | (41.249) | (41.611) | (32.542) |
| SOA ($= 1 - LBL$) | 38.4% | 45.1% | 45.2% | 57.9% | 34.6% | 37.5% | 39.5% | 46.5% |
| N | 2737 | 2784 | 2862 | 1395 | 6235 | 6232 | 6200 | 4771 |
| Panel D: Under-leveraged firms | | | | | | | | |
| $LBL$ | 0.556*** | 0.576*** | 0.494*** | 0.371*** | 0.603*** | 0.577*** | 0.634*** | 0.537*** |
| | (25.809) | (27.633) | (22.250) | (12.334) | (42.632) | (39.670) | (38.815) | (30.735) |
| SOA ($= 1 - LBL$) | 44.4% | 42.4% | 50.6% | 62.9% | 39.7% | 42.3% | 36.6% | 46.3% |
| N | 3240 | 3331 | 2673 | 1255 | 6569 | 6680 | 5699 | 4027 |
| Panel E: Highly under-leveraged firms | | | | | | | | |
| $LBL$ | 0.366*** | 0.577*** | 0.531*** | 0.426*** | 0.616*** | 0.669*** | 0.665*** | 0.475*** |
| | (17.735) | (21.594) | (17.784) | (16.231) | (46.578) | (43.356) | (36.249) | (20.288) |
| SOA ($= 1 - LBL$) | 63.4% | 42.3% | 46.9% | 57.4% | 48.4% | 33.1% | 33.5% | 52.5% |
| N | 3431 | 2565 | 1809 | 1912 | 7694 | 6449 | 4680 | 2686 |

$t$-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimated adjustment speeds for intersections of absolute financing deficit quartiles and target book leverage deviation quintiles. The conditional estimates of adjustment speed are based on the event-study approach, using (for each event firm and each event year, if available) the year preceding the event year ($t = -1$) as the initial observation of the dynamic leverage process, the event year ($t = 0$), and the subsequent 5 ($t = +1$ to $t = +5$) observations as input for the DPF-estimator (see section 3): $L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. All variables except the coefficients on the lagged book leverage ratio ($LBL$) are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table X** – Speed of adjustment and absolute financing deficit (market leverage)

| | Market-based | | | | Bank-based | | | |
|---|---|---|---|---|---|---|---|---|
| | Q1 (low deficit) | Q2 | Q3 | Q4 (high deficit) | Q1 (low deficit) | Q2 | Q3 | Q4 (high deficit) |
| Panel A: Highly over-leveraged firms | | | | | | | | |
| $LML$ | 0.646*** | 0.575*** | 0.606*** | 0.572*** | 0.760*** | 0.754*** | 0.739*** | 0.615*** |
| | (18.949) | (17.819) | (19.966) | (18.434) | (33.955) | (36.705) | (49.456) | (32.376) |
| SOA $(= 1 - LML)$ | 35.4% | 42.5% | 39.4% | 42.8% | 24.0% | 24.6% | 26.1% | 38.5% |
| N | 1856 | 1992 | 2304 | 1586 | 4139 | 4463 | 5141 | 5143 |
| Panel B: Over-leveraged firms | | | | | | | | |
| $LML$ | 0.612*** | 0.605*** | 0.538*** | 0.488*** | 0.666*** | 0.695*** | 0.658*** | 0.536*** |
| | (22.365) | (22.115) | (18.533) | (17.509) | (38.530) | (40.083) | (37.258) | (29.379) |
| SOA $(= 1 - LML)$ | 38.2% | 39.5% | 46.2% | 51.2% | 33.4% | 30.5% | 34.2% | 46.4% |
| N | 2197 | 2322 | 2225 | 2086 | 5421 | 5919 | 5905 | 4663 |
| Panel C: At target firms | | | | | | | | |
| $LML$ | 0.484*** | 0.606*** | 0.583*** | 0.530*** | 0.636*** | 0.649*** | 0.658*** | 0.575*** |
| | (18.536) | (23.634) | (21.864) | (19.949) | (39.229) | (38.182) | (40.327) | (33.141) |
| SOA $(= 1 - LML)$ | 51.6% | 39.4% | 41.7% | 47.0% | 36.4% | 35.1% | 34.2% | 42.5% |
| N | 2265 | 2530 | 2447 | 2255 | 5733 | 6041 | 5882 | 4720 |
| Panel D: Under-leveraged firms | | | | | | | | |
| $LML$ | 0.545*** | 0.511*** | 0.501*** | 0.468*** | 0.626*** | 0.623*** | 0.593*** | 0.563*** |
| | (20.302) | (19.404) | (18.068) | (15.497) | (38.947) | (37.356) | (35.194) | (32.278) |
| SOA $(= 1 - LML)$ | 45.5% | 48.9% | 49.9% | 53.2% | 37.4% | 37.7% | 40.7% | 43.7% |
| N | 2606 | 2544 | 2324 | 1949 | 6010 | 5610 | 5379 | 4878 |
| Panel E: Highly under-leveraged firms | | | | | | | | |
| $LML$ | 0.644*** | 0.539*** | 0.614*** | 0.519*** | 0.617*** | 0.661*** | 0.628*** | 0.531*** |
| | (27.275) | (20.561) | (22.190) | (15.887) | (41.055) | (41.760) | (35.050) | (27.573) |
| SOA $(= 1 - LML)$ | 35.6% | 46.1% | 38.6% | 48.1% | 38.3% | 33.9% | 37.2% | 46.9% |
| N | 3334 | 2771 | 2426 | 1547 | 7501 | 6553 | 5206 | 4374 |

$t$-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimated adjustment speeds for intersections of absolute financing deficit quartiles and target market leverage deviation quintiles. The conditional estimates of adjustment speed are based on the event-study approach, using (for each event firm and each event year, if available) the year preceding the event year ($t = -1$) as the initial observation of the dynamic leverage process, the event year ($t = 0$), and the subsequent 5 ($t = +1$ to $t = +5$) observations as input for the DPF-estimator (see section 3): $L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. All variables except the coefficients on the lagged market leverage ratio ($LML$) are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table XI** – Speed of adjustment and financial constraints (book leverage)

| | Market-based | | Bank-based | |
|---|---|---|---|---|
| | Constrained | Unconstrained | Constrained | Unconstrained |
| | Panel A: Highly over-leveraged firms | | | |
| $LBL$ | 0.297*** | 0.456*** | 0.533*** | 0.465*** |
| | (11.407) | (33.986) | (28.696) | (54.929) |
| SOA $(= 1 - LBL)$ | 70.3% | 54.4% | 46.7% | 53.5% |
| N | 1251 | 6210 | 4164 | 16760 |
| | Panel B: Over-leveraged firms | | | |
| $LBL$ | 0.411*** | 0.497*** | 0.573*** | 0.597*** |
| | (15.059) | (38.225) | (27.574) | (70.924) |
| SOA $(= 1 - LBL)$ | 58.9% | 50.3% | 42.7% | 40.3% |
| N | 1881 | 7046 | 3197 | 18463 |
| | Panel C: At target firms | | | |
| $LBL$ | 0.469*** | 0.548*** | 0.572*** | 0.593*** |
| | (19.382) | (41.069) | (27.979) | (70.942) |
| SOA $(= 1 - LBL)$ | 53.1% | 45.2% | 42.8% | 40.7% |
| N | 2058 | 7191 | 3094 | 19580 |
| | Panel D: Under-leveraged firms | | | |
| $LBL$ | 0.497*** | 0.502*** | 0.442*** | 0.609*** |
| | (23.402) | (36.228) | (20.573) | (73.340) |
| SOA $(= 1 - LBL)$ | 50.3% | 49.8% | 55.8% | 39.1% |
| N | 2907 | 6924 | 2689 | 19540 |
| | Panel E: Highly under-leveraged firms | | | |
| $LBL$ | 0.419*** | 0.506*** | 0.483*** | 0.623*** |
| | (23.303) | (29.358) | (15.974) | (71.089) |
| SOA $(= 1 - LBL)$ | 58.1% | 49.4% | 51.7% | 37.7% |
| N | 4365 | 5096 | 1811 | 19259 |

$t$-statistics in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

This table shows the adjustment speed estimates using book leverage for the intersections of the two groups of constrained and unconstrained firms and target leverage quintiles. The classification of firms into constrained and unconstrained is based on rating probabilities and described in detail in section 6.2.3. The conditional estimates of adjustment speed are based on the event-study approach, using (for each event firm and each event year, if available) the year preceding the event year ($t = -1$) as the initial observation of the dynamic leverage process, the event year ($t = 0$), and the subsequent 5 ($t = +1$ to $t = +5$) observations as input for the DPF-estimator (see section 3): $L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. All variables except the coefficients on the lagged book leverage ratio ($LBL$) are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table XII** – Speed of adjustment and financial constraints (market leverage)

| | Market-based | | Bank-based | |
|---|---|---|---|---|
| | Constrained | Unconstrained | Constrained | Unconstrained |
| | Panel A: Highly over-leveraged firms | | | |
| $LML$ | 0.499*** | 0.633*** | 0.676*** | 0.697*** |
| | (14.756) | (35.450) | (29.712) | (62.417) |
| SOA ($= 1 - LML$) | 50.1% | 34.7% | 32.4% | 30.3% |
| N | 1596 | 6211 | 4452 | 14439 |
| | Panel B: Over-leveraged firms | | | |
| $LML$ | 0.451*** | 0.594*** | 0.613*** | 0.631*** |
| | (15.844) | (37.439) | (26.358) | (67.780) |
| SOA ($= 1 - LML$) | 54.9% | 40.6% | 38.7% | 36.9% |
| N | 2205 | 6770 | 3295 | 18618 |
| | Panel C: At target firms | | | |
| $LML$ | 0.508*** | 0.568*** | 0.549*** | 0.638*** |
| | (22.153) | (35.014) | (23.909) | (72.423) |
| SOA ($= 1 - LML$) | 49.2% | 43.2% | 45.1% | 36.2% |
| N | 3203 | 6365 | 2917 | 19469 |
| | Panel D: Under-leveraged firms | | | |
| $LML$ | 0.459*** | 0.535*** | 0.534*** | 0.611*** |
| | (19.823) | (30.803) | (22.611) | (68.021) |
| SOA ($= 1 - LML$) | 54.1% | 46.5% | 46.6% | 38.9% |
| N | 3388 | 6083 | 2694 | 19183 |
| | Panel E: Highly under-leveraged firms | | | |
| $LML$ | 0.522*** | 0.592*** | 0.461*** | 0.622*** |
| | (18.042) | (38.687) | (13.481) | (71.855) |
| SOA ($= 1 - LML$) | 47.8% | 40.8% | 53.9% | 37.9% |
| N | 2398 | 7761 | 1623 | 22011 |

$t$-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the adjustment speed estimates using market leverage for the intersections of the two groups of constrained and unconstrained firms and target leverage quintiles. The classification of firms into constrained and unconstrained is based on rating probabilities and described in detail in section 6.2.3. The conditional estimates of adjustment speed are based on the event-study approach, using (for each event firm and each event year, if available) the year preceding the event year ($t = -1$) as the initial observation of the dynamic leverage process, the event year ($t = 0$), and the subsequent 5 ($t = +1$ to $t = +5$) observations as input for the DPF-estimator (see section 3): $L_{i,t} = (1 - \lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. All variables except the coefficients on the lagged market leverage ratio ($LML$) are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table XIII** – Speed of adjustment and macroeconomic environment (book leverage)

| | Market-based | | | Bank-based | | |
|---|---|---|---|---|---|---|
| | Good state | Bad state | Good vs. bad | Good state | Bad state | Good vs. bad |
| Panel A: Full fiscal year overlaps with a recession ($REC1$) | | | | | | |
| $LBL$ | 0.770*** | 0.914*** | 0.772*** | 0.857*** | 0.964*** | 0.813*** |
| | (154.784) | (58.780) | (158.277) | (171.336) | (163.436) | (147.314) |
| SOA ($= 1 - LBL$) | 23.0% | 8.6% | 22.8% | 14.3% | 3.6% | 8.7% |
| $LBL \times REC1$ | | | 0.082*** | | | 0.068*** |
| | | | (6.500) | | | (17.257) |
| $REC1$ | | | −0.033*** | | | −0.048*** |
| | | | (−4.443) | | | (−17.538) |
| N | 32207 | 1664 | 33871 | 31233 | 9378 | 40611 |
| Panel B: Minimum of six months in a fiscal year are recession months ($REC2$) | | | | | | |
| $LBL$ | 0.762*** | 0.894*** | 0.769*** | 0.855*** | 0.949*** | 0.808*** |
| | (144.638) | (92.100) | (155.697) | (169.768) | (184.040) | (145.862) |
| SOA ($= 1 - LBL$) | 23.8% | 10.6% | 23.1% | 14.5% | 5.1% | 9.2% |
| $LBL \times REC2$ | | | 0.063*** | | | 0.059*** |
| | | | (7.104) | | | (16.747) |
| $REC2$ | | | −0.027*** | | | −0.038*** |
| | | | (−3.636) | | | (−14.992) |
| N | 30214 | 3657 | 33871 | 27084 | 13527 | 40611 |
| Panel C: Macroeconomic states determined by the credit spread ($CREDIT$) | | | | | | |
| $LBL$ | 0.835*** | 0.849*** | 0.842*** | 0.868*** | 0.933*** | 0.874*** |
| | (108.811) | (112.999) | (125.306) | (120.204) | (166.615) | (148.135) |
| SOA ($= 1 - LBL$) | 16.5% | 15.1% | 15.8% | 13.2% | 6.7% | 12.6% |
| $LBL \times BADDUM\_CREDIT$ | | | 0.011 | | | 0.045*** |
| | | | (1.453) | | | (8.161) |
| $BADDUM\_CREDIT$ | | | −0.012 | | | −0.024*** |
| | | | (−0.539) | | | (−4.958) |
| N | 8275 | 7317 | 15592 | 6655 | 9865 | 16520 |
| Panel D: Macroeconomic states determined by the Treasury-Eurodollar spread ($TED$) | | | | | | |
| $LBL$ | 0.837*** | 0.850*** | 0.837*** | 0.860*** | 0.919*** | 0.858*** |
| | (121.882) | (112.022) | (124.338) | (157.159) | (116.964) | (155.818) |
| SOA ($= 1 - LBL$) | 16.3% | 15.0% | 16.3% | 14.0% | 8.1% | 14.2% |
| $LBL \times BADDUM\_TED$ | | | 0.008 | | | 0.064*** |
| | | | (0.960) | | | (9.266) |
| $BADDUM\_TED$ | | | 0.007 | | | −0.037*** |
| | | | (1.066) | | | (−6.198) |
| N | 7513 | 6521 | 14034 | 8736 | 4112 | 12848 |
| Panel E: Macroeconomic states determined by the lagged term spread ($TERM$) | | | | | | |
| $LBL$ | 0.815*** | 0.797*** | 0.805*** | 0.871*** | 0.933*** | 0.895*** |
| | (124.928) | (100.724) | (113.984) | (123.740) | (158.901) | (157.122) |
| SOA ($= 1 - LBL$) | 8.5% | 20.3% | 19.5% | 12.9% | 6.7% | 10.5% |
| $LBL \times BADDUM\_TERM$ | | | −0.001 | | | 0.019** |
| | | | (−0.174) | | | (3.259) |
| $BADDUM\_TERM$ | | | −0.057** | | | −0.022*** |
| | | | (−2.973) | | | (−4.370) |
| N | 7954 | 6301 | 14255 | 7024 | 7126 | 14150 |

*continued*

**Table XIII** – (continued)

| | Market-based | | | Bank-based | | |
|---|---|---|---|---|---|---|
| | Good state | Bad state | Good vs. bad | Good state | Bad state | Good vs. bad |
| Panel F: Macroeconomic states determined by the GDP growth rate ($GDP$) | | | | | | |
| $LBL$ | 0.791*** | 0.873*** | 0.802*** | 0.892*** | 0.954*** | 0.883*** |
| | (87.170) | (109.636) | (108.234) | (163.978) | (169.438) | (169.167) |
| SOA (= 1 − $LBL$) | 20.9% | 12.7% | 19.8% | 10.8% | 4.6% | 11.7% |
| $LBL \times BADDUM\_GDP$ | | | 0.061*** | | | 0.064*** |
| | | | (6.940) | | | (13.217) |
| $BADDUM\_GDP$ | | | −0.025*** | | | −0.039*** |
| | | | (−3.315) | | | (−11.343) |
| N | 7631 | 5833 | 13464 | 9556 | 8720 | 18276 |
| Panel G: Macroeconomic states determined by the inflation rate ($INF$) | | | | | | |
| $LBL$ | 0.833*** | 0.823*** | 0.835*** | 0.939*** | 0.928*** | 0.939*** |
| | (104.815) | (106.219) | (108.664) | (146.294) | (190.400) | (173.111) |
| SOA (= 1 − $LBL$) | 16.7% | 17.7% | 16.5% | 6.1% | 7.2% | 6.1% |
| $LBL \times BADDUM\_INF$ | | | −0.021* | | | −0.021*** |
| | | | (−2.402) | | | (−3.750) |
| $BADDUM\_INF$ | | | 0.007 | | | 0.016* |
| | | | (1.203) | | | (2.318) |
| N | 6242 | 6903 | 13145 | 6395 | 9362 | 15757 |
| Panel H: Macroeconomic states determined by the equity risk premium ($ERP$) | | | | | | |
| $LBL$ | 0.835*** | 0.817*** | 0.837*** | 0.918*** | 0.891*** | 0.908*** |
| | (107.380) | (113.373) | (118.034) | (172.757) | (155.916) | (165.659) |
| SOA (= 1 − $LBL$) | 16.5% | 18.3% | 6.3% | 8.2% | 10.9% | 9.2% |
| $LBL \times BADDUM\_ERP$ | | | −0.029*** | | | −0.043*** |
| | | | (−3.400) | | | (−8.932) |
| $BADDUM\_ERP$ | | | −0.022** | | | 0.004 |
| | | | (−2.622) | | | (0.555) |
| N | 6888 | 6940 | 13828 | 11140 | 8457 | 19597 |

$t$-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimated adjustment speeds using book leverage conditional on the macroeconomic environment. Sample years are sorted into quintiles, and the good macroeconomic states (the quintile years with the best observations) are compared with the bad macroeconomic states (the quintile years with the worst observations). A state is classified as bad if the recession indicator (either $REC1$ or $REC2$) is one, the credit spread ($CREDIT$) is high, the $TED$ spread is high, the lagged term spread ($TERM$) is high, the GDP growth rate ($GDP$) is low, the inflation rate ($INF$) is high, and the equity risk premium ($ERP$) is high. Good states are defined accordingly. $LBL$ denotes lagged book leverage, and SOA is the speed of adjustment. The combined model (good vs. bad) estimates whether the difference between adjustment speeds in good and bad states is statistically significant. Table III contains a detailed explanation of the macroeconomic variables. $BADDUM$ is a dummy variable taking the value of one in bad states, and $LBL \times BADDUM$ is an interaction term between lagged book leverage and this dummy variable. All estimates are obtained by using the DPF-estimator (see section 3): $L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. Time dummy variables, constants, initial leverage, and mean exogenous variables are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

**Table XIV** – Speed of adjustment and macroeconomic environment (market leverage)

| | Market-based | | | Bank-based | | |
|---|---|---|---|---|---|---|
| | Good state | Bad state | Good vs. bad | Good state | Bad state | Good vs. bad |
| Panel A: Full fiscal year overlaps with a recession ($REC1$) | | | | | | |
| $LML$ | 0.825*** | 0.870*** | 0.829*** | 0.888*** | 0.901*** | 0.889*** |
| | (147.210) | (44.096) | (149.172) | (247.777) | (124.097) | (268.761) |
| SOA (= $1 - LML$) | 17.5% | 13.0% | 17.1% | 11.2% | 9.9% | 11.1% |
| $LML \times REC1$ | | | 0.070*** | | | 0.021*** |
| | | | (6.093) | | | (4.625) |
| $REC1$ | | | −0.013* | | | −0.030*** |
| | | | (−2.167) | | | (−9.488) |
| N | 32638 | 1678 | 34316 | 31216 | 9387 | 40603 |
| Panel B: Minimum of six months in a fiscal year are recession months ($REC2$) | | | | | | |
| $LML$ | 0.828*** | 0.867*** | 0.829*** | 0.888*** | 0.877*** | 0.885*** |
| | (140.332) | (70.216) | (146.601) | (155.237) | (117.209) | (95.298) |
| SOA (= $1 - LML$) | 17.2% | 13.3% | 17.1% | 11.2% | 12.3% | 11.5% |
| $LML \times REC2$ | | | 0.032*** | | | 0.004 |
| | | | (3.954) | | | (1.112) |
| $REC2$ | | | 0.009 | | | 0.003 |
| | | | (1.393) | | | (0.958) |
| N | 30627 | 3689 | 34316 | 27067 | 13536 | 40603 |
| Panel C: Macroeconomic states determined by the credit spread ($CREDIT$) | | | | | | |
| $LML$ | 0.854*** | 0.852*** | 0.846*** | 0.930*** | 0.898*** | 0.918*** |
| | (94.929) | (97.944) | (109.614) | (114.835) | (125.443) | (123.166) |
| SOA (= $1 - LML$) | 14.6% | 14.8% | 15.4% | 7.0% | 10.2% | 8.2% |
| $LML \times BADDUM\_CREDIT$ | | | 0.012 | | | −0.009 |
| | | | (1.513) | | | (−1.379) |
| $BADDUM\_CREDIT$ | | | 0.019 | | | 0.033*** |
| | | | (0.848) | | | (5.699) |
| N | 8369 | 7418 | 15787 | 6656 | 9886 | 16542 |
| Panel D: Macroeconomic states determined by the Treasury-Eurodollar spread ($TED$) | | | | | | |
| $LML$ | 0.827*** | 0.910*** | 0.827*** | 0.917*** | 0.921*** | 0.911*** |
| | (103.538) | (86.430) | (115.008) | (135.496) | (80.142) | (147.011) |
| SOA (= $1 - LML$) | 17.3% | 9.0% | 17.3% | 8.3% | 7.9% | 8.9% |
| $LML \times BADDUM\_TED$ | | | 0.084*** | | | 0.029*** |
| | | | (10.169) | | | (3.729) |
| $BADDUM\_TED$ | | | 0.002 | | | 0.004 |
| | | | (0.261) | | | (0.577) |
| N | 7632 | 6610 | 14242 | 8745 | 4114 | 12859 |
| Panel E: Macroeconomic states determined by the lagged term spread ($TERM$) | | | | | | |
| $LML$ | 0.803*** | 0.843*** | 0.798*** | 0.876*** | 0.894*** | 0.889*** |
| | (103.544) | (81.952) | (102.402) | (96.287) | (125.913) | (136.568) |
| SOA (= $1 - LML$) | 19.7% | 15.7% | 20.2% | 12.4% | 10.6% | 11.1% |
| $LML \times BADDUM\_TERM$ | | | 0.058*** | | | 0.002 |
| | | | (7.407) | | | (0.238) |
| $BADDUM\_TERM$ | | | −0.026 | | | −0.012* |
| | | | (−1.410) | | | (−2.052) |
| N | 8061 | 6377 | 14438 | 7029 | 7113 | 14142 |

*continued*

**Table XIV** – (continued)

| | Market-based | | | Bank-based | | |
|---|---|---|---|---|---|---|
| | Good state | Bad state | Good vs. bad | Good state | Bad state | Good vs. bad |
| Panel F: Macroeconomic states determined by the GDP growth rate ($GDP$) | | | | | | |
| $LML$ | 0.842*** | 0.854*** | 0.841*** | 0.881*** | 0.908*** | 0.901*** |
| | (90.938) | (91.488) | (105.555) | (119.846) | (136.803) | (165.665) |
| SOA ($= 1 - LML$) | 15.8% | 14.6% | 15.9% | 11.9% | 9.2% | 9.9% |
| $LML \times BADDUM\_GDP$ | | | 0.015 | | | 0.000 |
| | | | (1.778) | | | (0.004) |
| $BADDUM\_GDP$ | | | −0.008 | | | 0.018*** |
| | | | (−1.159) | | | (4.185) |
| N | 7733 | 5920 | 13653 | 9569 | 8734 | 18303 |
| Panel G: Macroeconomic states determined by the inflation rate ($INF$) | | | | | | |
| $LML$ | 0.895*** | 0.822*** | 0.886*** | 0.892*** | 0.887*** | 0.884*** |
| | (91.248) | (93.722) | (109.285) | (104.559) | (156.290) | (145.073) |
| SOA ($= 1 - LML$) | 10.5% | 17.8% | 11.4% | 10.8% | 11.3% | 11.6% |
| $LML \times BADDUM\_INF$ | | | −0.058*** | | | 0.012* |
| | | | (−6.666) | | | (2.024) |
| $BADDUM\_INF$ | | | 0.012* | | | −0.026** |
| | | | (2.201) | | | (−3.290) |
| N | 6335 | 7019 | 13354 | 6409 | 9379 | 15788 |
| Panel H: Macroeconomic states determined by the equity risk premium ($ERP$) | | | | | | |
| $LML$ | 0.858*** | 0.808*** | 0.874*** | 0.843*** | 0.869*** | 0.871*** |
| | (84.395) | (97.256) | (117.153) | (113.674) | (124.499) | (175.354) |
| SOA ($= 1 - LML$) | 14.2% | 19.2% | 12.6% | 15.7% | 13.1% | 12.9% |
| $LML \times BADDUM\_ERP$ | | | −0.072*** | | | 0.013* |
| | | | (−8.733) | | | (2.363) |
| $BADDUM\_ERP$ | | | −0.069*** | | | −0.067*** |
| | | | (−8.465) | | | (−7.737) |
| N | 7019 | 7033 | 14052 | 11165 | 8468 | 19633 |

$t$-statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimated adjustment speeds using market leverage conditional on the macroeconomic environment. Sample years are sorted into quintiles, and the good macroeconomic states (the quintile years with the best observations) are compared with the bad macroeconomic states (the quintile years with the worst observations). A state is classified as bad if the recession indicator (either $REC1$ or $REC2$) is one, the credit spread ($CREDIT$) is high, the $TED$ spread is high, the lagged term spread ($TERM$) is high, the GDP growth rate ($GDP$) is low, the inflation rate ($INF$) is high, and the equity risk premium ($ERP$) is high. Good states are defined accordingly. $LML$ denotes lagged market leverage, and SOA is the speed of adjustment. The combined model (good vs. bad) estimates whether the difference between adjustment speeds in good and bad states is statistically significant. Table III contains a detailed explanation of the macroeconomic variables. $BADDUM$ is a dummy variable taking the value one in bad states, and $LML \times BADDUM$ is an interaction term between lagged market leverage and this dummy variable. All estimates are obtained by using the DPF-estimator (see section 3): $L_{i,t} = (1 - \lambda)L_{i,t-1} + \lambda\beta X_{i,t-1} + \mu_i + \epsilon_{i,t}$ with $\mu_i = \alpha_0 + \alpha_1 L_{i,0} + E(X_i)\alpha_2 + \alpha_i$. Time dummy variables, constants, initial leverage, and mean exogenous variables are omitted. The data cover the period from 1992 to 2009, and N denotes the number of observations.

# A Financial constraints estimation

**Table I** – Logistic regression for rating probability

| | USA | UK | Canada | Continental Europe | Japan |
|---|---|---|---|---|---|
| $AT$ | 0.608*** | 1.105*** | 0.817*** | 1.025*** | 1.883*** |
| | (0.010) | (0.049) | (0.042) | (0.038) | (0.076) |
| $OIBD$ | 1.075*** | −3.560*** | −0.285 | −2.964*** | 4.277** |
| | (0.140) | (0.664) | (0.560) | (1.002) | (1.840) |
| $BL$ | 1.838*** | 2.548*** | 2.484*** | 0.337 | −1.691*** |
| | (0.064) | (0.365) | (0.312) | (0.553) | (0.395) |
| $TANG$ | −0.084 | 1.406*** | 0.176 | 0.774 | −0.151 |
| | (0.086) | (0.387) | (0.265) | (0.482) | (0.510) |
| $MTBV$ | −0.111*** | 0.314*** | 0.120* | 0.101 | −0.183 |
| | (0.019) | (0.085) | (0.067) | (0.098) | (0.133) |
| $AGE$ | 0.074 | −0.075 | −0.226 | 1.007*** | 1.381*** |
| | (0.049) | (0.215) | (0.160) | (0.252) | (0.462) |
| $VOLA$ | 0.002 | −0.001 | 0.012 | 0.0141 | 0.053** |
| | (0.004) | (0.028) | (0.014) | (0.020) | (0.022) |
| Constant | −8.471*** | −14.280*** | −9.037*** | −26.910*** | −31.921*** |
| | (0.478) | (1.335) | (0.505) | (0.863) | (1.767) |
| N | 45 389 | 11 503 | 4937 | 12 245 | 39 636 |

Robust standard errors are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

This table shows the estimation results for firms' rating probabilities, which are taken as a proxy for their debt capacity. The dependent variable is a dummy variable which is set equal to one if the firm has a public rating, and zero otherwise. $AT$ is the log of total assets; $OIBD$ is profitability; $BL$ is book leverage; $TANG$ is tangibility; $MTBV$ is the market-to-book ratio; $AGE$ is the number of years the firm is contained in Compustat Global; $VOLA$ is the volatility of earnings. The estimation is carried out using a logistic regression. A firm is classified as constrained if its probability of having a public rating falls into the lower quartile, and unconstrained otherwise. The data cover the period from 1992 to 2009, and N denotes the number of observations.

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