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Asymmetric adjustment toward optimal capital structure: Evidence from a crisis ☆

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ABSTRACT

We employ dynamic threshold partial adjustment models to study the asymmetries in firms' adjustments toward their target leverage. Using a sample of US firms over the period 2002–2012, we document a negative impact of the Global Financial Crisis on the speed of leverage adjustment. In our subperiod analysis, we find moderate evidence of cross-sectional heterogeneity in this speed, which seems more pronounced pre-crisis and provides little support for the financial constraint view. Over the pre-crisis period, more constrained firms, such as those with high growth, with large investment, of small size, and with volatile earnings, adjust their capital structures more quickly than their less constrained counterparts. These firms rely heavily on external funds to offset large financing deficits, suggesting that their higher adjustment speeds may be driven by lower adjustment costs that are shared with the transaction costs of accessing external capital markets. During the crisis, the speed of adjustment varies with the deviation from target leverage: only firms with sufficiently large deviations attempt to revert to the target, albeit slowly. Overall, our results provide new evidence of both cross-sectional and time-varying asymmetries in capital structure adjustments, which is consistent with the trade-off theory.

1. Introduction

Since the publishing of Modigliani and Miller's (1958) irrelevance theorem, three main views of corporate capital structure have been advanced in which the method of financing matters: the trade-off theory, the pecking order theory, and the market timing hypothesis. The trade-off theory, in both its static and dynamic forms, predicts an optimal capital structure that balances the costs (e.g., financial distress costs) against the benefits (e.g., the debt interest tax shield) of debt financing; see, for example, Kraus and Litzenberger (1973) for a static trade-off model and Strebulaev (2007) for a dynamic model. Under this framework, corporate leverage is predicted to exhibit mean reversion as firms seek to adjust toward their target leverage. The pecking order theory, based on asymmetric information and adverse selection, suggests that a firm's observed mix of debt and equity simply reflects its cumulative financing decisions over time, whereby internal finance is preferred over external finance and debt is preferred over equity (Myers, 1984; Myers & Majluf, 1984). The market timing hypothesis posits that capital structure decisions are driven by behavior whereby firms attempt to time the equity markets by issuing shares when market conditions are favorable (Baker & Wurgler, 2002). Neither the pecking order theory nor the market timing hypothesis predicts the existence of target leverage ratios and firms' adjustments toward those targets. Hence, a large body of empirical research has tested the trade-off theory against these alternative views of capital structure by examining whether and how fast firms move toward target leverage; see Frank and Goyal (2007) for a comprehensive survey.

So far, studies have mainly used a linear partial adjustment model of leverage to estimate the speed of adjustment (hereafter SOA), i.e., the speed with which firms adjust their capital structures toward target leverage. For example, Flannery and Rangan (2006) find that, over the period 1965–2001, US firms adjust at a rate of 34% per year. Examining international data in the G-5 countries, Antoniou, Guney, and Paudyal (2008) also document reasonably fast adjustment speeds for firms in the US (32%), the UK (32%), and France (39%). Taken together, these empirical studies provide evidence of active target adjustment behavior as predicted by the trade-off framework.

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Most recent research has begun to investigate two important issues in the study of the SOA that have not been thoroughly investigated by the aforementioned studies. The first issue is how to obtain a consistent estimate of the SOA in short, dynamic panels with (unobserved) firm fixed effects, in which the precision of the estimate is highly sensitive to the econometric methods and procedures used (e.g., Flannery & Hankins, 2013; Huang & Ritter, 2009).[1] The second issue, which is the focus of this paper, is whether there exists asymmetry in target adjustment behavior such that firms take different paths toward their target leverage, at potentially heterogeneous rates. One main source of the heterogeneity in the SOA is the differential adjustment costs facing firms with different characteristics or those at different positions relative to their target leverage. Dynamic trade-off models, for example, suggest that firms may have a range of leverage targets and that they only adjust their capital structures when the costs of adjustment can be offset by the benefits of adjustment (i.e., the benefits of being close to or at leverage targets) (Fischer, Heinkel, & Zechner, 1989; Leary & Roberts, 2005). An important implication is that the magnitude and speed of the adjustment are dependent on how far the actual leverage ratio is from the target ratio. Firms with large deviations from target leverage may have an incentive to make quick adjustments, especially when they face a fixed adjustment cost.

Another source of heterogeneity in the SOA is the time-series variation in macroeconomic conditions that affect corporate leverage and dynamic leverage adjustment. According to the credit channel theory, leverage is pro-cyclical because firms borrow less during economic downturns, when their balance sheets and financial conditions (e.g., the value of their collateral) deteriorate (Bernanke & Gertler, 1989; Kiyotaki & Moore, 1997). Moreover, Hackbarth, Miao, and Morellec (2006) show theoretically that firms adjust their capital structures more frequently in economic expansions than in recessions. The leverage rebalancing thresholds are higher in recessions because the leverage adjustment costs tend to increase under adverse macroeconomic conditions. These arguments suggest that the stage of the business cycle should be related to the SOA. The recent Global Financial Crisis of 2007–2009 and the resulting economic recession provide an excellent testing ground for this relationship. Several studies show, for example, that the crisis had dramatic effects on corporate financial policies (Campello, Giambona, Graham, & Harvey, 2011; Campello, Graham, & Harvey, 2010; Duchin, Ozbas, & Sensoy, 2010). Overall, the above arguments and findings indicate that the SOA should vary over time, being lower during the crisis period.

In this paper, we address these important empirical issues regarding the estimation of the SOA and asymmetries in capital structure adjustments. Our contribution is two-fold. First, we are the first to examine both the cross-sectional and time-varying heterogeneity in the SOA. Second, we employ a new approach using dynamic threshold partial adjustment models of leverage, which enables us to consistently estimate the heterogeneous adjustment speeds of firms facing differential adjustment costs, under different financing regimes and different states of the economy. To study the cross-sectional asymmetry in the SOA, we consider several firm-specific variables that may affect the adjustment costs, namely growth opportunities, investment, firm size, earnings volatility, the Size–Age index (hereafter SA, a measure of financial constraints), and deviations from target leverage. To examine the time-series variation in the SOA, we compare the SOA estimated for the pre-crisis period with that estimated for the crisis period. Overall, our approach enables us to test the validity of the dynamic trade-off theory because it explicitly allows for asymmetric and costly capital structure adjustments.

Using a recent sample of US firms over the period 2002–2012, we provide the first evidence in the literature of the negative impact of the Global Financial Crisis on the SOA. While we document strong and robust evidence of the time-varying heterogeneity in the SOA, we observe weaker cross-sectional variation in this speed. For the whole sample period, there is limited evidence of threshold effects and asymmetric adjustment speeds conditional on the firm-specific variables proxying for financial constraints. In our subperiod analysis, however, we document stronger cross-sectional heterogeneity in the SOA, which is most pronounced pre-crisis. In the period leading up to the crisis, more constrained firms, including those with high growth, with large investment, of small size, with volatile earnings, and with a high SA index, move toward their target leverage more rapidly than their less constrained counterparts. These results provide little support for the financial constraint argument, suggesting that firm-specific measures of constraints play a less important role than supply-side external factors, such as the credit shock triggered by the crisis. Our analysis of the firm-specific characteristics reveals that constrained firms have large financing deficits, which they offset using external funds. Thus, these firms' higher adjustment speeds may be due to relatively lower adjustment costs that can be shared with the transaction costs of raising external finance (Faulkender, Flannery, Hankins, & Smith, 2012). For the crisis period, the SOA only varies cross-sectionally with the deviation from target leverage. Firms with large deviations attempt to revert to their target leverage, albeit at slow rates, while those with small deviations make no such attempt. Finally, comparing the pre-crisis and crisis results, we find that the negative effects of the crisis on the adjustment speeds are also asymmetric: they seem more pronounced for firms facing more financial constraints. Overall, our results provide new evidence of both time-varying and cross-sectional asymmetries in capital structure adjustments, which is broadly consistent with the trade-off theory.

Our paper is related to, and improves on, a few recent studies that have started to examine the implications of costly adjustment on dynamic leverage rebalancing. Drobetz, Pensa, and Wanzenried (2006) investigate the impact of various firm-specific variables on the SOA, although unlike our paper, the authors do not explicitly account for the asymmetries in capital structure adjustments. More recently, some research has explicitly allowed for cross-sectional heterogeneity in the SOA, conditional on a number of factors, namely (i) firms' specific characteristics proxying for financial constraints (e.g., Dang, Garrett, & Nguyen, 2011; Elsas & Florysiak, 2011), (ii) the magnitude of firms' deviations from target leverage and/or their financing gaps (e.g., Byoun, 2008), and (iii) firms' cash flow realizations (e.g., Faulkender et al., 2012). Unlike our paper, however, these studies generally adopt a simple approach based on dummy variables or sample splitting using given thresholds (e.g., the medians), which involves a degree of arbitrariness and is likely to suffer from a sample selection bias problem (Hansen, 2000). Simply put, these existing studies may not provide accurate estimates of the heterogeneous adjustment speeds. We address this crucial drawback by employing a threshold partial adjustment model in which the threshold is estimated within the model rather than being imposed arbitrarily *ex ante*. Hence, our approach provides consistent estimates of the (heterogeneous) SOA. In addition, by categorizing firms into different financing regimes using the threshold estimates, we provide important insights into the characteristics of firms that have differential adjustment costs and consequently take asymmetric adjustment paths.

Our study contributes to the literature examining the effects of macroeconomic conditions on corporate capital structure (e.g., Covas & Den Haan, 2011; Erel, Julio, Kim, & Weisbach, 2012; Korajczyk & Levy, 2003). In particular, our empirical work is related to a strand of research focusing on the effects of business cycle variables on dynamic capital structure adjustments (Cook & Tang, 2010; Drobetz & Wanzenried, 2006; Ebrahim, Girma, Shah, & Williams, 2014). We extend this research agenda by studying the impacts of the recent Global Financial Crisis

[1] It is well-established in the literature that pooled OLS estimates of the SOA (Fama & French, 2002) are biased downward and fixed-effects estimates (Flannery & Rangan, 2006) are biased upward, while GMM (Ozkan, 2001) and system GMM estimates (Antoniou et al., 2008; Lemmon, Roberts, & Zender, 2008) provide intermediate (unbiased) cases.

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