ON CORPORATE CAPITAL STRUCTURE ADJUSTMENTS

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Abstract

Recent research has examined asymmetries in firms' adjustments toward target leverage. Assuming firms mainly adjust their debt levels, Byoun (2008) finds that firms adjusting most quickly possess two important characteristics: above-target debt and a financing surplus. Using alternative models allowing for adjustments in both debt *and* total assets, we still find evidence of asymmetries in leverage adjustments, but that firms adjusting fastest have above-target leverage and a financing deficit. Our paper shows how alternative assumptions about leverage dynamics may lead to different conclusions about target adjustment behavior.

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***Keywords*:** Capital structure; Dynamic trade-off theory; Partial adjustment model; Asymmetric adjustment; Model specification.

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1. Introduction

Recent empirical work on capital structure has investigated whether firms adjust partially toward target leverage, and whether the speed at which they adjust their leverage (the speed of adjustment, hereafter SOA) is asymmetric, the asymmetry being determined by the magnitude of the deviation from target leverage, financing gaps, and/or cash flow realizations (Byoun, 2008; Faulkender et al., 2012). Byoun (2008), in particular, was the first to show that in financing-needs-induced models that incorporate both elements of the trade-off and pecking order theories firms adjust toward optimal capital structures at different rates. He found that firms with above-target debt and a financing surplus have the highest SOA (33% per annum), while those with above-target debt and a deficit have an extremely low SOA (2%). These findings suggest firms that find themselves with a financing surplus and that have overshot their target face relatively low adjustment costs because they can use the surplus to reduce debt from the above-target level.

We show that while Byoun's (2008) empirical approach represents an important contribution to the literature, his key findings depend on an implicit assumption that firms adjust toward target leverage by making changes in debt levels. Using model specifications based on an alternative assumption that firms move toward target leverage by making changes in both debt *and* total assets, we provide new insights into capital structure adjustment mechanisms. First, we analytically derive the difference in the SOA when the adjustment is restricted to changes in debt, and when it includes changes in debt, equity, and total assets. We show that the two approaches only deliver the same SOA under restrictive scenarios. Second, we find that when estimating model specifications based on the alternative assumption that firms adjust debt, equity, and total assets, the nature of the asymmetry in the adjustment toward target capital structure changes. Specifically, we find that firms move fastest toward their target leverage when they are over-levered with a financing deficit, a result that differs from Byoun's main finding that it is over-levered firms with a financing surplus that adjust quickest. Our new finding suggests that relative to over-levered firms with a financing surplus or firms that are under-levered with either a surplus or deficit, firms under pressure to offset their deficit and to reduce the financial distress costs associated with above-target leverage have incentives to adjust more quickly toward their target. Further, we also document that firms facing a financing deficit generally have a higher SOA than those having a financing surplus.

The rest of the paper proceeds as follows. In Section 2, we review Byoun's partial adjustment specifications and the underlying assumption. We then show how using an alternative assumption allowing for adjustments in debt, equity, and total assets alters the specifications and delivers different SOA estimates. In Section 3, we develop asymmetric partial adjustment models based on this flexible assumption. We report our empirical results in Section 4, and offer some concluding remarks in Section 5.

2. Partial Adjustment Models and Underlying Assumptions about Leverage Dynamics

In this section, we show how using different assumptions and model specifications to model leverage dynamics leads to nontrivial differences in estimates of the SOA. We take as our starting point Byoun's (2008) model of capital structure adjustment:

$$\Delta D_{it} = (D_{it} / A_{it})^* A_{it} - D_{it-1}, \tag{1}$$

where D_{it} and A_{it} are the actual debt level and total assets for firm *i* at time *t*, respectively, while $(D_{it} / A_{it})^*$ represents the target debt ratio (leverage). The left hand side of (1) is the change in debt from the previous to the current period, while the right hand side captures the change in debt required to ensure there is full adjustment toward the target within the period.

In the presence of positive adjustment costs, firms will not completely adjust toward their target debt ratios. Rather, they will adjust partially with a speed in the range of 0 (no adjustment) and 1 (full adjustment). Dividing both sides of (1) by total assets A_{it}, we obtain the following partial adjustment model, which forms the basis of Byoun's empirical work:

$$\Delta D_{it} / A_{it} = \alpha + \lambda_1((D_{it} / A_{it})^* - (D_{it-1} / A_{it})) + \varepsilon_{it}, \quad (2)$$

where α is a constant and ε_{it} is an error term. We can write (2) more compactly as

$$\Delta D_{it} / A_{it} = \alpha + \lambda_1 TDE_{it} + \varepsilon_{it}, \quad (3)$$

where $TDE_{it} = (D_{it} / A_{it})^* - (D_{it-1} / A_{it})$.[1] Note that the target leverage ratio can be estimated as a function of firm- and industry-specific variables:

$$(D_{it} \overset{\wedge}{/} A_{it})^* = \hat{\boldsymbol{\beta}}'\mathbf{x}, \quad (4)$$

where **x** is a vector of factors determining target leverage. We will discuss these variables further in Section 4.

Equation (3) looks similar to, but is strictly not the same as, the partial adjustment model of leverage commonly used in the literature (e.g., Flannery and Rangan, 2006; Faulkender et al., 2012). This latter model, based on theoretical models such as those in Fischer et al. (1989) and Leland (1994), is given by:

$$(D_{it} / A_{it}) - (D_{it-1} / A_{it-1}) = \alpha + \lambda_2((D_{it} / A_{it})^* - (D_{it-1} / A_{it-1})) + \varepsilon_{it}, \quad (5)$$

which can be written more compactly as,

$$\Delta L_{it} = \alpha + \lambda_2 DEV_{it} + \varepsilon_{it}, \quad (6)$$

where $L_{it} = D_{it} / A_{it}$ is leverage, DEV_{it} is the deviation from target leverage, given by $DEV_{it} = L^*_{it} - L_{it-1}$, and L^*_{it} is target leverage. The important difference between models (3) and (6) is that while they both assume firms move toward target debt ratios, they allow for different adjustment processes. Model (3) focuses on the change in the debt level, ΔD_{it}, in

[1] Byoun (2008) uses an extended, asymmetric model based on (2) where firms with above- and below-target leverage are assumed to have different adjustment speeds. See his Equation (2).

the numerator. By focusing on changes in the level of debt the model does not account for the effect any changes in equity and total assets (the denominator) have on the overall change in leverage, ΔL_{it}; see also Footnote 7 in Faulkender et al. (2012). Further, implicit within the model given by (3) is the assumption that while firms focus on adjusting the debt level, the overall change in total assets, A_{it}, is negligible such that one can use this as the scaling variable for both current and past debt levels, D_{it} and D_{it-1}. The commonly-used model (6), on the other hand, is based on a more flexible assumption that firms adjust both debt and equity, and thus total assets, in moving toward target leverage.

Table 1 provides an example to illustrate the subtle, yet important, difference between models (3) and (6). Consider a simple scenario where at time *t*–1, firm A has total assets of 80 dollars and debt of 16 dollars, and at time *t*, it has total assets of 100 dollars and debt of 20 dollars. According to (3), firm A has increased its debt level by 4 dollars and the left hand side of (3) is 4%. In model (6), however, the left hand side is 0% because the firm's leverage ratio remains unchanged at 20%. Here, the two models differ because (3) does not take into account the increase in the firm's equity and total assets that cancels out the increase in debt.

We now show analytically that using (3) and (6) may lead to different estimates of the SOA. For simplicity, and without loss of generality, we focus on the case of a single firm operating over two periods, *t*–1 and *t*. Thus, we can suppress the constant and error term in (2), and rewrite the estimated model as follows:

$$\Delta D_t / A_t = \hat{\lambda}_1 ((D_{it} / A_{it})^* - (D_{it-1} / A_{it})). \tag{7}$$

The SOA is given by:

$$\hat{\lambda}_1 = (\Delta D_t / A_t)((D_t / A_t)^* - D_{t-1} / A_t)^{-1} = (\Delta D_t)(L_t^* A_t - D_{t-1})^{-1}. \tag{8}$$

Similarly for the model given by (5):

$$\hat{\lambda}_2 = (D_t / A_t - D_{t-1} / A_{t-1})((D_t / A_t)^* - D_{t-1} / A_{t-1})^{-1} = (D_t A_{t-1} - D_{t-1} A_t)\left[A_t (L_t^* A_{t-1} - D_{t-1}) \right]^{-1}. \qquad (9)$$

Subtracting (9) from (8) gives the difference between the two estimated SOAs:

$$\hat{\lambda}_1 - \hat{\lambda}_2 = (\Delta D_t)(L_t^* A_t - D_{t-1})^{-1} - (D_t A_{t-1} - D_{t-1} A_t)\left[A_t (L_t^* A_{t-1} - D_{t-1}) \right]^{-1}, \qquad (10)$$

which, after some rearrangement, can be written as:

$$\hat{\lambda}_1 - \hat{\lambda}_2 = L_{t-1}(\Delta A_t / A_{t-1})(L_t^* - L_t)\left[(L_t^* A_t / A_{t-1} - L_{t-1})(L_t^* - L_{t-1}) \right]^{-1}. \qquad (11)$$

Equation (11) captures the difference in the estimate of the SOA when using (3) instead of (6). Note that this difference only disappears under the following restrictive conditions: (i) when the lagged leverage ratio is zero ($L_{t-1} = 0$); (ii) when total assets do not change $(\Delta A_t = 0)$; or (iii) when the firm is operating at its target leverage ratio ($L_t = L_t^*$).

Returning to the example in Table 1, suppose that the target leverage ratio is 21%. The SOA in (3) is $\hat{\lambda}_1 = (20 - 16)((21\%) \times 100 - 16)^{-1} = 80\%$. However, the SOA in (6) is $\hat{\lambda}_2 = (20 \times 80 - 16 \times 100)[100((21\%) \times 80 - 16)]^{-1} = 0$, that is, firm A makes no adjustment toward its target leverage ratio, a result that is consistent with the fact that its leverage ratio remains unchanged at 20%. The difference in the SOA estimate is quite large in this example (80%) because there is a considerable change in the firm's total assets that is not accounted for in (3) but is in (6). What this discussion shows is that the way in which this change in total assets is dealt with in the two models manifests itself in potentially quite different SOAs.

3. Models and Hypotheses

We showed in the previous section that the SOA estimated from a model focusing on changes in debt, as in Byoun (2008), differs from that obtained from a model allowing for changes in both debt and total assets except under a set of restrictive assumptions. This difference will most likely also be present in the more complex nonlinear models that allow for heterogeneous SOA, although in such models the size of the bias may not be derived analytically. We now turn our attention to investigating whether the difference is present empirically when we allow for heterogeneous SOAs.[2]

The first asymmetric model we examine is an extension of the symmetric model (6):

$$\Delta L_{it} = \alpha + \lambda_3 DEV_{it} D^a + \lambda_4 DEV_{it} D^b + u_{it}, \tag{12}$$

where D^a (D^b) is a dummy variable equal to one if firms have above- (below-) target leverage (i.e., $DEV_{it} < 0$ $(DEV_{it} > 0)$), and zero otherwise. Although Equation (12) and Byoun's model differ in the definitions of variables (Byoun uses $\Delta D_{it} / A_{it}$, instead of ΔL_{it} and TDE_{it} instead of DEV_{it}), our prediction is similar to Byoun's: over-levered firms should adjust at a higher rate than their under-levered counterparts ($\lambda_3 > \lambda_4$) because (i) over-levered firms should be more concerned about the potentially high financial distress/bankruptcy costs associated with above-target leverage, and (ii) the costs of adjustment (via debt reductions) should be relatively lower than the costs of debt issues.[3]

We then move on to examine the case in which firms with different financing gaps may adjust toward their target leverage ratios at heterogeneous rates:

$$\Delta L_{it} = \alpha + \lambda_5 DEV_{it} D^s + \lambda_6 DEV_{it} D^d + u_{it}, \tag{13}$$

where D^s (D^d) is a dummy variable equal to one if firms have a financing surplus (deficit) (i.e., $FD_{it} < 0$ $(FD_{it} > 0)$), and zero otherwise. As in Byoun (2008), we define a financing gap as $FD_{it} = \Delta D_{it} + \Delta E_{it} \equiv -OCF_{it} + I_{it} + \Delta W_{it} + DIV_{it}$, where ΔD_{it} and ΔE_{it} represent net

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[2] Chang and Dasgupta (2009) show that it may not be possible to distinguish between target adjustment behavior and mechanical mean reversion of leverage in partial adjustment models. Faulkender et al. (2012) argue that using more refined models allowing for asymmetric adjustment speeds may overcome this criticism.

[3] Under-levered firms may have less incentive to move toward target leverage than over-levered firms because they may wish to preserve debt capacity.

debt and equity issued, respectively, OCF_{it} is operating cash flow after interest and taxes, I_{it} is net investment, ΔW_{it} is change in net working capital, and DIV_{it} is dividend payments.

In (13), there are conflicting predictions about the impact of financing gaps on the SOA. First, firms running a deficit face pressure to offset their imbalance by accessing capital markets, which provides them with opportunities to alter their capital structure mix appropriately (i.e., $\lambda_5 < \lambda_6$). However, firms with a surplus may find it easier and less costly to adjust their leverage because the costs of retiring debt and/or repurchasing equity may be lower than the costs of issuing them (i.e., $\lambda_5 > \lambda_6$).

In the last step of our analysis, we follow Byoun (2008) and include the interactions between firms' deviations from target leverage and their financing gaps[4]

$$\Delta L_{it} = \alpha + \lambda_7 DEV_{it} D^a D^s + \lambda_8 DEV_{it} D^a D^d + \lambda_9 DEV_{it} D^b D^s + \lambda_{10} DEV_{it} D^b D^d u_{it}. \quad (14)$$

Our expectation is that firms move faster toward their target leverage when they have both above-target leverage and a financing deficit. The reason is that these firms are under greater pressure to deal with their potentially high distress costs and financing imbalance such that the costs of adjustment in this case may be 'shared' with capital market transaction costs, implying a higher SOA. Further, conditional on having above-target leverage, firms should have a higher SOA when they face a financing deficit than when they face a surplus (i.e. $\lambda_8 > \lambda_7$). Finally, contingent on facing a financing deficit, firms should adjust faster when they are over-levered than when they are under-levered (i.e., $\lambda_8 > \lambda_{10}$).

4. Empirical Results

For the purpose of comparison, we consider a dataset similar to the one used by Byoun (2008). We collect data from Compustat for the period 1971–2003 and then remove

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[4] In robustness checks, we also follow Byoun (2008) and include dummies to allow for changes in the intercept. The (unreported) results are qualitatively similar.

financial firms (SIC 6000–6999) and regulated utilities (SIC 4900–4999). We also exclude non-positive values for total assets, book and market values of equity, and net sales, as well as missing values for the variables of interest. Our empirical strategy involves first estimating target leverage as in Equation (4) and then estimating the heterogeneous SOA in (6), (12), (13), and (14). To estimate (4), we need to specify the firm- and industry-specific variables in the vector **x**. We follow Byoun (2008) and include the industry median debt ratio (Med), the marginal tax rate (Tax), profitability (OI), the market-to-book ratio (MB), firm size (lnA), depreciation (DEP), tangibility (FA), R&D expenditures (RND), an R&D dummy (D_RND), dividends (DIV), and Altman's Z-score (AZ). Detailed definitions of these variables can be found in the notes to Table 2; the summary statistics for the variables we use are similar to those documented in previous research (e.g., Flannery and Ragan, 2006), and so are not reported to preserve space.[5]

Table 2 presents the regression results for the target leverage model (4). Overall, all coefficients are significant and carry the expected signs. They are generally consistent with the trade-off theory's predictions about the relations between target leverage and its determinants, and are in line with previous empirical evidence in the literature (Flannery and Rangan, 2006; Byoun, 2008).

Table 3 reports the regression results for the symmetric and asymmetric partial adjustment models. The results for our specifications are presented in Panel A while those for Byoun's specifications are presented in Panel B. In the symmetric model, our estimated SOA is 29.2%, slightly lower than the estimate of 33.3% obtained using Byoun's model specification. Note that these estimates are in line with Flannery and Rangan's (2006) results

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[5] We also only report results for one measure of leverage (total debt to total assets (book leverage)) to conserve space. We obtain qualitatively similar results for alternative measures of leverage (market leverage, and long-term book or market leverage). These results are available on request.

but indicate that adjustment is slightly faster than Byoun's original estimates, which are between 21.5% and 22.6%.

For the asymmetric models, we find that over-levered firms adjust significantly faster than their under-levered counterparts (35.2% (λ_3) versus 20.2% (λ_4); see column (2) in Table 3), which is qualitatively similar to the evidence obtained using Byoun's specification (see column (5) in Table 3). This finding is also in line with his original finding, clearly confirming the asymmetry in firms' target adjustment behavior. In column (3) of Table 3 we document new evidence that firms running a financing deficit have a significantly higher SOA relative to those running a financing surplus. The speed of adjustment for those running a deficit (λ_6) is 30.8% as compared to a speed of adjustment of 16.3% for those running a surplus (λ_5 in Table 3). This result is consistent with the argument that firms facing a financing deficit are under greater pressure to cover their financing imbalance and visits to the capital markets to do so may provide them with opportunities to adjust their capital structures appropriately. Using Byoun's model specification, however, we do not find such evidence. Finally, as can be seen in column (4) of Table 3, there is evidence that firms with above-target leverage and a financing deficit have the highest SOA (36.8%), compared to those with above-target leverage and a financing surplus (21.3%), and those with below-target leverage and a deficit (21.6%). This is an important empirical finding and is quite different from the results obtained using Byoun's model specification (see column (8) in Panel B of Table 3 or Byoun's original evidence (see his Table 7)).

Finally, in a series of (unreported) robustness checks, we find that our results are robust to the choice of the estimator (system GMM), alternative measures of leverage (market-based leverage or long-term leverage ratios), and the choice and definitions of the explanatory variables in the target leverage model (e.g., Flannery and Rangan, 2006).

5. Conclusions

Using financing-needs-induced partial adjustment models, Byoun (2008) was the first to document asymmetries in the way firms adjust toward their optimal capital structure. We show that his model specification implicitly relies on the assumption that firms adjust toward target debt ratios by making changes in their debt levels. Estimating asymmetric partial adjustment models under an alternative assumption that firms adjust both debt *and* total assets, we obtain different estimates of the speed of adjustment. Specifically, we find that firms that have above-target leverage and a financing deficit adjust more quickly toward their target capital structure, a result that contrasts with Byoun's (2008) finding that firms that adjust most quickly have above-target debt and a financing surplus. This difference comes from the instrument firms are assumed to use to move toward their target capital structure. We also document a new finding that firms facing a financing deficit generally have a higher adjustment speed than those facing a surplus.

Our study provides two implications for future capital structure research. First, it highlights the importance of the choice of model and hence instrument used to adjust toward the target when modeling leverage dynamics. We show how alternative assumptions about capital structure adjustments and different model specifications may lead to different conclusions about target adjustment behavior. Second, we call for further research on the mechanisms of leverage adjustments, i.e., how firms adjust their capital structures in order to move toward target leverage. Specifically, since our results show that firms with above-target leverage and a financing deficit have a higher adjustment speed, we expect that these firms will actively retire debt and/or issue equity under the trade-off framework. It would therefore be of interest to verify this conjecture and investigate firms' choice of securities conditional on their deviations from target leverage and financing gaps.

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Table 1. Illustrative Example

This table provides an example about a firm's capital structure adjustment operating over two periods, t–1 and t. D_t and A_t denote the firm's total debt level and total assets at time t, respectively. L_t is the firm's leverage ratio, defined as the ratio of total debt to total assets. $(D_{it}/A_{it})^* \equiv L_t^*$ is the firm's target debt ratio or target leverage. Deviation from target debt ratio and Deviation from target leverage correspond to $TDE_{it} = (D_{it}/A_{it})^* - (D_{it-1}/A_{it})$ (used in Byoun's model given by (3)) and $DEV_{it} = L_{it}^* - L_{it-1}$ (used in our model given by (6)), respectively. The adjustment speed 1 and 2 are estimated from those models, respectively.

		Assets	Adjustment in Debt	Adjustment in Debt and Assets
1	Time t – 1	$A_{t-1} = 80$	$D_{t-1} = 16$	$L_{it-1} = D_{t-1}/A_{t-1} = 20\%$
2	Time t	$A_t = 100$	$D_t = 20$	$L_{it} = D_t / A_t = 20\%$
3	Actual change from time t – 1 to t	$\Delta A_t = 20$	$\Delta D_t = 4$	$\Delta L_{it} = \Delta(D_t / A_t) = 0\%$
4	Actual change scaled by assets		$\Delta D_{it} / A_{it} = 4\%$	
5	Target debt ratio/leverage		$(D_{it}/A_{it})^* = 21\%$	$L_t^* = 21\%$
6	Deviation from target debt ratio		$TDE_{it} = (D_{it}/A_{it})^* - (D_{it-1}/A_{it}) = 5\%$	
7	Deviation from target leverage			$DEV_{it} = L_{it}^* - L_{it-1} = 1\%$
8	Adjustment speed 1 ((4)/(6))		80%	
9	Adjustment speed 2 ((3)/(7))			0%

Table 2. Regression Results for Target Leverage

This table presents the regression results for target leverage, modeled by Equation (4). The dependent variable is book leverage, measured by total debt (i.e., short-term debt (data34) plus long-term debt (data9)) divided by total assets (data6). The choice and definitions of the independent variables are based on Byoun (2008). MedB is the industry median book leverage ratio based on Fama and French's industry classifications. Tax is the marginal tax rate, equal to the statutory tax rate if the firm reports no net operating loss carryforwards (data52) with positive pretax return (data170) and zero otherwise. The statutory taxes are either 48% (over the period 1971–78), 46% (1979–86), 40% (1987), 34% (1988–1992) or 35% (1993–2003). OI is operating income (data13) divided by total assets. MB is the market-to-book ratio, equal to total assets (data6) less total equity (data216) and deferred taxes and investment (data35) plus the market value of equity (i.e., share price (data199) times shares outstanding (data54)) plus preferred stock liquidating value (data10 or data56 for the redemption value of preferred stock), all divided by total assets. lnA is the natural logarithm of total assets, adjusted for inflation. DEP is depreciation and amortization (data14) divided by total assets. FA is fixed assets (data8) divided by total assets. RND is research and development expenditures (data46) divided by net sales (data12). D_RND is a dummy variable that equals 1 if the data for RND are missing and 0 otherwise. DIV is common dividends (data127) divided by total assets. AZ is Altman's modified Z score, AZ = 3.3EBIT (data178) + Sales (data12) + 1.4RE (data36) + 1.2WC (data4–data5). All variables are winsorized at the 1% and 99% to mitigate the impact of outliers. The model is estimated using the Pooled OLS estimator. Figures in parentheses are robust standard errors. *, ** and *** indicate the coefficients are significant at the 10%, 5%, and 1% levels of significance, respectively.

Variables	D_t / A_t
MedB	0.534***
	(0.009)
Tax	0.016**
	(0.006)
OI	-0.014***
	(0.005)
MB	-0.002***
	(0.000)
lnA	0.014***
	(0.000)
DEP	0.157***
	(0.024)
FA	0.142***
	(0.004)
RND	-0.029***
	(0.001)
D_RND	0.019***
	(0.001)
DIV	-2.682***
	(0.041)
AZ	-0.011***
	(0.000)
Constant	-0.064***
	(0.005)
Observations	117,983
Adj. R-squared	0.210

Table 3. Regression Results for Partial Adjustment Models

This table presents the regression results for the symmetric and asymmetric partial adjustment models. Panel A reports the results for Equations (6) and (12), (13) and (14), in which the dependent variable is the change in leverage (ΔL_{it}) and the independent variables are DEV_{it} or its interactions with dummy variables, where $DEV_{it} = L^*_{it} - L_{it-1}$ and L^*_{it} is the estimated target leverage ratio. Panel B reports the results for models where the dependent variable is $\Delta D_{it} / A_{it}$ and the independent variables are TDE_{it} or its interactions with dummy variables, where $TDE_{it} = L^*_{it} - D_{it-1} / A_{it}$. D^a (D^b) is a dummy variable equal to 1 if firms have above (below) target leverage and 0 otherwise. D^s (D^d) is a dummy variable equal to 1 if firms have a financing surplus (deficit) and 0 otherwise. A financing deficit is defined as operating cash flows after interest and taxes, less net investment, changes in net working capital and dividend payments. *F*-test reports the *p*-value of the *F*-test for the hypothesis that the coefficient estimates (the SOA estimates) are equal. Figures in parentheses are robust standard errors. *, ** and *** indicate the coefficients are significant at the 10%, 5%, and 1% levels of significance, respectively.

Panel A	(1)	(2)	(3)	(4)
Variables	ΔL_{it}	ΔL_{it}	ΔL_{it}	ΔL_{it}
DEV_{it} (λ_2)	0.292***	-	-	-
	(0.004)	-	-	-
$DEV_{it} D^a$ (λ_3)	-	0.352***	-	-
	-	(0.007)	-	-
$DEV_{it} D^b$ (λ_4)	-	0.202***	-	-
	-	(0.007)	-	-
$DEV_{it} D^s$ (λ_5)	-	-	0.163***	-
	-	-	(0.010)	-
$DEV_{it} D^d$ (λ_6)	-	-	0.308***	-
	-	-	(0.004)	-
$DEV_{it} D^a D^s$ (λ_7)	-	-	-	0.213***
	-	-	-	(0.014)
$DEV_{it} D^a D^d$ (λ_8)	-	-	-	0.368***
	-	-	-	(0.007)
$DEV_{it} D^b D^s$ (λ_9)	-	-	-	0.089***
	-	-	-	(0.014)
$DEV_{it} D^b D^d$ (λ_{10})	-	-	-	0.216***
	-	-	-	(0.007)
Constant	0.001***	0.013***	0.001***	0.013***
	(0.000)	(0.001)	(0.000)	(0.001)
Observations	112,605	112,605	112,605	112,605
R-squared	0.158	0.162	0.162	0.166
F-test ($\lambda_3 = \lambda_4$)	-	0.000	-	-
F-test ($\lambda_5 = \lambda_6$)	-	-	0.000	-
F-test ($\lambda_7 = \lambda_8$)	-	-	-	0.000
F-test ($\lambda_8 = \lambda_{10}$)	-	-	-	0.000

Panel B	(5)	(6)	(7)	(8)
Variables	$\Delta D_{it} / A_{it}$	$\Delta D_{it} / A_{it}$	$\Delta D_{it} / A_{it}$	$\Delta D_{it} / A_{it}$
TDE_{it} (λ_1)	0.333***	-	-	
	(0.004)	-	-	-
$TDE_{it} D^a$ (λ_3)	-	0.437***	-	-
	-	(0.007)	-	-
$TDE_{it} D^b$ (λ_4)	-	0.164***	-	-
	-	(0.005)	-	-
$TDE_{it} D^s$ (λ_5)	-	-	0.323***	-
	-	-	(0.011)	-
$TDE_{it} D^d$ (λ_6)	-	-	0.335***	-
	-	-	(0.004)	-
$TDE_{it} D^a D^s$ (λ_7)	-	-	-	0.475***
	-	-	-	(0.014)
$TDE_{it} D^a D^d$ (λ_8)	-	-	-	0.429***
	-	-	-	(0.007)
$TDE_{it} D^b D^s$ (λ_9)	-	-	-	-0.006
	-	-	-	(0.010)
$TDE_{it} D^b D^d$ (λ_{10})	-	-	-	0.182***
	-	-	-	(0.006)
Constant	0.006***	0.028***	0.006***	0.028***
	(0.000)	(0.001)	(0.000)	(0.001)
Observations	112,413	112,413	112,413	112,413
R-squared	0.186	0.198	0.187	0.201
F-test ($\lambda_3 = \lambda_4$)	-	0.000	-	-
F-test ($\lambda_5 = \lambda_6$)	-	-	0.316	-
F-test ($\lambda_7 = \lambda_8$)	-	-	-	0.000
F-test ($\lambda_8 = \lambda_{10}$)	-	-	-	0.000