

Dynamic Capital Structure Trade-off Theory: Evidence from Malaysia

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Dynamic trade-off theory proposes that firms may deviate from their target capital structure but they will exhibit an adjustment behavior towards that target. Estimating the speed of adjustment (SOA) is an investigation for the joint hypotheses that the target actually exists and that firms adjust toward their target. However, using a single estimated SOA that fits all firms is misleading and cannot be used as evidence for or against the dynamic trade-off theory if the real dynamic behavior is largely heterogeneous. This study finds evidence for this heterogeneity in the SOA for Malaysian firms using system GMM approach. The study finds that firms that are far from the target exhibit faster adjustments than firms close to the target, and firms that are overleveraged exhibit faster adjustment than underleveraged firms. These results are consistent with the dynamic trade-off theory. However, the finding of this study cannot reject other interpretations of capital structure i.e., pecking order or timing theory, since the SOA for some of the firms is very slow and hence, cannot be the first order determinant of capital structure.

JEL Codes: G32, G33, and O16

1. Introduction

Trade-off theory of capital structure (Baxter 1967; Kraus & Litzenberger 1973) suggests that firms choose their capital structure by balancing the advantages of borrowing, mainly tax savings, with the costs associated with borrowing including bankruptcy costs. This trade-off implies the existence of a target leverage that maximizes the value of the firm. The existence of a target, which is at the heart of the theory, requires that any deviation from that target leverage should be adjusted.

The dynamic version of the trade-off theory explicitly accounts for the adjustment behavior of the leverage ratio where adjustments take place when the cost of deviation from the target exceeds the cost of adjustment towards that target (Fischer et al. 1989). One advantage of the dynamic feature is that since the adjustment towards the target is a characteristic of trade-off theory, it can be used to validate the trade-off theory against other theories of capital structure that do not presume the existence of target leverage, i.e. pecking order theory (Myers & Majluf 1984) and timing theory (Baker & Wurgler 2002).

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Abdeljawad, Mat-Nor, Ibrahim & Abdul-Rahim

In both pecking order and timing theories, the leverage dynamism is driven by factors that are not related to the target leverage i.e., adverse selection costs and mispricing of the firm's equity, respectively. As argued by Fama and French (2002), the existence of the target and the adjustment toward that target are the most convincing evidence in favor of trade-off theory.

The two features of trade-off theory, namely the existence of the target and the adjustment toward that target, can be jointly tested by estimating the speed of adjustment (SOA) to the target. The SOA is the percentage of the deviation from the target that the firm removes each period. In estimating the SOA, the implicit assumption is that the SOA is homogenous across firms (Fama & French 2002; Flannery & Rangan 2006; Ozkan 2001). This assumption is however inconsistent with the argument of the dynamic trade-off theory which posits that different costs of deviation and different costs of adjustments should result in different estimations for the SOA. Few recent papers indicate that no single estimated SOA can fit all firms. A more reasonable approach is to acknowledge multiple SOAs to understand the true dynamic behavior of the firms (Flannery & Hankins 2007; Lemmon et al. 2008). The heterogeneity of the SOA does not only give support to the trade-off theory; it may also explain possible conditions under which other theories may prevail. In cases where the adjustment speed is slow, the adjustment behavior may not be the priority such that other considerations, for instance, the mispricing of equity or the adverse selection costs may drive the capital structure decisions. Nonetheless, if the SOA is high, it is likely that the adjustment to the target will dominate other considerations in which the trade-off theory is likely to appear as the first order determinant.

This paper builds on this new line of arguments and aims to add evidence for the heterogeneity of the SOA from Malaysian data. This paper conditions the deviation from the target using two different criteria specifically, whether the firm is over or under-leveraged and whether the firm is close or far from the target. This study addresses the estimation problems highlighted in previous literature by using the system GMM approach of Blundell and Bond (1998). This estimator is recent to the Malaysian capital structure research and the results may improve the understanding of the way Malaysian firms make financing decisions.

In the remaining of this paper, the review of the literature is presented in Section 2. Section 3 discusses the methodology and estimation models, followed by Section 4 which reports and discusses the results and Section 5 which concludes.

2. Literature Review

Theories of capital structure can be grouped into two categories; the first includes trade-off theory (Baxter 1967; Kraus & Litzenberger 1973), agency theory (Jensen & Meckling 1976) and free cash flow theory (Jensen 1986) which recognize the existence of an optimal level of debt (target leverage). The second category includes pecking order theory (Myers & Majluf 1984) and equity market timing theory (Baker & Wurgler 2002) that do not assume any optimal level of debt. Theories in both categories can be modeled into static or dynamic framework. Adjustment behavior towards the target is associated with the dynamic versions of theories from the first category while the dynamic versions of theories from the second category do not include target leverage that the firm is adjusting to. Instead, the dynamism of theories

Abdeljawad, Mat-Nor, Ibrahim & Abdul-Rahim

from the second category relates to non-target factors like the cost of adverse selection (pecking order theory) or the mispricing of the common stock (timing theory).

The main difference between the dynamism of theories in both categories is that the dynamism implied by the first category theories gradually moves the observed leverage toward the target leverage. Meanwhile, the dynamism of the second category theories may move the observed leverage to any direction depending on the factor that drives the leverage ratio. The present study intends to investigate the dynamic adjustment towards the target. Hence, it is more related to theories of the first category. Introducing the main characteristics of static versions of these theories may facilitate the discussion about the dynamic adjustment toward the target later. Interestingly, these theories can be seen as complementary to each other, not substitutes (Myers 2003). Therefore, the costs and benefits in the real world can be the sum of the costs and benefits highlighted in all theories.

The static version of capital structure theories that include target leverage emphasize the idea that firms trade-off between costs and benefits of debt, and this trade-off can explain the cross-section variation in leverage ratio across firms. These theories implicitly assume the existence of target leverage but believe that all firms are already at their targets. However, what determine the equilibrium point in these theories differs from one theory to the other. In the tax-based trade-off theories, the benefits of interest tax shield are offset by the costs from additional borrowing, particularly the bankruptcy costs. Baxter (1967) and Kraus and Litzenberger (1973) state that a taxable corporation should increase its debt level until the marginal value of tax shield is offset by the present value of possible financial distress costs.

Dynamic trade-off theories explicitly emphasize the idea that firms have a target that maximizes its value and deviations from that target are costly. Hence, deviations will be gradually removed over time. Extant literature generally supports the existence of long-run target leverage and agrees to the notion that a typical firm converges to that target gradually at a certain SOA but the magnitude of this SOA is not a settled issue (Frank & Goyal 2007). A very high SOA of about 80 percent yearly is found by de Miguel and Pindado (2001). Ozkan (2001) also finds a relatively fast speed of more than 50 per annum while Flannery and Rangan (2006) document a rapid but more reasonable SOA of 35 percent yearly which they interpret as evidence in favor of the trade-off theory. In contrast, Fama and French (2002) find a slow SOA that ranges between 7 percent minimum for dividend payers and 18 percent maximum for dividend non-payers while Huang and Ritter (2009) find a SOA of 17 percent annually. Despite the slow SOA, Fama and French (2002) interpret their result as being consistent with trade-off model but conclude that the result cannot be used to reject the pecking order model. A slow SOA indicates that trade-off factors may be only a secondary consideration in the capital structure decisions. Malaysian literature finds a relatively active adjustment behavior that is usually interpreted in favor of the trade-off theory (Hussain 2005). However, what is the reason for the high heterogeneity in the estimated SOA? Some researchers point to fundamental reasons (Flannery & Hankins 2007) while others attribute the differences to the methodology used (Hovakimian & Guangzhong 2011; Iliev & Welch 2010).

One possible reason for the heterogeneity of the SOA is the variation across countries such as in terms of the country's economic environment, institutions, tax systems and governance practices on the capital structure decisions (Antoniou et al. 2008).

Nonetheless, the SOA is still likely to be heterogeneous even across firms within the same country and in studies that use the same estimation method. Flannery and Hankins (2007) suggest a theory of dynamic capital structure where capital structure decisions reflect the level of optimal leverage as well as the cost of deviation from that leverage and the costs of adjusting toward that optimal level of leverage. The SOA depends on the costs and benefits of rebalancing. Since these costs vary across firms, so do the SOAs. Elsas and Florysiak (2011) find that the SOA is higher for firms with high default risk, high expected bankruptcy costs and higher opportunity costs of deviating from the target. Drobetz and Wanzenried (2006) find that faster growing firms and firms that are more deviated from the target adjust more quickly. Byoun (2008) finds that a single constant SOA cannot capture the dynamics of capital structure for all firms as financial deficit and over- or underleveraged of the firm may affect the SOA. Byoun (2008) finds that firms that are above the target debt with financial surplus adjust at a rate of 33 percent and firms that are below target with financial deficit adjust at 20 percent. On the other hand, firms with deficit and above target adjust at 2 percent while those with surplus and below target adjust at 5 percent. Meanwhile, Dang et al. (2012) find that firms with large financing imbalances, large investment or low earnings volatility adjust faster to their target capital structure.

3. Methodology

The study includes all non-financial firms listed on Bursa Malaysia for which data are available from Thomson Financial Worldscope Database during the period of 1992-2009. Data prior to 1992 is often missing and hence, returning to earlier year is not feasible. Financial firms are excluded since their capital structure reflects special regulations. Effect of outliers is restricted by excluding firm-year observations where (i) book value of assets is missing, (ii) book leverage ratio exceeds 1.0, and (iii) market-to-book ratio exceeds 10.0 (Baker & Wurgler 2002; Hovakimian 2006). The resulting unbalanced panel data of 434 firms provides 7978 firm-year observations.

The dependent variable is the firm's leverage ratio which is the ratio of total debt to total assets. This leverage reflects only the debt financing policy of the firm (Hovakimian 2006). Following Fama and French (2002), this study uses the book value of leverage because it better captures the active adjustment behavior since market leverage also captures adjustment to market fluctuation.

Standard partial adjustment model is used to capture the dynamic adjustment toward the target, that is;

$$Lev_{i,t} - Lev_{i,t-1} = \delta(Lev_{i,t}^* - Lev_{i,t-1}) + \varepsilon_{i,t} \quad (1)$$

where δ is the average SOA to the target each period for all firms used in the estimation, $Lev_{i,t}^*$ is the target leverage whereas $Lev_{i,t}$ and $Lev_{i,t-1}$ are the current and lagged 1 period leverage ratios, respectively. The model assumes that the firm has a target leverage that minimizes the cost of capital. Once the firm is deviated from the target, it should adjust once the cost of deviation is higher than the cost of adjustment. Since a full adjustment occurs when $\delta=1$ while $\delta=0$ means no adjustment takes place, the partial adjustment model proposes that actual adjustment in leverage should be between 0 and 1.

Abdeljawad, Mat-Nor, Ibrahim & Abdul-Rahim

The target leverage $Lev_{i,t}^*$ is unobservable and hence, is proxied by the fitted value from a regression of observed leverage on a set of firms' characteristics that determine target capital structure (Fama & French 2002; Flannery & Rangan 2006). The firm's characteristics used in this study are the variables found to be the significant capital structure determinants in the US and other developed countries (Rajan & Zingales 1995; Baker & Wurgler 2002), as well as in Malaysia (Booth et al. 2001). The regression results later show that the variance inflation factors (VIF) of these variables range from 1.017 to 1.034.

$$Lev_{i,t}^* = \beta_1 + \beta_2 Growth_i + \beta_3 Profit_i + \beta_4 Tang_i + \beta_5 Size_i + \gamma_t + \eta_i \quad (2)$$

Where γ_t and η_i are firm and time fixed effects following Flannery and Rangan (2006) and Lemmon et al. (2008). Other variables are self-explanatory (refer to Table 1). However, an estimation of the partial adjustment model can be done by substituting the target leverage from Eq. (2) into the partial adjustment model in Eq. (1) and by rearranging the terms the estimation can be done in a single step of Eq. (3).

$$Lev_{i,t} = \delta \beta X_{i,t} + (1 - \delta) Lev_{i,t-1} + \gamma_t + \eta_i + \varepsilon_{i,t} \quad (3)$$

Where δ is the SOA, equals to 1.0 minus the coefficient of the lagged leverage. $X_{i,t}$ is the set of determinant variables of the target from Eq.(2). All variables are used as concurrent regressors except for the lagged leverage, to allow for more observations to be used.

To estimate the SOA, this study employs the system generalized methods of moments (GMM) following recent studies (Antoniou et al. 2008; Lemmon et al. 2008). Lemmon et al. (2008) argue that system GMM is expected to produce large efficiency gains over other approaches that use difference GMM or two stages least square methods. This study also uses orthogonal deviation to remove the fixed effects (Arellano & Bover 1995; Roodman 2006). Orthogonal deviations are preferable in cases where many gaps exist in the unbalanced panel data, especially when sub-samples are created. That is, after Eq. (3) is estimated for the full sample, it is re-run on sub-samples of over or underleveraged firms to control for the direction of the deviation from the target. Investigating the differences in capital structure determinants using partial adjustment models by dividing the full sample into subgroups can be found in Antoniou et al. (2008). Finally, Eq. (3) is re-estimated for another set of two sub-samples of firms close to the target and firms far from the target. Deviation (DEV) from the target is;

$$DEV_{i,t} = Lev_{i,t} - Lev_{i,t}^* \quad (4)$$

where $Lev_{i,t}^*$ is estimated using Eq. (2). Since leverage value is by definition bounded by minimum 0 and maximum 1, any fitted value for the target leverage that is out of the sample observations is replaced by its actual value to be consistent with the defined boundaries. The sub-samples are then created using the median of the absolute value of DEV as the cut-off point. Firms below the median (near-target firms) are separated from those above the median (off-target firms).

4. Estimation Results

The descriptive statistics for the variables are presented in Table 1. Results from estimating Eq. (3) for the full and sub-samples are reported in Table 2. For diagnostics, both significance of AR(1) and AR(2) are reported and the insignificant AR(2) indicates the absence of second order autocorrelation as required for a GMM estimation. The validity of instruments is satisfied under the Hansen test. The Wald test indicates that the regressors are jointly significant in explaining the dependent variable. The number of instruments is also reported following the recommendation of Roodman (2006).

Table 1: Descriptive statistics

Variable	Definition	Mean	Median	Maximum	Minimum	Std. Dev.
Leverage	Total Debt/Total Assets	0.251	0.233	0.997	0.000	0.196
Growth	MV(Equity)/BV(Equity)	1.116	0.918	9.297	0.000	0.737
Tangibility	Net PPE/Total Assets	0.403	0.394	0.999	0.000	0.222
Size	Log(Sales)	19.104	19.026	23.969	9.250	1.545
Profit	EBITD/Total Assets	0.067	0.075	11.096	-2.434	0.188

Notes: N is always equals to 7978 except for size where N equals to 7955. PPE is net plant, property and equipment and EBITD is earnings before interest, taxes and depreciation.

The results for the full sample in Column (a) of Table 2 show that the lagged leverage is the most important determinant of current leverage. Holding all other regressors constant, about 87.4 percent change in the mean of current leverage is resulted from a 100 percent change in the lagged leverage. This is evidence for the high persistence of the leverage variable. The lagged dependent variable is of special importance in the partial adjustment model. If the firm follows an adjustment policy, the coefficient of this variable must lie between 0 and 1.

The speed of adjustment (SOA, δ) for the full sample suggests that only 12.7 percent of the difference between desired and actual level of leverage is closed in one year. The low SOA is consistent with results reported in developed markets (Baker & Wurgler 2002; Fama & French 2002; Huang & Ritter 2009; Iliev & Welch 2010; Lemmon et al. 2008). However, this result is different from Flannery and Rangan (2006) who document a relatively high SOA of 34.4 percent. The difference can be traced to the estimation approach used. Flannery and Rangan (2006) use a within-estimator to remove the fixed effects, which tends to be severely biased in estimating dynamic models (Lemmon et al., 2008). The slow SOA is also inconclusive in supporting or rejecting the trade-off theory. The adjustment behavior is significant but it is too small to be a first priority in determining the capital structure. Fama and French (2002) find similar slow SOA ranging from 7-17 percent and they find it difficult to interpret the results in favor of the trade-off theory despite the statistically reliable coefficient.

Overleveraged firms face higher costs of deviation so that they are more pressured to adjust. Meanwhile, the costs of deviation are lower for underleveraged firms where adjusting is not a priority for these firms. To investigate this hypothesis, two subsamples representing overleveraged and underleveraged firms are created. Eq. (3) is re-estimated for each subsample and the results are reported in Columns (b) and (c) of Table 2. Generally, firms are found to be much more sensitive when they are overleveraged than when they are underleveraged. The SOA for overleveraged firms

Abdeljawad, Mat-Nor, Ibrahim & Abdul-Rahim

is much higher (29.4%) than for underleveraged firms (13.1%). The impacts of control variables are also much higher for overleveraged than for underleveraged firms.

Table 2: Estimation Results for the Short-Run Determinants of Leverage

	Whole	Over-levered	Under-levered	Off-target Leverage	Near-target Leverage
<i>LEV(-1)</i>	0.8743 (36.91)***	0.7061 (9.41)***	0.8687 (21.08)***	0.8253 (27.22)***	0.9767 (9.41)***
<i>Growth</i>	0.0117 (3.59)***	0.0201 (4.62)***	0.0029 (1.09)	0.0164 (3.10)***	0.0037 (0.67)
<i>Profit</i>	-0.2156 (-8.61)***	-0.2606 (-8.04)***	-0.1259 (-3.93)***	-0.2370 (-5.83)***	-0.0679 (-0.96)
<i>Size</i>	0.0049 (4.23)***	0.0045 (2.35)**	0.0026 (2.14)**	0.0051 (2.08)**	-0.0004 (-0.48)
<i>Tangibility</i>	0.0365 (5.04)***	0.0477 (3.26)***	0.0150 (2.35)**	0.0428 (3.14)***	0.0140 (0.58)
SOA	12.7%	29.4%	13.1%	17.48%	2.3%
No. of Obs.	6931	2384	2644	2489	2496
No. of Inst.	156	156	154	156	152
Sig. of AR(1)	0.000	0.000	0.000	0.000	0.000
Sig. of AR(2)	0.989	0.679	0.942	0.502	0.937
Sig. of Hansen test	0.668	0.352	0.454	0.752	0.684
Wald Chi ²	(2579.8)***	(888.9)***	(1169.2)***	(1251.5)***	(72732.8)***

Notes: SOA is speed of adjustment. Constant coefficient and time dummies are included but not reported. Standard errors are robust and corrected using Windmeijer's (2005) finite sample correction. The significance of Arellano and Bond's (1991) test for AR(1) and AR(2) are reported. ***, ** and * indicate the coefficient is significant at 1%, 5% and 10% levels, respectively.

Next, the magnitude of the deviation is controlled for by creating two sub-samples; firms close to the target and firms far from the target. Dynamic trade-off theory expects that the higher the costs of deviation, the faster the adjustment speed. Columns (d) and (e) of Table 2 present the results. The SOA for firms that are far from the target is about 17.5 percent while it is only 2.3 percent for firms close to the target. This result is consistent with the predictions of dynamic trade-off theory. Table 2 also reveals that all the determinants of leverage ratio are only significant for the off-target leverage firms. The large coefficient of the lagged leverage for firms close to the target indicates that the leverage ratio is very persistence for these firms.

5. Conclusion

Using system GMM, this study reveals that Malaysian firms are adjusting their capital structure to the target but at a slow rate of 12.7 percent. However, this study finds evidence for heterogeneity in the targeting behavior; overleveraged firms adjust to the target faster than underleveraged firms (29.4% versus 13.1%). This behavior is likely to result from the asymmetry of the benefits of being at the target. Deviating from the target on the upper side is likely to be more costly than deviating below the target because bankruptcy costs and agency costs of debt will intensify quickly as the firm deviates more above the target. Hence, overleveraged firms need to adjust faster to reduce these costs. The dynamic behavior for firms far from the target and firms close to the target is different which is expected as greater deviation from the target makes it more critical for the firm to adjust. Firms far from the target are found to adjust faster

Abdeljawad, Mat-Nor, Ibrahim & Abdul-Rahim

(17.5%) than firms close to the target which adjust at only 2.3 percent. This is probably because off-target leverage firms face higher cost of adjustment. The findings imply that firm capital structure should be kept close to the target to minimize unnecessary leverage adjustment costs.

The findings of this study support the relevance of the dynamic trade-off theory. However, the dynamic adjustment in certain conditions, specifically for near-target and underleveraged firms, is weak and can be easily dominated by other considerations. That means that other theories of capital structure might dominate the financing decisions. If the timing or adverse selection considerations produce benefits that overcome the costs of deviation, they may dominate the behavior of the firms and the timing theory or pecking order theory will appear as first order priorities. This is more likely to occur for firms that are close to the target than firms far from the target and for firms below the target than firms above the target. These results, though consistent with the trade-off theory, might be specific to the sample of study and limited by the controlled variables used to explain leverage. Future studies in other countries are necessary to validate and generalize the results.

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Abdeljawad, Mat-Nor, Ibrahim & Abdul-Rahim

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