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Determinants of Adjustment Speed to Target Capital Structure: Evidence from Indian Manufacturing Firms

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Abstract — **The objective of the study is to identify the determinants of adjustment speed to target capital structure for 891 Indian manufacturing companies over the period from 1993-94 to 2007-08. Using a dynamic panel data analysis and more specifically generalized method of moments technique we find that financial constraints, external financing cost, distress cost, ownership and macro economic conditions affect the speed of adjustment to target capital structure significantly.**

Key words- Adjustment speed, target capital structure, dynamic panel data, generalized method of moments, macroeconomic condition, and financial constraints.

I. INTRODUCTION

In the previous empirical capital structure literature the dynamic trade-off theory of capital structure has found strong support (see [1], [2], [3] and [4]). This theory argues that firms do have a target capital structure, which balances the costs and benefits of leverage. But that observed capital structures frequently deviate from the target level because adjustment costs are keeping firms from reaching their target structure every year. For example, [2] examine the frequency of issuance and repurchase activities of firms and find that issuances appear to be clustered in time, consistent with a fixed issuance cost.

Therefore, the literature has begun to examine how quickly firms converge to their optimal capital structures and what are the determinants of the speed at which they adjust to their target capital structures (see [5], [6], [7] [8], [9], [10] and [11]). The speed of adjustment weighs rebalancing costs against the costliness of deviating from the target. Slower adjustment speeds are predicted in the presence of higher adjustment costs and faster adjustment speeds are predicted when deviations are more costly. The researchers have argued that the adjustment speed varies across firms and time period because of the varying adjustment costs incurred by the firms. The adjustment costs of the companies vary over the different types of companies. The broad factors like financial constraint, external financing cost, financial distress, financial deficit or surplus, distance between the observed and optimal debt ratio, ownership of the company and macro economic conditions affect the adjustment costs of the companies which in turn affect the adjustment speed to the target capital structure. To our knowledge there is no literature available on the determination of factors which affect the speed of adjustment to target capital structure in the context of Indian companies. In this context, this paper has tried to fill this gap by estimating the capital structure equation in the dynamic model framework to determine those factors which affect the adjustment speed to target capital structure.

The rest of the paper is organized as follows. Section II presents the model specification and methodology. Section III discusses the measures and determinants of leverage. Section IV discusses the a priori determinants of adjustment speed to target leverage. Section V describes our panel of Indian non-financial company data. The results are discussed in Section VI. Summary and conclusions are provided in Section VII.

II. MODEL SPECIFICATIONS AND METHODOLOGY

We specify a dynamic panel data model to analyze the impact of adjustment costs and other firm specific control variables on optimal leverage ratios of the firm. Let the optimal leverage ratio for firm i, at time t be denoted as $D/E_{i,t}^{*}$. It is specified as a function of a vector of firm and time-varying variables. Specifically, in this model, the optimal leverage is allowed to vary across firms and over time. Since factors that determine a firm's optimal leverage may change over time, it is likely that the optimal debt ratio itself may also move over time for the same firm. Thus, this formulation explicitly accommodates the dynamic nature of a firm's capital structure decision.

The model is specified as follows:

$$D/E^{*}_{i,t} = \beta X_{i,t} \quad \text{---------- (1)}$$

Where, $D/E^{*}_{i,t}$ = target leverage ratio and X = firm specific variables.

The equation (1) provides an estimate of each firm's target leverage ratio, which we define as the debt ratio that firms would choose in the absence of information asymmetries, transaction costs, and other adjustment costs. However, in an imperfect market, in the presence of adjustment costs firms may not fully adjust their actual debt ratio from the previous period to the current target debt ratio. Therefore, we have used a standard partial adjustment model as used by Hovakimian et al. (2001) as follows:

$(D/E_{i,t} - D/E_{i,t-1}) = \lambda (D/E^{*}_{i,t} - D/E_{i,t-1}) + \varepsilon_{i,t}$ --------(2)

Where $D/E_{i,t}$ and $D/E_{i,t-1}$ represent leverage for firm i in period's t and t-1, and λ represents the adjustment speed and this adjustment parameter represents the magnitude of the desired adjustment between two subsequent periods or the rate of convergence of $D/E_{i,t}$ to its target level, $D/E^{*}_{i,t}$. The effects of the adjustment costs are represented by the restriction that $|\lambda| < 1$, which is a condition that $D/E_{i,t-1}$ tends to $D/E^{*}_{i,t}$ as $t \to \infty$. Leverage values that deviate from their target level will be regarded as sub-optimal.

Equation (2) can be written as

$D/E_{i,t} = \lambda D/E^{*}_{i,t} + (1- \lambda) D/E_{i,t-1} + \varepsilon_{i,t}$ ----------(3)

Putting the value of $D/E^{*}_{i,t}$ from equation (1) in equation (3) we get:

$D/E_{i,t} = (1-\lambda) D/E_{i,t-1} + \lambda \beta X_{i,t} + \varepsilon_{it}$ ---------- (4)

Further we have endogenized both the target level of adjustment and the adjustment factor to reach the target level, so that we extend the partial adjustment process in equation (4) to allow for per period degree of adjustment in the following way

$D/E_{i,t} = (1-\lambda_{i,t}) D/E_{i,t-1} + \lambda_{i,t} (D/E)^{*} + \varepsilon_{i,t}$----------(5)

Where $\lambda_{i,t}$ is not necessarily equal to λ. Now substituting equation (1) in equation (5), we get

$D/E_{i,t} = (1-\lambda_{i,t}) D/E_{it-1} + \lambda_{i,t}(\beta X_{i,t}) + \varepsilon_{i,t}$----------(6)

Specifying λ_{it} as a linear function of factors affecting the transaction costs as well as the unobserved firm-specific effects the equation can be specified as:

$\lambda_{i,t} = k + \phi Z'_{i,t}$ ---------- (7)

Where, Z'= vector of variables which affect the transaction costs of the company and k = unobservable factors related to company.

Substituting Eq.(7) in Eq.(6) we get,

$D/E_{i,t} = [1- (k+ \phi Z'_{i,t})] D/E_{i,t-1} + (k + Z'_{i,t\ it}\ \phi)(\beta X_{i,t}) + \varepsilon_{i,t}$--(8)

$D/E_{i,t} = (1-k) D/E_{i,t-1} - \phi Z'_{it} D/E_{i,t-1} + (k + Z'_{it}\ \phi)(\beta X_{i,t}) + \varepsilon_{i,t}$-------(9)

We have estimated equation (1) using a static pooled data method to determine the factors affecting the leverage ratio. We have used generalized method of moments technique to estimate the equation (9) to determine the factors affecting the adjustment speed to target capital structure. Generalized Method of Moments (GMM) technique has been used because it provides consistent parameter estimates by utilizing instruments that can be obtained from orthogonality conditions that exist between the lagged values of the variables and the disturbances [12].

III. Measures And Determinants Of Leverage

Following [13] we have used the ratio of total debt to total capital where capital is defined as total debt plus total market value of equity. This measure of leverage takes into account the capital employed and thereby gives a best representation of the effects of past financing decisions. This definition of leverage also relates to the agency problem associated with debt {[14] and [15]}.

We have used the commonly used explanatory variables like size of the company (SZ), tangibility (TAN), non debt tax shields (NDTS), profitability (PROF), growth opportunity (GR), liquidity (LQ) and research and development intensity (RDIN) as the determinants of capital structure. The measures of these variables are explained as follows. SZ= natural logarithm of total assets, TAN= the ratio of fixed assets to total assets, NDTS= the ratio of depreciation to total assets, PROF= the ratio of net income to total assets, GR= market to book ratio of assets, LQ= current assets to current liability, RDIN= the research and development expenditure as a proportion of total assets. These variables are used to estimate the target capital structure.

IV. Determinants Of Speed Of Adjustment

Reference [8] argues that the speed of adjustment to target capital structure is determined by the adjustment costs and benefits to maintain the target leverage ratio. The sources of adjustment costs include financial constraints faced by the firm and external financing costs. The sources of adjustment benefits are the potential distress costs and the tax benefits. Financing constraints may impact the ability to retire debt or repurchase shares and, in turn, play an important role in the adjustment process. Regular cash flows may limit flexibility by reducing the amount of available cash and restricting manager's ability to easily alter the leverage. As argued in [16] and [17] dividend payment (DIV) is noted as the principal financial constraint of the firm to change the leverage frequently. Therefore, an inverse relationship can be expected between dividend and the speed of adjustment to target capital structure. Other source of financial constraint has been the unavailability of free cash flow to the firm which increases the need of external financing which may affect the speed of adjustment because it decreases the financial flexibility, so that we hypothesize a positive relationship between the cash flow available to the firm and the adjustment speed to target capital structure. We use cash inflows measured by profitability (PROF). Reference [15] notes that changes in profitability affect internal constraints and [1] states that it may affect the speed of adjustment. Profitability provides funds for share repurchases as well as the financial stability to issue securities at an attractive rate.

The external financing costs affect the adjustment decision when leverage rebalancing requires security issuance. More costly financing creates a hurdle that may slow the speed of rebalancing. For instance, information asymmetry creates frictions that increase the difficulty of issuing securities, [15] and [18]. As the cost of external financing fluctuates with information asymmetry and access to the capital markets, we expect these factors to affect the capital structure adjustment process. We have used size (SZ) of the company as a proxy for information asymmetry. Larger firms frequently have lower information asymmetry which would imply a lower cost of financing and faster adjustment. But they generally have less cash flow volatility which reduces the potential costs of distress and the expected speed of adjustment [3]. The other variable which is linked with the alternative sources of financing is the growth opportunity of the company (GR), which is measured as the ratio of market value of assets to book value of assets. A growing firm do find it easier to avail several alternative sources of financing and this makes them easier to make

change in its capital structure. A low growth firm has lesser opportunities to avail in order to raise funds from the market and swap debt against equity to change its capital structure. Therefore, a positive relationship is expected between growth and adjustment speed.

Collaterals are generally assumed to reduce the costs of distress of the firms, [19]. As the costs of deviating from the target should fall with distress costs, we expect a lower speed of adjustment for firms with higher tangibility (TAN). Alternatively [14] argues that tangibility decreases the asset substitution problem. This implies faster adjustment. It is measured as the total fixed assets to total assets. The tax benefit of debt increases the value of maintaining the target debt ratio. But firms that exceed their non-debt tax shields (NDTS) can extract value from increased tax shield utilization. The non-debt tax shield is used as the ratio of depreciation to total assets. Following [7] the speed of adjustment towards the target capital structure level critically depends on how far away a firm's capital structure is from the target level. Therefore, we define a variable denoted as DIST which is the absolute difference between target leverage and observed leverage. This variable is defined as $| D/E^{*}_{i,t} - D/E_{i,t}|$ where $D/E^{*}_{i,t}$ is the fitted value from the fixed effect of the debt ratio of firm i on the capital structure determinants as of time t. The speed of adjustment is expected to be more rapid, the farther away the firm's capital structure is from its target level. Therefore, we predict a positive relationship between DIST and the adjustment speed. In this regard another argument is that if the major portion of the adjustment costs are fixed costs and fixed costs are very high then the firms may be reluctant to change the leverage more rapidly, so that a negative relationship can be hypothesized between DIST and the adjustment speed. Sorting out between the two arguments is an empirical matter.

We also include the effects of ownership structure on decisions about a firm's capital structure, and, therefore, the firm's speed of adjustment. In particular, the company under a business group (BG) affects the firm's speed of adjustment. It can be expected that the company which is in a business group is not financially constraint and the cost of external financing has been low for it. Therefore, a positive relationship is expected to have a positive effect on adjustment speed. We use dummy variable one for the company which is in the business group and zero otherwise. Specifically the hypothesis proposed in [20] says that the speed of adjustment depends on the stage of the business cycle. They argue that the speed is higher in booms than in recessions. Since an economic recession is traditionally defined as a decline in real Gross Domestic Product (GDP) for two or more successive quarters of a year, we use the real GDP growth rate over quarters in a year as a direct indicator of macroeconomic conditions (MC). We expect a faster adjustment speed in good macroeconomic conditions as indicated by a higher contemporaneous real GDP growth rate.

V. DATA

Our sample targets all the companies available in the PROWESS data base maintained by Centre for Monitoring the Indian Economy (CMIE). However, we have made several adjustments because of data constraints and other specific fundamental reasons. Following [13] we have excluded all financial firms because their financing policies are determined by many exogenous factors. Since leverage ratio is one of the significant concerns for manufacturing companies, this study has emphasized on that specific companies. We have selected those companies which have continuous data for the period 1993-94 to 2007-08, which represents the period of liberalization in India in order to have a balanced panel. We have found 891 companies which have the continuous data for the above-mentioned period and they all belong to the manufacturing industry.

VI. EMPIRICAL RESULTS

The estimation results of all the specified models are discussed in this section. The results of the determinants of capital structure have been reported in Table 1. These values are used to measure the target leverage ratio and DIST variable, which is measured as $| D/E^{*}_{i,t} - D/E_{i,t}|$.

TABLE I. DETERMINANTS OF TARGET CAPITAL STRUCTURE (ESTIMATED RESULTS OF EQUATION-1)

Variables	Coefficients	T-statistics
SZ	0.09**	12.29
TANG	0.59**	7.41
NDTS	0.052**	5.89
PROF	-0.007*	-1.98
GR	0.002*	2.16
LQ	-0.009**	-8.11
RDIN	-0.36 **	-2.67
Adjusted R^2	0.69	
F-statistics	F (7, 13357)= 391.27 (0.00)	
Number of Observations	13365	

Notes: * and ** show 5 % and 1 % level of significance.

TABLE II. DETERMINANTS OF ADJUSTMENT SPEED TO TARGET CAPITAL STRUCTURE (ESTIMATED RESULTS OF EQUATION-9)

Variables	COEFF (1)	COEFF (2)	COEFF (3)	COEFF (4)	COEFF (5)	COEFF (6)	COEFF (7)	COEFF (8)	COEFF (9)	COEFF (10)
$D/E_{i,t-1}$	0.61** (7.57)	0.55** (5.61)	0.59** (11.07)	0.58** (4.71)	0.68** (5.66)	0.63** (4.31)	0.57** (7.11)	0.67** (12.43)	0.59** (6.86)	0.63** (5.17)
$D/E_{i,t-1}$ x DIV	0.09** (2.91)	-	-	-	-	-	-	-	-	0.05** (3.67)
$D/E_{i,t-1}$	-	-0.07**	-	-	-	-	-	-	-	-0.05**

x PROF		(4.67)								(-4.20)
$D/E_{i,t-1}$ x SZ	-	-	-1.26** (-14.27)	-	-	-	-	-	-	-1.06** (-3.87)
$D/E_{i,t-1}$ x GR	-	-	-	-0.003* (-2.19)	-	-	-	-	-	0.003* (2.82)
$D/E_{i,t-1}$ x TAN	-	-	-	-	0.37* (2.96)	-	-	-	-	0.21** (3.75)
$D/E_{i,t-1}$ x NDTS	-	-	-	-	-	-0.11** (-3.91)	-	-	-	-0.012* (-2.77)
$D/E_{i,t-1}$ x DIST	-	-	-	-	-	-	-0.008** (-7.83)	-	-	-0.003** (-6.91)
$D/E_{i,t-1}$ x BG	-	-	-	-	-	-	-	-0.69** (-5.35)	-	-0.71** (-6.01)
$D/E_{i,t-1}$ x MC	-	-	-	-	-	-	-	-	-0.07** (-3.51)	-0.09** (-3.74)
Wald Test	205.2 (0.041)	203.8 (0.00)	243.4 (0.037)	269.3 (0.00)	218.22 (0.00)	289.71 (0.00)	197.67 (0.00)	301.19 (0.00)	267.21 (0.00)	371.59 (0.00)
Sargan Test	56.35 (0.34)	79.49 (0.27)	63.59 (0.29)	68.96 (0.25)	61.07 (0.30)	59.66 (0.32)	47.66 (0.41)	71.29 (0.28)	39.87 (0.45)	71.27 (0.28)
NOB	10692	10692	10692	10692	10692	10692	10692	10692	10692	10692

Notes (i) Figures in the bracket are the t-statistics. (ii) * and ** show 5% and 1% level of significance respectively. (1) Second order autocorrelation of residuals (z2 statistics), which is distributed as standard normal N (0,1) under the null of no serial correlation. (2) Wald test is a test of joint significance of the estimated coefficients which is asymptotically distributed as Chi- Square under the null of no relationship (3) Sargan test of over identifying restrictions, which is asymptotically distributed as Chi-Square under the null of instrumental validity. The figures in the parenthesis for the test statistics are the probability values, COEFF= Coefficients, and NOB= Number of Observations.

Table 2 shows the empirical results of the determinants of speed of adjustment to target capital structure. The Wald test results conclude that the models are correctly specified. The Sargan test results conclude that the instruments used in the GMM estimation of equation (9) are valid. From the equation (9) we can see that the coefficient of the interaction term of lagged value of coefficient and the determinants of adjustment speed has been negative. Therefore, it is important to interpret the signs of the respective estimates for the coefficients of the interaction terms accordingly. A negative sign in the interaction term implies a faster adjustment speed and a positive sign implies a lower adjustment speed. We find an inverse relationship between dividend and the adjustment speed, which is consistent with our hypothesis. Profitability has been positively related with the adjustment speed to target capital structure. This implies that higher profit increases the financial flexibility of the company to alter the leverage frequently. We find a positive relationship between size of the company and the adjustment speed. This result lends support to the hypothesis that for large firms the adjustment costs are relatively lesser than the small firms due to the less asymmetric information. Therefore, the adjustment speed to the target leverage ratio has been more for large firms than small firms. The estimated coefficient of the interaction term with growth is statistically significant and negative. This result is consistent with our hypothesis. This result indicates that firms with higher growth opportunities adjust faster towards their target leverage. This result confirms the hypothesis that a growing firm may find it easier to change its capital structure by altering the composition of new issuances. Tangibility has a negative impact on the adjustment speed which implies that slower rebalancing occurs in firms with high fixed assets. We find a positive relationship between non-debt tax shield and adjustment speed to target capital structure. This implies that companies with higher tax shields can have higher speed of adjustment to target leverage.

There is evidence of a statistically strong and positive relationship between the speed of adjustment and the distance variable. This result confirms the idea that the firm's cost of maintaining a sub optimal debt ratio is higher than the cost of adjustment and the fixed costs of adjustments are not significant. Therefore, the companies which are sufficiently away from their target leverage always want to reach the optimal very quickly. There is evidence of statistically strong and positive relationship between the speed of adjustment and the group affiliation dummy. This indicates the speed of adjustment to target capital structure for group affiliated firms has been more than the standalone firms. The regression coefficient of the interaction term of lagged value of leverage and macroeconomic condition dummy has been negative and statistically significant. The negative coefficient estimate on the interaction term between the lagged debt ratio and the good state dummy implies that adjustment speed is faster in good states than in bad states.

VII. Conclusions

We find that the variables like size of the company, profitability, growth opportunity, tangibility and research and development intensity have been playing the significant role for determination of target leverage ratio for Indian manufacturing companies. We also find the evidence that the

adjustment speed to target capital structure is determined by the various adjustment costs and benefits incurred by the company. Employing various proxies for the costs and benefits of adjustment we find that the dividend, and tangibility have the negative and other variables such as profitability, size, growth opportunity, non-debt tax shields, distance, business group affiliation and macroeconomic condition have the positive impact on the adjustment speed to target capital structure in India. These results are consistent with the findings with [7] and [8].

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