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Dynamism of Capital Structure: Evidence from Pakistan

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Abstract

This study investigates the existence of target capital structure and estimates speed of adjustment towards target capital structure for the non financial listed firms of Pakistan. The study also examines the firm level and macroeconomic factors determining the target capital structure. This study implies the dynamic panel data modeling using partial adjustment model. The study uses the Generalized Method of Moments (GMM) as the estimation technique. Firms in Pakistan are found to chase target debt ratios and make complete adjustment towards target in less than two years. Two firm level significant determinants of the target capital structure are profitability and tangibility. Macroeconomic factors such as GDP growth rate, inflation and interest rates are also found as the significant determinants of target debt.

Keywords: Dynamic capital Structure, Speed of Adjustment, Panel data, Partial Adjustment Model, Generalized Method of Moments

1. Introduction

Empirical studies of the capital structure are being carried out for more than five decades after thought provoking research article by the Modigliani and Miller (1958). Earlier empirical studies in capital structure focus on investigating the determinants of the debt. Using static framework, these studies consider the observed debt as optimal debt and focus on its determinants (see for example Rajan & Zingales, 1995; Booth, Aivazian, Demirguc-Kunt, and Maksimovic, 2001; and De Jong, Kabir, and Nguyen, 2008). However, Banerjee, Heshmati, and Wihlborg (1999) argue that earlier studies focusing on the determinants of leverage have two shortcomings. The first shortcoming is the use of observed debt as the optimal debt, which may not necessarily be the case; as the factors determining debt levels may vary overtime. The second shortcoming is the use of non dynamic approach of empirical analysis, while the firms' leverage ratios move overtime and may adjust towards target. Supporting Banerjee *et al.* (1999) argument, Graham and Harvey (2001), Drobetz, Pensa, and Wanzenried (2007), and Brounen, De Jong, and Koedijk (2006) point out to the empirical evidences that companies do chase target debt ratios; but due to sudden shocks or random changes they may temporarily move away from their target debt ratio, and adjust back slowly towards target debt. The firms may not immediately adjust back their debt ratios to target due to adjustment cost. This is in line with the dynamic trade-off theory of capital structure, which suggests that firms have their target debt but due to market imperfections and cost associated with adjustment, they may not be at target, and therefore observed debt level may not be the optimal debt (Mukherjee & Mahakud, 2010). Given this, it becomes necessary to use dynamic model that should estimate the target debt ratio and take in account the reality of partial adjustment towards optimal leverage. Realizing the fact that capital structure decisions are not static, recent researches of capital structure are taking in account the dynamic perspective of the capital structure and have used dynamic adjustment models. Some of them are Fischer, Heinkel, and Zechner (1989), Ozkan (2001) for UK firms, Flannery and Rangan (2006) for Compustat Industrial Database firms, Huang and Ritter (2009) for US firms, and Oztekin (2013) for a sample of 37 countries.

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Movement towards optimal capital structure needs a developed capital market (equity and bond market). The corporate bond market of Pakistan is not very developed. It only accounts for less than 1% of GDP while in US the bond market accounts for 175% of GDP and in Japan 198% of GDP (Saleem, 2013). The corporations in Pakistan heavily rely on banking sector for borrowing. Equity market in Pakistan, despite outstanding performance in recent years, faces a downward trend in terms of total number of companies listed and its market capitalization stands at 18.9 percent of GDP, while in US and Japan equity market capitalization stands at 114.9 percent and 62 percent of GDP respectively (World Bank, 2013). Given the under development of the capital market in Pakistan, it becomes interesting to investigate the existence of optimal capital structure and estimate adjustment speed towards optimal capital structure. The available empirical literature on the issue of target capital structure, particularly the dynamism of capital structure for Pakistani firms, is insufficient and not comparable to the developed countries. Hence there is a need to conduct the empirical study in Pakistan that considers the dynamism of capital structure, identify the determinants of optimal capital structure, and estimate adjustment speed towards target debt ratio by using partial adjustment model. Partial adjustment model characterizes the financing behavior of the firms as partial adjustment towards optimal debt ratio, estimate the adjustment speed towards optimal debt ratio, and investigate factors affecting optimal debt ratio. This study uses Arellano and Bond's (1991) first difference Generalized Method of Moments (GMM) to estimate the dynamic model of optimal debt. The findings of this paper reveal that Pakistani firms are not always at their optimal levels of debt and move towards target with adjustment speed of approximately 60% per year, that is, they fill the gap between observed and the target debt level in less than 2 years. Factors significantly affecting the optimal debt levels are firms' profitability and tangibility, while macroeconomic factors affecting the optimal debt levels are GDP growth, inflation, and interest rates. The rest of the paper is organized as follows. Section 2 discusses the available literature on the issue of the dynamism of the capital structure. Based on this literature review, section 3 briefly discusses the determinants of debt, their measurement, and hypothesis for this study. Section 4 describes modeling, data, and methodology used in this study. Empirical results are discussed in section 5. Section 6 concludes this study.

2. Existing Studies on Dynamic Capital Structure

Empirical studies started considering the dynamism of capital structure when Jalilvand and Harris (1984) reported that financing behavior of the firms is characterized by the fractional adjustment towards long run target capital structure and firms strive to reach that target with certain adjustment speed. Adjustment costs hurdles the complete adjustment towards target debt (Myers 1984). Banerjee *et al*. (1999) report the differences between observed and optimal leverage and find that the adjustment speed is lower for large firms. Distance from optimal leverage has negative influence on the speed of adjustment for UK firms. De Miguel and Pindado (2001) examine the determinants of capital structure and impact of institutional factors on capital structure using target adjustment model for non financial Spanish firms. The study finds relatively low speed of adjustment towards optimal debt for non financial Spanish firms. The study finds non-debt tax shield, financial distress cost, and cash flows to be significant and negatively related to debt ratio. It further establishes positive relationship between debt ratios and investment.

Ozkan (2001) investigates the determinants of optimal capital structure and process of adjustment towards it using panel data for UK firms. The study uses the partial adjustment model where a firm's financial behavior is characterized as partial adjustment towards long term debt ratio. This study confirms the existence of target ratios among the firms and reports that firms make relatively fast adjustment towards it. The study finds liquidity and profitability having negative relationship with leverage, and past profitability having positive impact on leverage. Gaud, Jani, Hoesli, and Bender (2005) analyze the determinants of leverage and speed of the adjustments towards target capital structure for Swiss firms. Gaud *et al.* (2005) finds the size and tangibility to be positively related and profitability and growth to be negatively related to the use of debt. The study further reveals that Swiss firms adjust towards the target debt ratio but the speed of adjustment is slower than that of other countries. Flannery and Rangan (2006) investigate empirically the existence of target debt ratios and the adjustment speed towards target ratio for the Compustat Industrial Annual database firms. The study supports the presence of target debt ratios and reports that firms adjust one third deviation from target each year. Clark, Francis, and Hassan (2009) examine the applicability of partial adjustment model of capital structure in developing and developed countries. The study reveals that the firms do have target capital structure in all sampled countries. However the adjustment speed towards target varies across the countries.

They report that 16 % variation in adjustment speed for the full sample is explained by the institutional, and other country-level factors, while for the developing countries about one-third. Mukherjee and Mahakud (2010) investigate dynamism of capital structure for Indian manufacturing firms.

They report that 41% of the deviation from target debt is adjusted every year by Indian manufacturing firms. Getzmann, Lang, and Spremann (2010) examine the determinants of capital structure and estimate adjustment speed towards target capital structure for Asian corporations. The results of this study confirm that the target capital structure is pursued in the Asian companies. The components of Capital structure choice are common and industry based. The common determinants of capital structure are found to be the profitability and tangibility. The industry based components are non debt tax shield, size, and industry median leverage. The convergence speed towards target is found to range from 27% to 39%. Florysiak and Elsas (2011) investigate the cross sectional heterogeneity in the speed of adjustment of the firms towards target using fractional dependent variable (DPF) estimator for all industrial Compustat firms. They estimate the speed of adjustment towards target to be 26% for their sample. They further find the difference in the speed of adjustment for the firms based on financing deficit, deviation from target, and default risk. Haron, Ibrahim, Nor, and Ibrahim (2013) empirically study the dynamism of capital structure for Malaysian firms. The results of their study confirm the existence of target capital structure among Malaysian firms and these firms adjust to target capital structure at annual rate of 57%.

3. Determinants of Optimal Capital Structure, their Measurement, and Hypotheses

This section discusses the leverage determinants that are considered in this study.

3.1 Growth

Growth firms with risky debt are more likely to under invest in positive Net Present value (NPV) projects (Frank & Goyal, 2009). Hence to secure their future growth opportunities such firms prefer to use equity financing. Static Trade-off theory also predicts negative relationship between growth and leverage because financial distress cost may be more severe for growth firms. Contrary to this, pecking order theory predicts the positive relationship of growth with leverage because growing firms need more finances to meet their capital expenditure requirements (Bhaduri, 2002). Rajan and Zingales (1995), Antoniou, Guney, and Paudyal (2008), and Drobetz and Wanzenried (2006) report the significant negative relationship of growth with debt. Based on these findings and the arguments, we hypothesize the negative relationship of growth with leverage. This study, following Clark *et al.* (2009), and Haron *et al.* (2013), uses market value of equity to book value of equity as proxy of the growth.

3.2 Size

As stated by Frank and Goyal (2005), static trade-off theory predicts that large firms use more debt because such firms are more diversified, thus having low default risk. Larger firms also have more reputation; thus they face lower agency costs. Rajan and Zingales (1995), Flannery and Rangan (2006), Mukherjee and Mahakud (2010), and Haron *et al.* (2013) report positive relationship of size with leverage. These arguments and the results of previous studies guide us to hypothesize the positive relationship between firm's size and leverage. In this study, following Delcoure (2007), Clark *et al.* (2009), Mukherjee and Mahakud (2010), and Haron *et al*. (2013), natural logarithm of firms' total assets is used as the measure of the firms' size.

3.3 Tangibility

Tangible assets are collateralized to issue the secured debt, which reduces the bankruptcy cost. As compared to intangible assets, the tangible assets suffer less loss of value in case of distress. Static trade-off theory predicts the positive relationship between tangibility and debt ratio. Rajan and Zingales (1995), Heshmati (2001), Flannery and Rangan (2006), and De Jong *et al.* (2008) indicate positive association of assets tangibility with debt. Positive relationship between tangibility and leverage is expected in this study. Mukherjee and Mahakud (2010) and Saarani and Shahdan (2013) have reported negative impact of tangibility on leverage, which supports the agency theory argument that firms with lower amounts of collateralizable assets may voluntarily choose higher level of leverage to avoid excessive privileges by the management (Drobetz & Wanzenried, 2006). Following Baker and Wurgler (2002), Hovakimian, Hovakimian, and Tehranian (2004), and Cho, El Ghoul, Guedhami, and Suh (2014), we use the ratio of net plant, property, and equipment to total assets as the measure of the tangibility.

3.4 Profitability

Firms having high profits are likely to have large reservoir of internal funds, hence according to Pecking Order Theory there should be inverse relationship of profitability with optimal debt level.

Static trade-off theory predicts positive association because the highly profitable firms can enjoy more debt tax shield and lower expected bankruptcy cost. Rajan and Zingales (1995), Flannery and Rangan (2006), Mukherjee and Mahakud (2010), and Haron *et al.* (2013) report negative relationship of profitability with debt. Based on the pecking order theory and findings of these studies we hypothesize the negative relationship of profitability with leverage. Ratio of EBIT to total assets, following Clark *et al.* (2009), Haron *et al.* (2013), and Cho *et al.* (2014), is used as measure of the profitability.

3.5 Earning Volatility

Literature of the capital structure argues that the higher the earning volatility of the firms the higher will be their probability of bankruptcy due to inability of the firms meeting interest and maturing debt obligation (Banerjee *et al.,* 1999). The firms with volatile earnings should use low debt. De Jong *et al.* (2008), for 14 countries in their sample, find negative significant impact of earning volatility on leverage which is in line with the trade off theory. Chang, Lee, and, Lee (2009) also find negative significant relationship of volatility with leverage. In line with these findings, a negative relationship of earning volatility is hypothesized with leverage. Agency theory predicts the positive relationship between earning volatility and optimal debt because the underinvestment problem decreases with the increase in earnings volatility. Antoniou *et al.* (2008) report the insignificant positive relationship of earning volatility with leverage. Following the Deesomsak, Paudyal, and Pescetto (2004) volatility is measured as the absolute difference between the annual percentage change in EBIT and average of this change.

3.6 Cash

High free cash flows reduce the need of external financing (Ameer, 2013), hence Pecking Order theory establishes the negative relationship of free cash flows with leverage. Due to asymmetric information that exists in financial markets, pecking order theory suggests the use of cash flows over debt (DeMiguel & Pindado, 2001). Negative significant relationship of free cash flows has been reported by DeMiguel and Pindado (2001), Gracia and Mira (2008), Vivani (2008), and Ameer (2013). Based on these findings we hypothesize that cash flows have negative relationship with leverage. An opposite stance regarding the relationship between cash flows and optimal debt arises based on the agency theory that suggests that more use of debt enhances the fixed obligations for the firms; hence it reduces the possibility of misuse of cash (De Jong, 2002). In this study, following Vivani (2008), we use cash divided by total assets as the proxy of cash flows.

3.7 Tax Rate

Feld, Heckemeyer, and Overesch (2013) in their Meta study of impact of taxes on firms' debt, report that tax has substantial impact on firms' debt policy. Firms in high corporate tax bracket may be tempted to use more debt to obtain more tax shield (Brigham & Ehrhardt, 2005). Krishnan and Moyers (1997) find marginally positive significant relationship of tax rate with debt. De Jong and Dijk (2007), Delcoure (2007), De Jong *et al.* (2008), and Fan, Titman, and Twite (2012) report the positive significant relationship of tax rate with leverage, supporting the argument that firms with high tax rates use more debt. Accordingly we also hypothesize that tax rate is positively related with leverage. DeAngelo and Masulis (1980) argue that high tax rates can provide also the high non debt tax shield to the firms which reduce the stimulation of firms to use debt. This argument establishes the negative relationship. Following Antoniou *et al.* (2008), Clark *et al.* (2009), and Cho *et al.* (2014) effective tax rate, calculated as total taxes divided by taxable income or pretax income is used as the proxy.

3.8 Non Debt Tax Shield

If firms are having large amount of non debt tax shield, they don't need to use leverage to get benefit of tax shield (DeAngelo & Masulis, 1980). Trade off theory establishes the negative relationship between non debt tax shield and leverage (Delcoure, 2007). Commonly considered major source of non-debt tax shield is the depreciation. High amount of depreciation and amortization expenses lessen the taxable income and save taxes to the firm. Heshmati (2001), Flannery and Rangan (2006), Ameer (2013), and Haron and Ibrahim (2012) report the significant negative relationship between non debt tax shield and target debt ratio.

For this study negative relationship between non debt tax shield and debt is hypothesized. However, Delcoure (2007) reports the positive significant relationship of non debt tax shield with leverage. Following Clark *et al.* (2009) this study uses the ratio of depreciation, depletion, and amortization expense to firms' total assets as proxy of the non debt tax shield.

3.9 GDP Growth Rate

Gross Domestic Product (GDP) reflects country's economic growth. Change in economic conditions may affect the level of debt used by the firms (Cook & Tang, 2010). De Jong *et al*. (2008) conclude that change in GDP growth is positively associated with change in companies' debt. Similar findings are also reported by Haron *et al.* (2013). During the surge in economic activities the chances of bankruptcy decreases and the taxes increase. Tax benefit of debt depends upon the firm's taxable income that in fact depends upon the economic conditions. All this suggest that companies may increase the use of debt in their capital structure and positive relationship is hypothesized for this study. However a negative relationship can also be established based on the argument extended by Myers (1977) that the economic growth is closely associated with companies' growth and growing firms use less debt. In this study, following the Oztekin and Flannery (2012) we use the annual growth in nominal GDP as a proxy.

3.10 Interest Rates

Prevailing lending rate in the country is known as the interest rate. If the market interest rate is low, the firms are likely to use more debt. Surveys by Graham and Harvey (2001) and Drobetz *et al.* (2007) report firms' mangers admitting that they issue debt when the lending rates are low. Market timing theory predicts negative relationship between market interest rates and leverage. A negative relationship between interest rates and leverage is hypothesized for this study. However the positive relationship of debt with interest can also be established if the lending rates, which also include expected inflation, are rising (Deesomsak *et al.,* 2004). Haron *et al.* (2013) find the positive relationship. Following the Haron *et al*. (2013) and Deesomsak *et al.* (2004) this study intends to use the maximum lending rate from World Bank's World Development Indicators (WDI) as the proxy of interest rate.

3.11 Inflation

Investors demand more return on their investments whenever the inflation increases (Brigham & Ehrhardt, 2005). Issuing the debt at higher rate will increase the chances of bankruptcy. So use of low leverage is suggested by the trade-off theory. This suggests that higher the inflation, higher will be the cost of debt, and lower will be the use of debt by the firms in their capital structure. Hanousek and Shamshur (2011), Oztekin and Flannery (2012), and Oztekin (2013) report negative significant relationship of inflation with leverage. Based on these findings and arguments a negative relationship between inflation and leverage is hypothesized. Based on the trade-off theory a positive relationship can also be established, as cited in Frank and Goyal (2009), Taggart (1985) argues that if inflation is high, the real value of tax deductions will be high. Following Oztekin and Flannery (2012) this study intends to use annual growth in consumer price index from WDI as measure of the inflation.

4. Data and Methodology

4.1 Data

This study uses the panel data of firms listed at Karachi Stock Exchange (KSE) of Pakistan. Panel data blends the characteristics of both cross sectional and time series data and improves efficiency of econometric estimates (Hsiao, 1985, as cited in Ozkan 2001). More choice of variables to be used as instruments to control for endogeneity is provided by the panel data (Ozkan 2001). For firm level data, this study uses the *Datasteam* database which contains the accounting data of the firms and the market value of firms' equity. This database contains the financial data of 271 Pakistani firms. The financial firms such as banks, insurance, mutual funds and other financial companies and the firms having the missing data for any variable or any year have been dropped. Only the non financial firms data is used following the Ozkan (2001), DeMiguel and Pindado (2001), Gaud *et al.* (2005), Drobetz and Wanzenried (2006), Clark *et al.* (2009), and Haron *et al.* (2013). Financial companies are excluded, because the financial industry is subject to many regulations including the minimum equity requirements and most of them are highly leveraged. Our final sample for this study is 90 firms with 6 years data from 2007-2012. This constitutes the balanced panel data with 540 firm year observations. For macroeconomic data World Bank's World Development Indicators (WDI) database is used.

4.2 Model

As discussed earlier firms are not always at their target debt levels due to presence of adjustment cost and other market frictions. However they move towards their target debt levels overtime. This suggests that a partial adjustment is made to reduce the distance between observed and the target debt level.

This financing behavior of the firms can be modeled using partial adjustment model. This partial adjustment model of target debt assumes that change in actual debt or observed leverage, (Lev_{it} - Lev_{it-1}), will be equal to a proportion, δ_{it} ,of target change (Lev^*_{it} - Lev_{it-1}). This can be expressed as follows:

$$Lev_{it} - Lev_{it-1} = \delta_{it} (Lev^*_{it} - Lev_{it-1}) \quad (1)$$

In equation (1), δ_{it} is the adjustment coefficient that takes the value between 0 and 1. Speed of adjustment towards target is denoted by $1/\delta_{it}$. Now consider two extreme cases of the values of δ that is 1 and 0. If the value of δ_{it} is 1 it means that complete adjustment is made and firm is at target debt level ($Lev_{it} = Lev^*_{it}$). If value of δ is 0 it means that no adjustment is made and $Lev_t = Lev_{t-1}$.

Equation (1) can be further transformed as:

$$Lev_{it} = Lev_{it-1} + \delta_{it} Lev^*_{it} - \delta_{it} Lev_{it-1} \quad (2)$$

$$Lev_{it} = (1- \delta_{it}) Lev_{it-1} + \delta_{it} Lev^*_{it} \quad (3)$$

As we know that the target debt ratio (Lev^*_t) in this study is considered to be the linear function of set of firm and country specific explanatory factors. It is expressed in equation 4 below

$$Lev^*_{it} = f(V_{it}, V_i, V_t) \quad (4)$$

This relationship can also be shown as:

$$Lev^*_{it} = \sum_{i=1}^{n} \beta_k V_{kit} + u_{it} \quad (5)$$

Where Lev^*_{it} is the target debt ratio of firm *i* at time *t,* V_{it} is the vector of firm and time variant explanatory factors of target debt ratio. V_i and V_t are unobservable firm, country, and time specific effects that are common to all firms and may change overtime. Now replacing the value of Lev^*_{it} from equation 5 to equation 3 we get:

$$Lev_{it} = (1- \delta_{it}) Lev_{it-1} + \delta_{it} (\sum_{i=1}^{n} \beta_k V_{kit} + u_{it}) \quad (6)$$

Since the firm specific factors considered in this study are profitability (*pro*), tangibility (*tan*), growth (*gro*), size (*siz*), earning volatility (*erv*), cash (*csh*), tax rate (*txr*), non debt tax shield (*ndt*), and country specific factors considered are GDP growth rate (*gdp*), interest rate (*inr*), and inflation (*inf*), so equation (6) can be expanded as:

$$Lev_{it} = (1 - \delta_{it}) Lev_{it-1} + \delta_{it}\beta_1 pro + \delta_{it}\beta_2 tan + \delta_{it}\beta_3 gro + \delta_{it}\beta_4 siz + \delta_{it}\beta_5 erv +$$

$$\delta_{it}\beta_6 csh + \delta_{it}\beta_7 txr + \delta_{it}\beta_8 ndt + \delta_{it}\beta_9 gdp + \delta_{it}\beta_{10} inr + \delta_{it}\beta_{10} inf + u_{it} \quad (7)$$

Assuming $\lambda 0 = (1- \delta_{it})$ and $\delta it\, \beta_k = \lambda_k$, equation (7) can be re-written as:

$$Lev_{it} = \lambda_0 Lev_{it-1} + \lambda_1 pro + \lambda_2 tan + \lambda_3 gro + \lambda_4 siz + \lambda_5 erv + \lambda_6 csh + \lambda_7 txr + \lambda_8 ndt +$$

$$\lambda_9 gdp + \lambda_{10} inr + \lambda_{11} inf \quad (8)$$

Equation (8) is subject to estimation using Arellano and Bond (1991) difference GMM. Taking first difference avoids the correlation between the regressors and unobserved firm specific factors such as the management's attitude towards risk and its ability to motivate. To test the validity of instruments, Sargan test is used. Higher p-value (insignificant) for this test is better.

This study also uses Arellano-Bond second order Autocorrelation (AR2) to investigate that error term of the differenced equation is not serially correlated at the second order (AR2). Higher p-value is also needed here.

4.3 Estimation Technique

As suggested by Arellano and Bond (1991) for estimating the dynamic model consistently from a short panel data, the Generalized Method of Moments (GMM) estimation procedure is used. The use of panel data and GMM provide a more satisfactory basis for this purpose. Roodman (2006), as cited in Haron *et al*. (2013), argued that GMM has been designed to be used in the conditions where there are few time periods and large number of firms.

It is proved by Arellano and Bond (1991) that consistent estimates of the parameters are provided by GMM by using the instruments obtained from orthogonality conditions that exist between variables' lagged values and the disturbances. Flannery and Hankins (2013) report that, out of established estimation techniques of dynamic panel model, GMM appears to perform better. Following Titman and Wessels (1988) and Delcoure (2007), we use two measures of leverage, calculated as total liabilities to total assets (Lev_{TL}) and long term debt to total assets (Lev_{LTD}). The long term debt to total assets is used as the measure of the leverage in this study mainly because of the reason that firms' leverage is largely driven by the long term debt (Johnson 2003, as cited in Cho *et al.* 2014). Tax response of long term debt is significantly higher (Feld *et al.* 2013). Following the argument of Kim *et al.* (2005), book value of leverage is used because financial distress cost is related to the book value of debt rather than market value of debt.

5. Empirical Results

Table 1 reports the summary statistics of the variables used in this study. The firms in the sample of this study have average total liabilities, a measure of the debt, of 57.6% of total assets. Average long term debt of sampled firms is 14.3%. Basic earning power (profitability) of the sampled firms in Pakistan is 10.6% while average interest rate, inflation and GDP growth are 13.53%, 12.84%, and 2.96% respectively. Table 2 reports the correlation coefficient between the leverage variables and independent variables used in this study. Multicollinearity does not seem to be a concern for this study as the values of the correlation coefficients are smaller than 0.9, a level from where the researchers believe that multicollinearity may cause the problems in estimation (Asteriou and Hall 2007).

Table: 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.
Lev_{TL}	540	0.57614	0.281891
Lev_{LTD}	540	0.143216	0.166396
pro	540	0.106497	0.1363
tan	540	0.479709	0.243659
siz	540	16.34704	1.371479
erv	540	187.1428	545.7047
gro	540	2.072056	7.192935
txr	540	0.263382	0.907501
ndt	540	0.033165	0.018818
csh	540	0.027715	0.047446
inr	540	13.53708	0.96046
gdp	540	2.962402	1.16187
inf	540	12.83592	3.992401

Table 1 reports the descriptive statistics of the dependent and independent variables. The measures of the debt used in this study are total liabilities to total assets (Lev_{TL}) and long term leverage measured as long term debt to total assets (Lev_{LTD}). Profitability (*pro*) is measured as EBIT divided by total assets. Tangibility (*tan*) is measured as the ratio of net property, plant, and equipment to total assets. Growth (*gro*) is measured as market value of equity to book value of equity. Size (*siz*) is measured as natural logarithm of total assets. Earning volatility (*erv*) is measured as the absolute difference between the annual percentage change in EBIT and average of this change. Cash (*csh*) is measured as cash divided by total assets. Tax rate (*txr*) is measured as total taxes divided by taxable income or pretax income. Non debt tax shield (*ndt*) is measured as ratio of depreciation, depletion, and amortization expense to firms' total assets. GDP growth rate (*gdp*) is the annual growth in nominal GDP. Interest rate (*inr*) is the maximum lending rate from World Bank's World Development Indicators (WDI). Inflation (*inf*) is annual growth in consumer price index from WDI.

Table 3 repots the results based on GMM estimation. The first column of table 3 shows the results considering total liabilities to total assets as the measure of the leverage. The coefficient of lagged dependent variables is reported to be 0.435, which is significant at 1%. This implies the existence of target debt among Pakistani firms and their partial movement to that target due to the existence of transaction cost (Ozkan, 2001).

Given that the adjustment coefficient, λ_0, is equal to 1- δ_{it}, the adjustment speed turns out to be 0.565 or 56.5%. This implies that it takes 1.75 years, calculated as $1/\delta_{it}$, to firms in Pakistan to make complete adjustment towards target.

Table 2: Correlation Matrix

	LEV(TL)	LEV(LTD)	GRO	PRO	TAN	TXR	NDT	CSH	ERV	SIZ	GDP	INR	INF
gro	0.0576	-0.0945	1										
pro	-0.4526	-0.3729	0.2161	1									
tan	0.2808	0.5517	-0.0362	-0.343	1								
txr	-0.0092	-0.0388	0.0146	0.0362	-0.0033	1							
ndt	0.037	0.0311	0.0445	-0.002	0.3442	0.048	1						
csh	-0.1868	-0.2046	0.0428	0.2692	-0.232	-0.016	-0.0262	1					
erv	0.028	0.096	-0.0245	-0.072	0.0388	-0.02	-0.0201	-0.0613	1				
siz	0.1515	0.0573	-0.0174	-0.054	-0.0504	-0.071	-0.016	-0.1234	0.04	1			
gdp	-0.0288	-0.0211	0.065	0.0374	-0.0238	0.025	0.0333	-0.0469	0.064	-0.0288	1		
inr	0.0752	-0.0249	-0.0894	-0.055	0.0007	-0.083	-0.0431	-0.0252	-0.061	0.1068	-0.5298	1	
inf	0.0095	0.0414	-0.0647	-0.033	0.0191	-0.012	-0.0205	0.0408	-0.043	-0.0103	-0.8593	0.2338	1

Table 2 reports the Pearson's correlation coefficients between dependent and independent variables. The measures of the debt used in this study are total liabilities to total assets (Lev_{TL}) and long term leverage measured as long term debt to total assets (Lev_{LTD}). Profitability (*pro*) is measured as EBIT divided by total assets. Tangibility (*tan*) is measured as the ratio of net property, plant, and equipment to total assets. Growth (*gro*) is measured as market value of equity to book value of equity. Size (*siz*) is measured as natural logarithm of total assets. Earning volatility (*erv*) is measured as the absolute difference between the annual percentage change in EBIT and average of this change. Cash (*csh*) is measured as cash divided by total assets. Tax rate (*txr*) is measured as total taxes divided by taxable income or pretax income. Non debt tax shield (*ndt*) is measured as ratio of depreciation, depletion, and amortization expense to firms' total assets. GDP growth rate (*gdp*) is the annual growth in nominal GDP. Interest rate (*inr*) is the maximum lending rate from World Bank's World Development Indicators (WDI). Inflation (*inf*) is annual growth in consumer price index from WDI.

The coefficient of the lagged dependent variable, using long term debt to total assets as proxy, is 0.35 or 35%, which is significant at 5% level. The adjustment speed turns out to be 0.65 employing that it takes firms 1.53 years in Pakistan to move to the target debt ratio. Lower the coefficients of the lagged dependent variables the higher will be the speed. The estimated adjustment speed is comparable to 57% of Malaysia as estimated by Haron *et al.* (2013) and it is higher than the range of 27% to 39% reported by Getzmann *et al.* (2010) for Asian firms and 43% for Indian firms (Mukherjee & Mahakud, 2010). The high speed of adjustment suggests that Pakistani firms frequently undergo the adjustment process. This quick adjustment may possibly be attributed to lower adjustment cost. Results reported in Table 3 further reveal that profitability, as expected, has negative significant influence at 5% on both measures of the leverage. This finding is supported by the pecking order theory and is in line with the findings of Mukherjee and Mahakud (2010), Haron *et al.* (2013) and others. Tangibility, as expected, has positive significant influence with leverage taking long term debt to total assets as the proxy of leverage. This relationship is supported by the trade-off theory and is in alignment with the findings of the Rajan and Zingales (1995), Flannery and Rangan (2006), and De Jong *et al.* (2008). Tangibility is found to be insignificant with opposite sign when ratio of total liabilities to total assets is used as the proxy of leverage. Firm size has expected sign but reported to be insignificant in determining the debt ratios of the firms. Similarly earning volatility has expected relationship with leverage, for both proxies of debt, but its effect in determining leverage is insignificant.

Growth, taking total liabilities to total assets as the measure of the leverage, has expected negative relationship with debt but it is insignificant. For other measure of debt it has positive insignificant relationship. Tax rate has expected positive relationship with debt for both measures of leverage. However this relationship turns out to be insignificant. Delcoure (2007), De Jong *et al.* (2008), and Fan *et al.* (2012) also come up with the positive relationship of leverage with tax rate.

Non debt tax shield has negative relationship with debt meeting our expectation. However this relationship is insignificant for both proxies of debt. Drobetz and Fix (2005) and Mukherjee and Mahakud (2010) also report negative insignificant relationship of non debt tax shield with debt. Role of cash in determining the leverage is unclear as it is having negative insignificant relationship with one measure of leverage and positive insignificant relationship with other.

Table: 03 Generalized Method of Moments Estimation Results

Variables	Lev (TL)		Lev (LTD)	
	Coefficient (1)	*t*-statistics (2)	Coefficient (3)	*t*-statistics (4)
LevTL(-1)/Levltd (-1)	0.4352452***	3.77	0.3496725***	1.98
pro	-0.2474363***	-2.29	-0.329008***	-2.45
tan	-0.1325856	-0.66	0.4947371***	2.46
siz	0.0199814	0.45	0.0722903	1.21
erv	-0.0000343	-1.41	-1.63E-05	-0.46
gro	-0.0009454	-0.52	0.0012281	0.96
txr	0.0009767	0.04	0.0756397	1.59
ndt	-2.823835	-1.42	-1.927461	-1.24
csh	-0.2279487	-0.73	0.3060971	0.94
inr	0.0198774***	2.26	0.0194835	1.41
gdp	0.0146223	1.49	0.0248034***	2.41
inf	0.0052284	1.26	0.0100652***	2.08
Sargan Test	25.6	p (0.538)	26.77	p(0.476)
Arellaon-Bond Autocorrelation (AR2)	0.53	p(0.597)	0.88	p(0.381)

Table 3 reports the results of equation 8 using Generalized Method of Moments (GMM) estimation technique. The measures of the debt used in this study are total liabilities to total assets (Lev_{TL}) and long term leverage measured as long term debt to total assets (Lev_{LTD}). Profitability (*pro*) is measured as EBIT divided by total assets. Tangibility (*tan*) is measured as the ratio of net property, plant, and equipment to total assets. Growth (*gro*) is measured as market value of equity to book value of equity. Size (*siz*) is measured as natural logarithm of total assets. Earning volatility (*erv*) is measured as the absolute difference between the annual percentage change in EBIT and average of this change. Cash (*csh*) is measured as cash divided by total assets. Tax rate (*txr*) is measured as total taxes divided by taxable income or pretax income. Non debt tax shield (*ndt*) is measured as ratio of depreciation, depletion, and amortization expense to firms' total assets. GDP growth rate (*gdp*) is the annual growth in nominal GDP. Interest rate (*inr*) is the maximum lending rate from World Bank's World Development Indicators (WDI). Inflation (*inf*) is annual growth in consumer price index from WDI. Coefficients significantly different from zero at the 1%/5%/10% level are marked with ***/**/*.

Table 3 also reports the impact of macroeconomic variables on leverage. Interest rate has positive relationship against our hypothesis for both measures of leverage. However significance is established for total liabilities to total assets measure of the leverage. This relationship is justified by the argument of Deesomsak *et al.* (2004) that positive relationship can also be established if the lending rates, which also include expected inflation, are rising. Haron *et al.* (2013) also report positive relationship of interest rate with debt. GDP growth rate, as expected, is also found to have positive effect on debt for both measures of leverage; but significance is established for long term debt to total assets. De Jong *et al.* (2008) and Haron *et al.* (2013) also report similar relationship of GDP growth with leverage. Like GDP, inflation is found to have positive relationship with leverage for both proxies of debt and its significance is established for long term debt to total assets measure. Taggart (1985), as cited in Frank and Goyal (2009), argues the positive relationship of inflation with the debt on the basis of trade-off theory. According to his stance, during inflationary period, the real value of tax deductions will be high. Table 3 further reports the results of Sargan test of over identifying restrictions which is used to test the validity of the instruments. The instruments are uncorrelated with the error term and they are acceptable. Results in table 3 suggest that our instruments are uncorrelated with disturbances and our specifications are satisfactory as p-value of Sargan test for both measures of the leverage is much higher than 5% or even 10% level of significance. Arellano-Bond second order auto correlation test is also having p-values greater than 0.05 suggesting that error term of the differenced equation is not serially correlated at second order.

6. Conclusion

This study aims at investigating the existence of optimal leverage and estimating the adjustment speed towards optimal debt ratios using partial adjustment model. The study also attempts to identify the factors affecting the optimal debt level using Generalized Method of Moments (GMM) estimation technique. The study uses balanced panel data from 2007 to 2012 of 90 listed firms of Pakistan using the Datastream database. This study makes use of two proxies of the leverage, namely total liabilities to total assets ratio and long term debt to total assets ratio. Pakistani firms are found to have target debt ratios and they make complete adjustment towards target ratio at speed of around 60 percent per year. It takes them less than 2 years to make full adjustment towards target. Using total liabilities to total assets ratio as the measure of the leverage study finds profitability, the only firm specific variable, significantly affecting the leverage. Using same measure of leverage, interest rate is found to significantly affect the leverage. Taking long term debt to total assets ratio as the measure of the firms' leverage, the study finds profitability to affect negatively and significantly, and tangibility positively significantly to the firms leverage. Using this measure of leverage the study finds inflation and GDP positively affecting leverage at 5% level of significance. The findings of this study suggest that firms' mangers may consider thoroughly the country's economic environment while making the financing decisions. Given this high speed of adjustment in Pakistan, the future studies regarding the dynamism of capital structure in Pakistan may be aimed at identifying factors contributing to the high adjustment speed towards target debt. Besides the conventional firm and macroeconomic factors used as the determinants of speed, the future studies may consider the factors such as financial market development and governance. Additional firm and country specific variables determining the optimal debt may also be considered in future studies.

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