Does industrial growth and capital expenditure induce corporate financing behaviour in Pakistan? The role of domestic credit growth and equity markets

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Abstract
This paper empirically investigates the dynamic causal relationship among corporate financing patterns, industrial growth, domestic credit, capital expenditures and market capitalization and the direction of causality in Pakistan for the 1975 to 2013 period. Our empirical results favour the presence of long run relationship among variables under the consideration. We found that the capital structure deviations from the long run equilibrium due to random economic shocks are corrected by the system at the rate of 17.42% per year. In the short run the causality runs from industrial growth, domestic credit and market capitalization to the debt financing and from the debt financing to the capital expenditure. In the long run the unidirectional causality runs from the domestic credit, capital expenditures and market capitalization to the debt financing. However, the industrial growth and debt financing have reciprocal causal relation in the long run. The presence of long run reciprocal causality indicates that a multipronged long-term financial policy may effectively contribute to the industrial development through efficient utilization of capital in Pakistan.
Keywords**:** Capital structure. Domestic credit growth. Capital expenditures. Speed of adjustment.

The optimal proportion of debt in the capital structure of a firm has been the subject of debate for the past six decades. As a matter of fact, the findings of capital structure research pose numerous controversies over a firm’s choice of debt and equity financing, thus rendered no choice except to refer it as a puzzle (Mayer 1984). The inconsistency in the results of capital structure research across countries may be attributed to the institutional differences associated with the level of economic development (Booth et al., 2001). Therefore the scanning of the country’s indigenous factors affecting the corporate financing behaviour is imperative for the formulation of an effective financial policy.

Beginning with the seminal work of Modigliani and Miller (1958) until the last decade, the issue of capital structure had been primarily researched in micro perspective. Few scholars, in accordance with the dynamic trade off theory, have applied partial adjustment model to capture the impact of macroeconomic variables on the speed of adjustment towards the target capital structure (e.g., Drobetz & Wanzenried, 2006; Cook & Tang, 2010; Öztekin & Flannery, 2012). The dynamic trade-off model envisages that the random economic shocks and financial markets' volatility cause the deviations from the target capital structure, over time. Firms make adjustments in the proportion of debt and equity to reach the target capital structure if the benefit of adjustment outweighs the cost of adjustment (Titman & Tsyplakov, 2007). The speed of adjustment towards the target capital structure estimated through partial adjustment model indicates the efficiency of financial system of a country. The partial adjustment model is not capacitated to demonstrate which factors bears the burden of capital structure inefficiencies in the short run and long run. This study attempts to fill this gap in literature by investigating the direction of short run and long run causality, among the debt financing and related variables, through error correction-based Granger causality test within the framework of vector error correction model (VECM).

It is conventional economic wisdom that the corporate sector, as a significant component of the economy, contributes to the overall economic development of a country. In normal discourse, the level of economic growth of a country is reflected in all of the economic indicators including industrial growth, domestic credit, capital expenditures and market capitalization (Singh, 1997; Demirgüç, 2004; Beck & Levine 2004; Shahbaz et al., 2008). Therefore the presence of bidirectional causal relation between the corporate financing patterns and the specific macroeconomic conditions cannot be overruled. The partial adjustment model also confirms the presence of causation between debt financing and the relevant factors. Despite the significant implications the direction of causality among the capital structure and related factors is still unknown.

The other prominent capital structure theories also accentuate the unidirectional relation of certain factors to explain the corporate financing behaviour. For instance, the market timing theory postulate that firms' financing decisions are driven by the prevailing capital market conditions (Baker & Wurgler, 2002). Contrary to that, the market signalling theory claims that the equity market reacts to the corporate financing decisions (Ross, 1977; Heinkel, 1982; Myers & Majluf, 1984). It appears that, the capital structure theorists presume that a firm's indigenous factors fully reflect the prevailing macroeconomic conditions. To an extent, this assumption may be true for a unidirectional causality between the macroeconomic conditions and the corporate financing patterns. However, this assumption restricts the feedback effect of corporate financing patterns on the relevant macroeconomic variables. Probably, because of this implied assumption the traditional models to analyse the variations in the capital structure do not corroborate the bidirectional causality between the corporate financing decisions and relevant factors (e.g., Hackbarth et al., 2006; Levy & Hennessy, 2007; Chen, 2010; Bhamra et al., 2010; Yeh & Roca, 2012). The results of a comprehensive investigation into the dynamic relationship and the direction of causality among the corporate financing patterns and the relevant variables would also help to confirm or refute the predictions of these theories.

The recent development in the capital structure research is the estimation of adjustment speed towards the target capital structure by using partial adjustment models (Huang & Ritter, 2009; Cook & Tang, 2010; Öztekin & Flannery, 2012). However, the existing literature with reference to Pakistan show that there are numerous studies which explored the relationship, between the capital structure and firm specific factors of Pakistan's non-financial corporate sector, by using static models but the dynamic models have not been tested. This paper contributes to the economics and finance literature as a pioneer attempt, with reference to nonfinancial corporate sector of Pakistan, to study the dynamic relationship among the corporate debt financing, industrial growth, domestic credit, capital expenditures and market capitalization through longest available time series data from 1975 to 2013. The capital structure studies in macroeconomic perspective with reference to the developing economies are rarely found. Despite the fact that the financial markets, especially the market of debt securities, are underdeveloped in most of the developing economies. Therefore the firms in developing economies face more complex financial challenges due to financial system's inefficiencies (Wurgler, 2000; Stiglitz, 2000; De Jong, et al., 2008; Fan et al., 2012). Pakistan is an emerging Asian agricultural economy with a sound corporate sector. The corporate sector of Pakistan is the second largest contributor to its national income. During fiscal year 2013-14, the corporate sector's contribution to the GDP was 20.8%, next to the agriculture sector (Economic Survey of Pakistan 2013-14). Despite the existence of a sound corporate sector, Pakistan's corporate debt securities market could not develop due to variety of reasons (Hameed, 2006; Arif, 2007). Nonfinancial corporate sector heavily depend on the banking sector for its financing needs (Ahmed &Wang, 2011). The financial attributes as an emerging economy Pakistan provide an exciting research opportunity to study the corporate financing behaviour.

Another contribution of this study is the application of contemporary time series methodologies such as newly developed combined cointegration approach by Bayer & Hanck (2013), to test the dynamic relationship among corporate debt financing and selected macroeconomic variables and error correction based Granger causality test within the framework of VECM to study the direction of causality. To the best of authors' knowledge, this is the first study which attempts to investigate the direction of causality between the corporate financing behaviour and the relevant macroeconomic variables in case of Pakistan. Analysis of the short run and long run relationship and direction of the causality among the variables relevant to corporate financing behaviour have great policy implications. For instance, if the causality is running from the domestic credit growth and market capitalization to corporate financing patterns at the same time from corporate financing patterns to industrial growth and capital expenditure the financial liberalization may greatly contribute to the industrial development. If there is a bidirectional causality between the financing patterns, domestic credit growth and market capitalization in long run a multipronged long term financial policy may optimize the utilization of capital and consequently industrial development. The remaining paper is organized as follows. In section 2 we present a brief account of the theoretical developments in the field of debt financing and empirical findings of the existing research in addition to the literary justification of the selected variables. In section 3 we present the empirical framework and methodological approaches to carry out our investigations. In section 4 we discuss the results of our investigations and section 5 concludes the research with policy implications.

Literature Review

Most of the capital structure research revolves around three groups of capital structure theories: (1) trade off theories (2) pecking order theories and (3) market signalling theories. A short account of theoretical developments in capital structure research is presented here.

Modigliani & Miller (1958) advanced the first capital structure theory and received the considerable attention of academia and practitioners. As pioneer capital structure theorists, the researchers set the stage for further research on this highly significant financial decision. The researchers postulate that a firm’s value is independent of its capital structure under the restrictive assumption of perfect capital markets with no corporate or personal taxes, a complete perfect market, no arbitrage and an equal rate of interest for individuals and firms. By clearly stating the conditions under which capital structure is independent of the firm value, they actually illuminated the factors that affect corporate financial policy. Later, in 1963, Modigliani & Miller revisited their initial supposition, relaxed the zero tax assumption and set the basis for the "Trade-Off Theory", which is considered the most significant and convincing theory of capital structure.

Developing on the work of Modigliani & Miller (1958), Donaldson (1961) proposed a theory of firms' preference for financing sources and postulated that firms follow an observable pattern of preference for financing the growth opportunities or operations. This theory was later modified by Myers & Majluf (1984) and proposed an adverse selection model, which was later known as the "Pecking Order Theory". The researchers suggested a pecking order of preference for various sources of finance. As a contender to the trade-off theory, the pecking order theory also fascinated many researchers in the field of financial policy. Capital structure has also been widely researched from an agency perspective. Jensen & Mackeling (1976) initiated the theory of agency conflict in which two types of agency conflicts were accentuated; one between owners and managers and one between owners and creditors. Leland & Payle (1977) suggested that inefficiencies in the capital market are propelled by the asymmetry of information between the managers and the outsiders. The asymmetric information theory predicts the changes in prices of securities in response to capital restructuring (Ross, 1977).

A significant dimension of capital structure that has recently been explored is the mean revision supposition, which is also known as the capital structure adjustment hypothesis. The first time, Hackbarth et al. (2006) noticed that capital structure research ignores the impact of macroeconomic conditions on the credit risk and capital structure decisions. The researchers devised a partial adjustment model to impart the influence of the macroeconomic conditions on capital structure decisions. There are numerous studies within the past few years that have explored the impact of macroeconomic conditions on the firm's ability to adjust to the target capital structure using the partial adjustment model (e.g., Drobetz & Wanzenried, 2006; Flannery & Rangan, 2006; Huang & Ritter, 2009; Mahakud & Mukherjee, 2011; Öztekin & Flannery, 2012; Aybar et al., 2012). In contrast to other capital structure theories, the partial adjustment model has more empirical support but is not free from criticism. Byoun (2008) refuted the adjustment hypothesis by clearly stating that adjustments in the capital structure are a contingent decision based on when and how a firm needs funds irrespective of the economic conditions. But this is contrary to our economic wisdom that macroeconomic conditions do not affect the corporate financing decisions, because when and how borrowing is needed largely depends on overall economic conditions. Chang & Dasgupta (2009) argued that the existing tests of the capital structure target hypothesis produce biased results and have limited explanatory powers to fully describe the target adjustments. Hovakimian & Li (2012) also rejected the idea to quantify the dynamic trade-off behaviour using the partial adjustment model. The researchers argued that the spread between the observed capital structure and the well-defined target debt ratio is a meaningless economic measure.

We argue that there are three fundamental problems with the capital structure adjustment hypothesis. First, the estimation of the target capital structure with a consistent and reliable set of determinants remains an abstract. The finance literature is littered with controversies over the determinants of capital structure (e.g., Bradley et al., 1984; Harris & Raviv, 1991; Myers, 1984; Myers, 2001; Bancel & Mittoo, 2004). There is no single set of determinants that can be reliably used to estimate the target level of capital structure. The financing decisions change over time across firms for many reasons. La Rocca et al. (2011) found empirical evidence to support their hypothesis that the determinants of capital structure change over the life cycle of the business. Therefore, the reliable estimation of the target capital structure with inconsistent set of a firm's data itself is debatable. Second, the partial adjustment model is not capacitated to disaggregate the upward adjustments by under-levered firms and downward adjustments by over-levered firms; instead, it estimates the overall adjustment speed. The aggregate adjustment speed has no economic sense. Therefore, the capital structure adjustment hypothesis fails to devise a clear strategy for under-leveraged and over-leveraged firms. Third, firm level analysis of capital structure variations may have some value for individual firms but cannot contribute to macroeconomic policy. The comprehensive analysis of corporate financing decisions in a macro perspective with the help of robust methodology have great policy implications.

We hold the view similar to Byoun (2008) and argue that it is beyond the scope of any existing capital structure theory or model to reliably estimate the target level of capital structure. The time varying macroeconomic environment and the institutional factors associated with the level of economic development of a country influence the debt financings differently in different economies. We posit that in the long run corporate debt financing decisions are influenced by the level of capital market development, industrialization, level of financial development and the need to finance fixed investments.

Four macroeconomic variables were selected on the basis of their relevance to corporate financing decisions. The selection of the variables and expected relation is justified as follows.

Variables

Domestic credit: The domestic credit refers to the financial resources provided to the private sector by the financial institutions including banking and non-banking sectors. The domestic credit as an indicator for the financial system development may potentially affect the corporate financing decisions in two different ways (Shahbaz & Lean, 2012). First, a sound financial system reduces the cost of capital by efficient channelling of capital from lender to borrowers (Levine, 1997; Chinn & Ito, 2006). Second, a developed financial system also ensure the availability of funds for investments in fixed assets which is imperative for the industrial growth (Wurgler, 2000). The relationship between domestic credit and capital structure can be hypothesized as follows;

H1: There is a positive relationship between domestic credit and debt financing.

Industrial Growth: It is well documented in the finance literature that growth opportunities positively affect the corporate borrowings. Numerous proxies are used in capital structure research for growth opportunities, for instance: (i) percentage annual increase in firm's sale (Aggarwal and Kyaw, 2010) (ii) assets growth rate (DeAngelo et al., 2006) (iii) market to book ratio (Fan et al., 2012) (iv) research and development expenditures (Ho et al., 2006; Kale & Shahrur, 2007; Brown et al., 2009) and (v) GDP growth (Huang & Ritter, 2009). Most studies confirm the positive relation between leverage and growth opportunities measured by various methods (e.g., Antoniou et al., 2008; Margaritis & Psillaki, 2010; Ahmed & Wang, 2011; Uysal, 2011). Most traditional analysis of the determinants of capital structure use the firm level data of percentage increase in sales from the last year as a proxy for growth opportunities (e.g., Shyam & Myers, 1999; Bevan & Danbolt, 2002; Linck et al., 2008; Aggarwal & Kyaw, 2010). This measure of growth opportunities has a serious issue of excessive volatility in data because a random small decrease in one year's sales yield a high growth value in the next period although sales in that particular year are normal. We used the macro level data of annual increase in manufacturing value added as proxy for the growth opportunities. Industrial growth is attributed to above average earnings and revenues to firms. During growth periods, firms have free cash to service debt or to expand their manufacturing facilities. We expect a positive relation between debt financing and industrial growth.

H2: There is a positive relationship between industrial growth and debt financing.

Capital expenditures: Gross fixed capital formation by the private sector is an indicator of net capital expenditures and inventories by the private sector. Growth in gross fixed capital formation is a lagging indicator of financing requirements. Capital expenditures also indicates the long-term solvency of the firm (Umutlu, 2010). An increase in collateral value, as a security against the debt, increases the debt capacity of firm (DeMarzo et al., 2012). The firms with high collateral value of assets have more debt capacity compared to low collateral value firms (Rampini & Viswanathan, 2013). Gavazza (2010) argued that the ratio of liquid assets in the asset structure of the firm decrease the cost of debt. The proportion of liquid assets in the capital structure of the firm reduces the bankruptcy cost and enhances the ability of firm to service the debt. The lower bankruptcy cost reduces the required rate of return of the investors resultantly reduces the cost of debt. Numerous studies have found a positive relation between capital expenditures and leverage (e.g., Benmelech & Bergman, 2009; Bolton et al., 2011; Campello & Giambona, 2013; Cvijanović, 2014;). This study explores the causal relation between gross capital formation and corporate capital structure. We posit a positive relation between debt financing and capital expenditures.

H3: There is a positive relationship between capital expenditure and debt financing.

Market capitalization: Market capitalization is the aggregate value of the capital stock in a market. Growth in market capitalization is a result of the issuance of new equity by corporations or an increase in the market value of the existing capital stock. In accordance with the market timing theory, firms issue new equity if market conditions are favourable (Baker & Wurgler, 2002). It is well established in the finance literature that capital market conditions play an important role in the financing decisions of the firms (e.g., DeAngelo et al., 2010; Elliott et al., 2007; Jenter, 2005; Ooi et al., 2010). Capital markets may also potentially be affected by the financing decision of the corporate sector. Therefore, we can expect a reciprocal causality between the financing decisions of corporations and market capitalization.

H4: There is a negative relationship between market capitalization and debt financing.

Debt financing: Three capital structure ratios are more frequently used in the capital structure research namely debt to equity ratio, debt to assets ratio and debt to capital employed ratio. We used debt to capital employed ratio also called gearing ratio which is a ratio of interest bearing long term debt to capital employed. Long term debt normally include the interest bearing long term liabilities such as mortgage loans, capital leases, bonds, debentures and other debt covenants with varying maturities. We used aggregate gearing ratio of non-financial corporate sector of Pakistan for our empirical investigation. For this study purpose, capital structure, debt financing, corporate borrowings we mean the proportion of debt in the capital employed of the non-financial corporate sector of Pakistan.

Research Methodology

The relationship among the debt financing, industrial growth, financial system development, capital expenditures and market capitalization is modelled as equation 1. The standard log linear specification helps to avoid the omitted variable bias and also overcome the problem of collinearity among the variables. We argue that the log linear model can be used to investigate the economic relationship among variables under the consideration.

$$lnDF_t = \alpha_1 + \alpha_2\, lnIG_t + \alpha_3 lnDC_t + \alpha_4\, lnCE_t + \alpha_5 lnMC_t + \varepsilon_t \qquad (1)$$

Where DF is for debt financing measured as the aggregate long-term debt to capital employed ratio of the non-financial corporate sector. IG is for industrial growth measured as the contribution of industry value added in the GDP, DC is the domestic credit measured as the ratio between gross domestic credit to private sector and GDP, CE is the capital expenditures measured as the gross fixed capital formation by private sector to GDP ratio, MC is the market capitalization to GDP ratio, and ε is normally distributed residual term. The data set consists of annual data for thirty eight years beginning from 1975 to 2013. The data of domestic credit, industrial growth and capital expenditures was collected from World Development Indicator (2016). The data of corporate debt financing and market capitalization is collected from the Hand Book of Statistics on Pakistan, (State Bank of Pakistan).

As a benchmark exercise we apply unit root tests to confirm the time series properties of the data before checking the cointegration among variables. At the outset, we apply the standard Dickey & Fuller (1981) test and the Philips & Perron (1988) test to check stationarity of the series.

ADF and PP tests are often criticized for their inability to consider the possible structural breaks in series. This inability of these conventional unit root tests often results in biased rejection of null hypothesis when series have break points (Perron, 1989). To avoid this bias, we apply the Zivot & Andrews (1992) test to check the unit root in presence of a single unknown structural break in the series. This test provides robust results by endogenously determining the single structural break points in the series. The next step in our empirical investigation is to determine the optimal lag length to extend the investigation into the presence of cointegration among the variables. We determine the optimal lag length on the basis Akaike information criterion (AIC).

Numerous tests of cointegration are used to check the long run relation among the variables with varying properties. For instance, Engle & Granger (1987) test is appropriate to check the cointegration for the same order integrated variables. The same order restriction limits the scope of test because sometimes data do not fulfils this condition. Johansen's (1988) Error-correction cointegration model is also a widely used approach to test the long run relation of time series data. This technique is more general and flexible compared to the Engle and Granger (1987) approach. Banerjee et al. (1998) proposed a test of cointegration, which relies on t-values for the acceptance or rejection of the cointegration hypothesis. The Philips & Ouliaris (1990) test, the Johansen & Juselius (1990) test and the Boswijk (1994) are also frequently used approaches for cointegration testing with different data properties. These standard tests of cointegration always encounter criticism for the discretionary selection of a particular test and their inability to provide robust results of small sample size. Another serious issue that these test fails to resolve is the inconsistent order of integration. The application of the standard cointegration tests without adjustments for sample size and an inconsistent order of integration lead to spurious results and consequently, a biased rejection of null hypothesis. To overcome the methodological biases, combined cointegration tests are desirable. We applied the combined cointegration approach recently proposed by Bayer & Hanck (2013) in addition to the autoregressive distributed lag (ARDL) bound testing to confirm the long run relationship among the model variables. Bayer & Hanck (2013) have proposed a combined test of cointegration. The researchers argue that combining the P-values of standard tests in accordance with Fisher's theorem yield more robust results. The combined cointegration method also overcome the problem of discretionary selection of a particular test. The researchers' proposed combined equation is given below.

$$EG - JO = -2\left[\ln(P_{EG}) + \ln\left(P_{JO}\right)\right] \quad (2)$$

and

$$EG - JO - BO - BD = -2\left[\ln(P_{EG}) + \ln\left(P_{JO}\right) + \ln(P_{BO} + \ln(P_{BD}\right] \quad (3)$$

Where;

EG is for Engel- Granger, JO is for Johansen, BO is for Boswijk and BDM for Banerjee-Doladoe-Mestre cointegration tests. The P_{EG}, P_{JOH}, P_{BO} and P_{BDM} are the p-values of the test statistics of individual cointegration tests. The researchers combined the p-values by Fisher's chai squire test.

The null hypothesis of no co-integration is accepted or rejected on the basis of the comparison of the computed Fisher's statistics with the critical values of the test. We accept the null hypothesis if the computed value is less than the tabulated value of Bayer & Hanck (2013) or reject otherwise. We also applied the Auto Regressive Distributed Lag (ARDL) bound testing approach to confirm the consistency of the cointegration test results. The ARDL technique is capable to handle the inconsistency of order of integration, I(0) and I(1) as well as structural breaks in the series. Through linear transformation it also establishes the dynamic unrestricted error correction model (UECM). The UECM helps to combine the short run dynamic relationship with the long run equilibrium, without losing long run information. The ARDL is specified as follows:

$$\begin{aligned}\Delta\, lnDF_t = {} & \mu_1 + \mu_{DUM} DUM + \mu_{DF} lnDF_{t-1} + \mu_{IG} lnIG_{t-1} \\ & + \mu_{DC} lnDC_{t-1} + \mu_{CE} lnCE_{t-1} + \mu_{MC} lnMC_{t-1} \\ & + \sum_{i=1}^{o} \mu \Delta ln\, DF_{t-i} + \sum_{j=1}^{p} \mu \Delta ln\, IG_{t-j} + \sum_{k=1}^{q} \mu \Delta ln\, DC_{t-k} \\ & + \sum_{l=1}^{r} \mu \Delta ln\, CE_{t-l} + \sum_{m=1}^{s} \mu \Delta ln\, MC_{t-m} + \theta_t\end{aligned}$$

(4)

In equation-4 Δ represents the operator of first difference, μ is for parameter coefficients, DUM is the dummy variable for structural breaks in the series and θ is the normally distributed error term. We use Wald test to check the joint significance. We test the null hypothesis of no cointegration $H_0: \mu_{IG}=\mu_{IF} = \mu_{GC} = \mu_{MC} = 0$ against the alternative hypothesis $H_1: \mu_{IG} \neq \mu_{IF} \neq \mu_{GC} \neq \mu_{MC} \neq 0$. We conclude that there is no sign of cointegration if all the parameters are zero and otherwise if non-zero. We compare the F-State with the asymptotic critical values of upper and lower bound given by Pesaran et al. (2001). The null hypothesis is rejected if the F-Stat is greater than the upper critical bound and if the calculated F-Stat is smaller than the lower critical bound we cannot reject the null hypothesis. If the calculated value of F-Stat fall between the upper and lower critical bounds the results are non-decisive. Narayan's tabulated values are more suitable for small sample size ranging between T-30 to T-80. We have T=38, therefore we preferred the critical values proposed by Narayan (2005) over the Pesaran et al. (2001)'s tabulated values. We also carry out other diagnostic tests for normality, heteroscedasticity and serial correlation for robust results of cointegration tests.

VECM technique is applied to study the dynamic causal relationship among the variables. If we find the evidence of cointegration among the series we can also apply (VECM), provided all the variables are same order integrated. The first difference of dependent variable is regressed with a range of first difference of lagged values of independent variables error term. The general framework of VECM is given as Equation-5.

$$\Delta y_t = \delta_0 + \sum_{i=0}^{p} \delta_i \Delta x_{t-1} + \sum_{j=1}^{k} \eta_i \Delta y_{t-j} - \lambda\left(y_{t-1} - \alpha - \beta x_{t-1}\right) + \varepsilon_t \tag{5}$$

Where Δ is sign of first difference operator of model series and Y_t is *P*1* vector at level I(0), In this equation sign δ represents *P*1* constant vector showing linear trend in the system. ε_t indicates the *P*x1 noise residual vector. The δ and η signs represent the *P*P* matrices indicating a short run association amongst the variables across P equations at the j^{th} lag, selected through lag selection criteria. The sign λ represents finite dimension vector of long run association. VECM is specified as follows:

$$(1-L)\begin{bmatrix} ln\,DF_t \\ ln\,IG_t \\ ln\,DC_t \\ ln\,CE_t \\ ln\,MC_t \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ a_4 \\ a_5 \end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix} b_{11i} & b_{12i} & b_{13i} & b_{14i} & b_{15i} \\ b_{21i} & b_{22i} & b_{23i} & b_{24i} & b_{25i} \\ b_{31i} & b_{32i} & b_{33i} & b_{34i} & b_{35i} \\ b_{41i} & b_{42i} & b_{43i} & b_{44i} & b_{45i} \\ b_{51i} & b_{52i} & b_{53i} & b_{54i} & b_{55i} \end{bmatrix} \times \begin{bmatrix} ln\,DF_{t-1} \\ ln\,IG_{t-1} \\ ln\,DC_{t-1} \\ ln\,CE_{t-1} \\ ln\,MC_{t-1} \end{bmatrix} + \begin{bmatrix} \gamma_1 \\ \gamma_2 \\ \gamma_3 \\ \gamma_4 \\ \gamma_5 \end{bmatrix} ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \end{bmatrix}$$

Where (1-L) is log operator, ECT_{t-1} is the one period lag Error Correction Term which represents the adjustments towards long run equilibrium. The long causal relationship is explained by the statistical significance of the coefficient of the error correction term, γ_j (j=1,2,3,4,5) represents the adjustment coefficients and ε_i (*i*=1,2,3,4,5) represents the residual errors. Short run causal relationship is determined by the statistically significant values of parameter coefficients of the variables.

Data Analysis and Results

Descriptive statistics and correlation matrix of the variables are presented in Table 1. The Jarque-Bera test statistics indicate that the series are normally distributed at 5% significance level. The pair-wise correlation values show a positive correlation between corporate debt ratio, industrial growth, domestic credit and capital expenditures and a negative correlation between debt financing and market capitalization. The weak correlations among the variables imply that there is no issue of multicollinearity.

Table 1. *Descriptive statistics and correlation matrix*

	$\ln DF_t$	$\ln IG_t$	$\ln DC_t$	$\ln CE_t$	$\ln MC_t$
Mean	-0.4211	-0.6689	-0.6218	-1.0609	-0.5559
Std. Dev.	0.1411	0.0259	0.0599	0.1189	0.6825
Jarque-Bera	5.9375	2.1260	3.2929	0.4766	3.6004
Probability	0.0514	0.3454	0.1927	0.7879	0.1653
$\ln DF_t$	1.0000				
$\ln IG_t$	0.0527	1.0000			
$\ln DC_t$	0.3103	0.2068	1.0000		
$\ln CE_t$	0.5045*	0.0755	0.1744	1.0000	
$\ln MC_t$	-0.6949*	0.0954	-0.1112	0.5509*	1.0000

* Indicates the significant correlation between the variables

As a preliminary investigation into the time series properties of the variables, we apply Augmented Dicky Fuller and Philips Parren tests. Table 2 reports the statistics of the ADF and PP tests at level and first difference. The results indicate that the null hypothesis of no unit root cannot be rejected at level for series debt financing, industrial growth, domestic credit, capital expenditures and market capitalization. However, the tests results support the rejection of null hypothesis of no unit root when first differenced. This finding is an indication that all the series are I(1) integrated. We conclude that all the series are non-stationary at level but stationary when first differenced.

Table 2. *ADF and PP unit root test statistics.*

	ADF				**PP**			
	Level		**1st Difference**		**Level**		**1st Difference**	
$\ln DF_t$	-1.3000	0.6208	-5.4221	0.0001	-1.3000	0.6208	-5.5039	0.0000
$\ln IG_t$	-0.8321	0.7994	-3.5674	0.0115	-0.9355	0.7669	-6.0000	0.0000
$\ln DC_t$	-2.8826	0.0559	-6.2580	0.0000	-2.9858	0.0544	-6.2899	0.0000
$\ln CE_t$	-0.5361	0.8737	-3.5370	0.0119	-0.5966	0.8605	-5.0528	0.0002
$\ln MC_t$	-0.0103	0.9542	-6.4616	0.0000	-0.0175	0.9515	-6.4631	0.0000

ADF and PP unit root tests are often criticized for their inability to allow structural breaks in series. To reach the unbiased conclusion regarding the order of integration, we also performed the Zaviot & Andrews (1992) unit root test. The test statistics by allowing one time shift in both the intercept and the trend process are presented in Table 3. Overall, the test results are consistent with the results of the ADF and PP unit root tests. The test statistics confirm that all of the series under the consideration are non-stationary at level but stationary at the first difference. We see that all of the series are integrated at I(1) regardless of which test is used.

Table 3. *Zaviot -Andrew unit root test statistics with structural breaks*

	At level				At 1st difference			
	T-statistics	p-value		Time break	T-Statistics	p-value		Time Break
$\ln DF_t$	-2.8617	0.2362	(0)	1992	-5.68283	0.0096	(0)	2006
$\ln IG_t$	-4.0342	0.2055	(1)	2006	-6.21782	0.0055	(0)	1989
$\ln DC_t$	-3.2417	0.2773	(0)	2002	-3.64056	0.0364	(1)	2004
$\ln CE_t$	-3.2970	0.2954	(1)	2002	-3.83049	0.0026	(1)	2003
$\ln MC_t$	-2.0893	0.7985	(1)	1984	-6.70363	0.0261	(0)	2006

After having information about the order of integration, we can proceed to the cointegration testing. We used combined cointegration approach newly proposed by Bayer and Hanck (2013) to check the presence of long run relationship among the variables. Table 4 reports the results of the combined cointegration test. The results show that computed values by Fisher statistics of *EG-JOH* and *EG-JOH-BO-BDM* are greater than the tabulated values for all cointegration equations except when the industrial growth is kept as dependent variable. Therefore, we can reject the null hypothesis of no cointegration between series. The critical values of the test at 1% significant level are given at the bottom of the table for benchmarking. The lag length is determined on the basis of minimum AIC values. The empirical results confirm the presence of long run relationship among debt financing, industrial growth, domestic credit, capital expenditures and market capitalization in Pakistan over the 1975 to 2013 period.

Table 4. *Combined Cointegration test results*

	EG-JOH	EG-JOH-BO-BDM	Lag Order	Conclusion
$DF_t = f(IG_t, DC_t, CE_t, MC_t)$	17.5361	32.1458	0	Cointegrated
$IG_t = f(DF_t, DC_t, CE_t, MC_t)$	13.4330	24.5632	1	Non-cointegrated
$DC_t = f(IG_t, DF_t, CE_t, MC_t)$	16.2621	31.1631	1	Cointegrated
$CE_t = f(IG_t, DF_t, CE_t, MC_t)$	16.5786	32.2154	1	Cointegrated

$MC_t = f(IG_t, DC_t, CE_t, DF_t)$	19.5784	33.0871	1	Cointegrated
Critical value at 1%	15.8450	30.7740	AIC	

We check the robustness of the Bayer & Hanck (2013) combined cointegration test results with ARDL bound testing approach. Table 5 shows the result of ARDL bound test. We see that the computed values of F-statistics of the dependent variable DF in presence of a structural break in 1992 is greater than the asymptotic upper bound critical value of Narayan (2005) at the 1% significance level, we can reject the null hypothesis of no cointegration. Similarly, the equations with DF, CE and MC as dependent variables also indicate the presence of long run relationship, as the calculated F-statistics are greater than the upper bound critical values at 5% significance level. We could not get empirical support for the rejection of the no cointegration null hypothesis when first differenced IG is kept as dependent variable in the ARDL equation. We reject the no cointegration null hypothesis for four series out of five. Thus we have four cointegration vectors. Overall the results of ARDL bound testing by using Narayan,s tabulated critical value are consistent with the results we found through the combined cointegration with Bayer & Hanck (2013) method.

Table 5. *ARDL bound testing results*

Variable	DF_t	Ln IG_t	Ln DC_t	Ln CE_t	Ln MC_t
Structural Break	1992	2006	2002	1984	2002
F-Statistics	12.6931*	4.5624	8.5803**	8.5217**	7.2658***
Critical Values	1% level	5% Level	10% Level		
Upper Bounds	11.130	7.980	6.680		
Lower Bounds	10.150	7.135	5.950		
R^2	0.8663	0.5245	0.6287	0.8812	0.5622
Adjusted R^2	0.7962	0.4827	0.5853	0.8135	0.4962
F-statistics	6.8724*	2.2381***	5.9847*	13.2367*	3.2657**

* Significant at 1% level, **significant at 5% level, *** significant at 10% level.

Table 6 presents the results of the long-term and short-term marginal impacts of industrial growth, domestic credit, capital expenditures and market capitalization on the corporate debt financing. The slope coefficients can be explained in terms of elasticities as our empirical model holds log linear specification. The empirical results show that the short-term and long-term elasticity estimates of debt financing with respect to industrial growth are positive and statistically significant at 5% and 1% level respectively. We note that the debt financing is more elastic to industrial growth in long run than short run, which implies that the firms in Pakistan prefer to finance the long-term growth opportunities with long term debt. The result was expected because our debt financing measurement does not include short term financing as it comes under the scope of working capital management. A 1% increase in the industrial growth results 0.23% increase in the debt to capital employed ratio in short run and 0.43% in the long run. Contrary to the industrial growth, the debt financing is more elastic towards domestic credit in short run than long run as indicated by the statistically significant values of respective coefficients at 5% significance level. In response to 1% increase in domestic credit the debt financing increase 0.86% in the short run and 0.47% increase in the long run. The domestic credit growth is attributed with the cost effective availability of credit to business firms. Any positive development in the financial system encourage the corporate sector to increase the financial leverage both in short run and long run. The short term slop coefficient of capital expenditures is statistically insignificant which indicate that the investing decisions do not affect financing decisions in short run. However the long run parameter coefficient of capital expenditures is positive and significant at 5% level. In long run 0.84% increase in debt financing can be expected in response to 1% increase in capital expenditures. The results show statistically significant negative impact of market capitalization on the debt financing in short run as well as in long run. This finding confirms the view that financing decisions are driven by the market conditions. One period lagged error correction term ECM_{t-1} is significant at the 1% confidence level with a negative sign. The significant and negative value of ECM_{t-1} represents the adjustment speed from short run to long run equilibrium. The estimated negative value of ($ECM_{t-1} = -0.1742$) significant at 5% level implies that any deviation in the debt financing from the long run equilibrium is corrected by the system at the rate of 17.42% each year. It means that firms in Pakistan take around six years to fully adjust their capital structure to long run equilibrium. Although the adjustment speed estimated through this VAR model is not directly comparable to the adjustment speed estimated through partial adjustment model due to certain fundamental methodological differences but the results of both estimation techniques indicate the same phenomenon. Huang and Ritter (2009) by using a modified partial adjustment model found that in the United States of America firms take 3.7 years to fully adjust their capital structure to the long run target capital structure. Similarly, Getzmann et al. (2010) reported that, in Asian countries, firms adjust to long run equilibrium 27% to 39% per annum. If we benchmark our adjustment speed estimations with the existing research findings the situation is alarming for Pakistan’s financial system. Pakistan needs to take effective initiative to overcome the financial system inefficiencies to enable firms to structure their capital optimally.

Table 6**.** *Short run and long run results*

Panel A	Coefficient	P-Values	Panel B	Coefficient	P-Values
Short Run Results			Long Run Results		
Constant	-0.1294*	0.0086	*Constant*	-0.3038**	0.0496
$\Delta\ lnIG_t$	0.2258**	0.0508	$lnIG_t$	0.4318*	0.0037
$\Delta\ lnDC_t$	0.8592**	0.0380	$lnDC_t$	0.4691**	0.0231
$\Delta\ lnCE_t$	0.1435	0.2803	$lnCE_t$	0.8363**	0.0235
$\Delta\ lnMC_t$	-0.2930*	0.0071	$lnMC_t$	-0.2230**	0.0314
ECM_{t-1}	-0.1742*	0.0359			
R^2	0.6748				
Adjusted-R^2	0.6331				
F-Statistic	16.9626				
Diagnostic tests					
	F-Stat	*P-Value*			
x^2 *normal*	0.5412	0.7451			
x^2*white*	2.3254	0.1653			
x^2*remsay*	2.1261	0.1245			
x^2*arch*	0.6584	0.3928			

* Significant at 1% level, **significant at 5% level, *** significant at 10% level.

The diagnostic tests results are presented in the lower portion of the table. Overall, the test results confirm the robustness of the model. The error term is normally distributed. The model is free from the serial correlation between the error term and the dependent variable. The results of the Ramsey regression equation specification error also confirms that model is well specified. We further investigated the stability of the model using Cumulative Sum (CUSUM) and Cumulative Sum of the Squires (CUSUMsq). The graph shows that the CUUSM and CUSUMsq are within the upper and lower bound at the 5% significance level. The results confirm that short run and long run parameters of the model are consistent and stable over time.

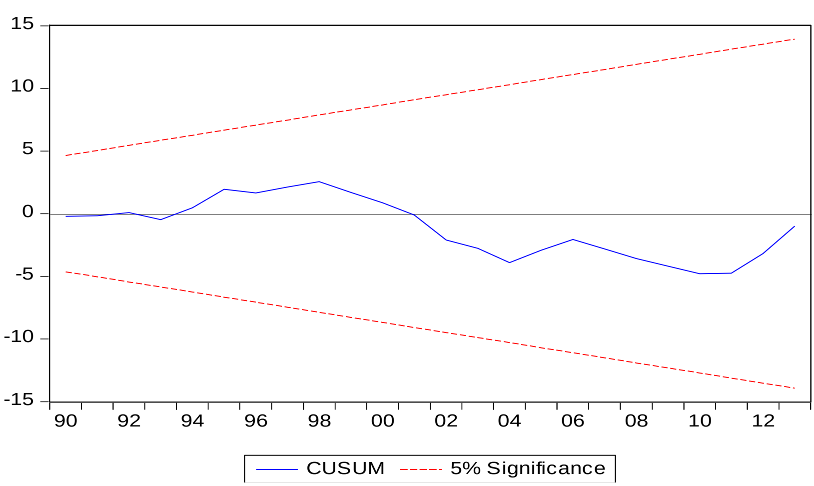

Figure 1. *Plot of Cumulative Sum of recursive residuals*

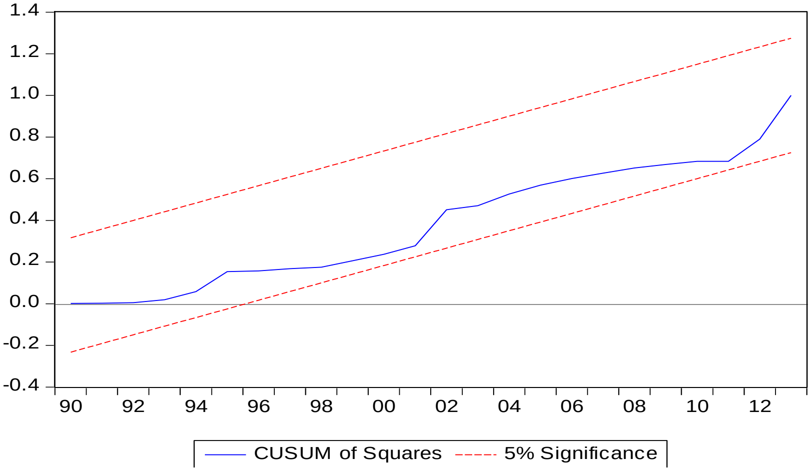

Figure 2**.** *Plot of Cumulative Sum of Squares of Recursive Residuals*

Since all of the variables are integrated at first difference the Granger Causality test within the framework of (VECM) qualifies the merit. We derived the results of VECM presented in the Table 7 by estimation of system equation through OLS regression, the values in brackets are P-values of the parameter coefficients.

Table 7. *Vector Error Correction Models*

Dependent Variables	Short Run					Long Run
	Δ ln DF_{t-1}	Δ ln IG_{t-1}	Δ ln DC_{t-1}	Δ ln CE_{t-1}	Δ ln MC_{t-1}	ECT_{t-1}
Δ ln DF_t	-	0.1923**	-0.0735**	0.1832	-0.1354*	-0.1651**
		(0.0314)	(0.0473)	(0.4206)	(0.0041)	(0.0357)
Δ ln IG_t	0.2385	-	1.5062*	0.7672	0.0045	-0.1404*
	(0.2477)		(0.0089)	(0.2913)	(0.4968)	(0.0026)
Δ ln DC_t	0.4792	0.5423**	-	0.2241	0.1254**	-0.2641
	(0.1128)	(0.0173)		(0.1945)	(0.0458)	(0.4134)
Δ ln CE_t	0.4225**	0.2568*	0.4572	-	0.4215	-0.0928
	(0.0176)	(0.0014)	(0.2873)		(0.2657)	(0.1658)
Δ ln MC_t	0.0131	0.0682**	0.5421**	0.8865	-	0.1522
	(0.3654)	(0.0021)	(0.0357)	(0.3691)		(0.5174)

* Significant at 1% level, **significant at 5% level, *** significant at 10% level.

The statistically significant values of the parameter coefficients, estimated by regressing the first differenced one period lagged independent variables with the first differenced dependent variables, represent the short term causal relationship. The statistically significant negative values of parameter coefficients of white noised one period lagged error correction term represents the long run joint causality running from the independent variables to dependent variable. We note that in short run the causality is running from the industrial growth, domestic credit and market capitalization to the debt financing. The parameter coefficient of market capitalization is negative and significant at 1% level in debt financing equation, which implies that any increase in the market capitalization cause decrease in the debt financing. We see that in short run domestic credit granger cause the industrial growth. The industrial growth and corporate debt financing Granger cause the investments in fixed assets in the short run. The domestic credit and industrial growth granger cause the market capitalization in the short run. The long run results show that there is a bidirectional causality between industrial growth and corporate debt financing. The unidirectional causality is running from domestic credit, capital expenditures and market capitalization to corporate debt financing it means that in long run debt financing decisions does not granger cause the market capitalization, capital expenditures and domestic credit.

Conclusion

In this paper, we investigated the dynamic relationship among the corporate capital structure and related macroeconomic variables such as industrial growth, domestic credit, capital expenditures and market capitalization using Pakistan's data over a period of 38 years from 1975 to 2013. We applied the combined cointegration approach developed by Bayer & Hanck (2013) in addition to ARDL bound testing approach to check the presence of long run relationship among the variables under the consideration. The empirical results favour the presence of long run relationship among the model variables. The elasticity estimates indicate that corporate debt financing is more elastic to industrial growth in the long run than short run. Domestic credit growth positively affect the debt financing both in short run and long run. However the debt financing is more elastic to domestic growth in the short run. Capital expenditures only affect the debt financing in long run. Market capitalization has negative impact on the debt financing both in short run and long run. The negative relationship implies that firms in Pakistan prefer to finance their operations and growth opportunities with equity if the equity market conditions are favourable. This finding confirms the assertions of market timing theory and refute the pecking order theory. The capital structure deviations from the long run equilibrium due to random shocks are corrected by the system at the rate of 17.46% annually. Although the capital structure adjustment speed towards target capital structure estimated through partial adjustment model is not directly comparable with the adjustment speed towards the long run equilibrium estimated through Vector Auto Regressive model due to certain methodological differences, both estimations reflect the system's efficiency to correct the deviations due to random economic shocks and leads to same conclusion. The adjustment speed in Pakistan is considerably low compared to other Asian countries where capital structure deviations from the target are corrected 27% to 39% annually (Getzmann et al., 2010). It takes about six years to reach the long run capital structure equilibrium in Pakistan *ceteris paribus*, which is almost double than the time required to achieve the target capital structure in the

USA (Huang and Ritter, 2009). The result implies that Pakistan's corporate sector suffers from capital structure inefficiencies stemming from the financial system's inability to cater the financing needs of the corporate sector.

The results of Granger causality test, achieved through VECM framework, indicate that in the short run industrial growth, domestic credit and market capitalization Granger cause the corporate financing decisions. The debt financing Granger cause the capital expenditures in the short run. Normally, debt is arranged to finance the already selected investment avenues, the inverse causality in case of Pakistan implies that firms make investment decision on the basis of availability of funds rather economic justification. The industrial growth Granger cause the domestic credit, capital expenditures and market capitalization. Domestic credit has bidirectional causal relation with debt financing and market capitalization. The long run causality test results reveal that industrial growth and debt financing have long term bidirectional causal relation. A unidirectional causality runs from domestic credit, capital expenditure and market capitalization to debt financing and industrial growth. The causality running from market capitalization to debt financing in both short run and long run validate the market timing theory and refute the market signalling theory.

The suboptimal use of debt capital due to the underdeveloped financial system hampers the industrial growth in Pakistan. Industrial growth Granger cause all the factors affecting debt financing in the short run. Thus there is a feedback effect of industrial growth to corporate debt policy. A long term multipronged financial policy may potentially contribute to achieve the industrial growth by enabling firms to optimally utilize the debt capital. The liberal credit policies in addition to development of corporate debt securities market would be needed to execute the effective financial policy.

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