

EMPIRICAL ANALYSIS OF LEVERAGE DECISIONS IN PYTHON WITH EVIDENCE BASED ON NON-FINANCIAL FIRMS OF PAKISTAN

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DOI: <https://doi.org/10.5281/zenodo.15761102>

Keywords

Capital Structure, Financial Leverage, Asset Tangibility, Profitability, Firm Size, Emerging Markets

Article History

Received on 20 May 2025

Accepted on 20 June 2025

Published on 28 June 2025

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Abstract

In this paper, the effect of asset tangibility, profitability, firm size, and anticipated growth on financial leverage associated with the capital structure decisions of non-financial firms listed in the Pakistan Stock Exchange between the years 2010 and 2014 are investigated. A random effects regression model was used after the results of Hausman test using panel data of 13 firms in oil and gas industry. Diagnostic tests found that there was no autocorrelation, heteroscedasticity, and non-normality, therefore, proving the model reliability. The findings indicate that asset tangibility had positive and significant effect on leverage with profitability and expected growth having with negative effects on leverage as the pecking order theory suggests. In particular, the coefficients of what were found to be influential were tangibility and profitability with 0.51 and -0.52, respectively. Firm size did not have a meaningful performance. The model has the capacity to explain about 71 percent of whether or not to engage in leverage decisions. These conclusions underline the importance of firm-specific differences in the development of financing strategy and set up some practical suggestions to financial managers working in emerging markets.

INTRODUCTION

Capital structure (CS) is yet another key financial decision which has a direct impact on the risk and the returns of a firm, as well as the total market value. It is a combination of equity and debt that company adopts to finance its activities and expansion (Khan et al., 2021). A company with no debt load is unleveraged and it entirely depends on equity financing in contrast to using a blend of debt financing and equity financing by a levered firm. There are two kinds of leverage identified in financial

management, operating and financial leverage, the former requires associated with fixed operational costs and financial leverage that emerges because of fixed financing liabilities like interest generating debt obligations (Altaf & Shah, 2020). The decision on capital structure is associated with strategic aims of the company and market conditions and companies frequently change the proportion of debt and equity capital in order to maximize performance and decrease the cost of capital. Bank loans and corporate

bond issues, lease obligations, and sale of stock can be some of the financing tools. The decisions made are also influenced by the changing theories of capital structure that came to propose how firms should act in various contexts and across time such as the trade-off theory, pecking order theory, and market timing theory (Jiraporn & Liu, 2022). Capital structure strategies of financial and non-financial firms are significantly different because they have different operational models, and they operate in diverse contextual environments. Non-financial companies, particularly those in production and manufacture, have considerable investment in real assets like raw materials, equipment and plant facilities. These physical resources are usually the collaterals that affect the capacity of the firm to acquire external finance (Ahmed et al., 2023). Subsequently, asset tangibility reaches to a point of determining the extent of loss and gain due to capital structure decisions to non-financial companies within capital-intensive industries.

Modigliani and Miller (1958), changed the academic study of capital structure presenting the notion that in perfect markets, financing decisions do not affect the value of a firm. In this basic hypothesis, also referred to as the MM Theorem, it is assumed all taxes, transaction costs and bankruptcy costs are absent and there are perfect information situations and efficient markets. According to this simplified model, the means of financing a firm (with debts or using equity) does not affect the overall evaluation of that company. In practice though, these assumptions are rarely ever true. On top of this, other academics such as Titman and Wessels (1988) presented the various conditions in addition to those that should be met by the MM theory to be true among them. The Modigliani Miller theorem assumes no taxes, no transaction or flotation costs, no bankruptcy costs, perfect contract enforcement, and perfect and complete capital markets relaxing any of these assumptions makes capital structure relevant to firm value. Slackening any of those assumptions results in conditions that bring the relevance of capital structure in a firm value into picture. Such a deviation of the ideal conditions of MM has led to a variety of modern capital structure theories:

- The Trade-off Theory states that companies consider the value of tax incentives which are associated with debt by considering the costs of financial distress (Frank & Goyal, 2009).
 - Myers and Majluf (1984) put forward the Pecking Order Theory which implies that companies first tend to self-finance, then use debts and turn to equity as the least preferred choice because of the asymmetry of information between managers and investors.
 - The Agency Theory emphasizes the management-shareholder-conflict of interests and equity-debtholder conflict and implies that capital structure decisions can reduce the agency-costs (Jiraporn & Liu, 2022).
- These logical models are responsive to the empirical drag that companies encounter and offer subtle information to practical economic decision making. Though the capital structure theories been extensively tested in the developed economies the emerging markets have their own unique challenges and dynamics. The development of undeveloped financial structures, the low protection of investors and variable macro-economic environment change the financing behavior of firms. In Pakistan and other similar countries, the non-financial sector significantly contributes to industrial and economic development though it has not been studied much in terms of the capital structure behavior. Available empirical evidence shows that firm-specific attributes including asset tangibility, profitability, size and growth potential strongly influence leverage choices but outcomes are usually not generalizable across environments (Altaf and Shah, 2020; Ahmed et al., 2023). An example is in the asset tangibility, which is normally believed to make access to debt financing easier because long-term assets are something that could be used as collateral. Profitability in turn is expected to have a negative relationship with leverage in the pecking order theory since highly profitable firms can easily resort to internal financing. On the same note, bigger companies might have greater access to credit market but they might also have greater retained earnings and the influence of firm size on the leverage is unclear. It is usually believed that growth opportunities can largely deter debt financing since the uncertainty and agency issues come into play.

Within this context, the study intends to empirically determine the sensitivity of asset tangibility, profitability, firm size, and expected growth on leverage in non-financial organizations that are listed in the Pakistan Stock Exchange between 2010 and 2014. The study will attempt to give a subtle insight into the behavior of capital structure in an emerging market with the help of panel data regression models and robust diagnostic tests. The results of the study will guide corporate financial managers, policy-makers, investors in terms of what are the main determinants of financing decision and shall be used to add the debate on the general financial strategy in transitional economies.

Leverage is a very important aspect in terms of capital cost of a firm. The firm is said to be in the optimum leverage situation when the cost of capital is minimized. Here, one of the main research questions is raised: what are the factors preventing reaching the optimal leverage, in the non-financial sector in particular. Financial leverage positioned by a certain firm is determined by numerous internal and external factors. These are the tangibility of assets, non-debt tax-shielding, profitability, firm size, anticipated growth, income variability, industry, and risk exposures. Though these factors have received a wide global literature base there has been little empirical evidence of the most dominant

determinants of leverage among companies listed in the Pakistan Stock Exchange. This deficit raises the necessity of a targeted study, what aspects are the most important in making capital structure decisions in Pakistani environment. The major purpose of the paper is to investigate how major determinants of the firm capital structures i.e., asset tangibility, profitability, firm size, and expected growth influence leverage of the non-financial firms in Pakistan. By applying the panel information of 2010-2014, the research will establish the positive and negative impacts provided by these variables to leverage, thus, providing an in-depth insight on the capital structure field in emerging economies. In order to answer the research objectives, a number of hypotheses are put forward. They are age, alternative hypothesis, the null hypothesis, and the views between leverage and the two independent variables. The null hypotheses of the former are that there is no correlation between leverage and asset tangibility whereas the alternative hypothesis implies that it is quite correlated. In the same way, hypothesis to the relationships between leverage and growth rate, profitability, and firm size are posed and each of them questions whether these factors are statistic factors in determining the capital structure decisions of a firm.

Table 1: Research Hypotheses on the Relationship between Leverage and Firm-Specific Determinants

Hypothesis Code	Null Hypothesis (H ₀)	Alternative Hypothesis (H ₁)
H ₀₁ / H ₁₁	There is no relationship between leverage and tangibility.	There is a significant relationship between leverage and tangibility.
H ₀₂ / H ₁₂	There is no relationship between leverage and growth rate.	There is a significant relationship between leverage and growth rate.
H ₀₃ / H ₁₃	There is no relationship between leverage and profitability.	There is a significant relationship between leverage and profitability.
H ₀₄ / H ₁₄	There is no relationship between leverage and firm size.	There is a significant relationship between leverage and firm size.

This study is likely to have practical use to financial managers and corporate strategists. The study will help the decision-makers to optimize the capital structure to minimize the sum of the cost of capital

and that it will enable them to optimize the capital structure to minimize the total cost of capital and improve financial performance because the key influential factors are identifies. Moreover, the results

provide valuable information to investors, regulators and policy-makers in wanting to know how the firm-based factors influence the financing behavior in a market that is still in its early stages. There are however limitations to this study. It depends on leverage measurements using book value as opposed to market value mostly because of limitation to data. Moreover, even though the stock exchange in Pakistan has a spectrum of industry sectors, this research study is limited to the sample of three sectors in the non-financial sector. Consequently, one is to be cautious of generalizing the results to all the listed companies or to the financial institutions.

1. LITERATURE REVIEW

It is not an exaggeration to state that the determinants of capital structure have been a focal point in corporate finance especially given the way corporate firms in different emerging and developed economies races to the various contemporary market changes, institutional development, and investor demands. Empirical studies are still based on the classical theories that relate to the pecking order theory (Myers & Majluf, 1984), trade-off theory, and agency cost theory among others, but the current literature has seen more empirical works focusing on region specific relationships as well as sector specific finance and finance relationships. Tangibility (TG) of asset is one of the factors that has been known to determine leverage. Tangible firms have higher fixed assets which can be used in securing loans thereby minimizing the risks taken by the lenders thereby providing more access to debt. Recent results show the affirmative correlation between tangibility and leverage. In their empirical study of non-financial companies in South Asia, Ahmed et al. (2023) discovered that the asset tangibility was still a reasonable predictor of increased debt ratios in capital-intensive businesses. Similarly, Khan et al. (2021) demonstrated that Pakistan firms with larger bases of tangible assets have a stronger tendency to debt financing, as the hypothesis of collaterals implies.

Profitability (PF) on its part has been found to exert a negative relationship strength with rather than leverage which helps to vindicate the pecking order theory. The companies that have more funding internally have fewer chances of depending on

external funding. Overall, this inverse relationship is confirmed empirically by Altaf and Shah (2020) in South Asia manufacturing companies. The same strategy was proven in a later cross-sectoral study by Munir et al. (2023) that showed profitable companies never bank on debt, particularly, short-term debt, preferring to reinvest their income, which decreases agency costs as well as signaling risks. Firm Size has even more involved implications. Big companies tend to have better access to capital markets, variety of their operations, and economy of scale all of which may extend their leverage ability. But the results are imbalanced. In a region of GCC, a study on large firms by Hasan and Nawaz (2024) revealed that although large firms would be able to arrange their long-term financing easier than smaller firms, the demand of large firms to achieve high-debt ratios does not appear, because of reputation issues and due to constraints on corporate governance. On the same note, Djokic and Milenkovic (2022) found a positive relationship between firm size and long-term leverage and negative relationships between firm size and short-term and total leverage which implies that firms make tradeoffs between selectively structured financing involving different maturities.

Growth Opportunities have also typically been considered negative in its association with leverage in that high-growth firms tend to not lever because they want strategic optionality and to ensure that they do not want to dilute control. Nguyen et al. (2021) confirmed this conclusion by suggesting that firms which enjoy a relatively higher expected growth face greater pecuniary cost of financial distress and, given the presence of restrictive covenant, are more willing than other firms to internal finance (either through ownership or equity). Nevertheless, the conflicting data related to the MENA area (Yousef et al., 2023) show that in some institutional contexts, there is nothing that hinders growth opportunities to spur borrowing more precisely when the optimism in the market or the credit growth supported by the government plays a vital role in easing the opportunity to access the funds. New variables are also becoming subjects of the recent literature. As an example, the effect has been found to moderate depending on firm age so far as capital structure relationships are concerned. A 2024 paper by Mahmood and Dar

found a more pronounced negative association between profitability and leverage and a lower association between tangibility and leverage in old firms, as compared to the young firms, suggesting a lifecycle effect in the financial strategy. Also many macro level variables are finding their way into capital structure models as well financial development, interest rates, inflation, and political stability (Al-Khouri & Arouri, 2021).

Some researchers also indicate the significance of a situation, particularly in new markets. Another example is in Pakistan where financial institutions are risk-averse, credit markets are under-developed and tax incentives are low and this influences the manner in which firms finance their enterprises in a manner which is differing with those which are in the developed economies. Rehman et al. (2022) claim that in Pakistan, corporate finance is shaped massively by industry factors, ownership pattern, and government

restrictions, and that company-level studies would do well to take into account the higher-order institutional factors. Therefore, the literature creates the perception that the determinants of the relationship between capital structures such as tangibility, profitability, size, and growth continue to be focal to the perception of financial leveraging decisions however, their functions tend to vary depending on the environment. In as much as classical theories offer a good start, recent empirical studies vividly point out the requirement of inconspicuous, data-based researches that are specific to local settings. Table 2 has some key studies regarding determinants of capital structure and their areas of concern have been outlined with their related limitations. The last row helps to place the given study in the system of prevailing literature with a focus on the sectoral value of contribution to the Pakistani non-financial sector.

Table 2: Summary of Key Literature on Capital Structure Determinants and Identified Research Gaps

Author(s) & Year	Focus of the Study	Identified Research Gap
Titman & Wessels (1988)	Impact of firm-specific variables on leverage in U.S. firms using factor analysis	Focused on U.S. data; lacks applicability to emerging markets like Pakistan
Banerjee, Heshmati & Wihlborg (1999)	Capital structure determinants in the UK market	Limited to developed economy; weak effect of growth opportunities examined
Mazur (2007)	Capital structure theories in Polish firms (WSE)	Data from early 1995-2000 period; sectoral differences not deeply explored
Abor & Biekpe (2005)	Determinants of CS in Ghanaian SMEs and listed firms	Strong sectoral insight but limited to Ghana; results not generalizable to South Asia
Mac an Bhaird & Lucey (2010)	Determinants of CS in Irish SMEs using seemingly unrelated regression	Did not focus on large listed firms or industry-level disaggregation
Sbeiti (2010)	Impact of stock market development on CS in GCC countries	Did not isolate firm-specific variables like profitability and growth individually
Sayeed (2011)	CS determinants in Bangladesh (agency costs, size, PF, etc.)	Lacked time variation effects; did not test tangibility or growth in detail
Nguyen et al. (2012)	CS and financial development in Vietnam using GMM method	Conflicting findings on growth and profitability; data limited to one stock exchange
Tarazi (2013)	CS determinants and tax effects in Thai listed firms	Focused on tax shield and cost of distress, less emphasis on firm size and tangibility

Author(s) & Year	Focus of the Study	Identified Research Gap
Osaretin & Michael (2014)	Size and profitability impact on CS in Nigeria	Analyzed only two variables; limited model sophistication
Altaf & Shah (2020)	CS determinants in South Asian manufacturing firms	Broad regional study; did not isolate sector-specific variations within countries
Khan et al. (2021)	Panel data analysis of CS in Pakistani firms	No disaggregation of firm type (financial vs non-financial); limited to overall effects
Ahmed et al. (2023)	Tangibility and leverage in South Asia	Did not distinguish between short- and long-term debt or firm growth metrics
Hasan & Nawaz (2024)	Size and governance effects on CS in GCC countries	Does not explore profitability and growth simultaneously; different institutional setting
This Study (2025)	Examines the impact of asset tangibility, profitability, size, and growth on leverage in non-financial PSX-listed firms (2010–2014) using panel data regression	Addresses sector-specific gap in Pakistani context; provides focused empirical evidence on firm-level CS determinants using diagnostic-backed model selection

This paper adds to the growing career of capital structure studies to consider a non-financial firm in the Pakistan Stock Exchange estimated on a panel data of 2010 to 2014. Consistent with the new discoveries, the study also seeks to confirm the existence of relationships between leverage and firm-specific variables in the setting of a developing country in which both institutional and market factors vary compared with those that are present in more developed countries.

2. Research Methodology

The current research methodology purports to probe the impact of the two major factors of capital structure determination that is, asset tangibility, profitability, firm size, and expected growth on financial leverage of non-financial firms in Pakistan Stock Exchange. All the sectors registered with Securities and Exchange Commission of Pakistan (SECP) will form the population of this research. Nevertheless, to create homogeneity and limit to one sector, its sample has been reduced to 13 companies in the Oil and Gas area. These companies have been picked due to the availability of data and consistency over the past 4 years 2010 to 2014. The panel data allows the inclusion of both variation between firms and time trends in the leverage behavior. The information of this study is secondary in nature as it has been

assembled from the Balance Sheet Analysis (BSA) issued by the State Bank of Pakistan (SBP). Such annual statements give an accurate and detailed financial information with such inclusive items of a balance-sheet and an income statement necessary to compute variables. In this analysis all the variables are measured on book basis because of the fact there were not much available market based information on the sample firms that was consistent. In this research, the variable of interest is financial leverage that is the ratio of total liability to total asset. Whereas other literature would choose to stick to market-value measure of leverage, the study uses book-value of leverage in conformity with what Titman and Wessels (1988) did. There are four independent variables including the ones that are firm-specific and these are used as the predictors. Fixed assets/Total assets Asset tangibility is calculated as a ratio of fixed assets to the total assets and it should have a positive impact on leverage, since fixed assets can act as a collateral to support a debt. It is hypothesized that profitability, defined as earnings before interest and taxes (EBIT) divided by total assets is also negatively related to leverage because of the pecking order theory according to which companies in general prefer internal financing. The measure of firm size is taken as the natural log of total assets, as literature is divided on this topic with some researchers supporting the idea that large firms are

better able to access capital markets, and some propose that they are less debt-dependent. The annual percentage change in the total assets is also expected

to increase and the expectations are that companies that are classified as high-growth companies might not incur debt to maintain their financial flexibility.

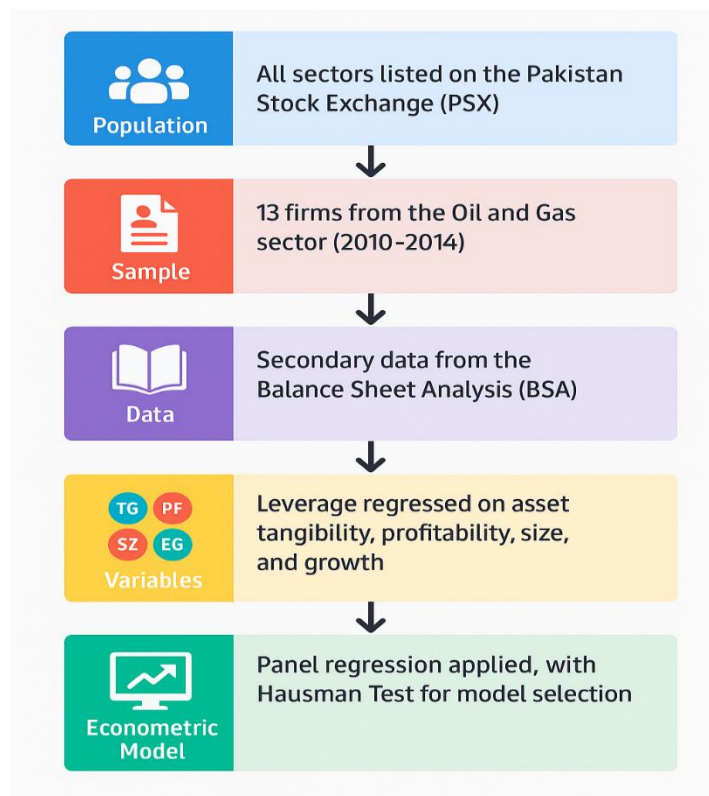


Figure 1: Flowchart of Research Methodology

Figure 1 shows the research methodology used in the study graphically. All the blocks are the crucial steps of the procedure: defining the study population, choosing the sample, setting the data source, setting the variables, implementing the econometric model. Icons have been employed to better understand and interact. The flowchart starts with Population with all the sectors that are listed on Pakistan stock exchange (PSX) giving it a wide scope of reference. The Sample is reduced to 13 Oil and Gas sector firms in the data of 2010-2014, resulting in a concentrated and uniform sample. The Balance Sheet Analysis (BSA) reports of State Bank of Pakistan are named as the Data Source, which contains the good quality secondary financial information. The Variables to be used in the research are asset tangibility, profitability, firm size, and expected growth, which are some of the key factors that were earlier found to be important in

determining capital structure choice as in the literature. Lastly, the Econometric Model to be used is a panel data regression, whose argument was arrived at through the implications of Hausman Test so as to represent a fixed or random effect. Such a methodology is highly structured and guarantees rigor of the analysis, replicability and theory-based insights. In order to investigate the associations among these variables, panel data regression methods are used. The determination of the most relevant model between fixed effects or random models in the study describes a systematic method in which the Hausman Test used determines which is more suitable. The Hausman Test tests that the unobserved heterogeneity (individual firm effects) are correlated with the regressors. When the p-value generated by the test denotes significant results, then the fixed effects model is an appropriate choice but when the p-value

records insignificance results, the random effect model is more fashionable. The final regression model may be given as linear panel model, leverage as a function of tangibility, profitability, firm size, and, expected growth. Such specification allows the marginal impact of each determinant to be estimated controlling on unobservable firm-specific effects. The panel data methodology helps in strengthening the analytical process giving more illumination on the issue under investigation, the nature of financial behavior of firms over time. This research procedure therefore gets to aid in a good grasp of capital structure choices when it comes to the Pakistani non-financial industry.

3. Results and Discussion

In this section the results of the analysis are provided and the findings are discussed in terms of the

objectives and hypotheses of the research. It contains all descriptive statistics, diagnosis testing and correlation analysis, as well as the review of the relationships between the independent variables and leverage. The descriptive statistics of the basic variables deployed in this research work are as indicated in Table 3. Leverage has a mean value of 0.7005 with a standard deviation of 0.0973 and it indicates that there is some moderate difference between the sampled firms. The mean of tangibility is 0.5214 and the profitability is 0.0954. The value of the standard deviation of growth is also large (1.1855) in relation to the dispersion of the growth patterns across firms. The mean of Size is larger at 14.2881 (log transformed) and we expect large-scale companies that operate in the oil and gas industry. The range of the minimum and the maximum values is reasonable, which shows that there are no outliers in the dataset.

Table 3: Descriptive Statistics of the Variables

Variable	Mean	Std. Dev.	Min	Max
Leverage	0.7005	0.0973	0.0201	0.1552
Tangibility	0.5214	0.1093	0.0225	0.8601
Profitability	0.0954	0.1355	-0.2659	0.8191
Size	14.2881	2.2454	8.0200	18.2946
Growth	0.2221	1.1855	-4.2212	20.6954

The Wooldridge serial correlation test was performed to check on the occurrence of autocorrelation. The hypothesis of no first-order autocorrelation was not rejected ($F(1, 12) = 0.078$, $p > 0.7843$), which is a recommendation that the panel data is not affected by a serial correlation and hence it satisfies an important assumption of the panel regression analysis. The pairwise relationship between leverage and the independent variables was done through the generation of a correlation matrix. The leverage has a positive relationship with tangibility ($r = 0.624$) and negative relationship with profitability ($r = -0.600$) as depicted by both the numeric table and the heatmap in Figure 2. These values indicate that more the tangible assets company has more is its tendency to utilize debt whereas the higher the profitability the

lesser the use of leverage thus the predictions of trade-off and pecking order theories build in both directions. The remaining associations seem weak: leverage is associated with size only slightly (0.116) and association with growth is close to zero (-0.014). As shown in table 4 there is high correlation between leverage and tangibility ($r = 0.624$), which means that the size of debt financing used by firms is greater the bigger the share that such firms have in tangible assets. This boosts the argument that physical assets are used as security and this minimizes lenders risk and maximizes on borrowing power. On the other hand, profitability shows negative dependence on leverage ($r = -0.600$), which is consistent with the fact that more profitable firms finance internally and get less leveraged as suggested by the pecking order theory.

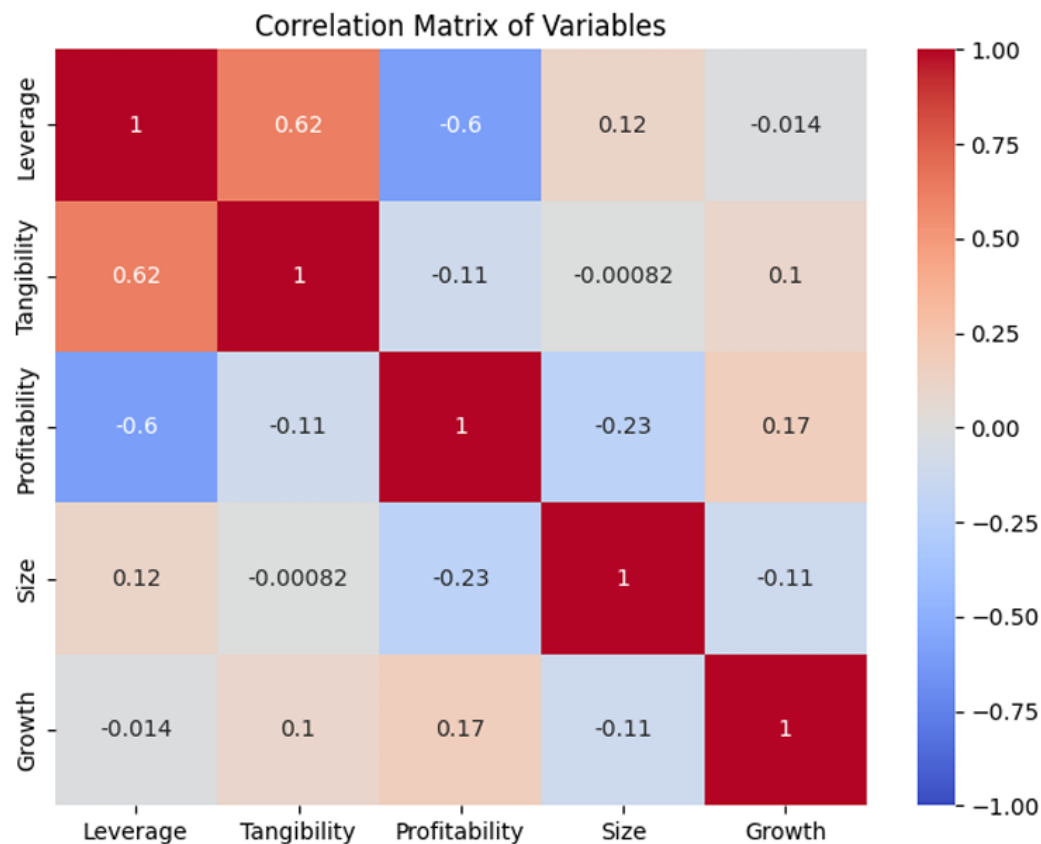


Figure 2: Correlation Matrix of Variables

There is also moderate negative relationship between profitability and firm size ($r = -0.226$) showing a mark of slight decline in profitability as the size of firm increases possibly because of inefficiencies at scale or increased cost of operations. Profitability however positively correlates just weakly with growth ($r = 0.169$) indicating that there is a possibility that a growing company holds or even increases profits in the long-term. The general correlation between firm size and any other variable is also very weak: its connection to tangibility ($r = -0.00082$), leverage ($r = 0.116$), and growth ($r = -0.112$) is too weak and does

not indicate that firm size is a strong data determinant. Growth, however, is minimally correlated with leverage ($r = -0.014$), and has modest positive correlations with the variables of tangibility ($r = 0.101$) and profitability, indicating that the latter can also be expected to be high in those firms with growing asset bases. Such associations confirm the conception that firm-specific traits, like asset structure and profitability, play a bigger role in trying to figure out leveraging as compared to firm size or development potential, at least in the context of sampled non-financial companies in Pakistan.

Table 4: Pearson Correlation Coefficients among Variables

	Leverage	Tangibility	Profitability	Size	Growth
Leverage	1	0.62437	-0.599729	0.115795	-0.013654
Tangibility	0.62437	1	-0.108075	-0.000817	0.100699
Profitability	-0.599729	-0.108075	1	-0.226454	0.169394
Size	0.115795	-0.000817	-0.226454	1	-0.111947
Growth	-0.013654	0.100699	0.169394	-0.111947	1

The model of panel regression has assumptions that should be verified prior to interpretation of the regression coefficients namely multicollinearity, heteroscedasticity, autocorrelation as well as collective residual normalcy. In order to check multicollinearity

among the independent variables, the Variance Inflation Factor (VIF) was calculated. All the VIF values were significantly lower than the cut-off peak of 5 as indicated in the table 5 below.

Table 5: Variance Inflation Factor (VIF) Analysis

Variable	VIF	Interpretation
Tangibility	2.85	Moderate multicollinearity
Profitability	3.26	Moderate multicollinearity
Size	3.25	Moderate multicollinearity
Growth	1.05	No multicollinearity concern

The values of VIF are acceptable in all predictors. The remaining predictors, profitability, tangibility and size have moderate relationships with the rest, whereas growth is practically independent. Such findings affirm the fact that the issue of multicollinearity does not arise as a significant issue in the model and therefore maintains a high level of reliability in the estimation of the coefficient. The Breusch-Pagan test was used to check whether the assumption of homoscedasticity performed. The chi-square test was

0.01 with a p-value of 0.9093 and this means the null hypothesis of constant variance is not to be rejected. This indicates that the model residuals have homoscedasticity. All VIF values are below 5, indicating no serious multicollinearity concerns. Growth shows very low VIF, suggesting it's not linearly dependent on other predictors. Profitability, Size, and Tangibility have moderate multicollinearity, but are still within acceptable limits.

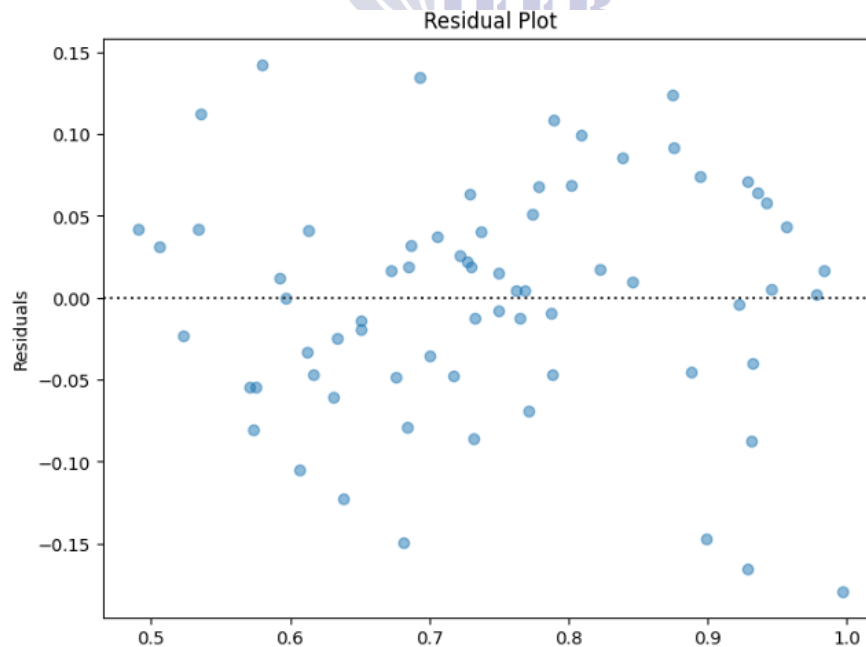


Figure 3: Residual Plot of the Regression Model

The residual plot in figure 3 shows the residual value against the fitted values. There seems to be no pattern

on how the points are distributed in relation to the zero line which supports the assumption of

homoscedasticity. The Jarque-Bera (Skewness-Kurtosis) test was applied to check the level of the normality of residuals. As shown in table 6 the test is conducted in the form of a Chi-square, its adjusted

value was 3.52 with a p-value of 0.1724. The value of the p-value is more than 0.05, which does not allow rejecting the hypothesis of normal distribution of the residuals.

Table 6: Skewness / Kustosis tests for Normality

Variables	Observation	Pr(Skewness)	Pr (Kurtosis	Adj chi ²	Prob>chi ²
Re	65	0.0766	0.6322	3.52	0.1724

The P-value is not very small under the standard significant level that is 0.05 and failed to reject the null hypothesis of normality and concluded that the residual is normally distributed. This knowledge area provides and discusses the empirical results of the study with respect to influence of firm-specific variables, namely tangibility, profitability, size, and growth on their influence on financial leverage. The findings are presented in a consecutive order with a diagnostics starting point and then model selection and interpretation of regressions and associated presentations. A number of diagnostics to check the appropriateness of the panel regression model were calculated. The Breusch-Pagan test of heteroscedasticity gave the Chi-square the value of 0.01 ($p = 0.9093$) to show no violation of the assumption of constant variance. Jarque-Bera test of

residuals normality obtained a p-value of 0.1724, which means that the residuals are normally distributed. Also, there was no presence of serial correlation as confirmed by the Wooldridge test on autocorrelation ($F(1,12) = 0.078$, $p = 0.7843$). Such diagnostics validate the assumption hypothesis of regression. The residuals are scattered around the zero line randomly in favor of the assumption of the homoscedasticity and the suitability of the used model. Hausman test came next so as to obtain the correct regression method. As depicted in table 7 the null hypothesis stating that the random effects model holds true could not be rejected as it has a p-value equal to 0.6974 indicating that firm effects are not correlated with the explanatory variables. Consequently the random effects model has been found suitable to use in this analysis.

Table 7: Hausman Test Results

CS	Coefficient (b) Fixed	Coefficient (B) Random	(b-B) Difference	Sqrt(diag(v_b-v_B)) S.E.
Tangibility	0.5341	- 0.5098	- 0.0243	0.0172
Profitability	- 0.6459	- 0.5237	- 0.1222	0.1606
Size	- 0.0014	- 0.0068	0.0053	0.0079
Growth	- 0.0452	- 0.0490	0.00379	0.0056

Subsequently, random effects model was implemented on estimating the correlation between leverage and the identified firm determined factors shown in table 8. The model indicated that the positive influence of the variable of tangibility on leverage is marked significant (0.5098, $p < 0.01$). This finding just meets the trade-off theory which holds that tangible assets increase the ability to borrow funds as it can act as security. The negative relationship is between profitability and leverage (beta

= -0.5237, $p = 0.014$), which confirms the nature of the pecking order theory-the most profitable firms choose hometown finance over foreign leverage. The size of the firms, however, did not raise a significant relation (beta = -0.0068, $p = 0.399$), this indicates that in this industry size alone does not drive the choice of debt. Growth is strongly and negatively related with leverage (-0.0490, $p < 0.01$), which suggests that high-growth firms do not to use leverage as it promotes flexibility and decreases agency costs.

Table 8: Random Effects Regression Results

Leverage	Coefficient	Robust Std. Error	Z-statistic	Probability
Constant	0.3674	0.0989	3.71	0.000**
Tangibility	0.5098	0.0481	10.58	0.000**
Profitability	-0.5237	0.2131	-2.46	0.014*
Size	-0.0068	0.0081	-0.84	0.399
Growth	-0.0490	0.0118	-4.12	0.000**

Further analysis of these results was made by drawing a series of regression line plots to explain the direction and intensity of the correlations between leverage and

each of the corresponding variables. Intuitive patterns in the figure are in agreement with the estimates of the regression.

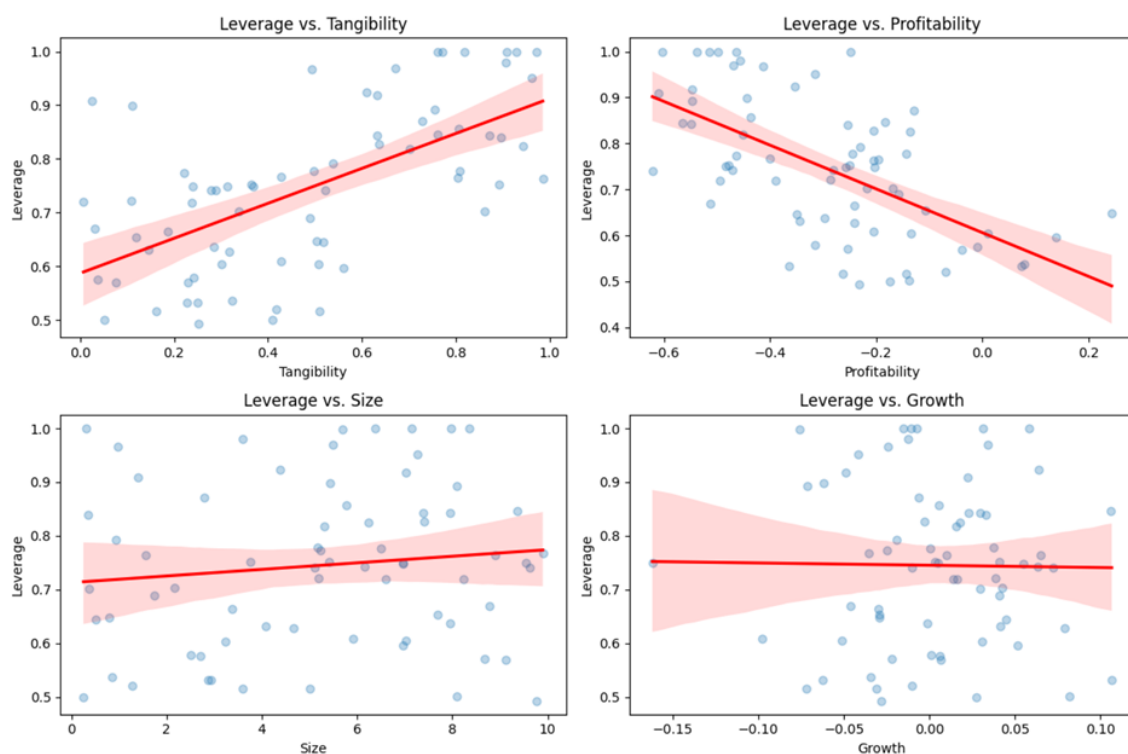


Figure 4: The Plots of Regression Lines between

Leverage and Independent Problems

The trends are positive in linking leverage-tangibility and negative in linking profitability and growth are shown in figure 4. The correlation between sizes seems to be weak and insignificant. It is important to note that the plot between leverage and tangibility show a definite upward tendency, proving the hypothesis that asset-heavy firms are highly rated on leverage. The leverage-profitability plot shows negative strong gradient that means that more profitable companies are more willing to have less debt. The statistical result

that size is insignificant is confirmed by a flat trend line on the leverage-size plot and by the mild and negative dependency expressed in the leverage-growth plot, which confirms that firms, oriented on growth, do not leverage. In order to see the connection between all variables, a pair plot was created shown in figure 4. The visualization provides a scatter plot of every pairwise combination of variables, as well as kernel density estimate on the diagonal with the distributions of individual variables.

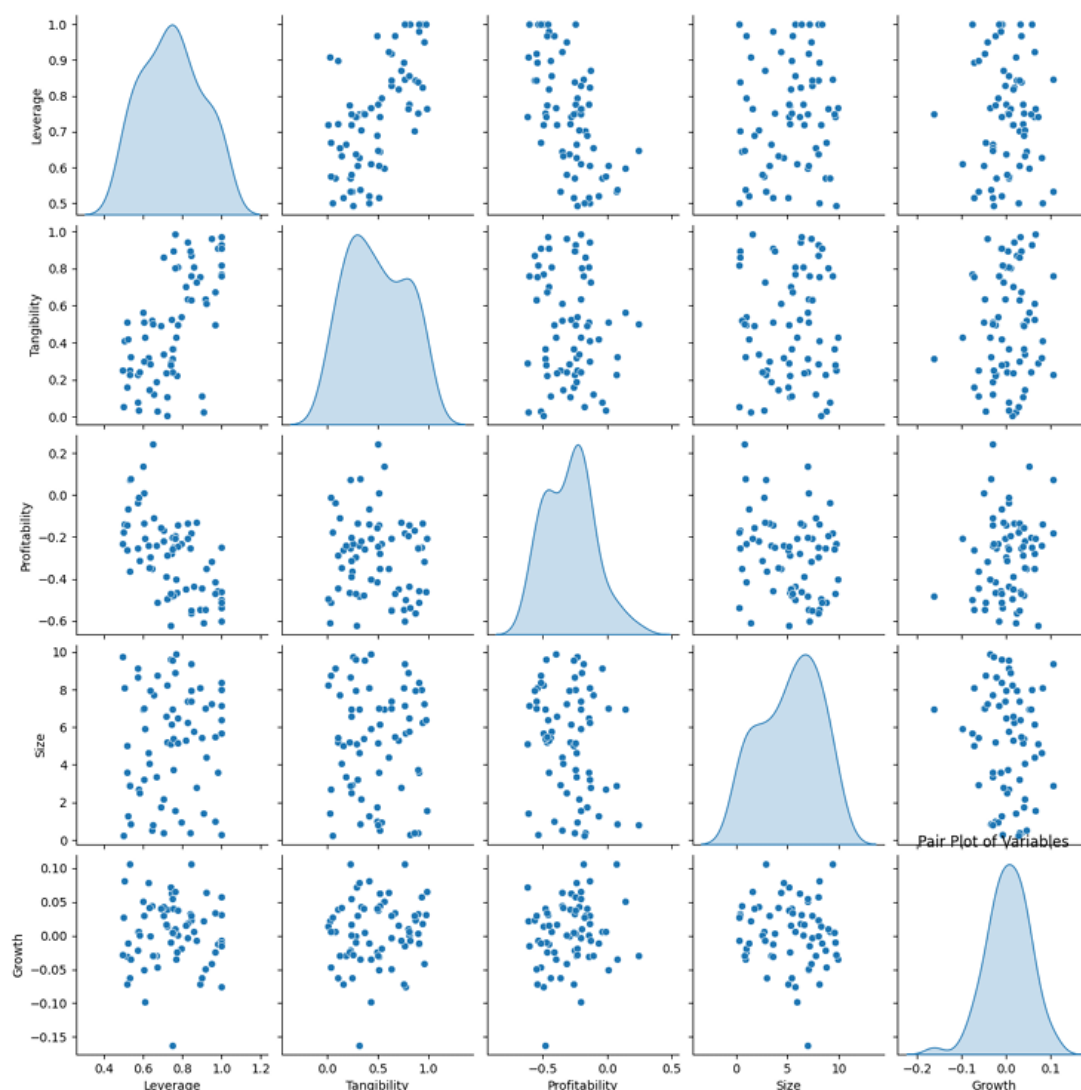


Figure 4: Plot of Variables Pair

The matrix includes bivariate scatterplot and univariate distributions on leverage, tangibility, profitability, size, and growth. When compared to size and growth, tangibility and profitability show stronger trends in terms of the leverage. Based on the pair plot, there is a visible positive linear relationship between leverage and tangibility and negative one with the profitability which increases the strength of the regression and the correlation analysis. The leverage distribution seems to have a small leftward bias which means that firms with moderate and high leverage are also prevalent. These scatter plots of the size and

growth exhibit less or more scattered trends which are in-line with their non-existent or limited explanatory capability in the regression model. These graphical indicators are more evidence that proves the above conclusion that the most powerful firm-level predictors of leverage in the given sample are tangibility and profitability. To determine the possible level of variation in leverage in the sample years (2010-2014), boxplot in figure 5 for the analysis of the distribution of leverage on yearly basis was used. This figure is useful in detection of changes in central tendency, spread and outliers over time.

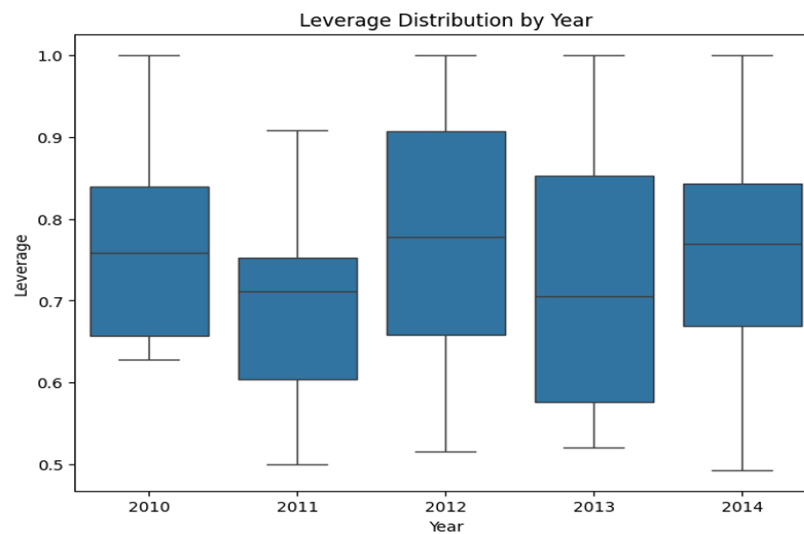


Fig 5: Leverage Distribution Year (2010 up to 2014)

Interquartile range, median, and outliers of the leverage are presented in the box plot of every year. The leverage is comparatively steady during the sample period with some variation in dispersion. The middle ground of the leverage over the five years is contained within a very small range, which indicates that there is stability in capital structure decisions amongst firms over time. The median of 2011 is slightly more, compared to 2010 and 2012, but not significantly. There is also skewness in the interquartile ranges where the widest variation was observed in 2013- showing a higher disparity in the leverages of the firms that year. Notably, there are no outliers of any extremes, all the values are within reasonable limits which strengthens the consistency of

the data filed and the credibility of longitudinal trends. This time series analysis also supports the more general finding that in addition to firm-specific effect such as tangibility and profitability that are so important in leverage, there is evidence that macroeconomic/time-varying measures are also not severe in leverage over the sample period of the firms being analyzed. In order to determine macro-level variations in leverage behavior over the period of study, average leverage time series plot of 2010 to 2014 was utilized. This gives a longitudinal insight of whether firm level financing preferences altered according to an external market environment or internal policy change.

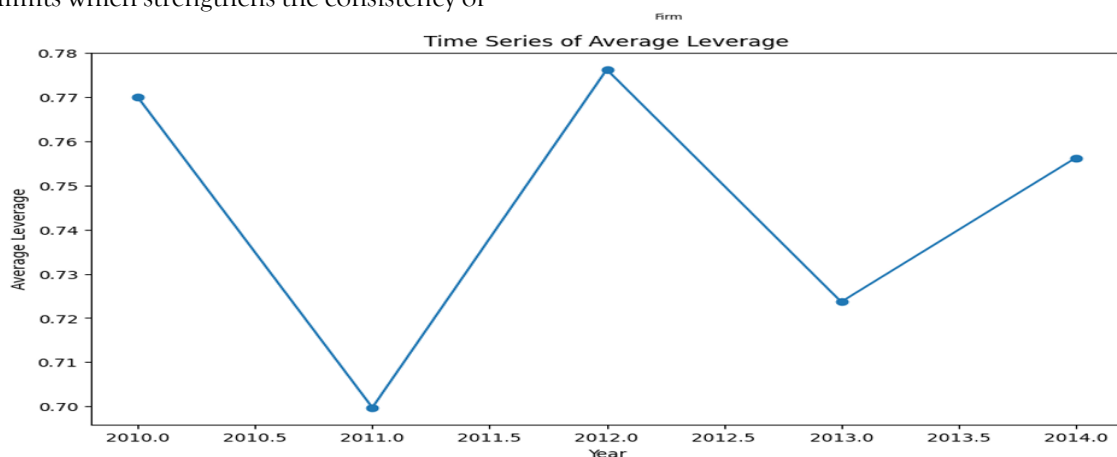


Figure 6: Time Series of Average Leverage (2010-2014)

This Line graph monitors the average financial leverage of the sampled firms in the five years period. The price fluctuations are apparent, yet there is no definite direction in it. The time series indicates that there is a decrease in the level of average leverage in 2011 that dropped to about 0.70 and then it peaked greatly in 2012 when the leverage started to increase to around 0.78. The trend later slows down again in 2013 and again shows a slight improvement in 2014. These variations can be indications of the sectoral reaction to external financial stress, which can be in the form of altering rates of interest or the fluctuating rates of oil price, but are in a relatively small range. The non-sustenance of any upward or downward trend in the capital structure implies that oil and gas firms held steady capital structure across time more often and more so based on firm specific aspects than the market-time effects to dictate their actions towards leverage decisions. This plot supports the above results as it further helps the viewer to understand that although tangibility, profitability, and growth make a true difference in the determination of leverage, the time sensitive factors that are external impacted on the determination of leverage but marginally within the observation period.

The empirical evidence of the current study yields a worthwhile insight into capital structure choice made by non-financial firms in the oil and gas industry of Pakistan. The analysis helps determine that asset tangibility, profitability and anticipated growth are the statistically significant factors affecting financial leverage, whereas there seems to be no need to focus on firm size to affect it significantly. It has been discovered that tangibility of assets is significantly and positively related to leverage (0.5098, $p < 0.01$). It provides evidence to the trade-off version of capital structure, which asserted that firms having an elevated level of fixed assets would have a greater probability of using debt funds since it can be used as tangible excavation and it will lower the risk of its creditors. The relationship between profitability and leverage is also found to be significant that is buy the profitability is significantly and negatively related to leverage (beta = -0.5237, $p < 0.05$) as stipulated in the pecking order theory, which states that a firm would tend to use the money it generated as opposed to the external funding. Infinitely profitable firms in the sample are

therefore not so dependent on debt. A large negative relationship lies between expected growth and leverage ($\beta = 0.0490$, $p < 0.01$). It supports the pecking order theory ideology, that is, firms with good future growth prospects can choose to abstain debt to maintain operational flexibility and minimize the probability of the agency conflict with the creditors. The natural logarithm of the total assets is not the statistically significant determinant of the leverage (beta = -0.0068, $p = 0.399$). It means that size is not determinant of the choice of capital structure in a given industry; perhaps because all firms will have access to credit or funds internally irrespective of their size. Their overall results follow the I-banking theories on corporate finance closely and focus on the significance of firm-specific attributes, in particular, profitability and asset structure, as predictors of leverage behavior. Such understanding can direct financial managers to perform better capital structure and tell lenders and investors about the sore spots and important internal figures influencing a firm to acquire debt in new markets.

4. Conclusion

The impact of firm-specific characteristics on the capital structure choice of non-financial firms listed on the Pakistan stock exchange (PSX) and specifically the oil and gas sector was the aim of the studies. The capital structure is central in corporate finance in that it impacts on the cost of capital of firms as well as the financial flexibility. Knowing the factors that determine the financial leverage can be vital to managers, investors, and policymakers more so in emerging markets due to their disparities, in terms of access to credit and the institutional conditions as compared to developed markets. The data was a secondary financial information of 13 oil and gas companies in five years (2010-2014). BSA report of State Bank of Pakistan (SBP) was used as the source of data through Balance Sheet Analysis (BSA) reports that are published on the site. The main independent variables were those of financial leverage (indicated as the amount of total liabilities relative to the total assets) of asset tangibility, profitability, the size of the firm, and prospective growth. The book value was used to measure all the variables since there were no consistent data on a

market value. In a bid to examine the correlation between leverage and the chosen explanatory variables panel data econometric methods were used. The Hausman test helped in selecting a random effects model after checking the assumptions of the model, i.e., the existence of no autocorrelation, homoscedasticity and normality of residuals. Regression diagnostics revealed that data satisfied the conditions of adequacy of statistical inference. Based on the empirical results, there is a positive relationship between leverage and asset tangibility implying that there is a stronger likelihood of increased use of debt financing by the firms with larger fixed assets due to quick availability of collaterals. Profitability and anticipated growth were both negatively related to leverage, as it should be based on the pecking order theory, which argues that companies prefer to use internal funds to finance rather than external funds. The size of firms, however, was not found to have a significant effect on leverage choices, meaning that access to debt might not significantly differ across firm size in the given industry. These findings add to the existing body of capital structure studies of emerging economic markets and indicate the significance of internal natures of firms looking only at external or macro-economic conditions. To financial managers, the study implies that they should put first the internal measures, that is, asset composition and the quality of earnings during formulation of company-level debt strategies. To investors and creditors, such understanding is beneficial in their ability to determine the ability of a firm to leverage and the financial risk

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