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Corporate Financing and Firm Efficiency: A Data Envelopment Analysis Approach

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This study investigates the endogenous determination of firm efficiency and leverage while testing the competing hypotheses of agency cost, efficiency-risk and franchise-value, in a sample of 136 non-financial firms listed on the Pakistan Stock Exchange (PSX), over the period 2002 to 2012. Data Envelopment Analysis (DEA) method is employed to measure firm efficiency as proxy for firm performance. The endogenous nature of firm efficiency and leverage allowed using two-stage least square (2SLS) technique. The findings of the efficiency equation suggest that leverage has a significant positive effect on firm efficiency. Additionally, firm risk, growth rate, size, board size and board composition positively affect firm efficiency. On the other hand, the results of the leverage equation suggest that firm efficiency has a significant negative effect on leverage. Firm size and CEO duality have positive effects on leverage while firm age, board composition, institutional ownership, managerial ownership and asset tangibility have negative effects on leverage. Generally, the results support agency cost and franchise-value hypotheses that higher leverage improves firm efficiency while higher firm efficiency results in reduced leverage.

Keywords: Leverage, Firm Efficiency, Capital Structure, Firm Performance, Data Envelopment Analysis

1. INTRODUCTION

Jensen and Meckling (1976) argued that managers are guardians of their shareholders' interests and they strive to maximise the firm's value. An agency problem, however, arises if managers serve their own interest instead of shareholders'. Adam Smith (1776) argued that multiple and diverse ownerships result in reduced performance of the firms as the manager of a firm may not look after the firm's operations with the same motivation as that of its owners. This insight became the basis and motivation for the work of Jensen and Meckling (1976) that resulted in abundant research work on corporate financing, in the context of agency theory. Within the principal-agent framework, the agency theory predicts that the agent tries to benefit from firm's resources and consequently the firm incurs cost which eventually reduces the firm value. On the other hand, the principal tries to reduce the possibility of incurring those costs by establishing various mechanisms. The agency theory provides a basis for studying contractual relationship between managers and shareholders. Both are considered as individuals maximising their own utility. Thus, shareholders use certain mechanisms that

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will lead to reduction in the agency costs. One such mechanism is the use of leverage in the capital structure of a firm.

The agency theory proposes that the choice of debt/equity mix helps in mitigating agency costs [Berger and Bonaccorsi di Patti (2006)]. Higher leverage can reduce agency costs but it may increase bankruptcy costs. Higher leverage may force managers to enhance firm performance by generating additional gains to support debt holders [Jensen (1986)]. Jensen and Meckling (1976) discussed that at a lower level of debt ratio, the agency costs positively affect firm performance and decrease total agency costs, while bankruptcy is likely when the leverage reaches a certain level and the costs of outside debt may be higher than the outside equity, resulting in higher total agency costs. Risk of default may result in conflict between debt holder and shareholder. Myers (1977) termed it as 'underinvestment' which may result in increased risky financing by the managers.

Leibenstein (1966) debated on the firm value by assuming the actual and expected output in terms of performance measured as efficiency. He noted that how difference in interests of the manager and shareholder results in an inefficiency of the firm. The work of Leibenstein (1966) is said to be in line with the view of employing leverage as an agency-cost mitigating device and importance of these costs in attaining the firm's optimal capital structure [Jensen and Meckling (1976); Myers (1977)]. Extant literature lacks evidence on the proxies for measuring performance of the firms which are in line with the definition of agency costs [Berger and Bonaccorsi di Patti (2006)].

In view of the above discussion, this study considers diverse characteristics of the firm to determine firm efficiency, in order to observe the implicit effects on the firm value. The aim is to establish the best-practice frontier of efficient firms and other inefficient firms as a distance from the frontier. The efficiency of the firms allows for examining its effects on the capital structure, by testing two hypotheses i.e. efficiency-risk and franchise value. The former is concerned with employing higher leverage in the capital structure as higher efficiency allows decreasing the costs associated with the leverage. The latter is concerned with choosing lower leverage as to preserve the benefits of higher efficiency and avoid possible bankruptcy [Margaritis and Psillaki (2007)].

The main objective of this study is to examine the endogenous role of leverage and firm efficiency by using an alternative measure of profit efficiency i.e. Data Envelopment Analysis. In doing so, we test several hypotheses of agency theory which are discussed in the preceding paragraphs. Moreover, we account for the problem of endogeneity by estimating two-stage least square (2SLS) regression and model the relationship between various variables, in a manner that is consistent with the suggestions of Margaritis and Psillaki (2007).

As opposed to previous studies, this study uses DEA which excludes the factors not related to agency costs [Berger and Bonaccorsi di Patti (2006)]. We expect that this study will enable local and foreign firms to have information about the corporate environment in terms of efficiency of the firms in Pakistan. Moreover, this study also shows how principal-agent problems can be minimised to enhance firm performance. In other words, this study is based on the competing hypotheses of agency cost, efficiency-risk and franchise-value. The study contributes to the literature in the following ways: first, we employ latest measures of efficiency as opposed to the traditional measures of firm performance; second, we assess whether the gap between the efficient frontier and other frontiers is a basis of choosing debt over equity or vice-versa.

The rest of the paper is organised as follows. Section 2 presents the literature review focusing in particular on different aspects of corporate financing including performance of the firm. Section 3 presents details about research methodology and methods for collection and analysis of the data. Section 4 spells out findings and interpretation of the data analysed. Section 5 concludes the discussion.

2. RELATED LITERATURE

The relevance of capital structure to firm's output efficiency can be explained in terms of the agency theory. Since managers are expected to maximise their own utility rather than increasing the firm value; shareholders need to use mechanisms that can force managers to maximise the firm value. One such mechanism might be the use of debt-financing. For example, Jensen (1986) argued that firms with excessive free cash flows are exposed to the risk of sub-optimal utilisation of these cash flows at the hands of managers. Therefore, if shareholders force a higher leverage ratio, then the firm will use cash for debt-servicing. This will limit the sub-optimal utilisation of the free cash flows. Below, we first discuss the agency problems and then focus on how such problems can be solved using leverage.

2.1. Agency Problems

The first agency problem '*lack of interest*' was identified by Smith (1776). He discussed that managers could not be expected to look after the operations of a business with the same interest and vigilance as the business owners. Berle and Means (1932) added to Smith's idea and argued that dispersed ownership has negative implications for firm value. Dispersed ownership extends supreme authority to the management to control the affairs of the firm. This creates a situation of opportunism for the managers to extract rents. They suggested concentrated ownership as an alternative to the dispersed ownership, in which case the managers cannot expropriate wealth away from shareholders. Later on, Jensen and Meckling (1976) highlighted the agency costs of equity.

Agency theory can solve two problems; risk sharing i.e. the difference in attitudes of two parties towards risk and agency problem i.e. different goals of two cooperating parties. The former problem arises when the agent and principal are aligned to different risk-taking choices and it then leads to the second problem i.e. agency problem. The more the number of fixed claimants, receiving a fixed amount, the more funds will be used to satisfy their claims. However, the use of more funds results in less retained earnings and/or free cash flow which leads to insolvency/illiquidity of the firm that forces the firm to go for external costly financing.

2.2. Capital Structure and Firm Efficiency

The area of capital structure and firm efficiency has attracted the attention of researchers in recent times. Few notable studies include Weill (2003); Margaritis and Psillaki (2007), Margaritis and Psillaki (2010), Cheng, *et al*. (2011) and Dawar (2014). Margaritis and Psillaki (2007, 2010) employed firm efficiency as a proxy for firm performance. They investigated the possibility whether firms can produce more output(s) with less input(s) in the presence of debt financing. They argued that the capital structure

plays a crucial role in determining the firm efficiency. The linkage between these two variables can be studied through agency theory. It refers to the conflicts based on interests between the managers, creditors and shareholders. Grossman and Hart (1982) argued that in the presence of little or no leverage, managers do not face much stress if they produce poor financial results. On the other hand, if the risk of default is high, it can motivate managers to work hard and increase efficiency to avoid bankruptcy. Recent papers provide support for the above argument. For example, Shah, Shah, Smith, and Labianca (2017) reported that managers perceive higher leverage in the presence of more efficient judicial systems as a serious threat to the continuation of their jobs or private benefits. In other words, debt financing can discipline managers which can result in better performance. Therefore external financing, including debt financing may restrict the manager's opportunism and discretion [Jensen (1986)]. The idea is to subject managers to the scrutiny of external capital markets, reduce the free cash flows under the discretion of the mangers, and put managers under constant pressure of regular payment of debt financing. Resultantly, it is expected that leverage will increase a firm's efficiency.

2.3. Control Variables

There are several control variables which may affect firm performance other than leverage. The following variables are most commonly used in studies of capital structure.

2.3.1. *Ownership Pattern and Efficiency*

The extant literature shows that agency problems can be controlled by changing the ownership structure of firm. For example, Jensen and Meckling (1976) suggested that agency problems can be reduced by increasing the ownership stake of managers. However, La Porta, *et al*. (2001) argued that insiders with significant shareholdings can easily expropriate minority shareholders. Similarly, Demsetz (1983) showed that increasing managerial ownership in the firm can invite the adverse impact of managerial entrenchment. On the link between ownership structure and firm performance, Shleifer and Vishny (1986) suggested that large shareholders can reduce agency costs as these shareholders can better monitor and discipline managers.

2.3.2. *Asset Structure*

Asset structure plays a key role in determining corporate financing. Compared to growth opportunities, tangible assets have more stable value at the time of default and hence are more useful to creditors [Titman and Wessels (1988)]. Firms with higher asset tangibility are expected to acquire more debt due to the ability to acquire debt at lower interest cost, considering that debt is backed by the assets. Shyam-Sunder and Myers (1999) showed that leverage and tangibility are positively associated. Several studies from Pakistan report similar association.

2.3.3. *Firm Size*

Larger firms are said to be less vulnerable to risk due to their diversification and resource endowments. Diversified product portfolio helps them to have a stable flow of funds which in turn helps in neutralising the possible negative effect of debt on the firm.

This factor gives larger firms an upper hand over smaller ones to easily acquire the debt directly or through collateral. Further, the creditors are expected to extend credit to larger firms as the recovery chances are high [Hall, *et al.* (2004)].

The size factor can influence the firm profitability as well, which in turn allows larger firms to choose the levels of internal and external financing. Furthermore, larger firms enjoy better economies of scale, can use advanced technology, spend well on research and development and attract and maintain qualified employees. These factors help larger firms to be more profitable over a longer period. Abdullah, Shah, and Khan (2012) used a sample of 183 firms listed at the Pakistan Stock Exchange over the period 2003 to 2008 and found that firm size has a positive effect on return on assets (ROA), an accounting-based measure of firm performance.

2.3.4. *Firm Age*

The survival of a firm in the market over a long period confirms that the firm has developed a reputation in the market. The experienced and reputed firms are expected to have easy access to external finance. This also attracts external monitoring of the firm which reduces the firm agency costs. Therefore, firm's age is expected to have a positive association with leverage and firm performance [Hall, *et al*., (2004)]. For a sample of PSX listed firms, Shah, Khan, and Afraz (2017) found that the implied cost of equity (an indication of the business risk of a firm) decreases as a firm passes through different stages of its life cycle, such as growth, maturity and stagnancy.

2.3.5. *Board Size*

The extant literature reports mixed evidence on the effectiveness of board size in reducing agency problems. Several studies report that larger boards can devote more time to monitoring managers' activities, can bring in diverse experience and knowledge [Bacon (1973); Herman (1981)], and can effectively allocate workload among board members. Singh and Davidson (2003) reported that larger boards are negatively associated with asset utilisation. However, they do not contain managerial expenses. This implies that larger boards fail to effectively monitor and control agency costs.

2.4. Institutional Investors and Capital Structure

Small shareholders own a small chunk of shares of the firm and may not be motivated to look after the day-to-day operations of the firm. They may not have the resources i.e. time, skill and willingness to monitor the managers of the firm. This leads to a problem which is commonly known as free rider problem [Shleifer and Vishny (1997)]. Small investors are considered to accept whatever the firm offers them. Additionally, any initiative by the small investors cannot solely go in their favour, as non-small investors with a stake and interest in the firm get benefit from it. The presence of large investors can overcome this problem as they have financial incentives to oversee the management of the firm. Moreover, these shareholders are able to elect board members and also can get themselves onto boards to closely monitor managers of the firm. The internal boards are expected to work and deliver in an acceptable manner when there is a presence of outside control [Denis, Denis, and Sarin (1997)]. Thus, the purchase of shares in bulk by the outsiders can act as a threat to discipline the management. The

performance of the managers produces turnovers and maximises the firm value in the presence of large investors and as a result of increased possibility of a threat of takeover [Denis and Denis (1995)]. The large shareholders also pressurise the management to avoid financing the projects to diversify the risk, as bulk of their money is at stake in a single firm whose diversification does not suit them which yields lower benefits.

3. DATA AND METHODOLOGY

3.1. Data and Sample

This study uses the financial data of 136 non-financial firms listed on PSX over the period 2002 to 2012. The sample is composed of firms with complete available information. Moreover, firms that meet the following criteria are included in the sample:

- A firm is a non-financial firm.
- A firm does not have negative equities i.e. loss.
- A firm is not a state-owned firm.
- A firm has data available for the entire sample period.

Financial firms are excluded because using leverage does not mean the same for non-financial and financial firms. Firms with negative equities are excluded because such firms are presumably financially-distressed and their decisions are not normal. State-owned firms are not included as they have institutional backing in situation of poor performance or bankruptcy, which is a clear event of default in terms of agency theory whose effect cannot be truly captured on firm performance.

3.2. Model Specification

Following the work of Margaritis and Psillaki (2007), DEA is employed to develop an efficiency frontier of the efficient firms and to assess other firms compared to the frontier. This study employs two equation-based structural models which take reverse causality into account, as noted by Margaritis and Psillaki (2007), because capital structure and firm performance might affect each other. This also helps us in testing the two competing hypotheses; agency cost and efficiency (efficiency-risk and franchise-value) hypothesis. Additionally, performance is measured using profit efficiency as opposed to conventional indicators, by employing DEA which considers benchmarking of the firms and excludes the effects that are unrelated to agency costs.

The final model has the following form:

$$FE_{it} = \alpha_o + \alpha_1(LEV_{it}) + \alpha_2(SV_{it}) + \alpha_3(GROW_{it}) + \alpha_4(FSIZE_{it}) + \alpha_5(FAGE_{it}) + \alpha_6(BSIZE_{it}) + \alpha_7(BCOMP_{it}) + \alpha_8(DUAL_i) + \alpha_9(INST_{it}) + \alpha_{10}(MANG_{it}) + \alpha_{11}(CI_{it}) + \alpha_{12}(TA_{it}) + \alpha 13(DEit) + \varepsilon_{1it} \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

$$LEV_{it} = \beta_o + \beta_1(FE_{it}) + \beta_2(SV_{it}) + \beta_3(GROW_{it}) + \beta_4(FSIZE_{it}) + \beta_5(FAGE_{it}) + \beta_6(BSIZE_{it}) + \beta_7(BCOMP_{it}) + \beta_8(DUAL_i) + \beta_9(INST_{it}) + \beta_{10}(MANG_{it}) + \beta_{11}(CI_{it}) + \beta_{12}(TA_{it}) + \beta_{13}(PR_{it}) + \beta 14(Qit) + \varepsilon_{2it} \quad \ldots \quad \ldots \quad (2)$$

Where FE refers to the measure of firm efficiency (obtained through DEA), and LEV is the proportion of debt of the firm. The remaining variables are control variables

which are expected to affect the capital structure and firm performance while ε is an error term which is assumed to have zero mean and constant variance.

3.3. Benchmarking Firm Performance

There exist several methods to determine the firm performance. The most commonly used among them is financial ratio analysis. This method outweighs all other methods to evaluate firm performance in the empirical literature [Coelli, *et al*. (2005)]. Different types of ratios include liquidity, leverage, profitability, asset turnover and dividend ratios. However, there are also drawbacks of using such measures of firm performance. There are issues in implementing and assessing the managerial and firm performance, using ratio analysis [Avkiran and Rowlands (2008)]. It is difficult to evaluate the top performer of the industry and relative comparison of all other firms. So, a firm follows its competitors to decide where to operate with lack of any benchmark performance of the industry. Moreover, the macroeconomic factors such as inflation may affect the firm's balance sheet in which case the financial analysis using those figures needs precision. The financial ratios use absolute numbers with a little margin of error.

The DEA is considered more useful in measuring firm performance [Berger and Bonaccorsi di Patti (2006)]. It is a profit efficiency measure that controls for factors, such as market prices which are not in control of the management. Additionally, it is useful in giving efficiency scores for each single firm thus enabling a comparison among all firms. This method provides a benchmark that allows firms to set out their direction in terms of their operations. Profit efficiency i.e. (DEA method) is better than cost efficiency (i.e. SFA method) as far as agency theory is concerned, as it focuses particularly on the managers and their activities that how effectively they raise funds and minimise costs. Profit efficiency focuses on the maximisation of the firm value [Avkiran and Rowlands (2008)]. However, it differs from shareholders' value as part of the decline in the shareholders' value comes from rising agency cost affecting firm value. Profit efficiency is considered a better measure due to different interests of managers and shareholders. The measured profit of the best firm (using profit efficiency) acts as a standard for all other firms in the industry operating under the same conditions. This method considers the agency costs and inefficiency of the firms compared to efficient firms operating under the same conditions. The method gauges how distinct different firms operate from the best practice firms where a firm is considered as best practice only if the agency costs are minimised.

3.4. Data Envelopment Analysis (DEA)

DEA is a non-parametric analysis technique for measuring firm performance. It is used to assess the productive efficiency of the firms i.e. decision making units (DMU), which are assumed to be similar in terms of their operations as well as the operating environment. Efficiency is defined as the ratio of output to input [Farrel (1957)]. The greater the output, with a given level of input the greater the efficiency and vice-versa. It is termed as absolute or optimum efficiency. A firm is said to be technically efficient if the efficiency score equals 1. The difference in the efficiency scores is often because of the differences in technology or production process. A value of less than 1 refers to inefficiency which is then compared to potential production obtained through the analysis. The analysis can be done through statistical (i.e. econometric) and non-

statistical (i.e. programming). In the former, the output being the dependent variable (Y) is the result of some input(s) (X) along with the error term which represents the inefficiency. It is a parametric approach which assumes a functional form. In contrast, DEA uses input and output data on some variables of the DMU or firms to develop the efficient frontier that acts as a benchmark. It calculates the efficiency by taking into account the ratio of weighted outputs to inputs [Johnes (2006)].

It is a useful method as compared to financial ratios due to its capability to take several inputs and outputs for each DMU. This results in efficiency scores for each DMU which can take value from 0 to 1. This absolute unit of measurement makes it easy to compare different DMUs. Like other approaches and models, the DEA method requires no specification on part of inputs and outputs to get the efficiency scores and uses the traditional measures or firm information as inputs and outputs. The idea is to minimise the inputs with given level of outputs or maximise the outputs with given level of inputs. The DEA helps to identify good performance firms that become benchmark for others. This not only helps the management to know about the area of weakness which can be improved but also facilitates investors in their investment choice.

Using a concept of relative efficiency, the DEA allows a comparison of firms based on the best-performing firms in the group. The comparison and analysis are done by developing an efficiency frontier which includes all the best-performing firms at the top while other firms lie below it. The frontier, which is created using traditional ratios, is the actual benchmark for the poor-performing firms. They are said to achieve their potential output using given inputs in order to approach the efficiency frontier. Those poor-performing firms with good liquidity ratios are better enough to approach efficiency frontier. On the other hand, the debt ratios can lead firms far from the efficiency frontier. The efficiency scores obtained through DEA method are easy to interpret than traditional ratios as they bundle several inputs to give a point efficiency score.

In the efficiency analysis using DEA, Charnes, Cooper, and Rhodes (1978) established a scale which became the basis for assessing the efficiency of the firms with one another. The DEA efficiency analysis can be carried out using cost, scale, allocative and technical efficiency ([Coelli, *et al*. (2005)]. This study uses technical efficiency which refers to how well a company translates inputs into outputs. The technical efficiency can be split into pure technical (underutilisation of resources) or scale-size impact on DMUs. The technical efficiency is measured through Constant Return to Scale (CRS), i.e. the output increases with the same amount of input when all firms are operating at the same scale. While pure technical scale is measured through Variable Return to Scale (VRS), i.e. the output may not change proportionally with a given level of input [Banker, Charnes, and Cooper (1984)]. Due to the varied characteristics of the sample, this study uses VRS technology to measure technical efficiency. The financial performance can be measured using market and/or accounting-based data. Therefore, this study employs only accounting-based data which allows for assessing managerial performance considering agency theory [Margaritis and Psillaki (2007)]. Moreover, the scale efficiency is equal to technical efficiency divided by pure-technical.

The general equation for the DEA analysis has the following form:

DEA *ivars* = *ovars*, [*if*] [*in*] [, rts(crs | vrs | drs | nirs) ort(in | out) stage(1 | 2)] … … … … … … … (3)

where ivars and ovars refer to the input and output variables. Rts refers to return to scale i.e. constant returns to scale, variable return to scale, decreasing returns to scale and non-increasing return to scale. Ort refers to orientation i.e. input-oriented and output-oriented DEA. Stage refers to one-stage DEA and two-stage DEA.

Based on the discussion in the above paragraph, the equation for the DEA analysis, assuming VRS employed in this study has the following form:

$$\text{DEA } CAP\ COS\ CL\ OE = VA\ S\ E\ GP, \text{ rts(vrs) ort(out) stage(2)} \quad \ldots \quad (4)$$

where CAP is capital measured as firm's annual fixed tangible assets, COS is cost of sales for the period, CL is annual current liabilities and OE is annual operating expenses. VA is value-added, measured as product of shared price and outstanding shares less equity, S is annual sales, E is annual earnings and GP is gross profit for the period.

3.5. Measurement of the Variables

The variables used in this study along with symbol and measurement are presented in Table 3.1.

Table 3.1

Variable, Symbol and Proxy

Variable	Symbol	Proxy
Firm Leverage	LEV	Total Debt ÷ Total Assets
Firm Efficiency	FE	Efficiency scores via DEA Inputs: Capital (CAP), Cost of sales (COS), Current liabilities (CL), Operating expenses (OE) Outputs: Value-added (VA), Sales (S), Earnings (E), Gross profit (GP)
Firm Risk	SV	Standard deviation of earnings before tax
Growth Opportunities	GROW	Annual percentage change in the earnings
Firm Size	FSIZE	Logarithm of the firm's sales
Firm Age	FAGE	Number of operational years of the firm
Board Size	BSIZE	Logarithm of number of members on the board
Board Composition	BCOMP	Number of external members ÷ Total members
Chair Duality	DUAL	Dummy – 1 if CEO is Chairman, 0 otherwise
Institutional Ownership	INST	Shares owned by Institutions ÷ Total shares
Managerial Ownership	MANG	Shares owned by Managers ÷ Total shares
Market Power	CI	Firm sales ÷ Industry Sales
Asset Tangibility	TA	Proportion of net fixed assets to total assets
Profitability	PR	Earnings before interest & tax ÷ total assets
Instruments		
For Leverage (Debt/Equity)	DE	Total Debt ÷ Total Equity
For Efficiency (Tobin Q)	Q	(Book value of debt + Market value of equity) / Book value of assets

3.6. Testing for Endogeneity

Endogeneity refers to the problem when the econometric model includes an exogenous variable which is endogenous in nature and correlated with the error term [Semykina and Wooldridge (2010)]. According to Semykina and Wooldridge (2010), the OLS estimates of the parameters are not unbiased as long as the correlation of variable X and error term ε is not equal to zero. In this study, we use the test proposed by Hausman (1978) to check whether leverage and firm performance are jointly determined. In case if there is endogeneity problem then the OLS method yields biased estimates and a method known as two-stage least square (2SLS) will be used to get unbiased estimates of the parameters. The test assesses whether the estimates of OLS and 2SLS differ from one another and statistically significant. If the estimates differ then it can be inferred that the leverage and firm performance are endogenous. Based on the test results, we find that the appropriate model estimates are obtained using 2SLS method.

3.7. Marginal Effect for Efficiency and Leverage

The marginal effect (ME) of variable Y refers to its rate of change with respect to variable X. It is computed for a given variable by assuming that all other variables are held constant [Bartus (2005)]. In the linear regression model, the ME equals the relevant slope coefficient. The estimated marginal effect is the average of the ME at every data point. We use ME for observing the mean effects of firm efficiency and leverage. In addition, we also assess that how different variables affect firm efficiency at different levels of leverage and vice-versa.

4. RESULTS AND DISCUSSION

This section discusses the results concerning leverage and firm efficiency.

4.1. Descriptive Statistics

Table 4.1 provides the descriptive statistics of the sample firms. The mean leverage is 0.528 which shows that on average firms have employed more leverage than equity in their capital structures. The standard deviation of 0.19 indicates deviation of the firm leverage from the mean value. The minimum and maximum values for firm leverage are 0.03 and 0.97 respectively. Firm risk has a mean of 0.04, showing that the firm's earnings do not vary much across the sample with minimum and maximum value of 0.001 and 0.56 respectively. The mean for the firm growth is 0.247 with a standard deviation of 4.59. The statistic of firm risk and growth exhibits clustered earnings in terms of risk but varied earnings in terms of growth of the firms. The firm size has a mean of 7.97 with minimum and maximum of 4 and 12 respectively. The average of firm age is 32.4 with a large standard deviation of 16.3, confirming that age varies across the sample as both newer and older firms are included in the sample, while minimum and maximum age is 6 and 52 years, respectively. The board composition shows that on average only 0.257 of external members are on the boards. The dummy variable 'duality' shows that on average 0.221 of the CEOs also act as chairman of the board. Both the institutional and managerial ownerships have a mean value of 0.37 and 0.30, respectively. The average of 0.10 for market power confirms that firms have minimal power in the

market which can be regarded as almost competitive. Firms have 0.467 of the assets in the form of fixed tangible assets and 0.533 percent of current assets. The minimum for market power and asset tangibility is 0.00 with a maximum of 0.99 and 0.96 respectively. The firm's profitability is only 0.10, meaning 1 rupee of total assets generates on average 0.1 percent of earnings while minimum and maximum value is -0.44 and 0.49, respectively.

Table 4.1

Descriptive Statistics

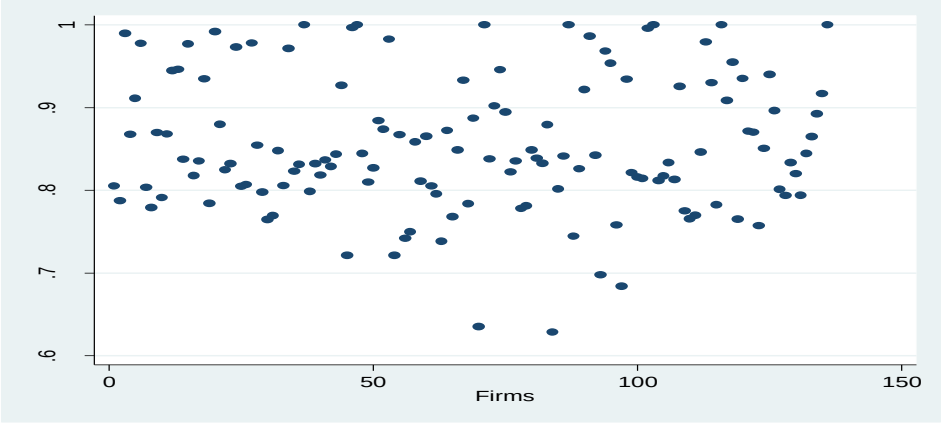
Variable	Mean	Median	Std.Dev.	Min	Max
Firm Leverage	0.528	0.548	0.194	0.030	0.978
Firm Risk	0.049	0.039	0.043	0.001	0.560
Firm Growth	0.247	0.071	4.590	-25.15	146.8
Firm Size	7.977	7.88	1.391	4.029	12.30
Firm Age	32.46	28	16.36	6	52
Board Size	2.074	2.07	0.178	1	3
Board Composition	0.257	0.143	0.287	0	0.929
Duality	0.221	0	0.415	0	1
Institutional Ownership	0.377	0.338	0.261	0	0.964
Managerial Ownership	0.307	0.244	0.285	0	0.967
Market Power	0.104	0.039	0.156	0.000	0.998
Asset Tangibility	0.467	0.477	0.198	0.001	0.965
Profitability	0.109	0.094	0.087	-0.445	0.493
CRS Technical Efficiency	0.822	0.813	0.093	0.473	1
VRS Technical Efficiency	0.855	0.850	0.097	0.051	1
Scale Efficiency	0.98	0.963	0.045	0.724	1

Table 4.1 also reports estimates of the mean firm efficiency. Both the efficiency estimates using CRS and VRS technology show almost similar mean efficiency score of 0.82 and 0.85 respectively. When CRS is assumed, it generates 0.47 of the minimum efficiency score while 0.05 in case of VRS. The maximum score is 1 for both the CRS and VRS. The scale efficiency being the ratio of CRS over VRS is 0.96 which is due to the increasing returns to scale as per estimates of the firms with minimum and maximum values of 0.72 and 1, respectively.

4.2. Efficiency by Firm

The efficiency measured through VRS technology of each firm is presented in Figure 4.1. It shows that seven firms can be termed as technically efficient among all the firms which constitutes the efficient frontier. All the remaining firms are inefficient considering the efficient frontier. The inefficient firms can improve, based on the slacks either to reduce the inputs with the given level of outputs or maximise the outputs with the given level of inputs.

Fig. 4.1. Firm by Efficiency



4.3. Correlation Analysis

Table 4.2 presents the correlation matrix. The association of FE with LEV, DUAL, MANG and TA is negative with LEV having the highest value of –0.50. It has a positive relationship with all other variables among which PR is strongly correlated followed by FSIZE. Similarly, LEV is positively related with BCOMP, DUAL, MANG while negatively with all others with PR being the highest. SV has a low negative correlation with FSIZE, FAGE, BSIZE, MANG, CI and TA and low positive correlation with all the remaining variables. Likewise, GROW also has a low correlation with all the variables with BSIZE, BCOMP, DUAL, INST and CI being negative. FSIZE is strongly correlated with CI and has a lowest positive and negative correlation with BCOMP and TA respectively. The same is true for FAGE which is negatively correlated with MANG and TA while positively correlated with all others. BSIZE and BCOMP have a low negative correlation with DUAL, MANG and TA. DUAL is positively correlated with MANG and TA while negatively correlated with others. INST is strongly negatively related to MANG and also to TA which is also negatively correlated with CI while both CI and PR have a negative correlation with MANG. PR is negatively associated with TA.

Table 4.2

Matrix of Correlation

	FE	LEV	SV	GROW	FSIZE	FAGE	BSIZE	BCOMP	DUAL	INST	MANG	CI	TA	PR
FE	1													
LEV	-0.50	1												
SV	0.10	-0.17	1											
GROW	0.06	-0.01	0.02	1										
FSIZE	0.42	-0.00	-0.10	0.01	1									
FAGE	0.18	-0.08	-0.03	0.01	0.24	1								
BSIZE	0.24	-0.01	-0.00	-0.02	0.34	0.10	1							
BCOMP	0.10	0.01	0.05	-0.01	0.02	0.05	0.19	1						
DUAL	-0.18	0.09	0.00	-0.01	-0.05	0.11	-0.12	-0.11	1					
INST	0.25	-0.18	0.03	-0.00	0.17	0.07	0.21	0.05	-0.14	1				
MANG	-0.29	0.16	-0.04	0.03	-0.24	-0.12	-0.22	-0.06	0.17	-0.71	1			
CI	0.36	-0.12	-0.05	-0.00	0.53	0.21	0.33	0.04	-0.12	0.17	-0.28	1		
TA	-0.37	-0.10	-0.02	0.02	-0.04	-0.19	-0.00	-0.07	0.08	-0.17	0.25	-0.05	1	
PR	0.63	-0.35	0.17	0.14	0.12	0.05	0.07	0.13	-0.11	0.10	-0.14	0.19	-0.26	1

4.4. Regression Results for Efficiency

Table 4.3 reports the results of the Sargan test for validity of the instruments used for the endogenous regressors. The p-value suggests that null hypothesis cannot be rejected and instruments are valid.

Table 4.3
Instruments Validity Test

Sargan test	1.323
Chi-sq(1) p-value	0.2501

Table 4.4 presents the estimates of the efficiency equation. The ***, **, * shows statistical significance at 1 percent, 5 percent, 10 percent levels respectively. The equation is estimated using 2SLS technique. The estimates are based on the VRS technology of the efficiency as the characteristics of the firms vary across sample such as age, size, tangibility of assets etc. Since there is a problem of endogeneity and errors are not i.i.d, the 2SLS is considered to provide efficient and unbiased estimates as it controls for the endogeneity along with robust estimates to correct for the error term.

The leverage has a significant positive impact on the efficiency. This result supports the *agency-cost hypothesis* that employing debt in the capital structure improves firm performance [Margaritis and Psillaki (2007); Zhang and Li (2007)]. The leverage is supposed to reduce the excess free cash flow, resulting in less agency costs and improved performance [Jensen (1986)]. Leverage also reduces the managerial opportunism which results in better firm performance [Warokka and Herrera (2011)]. Myers (2001) noted that leverage is also less costly and is coupled with reduced agency costs, which could have a positive impact on firm performance.

Risky firms are supposed to perform better than others. According to Florackis and Ozkan (2008), growth of the firm also enhances firm performance because of the disbursement of excess cash flow which reduces the free cash flow. The positive effect of size on efficiency suggests that bigger firms have improved performance. As mentioned by Titman and Wessels (1988), large firms have the ability to generate greater cash flows and acquire the least costly debt, backed by assets, resulting in less bankruptcy costs and better performance. Older and larger firms are expected to have a good reputation in the market with considerable market share [Hasan and Butt (2009)]. This is consistent with the findings of Hall, *et al*. (2004) in that the size and age of the firm determine the debt raised by a firm. Larger boards and external independent members on the board do contribute to firm performance. The variable of CEO duality has a statistically insignificant effect on firm performance. The existence of institutional investors does not improve efficiency while managers' stake in the firm also reduces firm performance. As mentioned by Shleifer and Vishny (1997), the institutions and large shareholders can exploit minority shareholder rights because minority may not have enough resources which can lead to a free rider problem. Firms with larger share of the market are supposed to exercise their power and influence the market, resulting in higher efficiency.

Table 4.4

Regression Results for Efficiency

Variables	2SLS
LEV	0.55***
	(0.17)
SV	0.25**
	(0.09)
GROW	0.001***
	(0.0005)
FSIZE	0.07***
	(0.01)
FAGE	0.003
	(0.002)
BSIZE	2.17***
	(0.49)
BCOMP	0.38***
	(0.14)
DUAL	0.48*
	(0.25)
INST	-0.32
	(0.50)
MANG	-1.80*
	(0.92)
CI	0.02
	(0.07)
TA	
Intercept	-4.54***
	(1.16)
Observations	1,392
R-squared	-0.057
Prob > F	0.000

The negative r-square indicates that the residual sum of squares is greater than the total sum of squares which can happen in 2SLS models; as instruments are used for the endogenous regressors to solve the structural model, while the r-square incorporates the actual values of the regressors which are different from those used to fit the model. The statistical significance of the individual coefficients is important which makes a good fit of the model.

4.5. Regression Results for Leverage

The test for validity of the instruments is presented in Table 4.5. The insignificant p-value does not allow the rejection of the null hypothesis of valid instruments.

Table 4.5

Instruments Validity Test

Sargan test	2.018
Chi-sq(1) p-value	0.1555

Table 4.6 presents the estimates for the leverage equation. The efficiency has a significant negative effect on leverage. It validates the *franchise-value hypothesis* that higher efficiency discourages the use of debt which can be used for protecting future gains. Higher efficiency as a result of higher earnings leads to higher retained earnings and lower debt ratio. Although higher efficiency increases firm's debt capacity but firms might not employ debt in the capital structure to avoid possible bankruptcy costs [Berger and Bonaccorsi di Patti (2006)].

Table 4.6

Regression Results for Leverage

Variables	2SLS
FE	–1.16***
	(0.08)
SV	-0.11
	(0.08)
GROW	0.0007
	(0.0006)
FSIZE	0.05***
	(0.01)
FAGE	–0.007***
	(0.001)
BSIZE	–0.60*
	(0.31)
BCOMP	–0.48***
	(0.07)
DUAL	0.62***
	(0.20)
INST	–1.36***
	(0.30)
MANG	–2.59***
	(0.68)
CI	0.01
	(0.07)
TA	–0.32***
	(0.03)
PR	
Intercept	3.57***
	(0.60)
Observations	1,392
R-squared	0.745
Prob > F	0.000

The same is true for risk that risky firms prefer equity over debt. Growth and market power positively affect leverage while risk and board size are statistically insignificant. Large, emerging and newer firms are expected to incur more debt than small and older firms. Board composition has a significant negative effect on leverage. Again, the institutional investors and managers cannot be the factors in determining debt. This is consistent with Warokka and Herrera (2011) that managerial ownership that leads to opportunism, being the cost of agency conflicts, may discourage leverage. Interestingly, the tangible assets do not help firms to raise debt. Based on the predictions of trade-off and agency cost theory, tangible assets are expected to be positively associated with leverage while pecking-order theory predicts a negative relationship. It also contrasts with Shah and Ilyas (2014), indicating a positive relationship between asset structure and leverage. Though, efficiency is negatively related to leverage which can cause firms to retain their assets for generating future gains.

4.6. Marginal Effects for Efficiency

Table 4.7 provides estimates of the mean effect of variables on efficiency of the firm. The findings are obtained from 2SLS method as employed earlier. These are the averages of the slopes for each variable with respect to the variable 'leverage'. The results suggest that on average, leverage is negatively associated with efficiency.

Table 4.7

Mean Effects for Efficiency

Variables	2SLS
LEV	–0.51***
	(0.13)
SV	0.29*
	(0.17)
GROW	–0.0004
	(0.001)
FSIZE	0.04***
	(0.008)
FAGE	–0.003***
	(0.001)
BSIZE	1.04***
	(0.20)
BCOMP	–0.10*
	(0.05)
DUAL	0.82***
	(0.12)
INST	–1.21***
	(0.24)
MANG	–3.07***
	(0.44)
CI	0.08
	(0.06)
Intercept	–0.76*
	(0.44)
Observations	1,392
R-squared	0.767
Prob > F	0.000

The same is true for growth, firm age, board composition and institutional and managerial ownership.[1] Greater risk helps firms to generate earnings. Firm size positively affects firm performance and is in line with the previous findings related to Pakistan [Latif, Bhatti, and Raheman (2017)]. The size factor is relevant with the view that larger firms do better than others in terms of survival while larger board size may ensure less exploitation of the resources due to monitoring of the independent members. As opposed to the view of agency theory, the CEO duality shows a positive relation with efficiency. As expected, market power enhances firm performance.

The regressions in Table 4.8 assess effects of different variables on firm efficiency at ten levels of leverage i.e. 0.05 for 1, 0.15 for 2, 0.25 for 3, 0.35 for 4, 0.45 for 5, 0.55 for 6, 0.65 for 7, 0.75 for 8, 0.85 for 9 and 0.95 for 10 with their respective p-values. Leverage ratio ranges from 0.05 to 0.95. The risk is statistically significant at levels 3, 4 and 5 and associated positively at low levels of leverage but negatively for highly levered firms. This may be caused by the additional risk taken to raise finance which increases the chances of financial distress resulting in poor performance.

Table 4.8

Marginal Effects for Efficiency

	SV		GROW		FSIZE	
_at	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
1	.2728	0.082	-.0002	0.881	.0465	0.000
2	.2337	0.059	.0001	0.932	.0509	0.000
3	.1947	0.035	.0004	0.606	.0553	0.000
4	.1556	0.016	.0007	0.158	.0597	0.000
5	.1165	0.012	.0011	0.007	.0640	0.000
6	.0774	0.123	.0014	0.011	.0684	0.000
7	.0384	0.598	.0018	0.043	.0728	0.000
8	-.0006	0.995	.0021	0.085	.0772	0.000
9	-.0397	0.768	.0024	0.123	.0816	0.000
10	-.0788	0.638	.0028	0.155	.0859	0.000
	FAGE		BSIZE		BCOMP	
_at	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
1	-.0036	0.000	1.0411	0.000	-.1055	0.072
2	-.0035	0.000	1.0379	0.000	-.1072	0.061
3	-.0033	0.000	1.0346	0.000	-.1089	0.053
4	-.0032	0.000	1.0314	0.000	-.1105	0.047
5	-.0031	0.001	1.0282	0.000	-.1122	0.043
6	-.0030	0.001	1.0249	0.000	-.1139	0.041
7	-.0028	0.002	1.0217	0.000	-.1156	0.041
8	-.0027	0.003	1.0184	0.000	-.1173	0.042
9	-.0026	0.005	1.0152	0.000	-.1190	0.044
10	-.0025	0.009	1.0119	0.000	-.1207	0.048
	INST		MANG		CI	
_at	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
1	-1.2131	0.000	-3.0725	0.000	.07557	0.190
2	-1.2076	0.000	-3.0687	0.000	.06500	0.210
3	-1.2022	0.000	-3.0649	0.000	.05443	0.250
4	-1.1967	0.000	-3.0611	0.000	.04386	0.324
5	-1.1912	0.000	-3.0573	0.000	.03329	0.446
6	-1.1858	0.000	-3.0535	0.000	.02272	0.614
7	-1.1803	0.000	-3.0498	0.000	.01214	0.802
8	-1.1748	0.000	-3.0460	0.000	.00157	0.976
9	-1.1694	0.000	-3.0422	0.000	-.00899	0.880
10	-1.1639	0.000	-3.0384	0.000	-.0195	0.768

[1]The extant literature generally shows that insider-ownership negatively affects firm performance (see for example, Ullah, Ali, and Mehmood (2017); Abdullah, Shah, and Khan (2012).

On the other hand, the growth variable is significant at levels 5, 6 and 7. Firm size and board size remain positive and significant at all levels except at level 1 for growth, while firm age, institutional and managerial ownership remain significant and negative at all levels. Similarly board composition also has a negative and significant effect at high levels of leverage. The effect of market power is also positive till level 8. The characteristics of the firm, as measured through the variables, allows inferring that highly levered firms generally show poor performance than low levered firms in the presence of the variables as discussed.

4.7. Marginal Effects for Leverage

The results for marginal effects of leverage regression are presented in Table 4.9.

Table 4.9

Mean Effects for Leverage

Variables	2SLS
FE	–1.91**
	(0.86)
SV	–1.00
	(0.82)
GROW	0.006
	(0.01)
FSIZE	0.08**
	(0.036)
FAGE	–0.009***
	(0.003)
BSIZE	–1.35***
	(0.45)
BCOMP	–0.65***
	(0.15)
DUAL	0.54**
	(0.22)
INST	–1.47***
	(0.40)
MANG	–2.18***
	(0.69)
CI	–0.98**
	(0.40)
TA	0.23
	(0.20)
Intercept	4.67***
	(0.90)
Observations	1,387
R-squared	0.753
Prob > F	0.000

The average efficiency has significantly negative effect while both risk and growth share an insignificantly negative and positive relationship with leverage, respectively. Large and newer firms seem to raise more debt financing while firms with large and diverse boards have low leverage. CEO duality positively affects leverage while institutional, managerial ownership and market power negatively affect it.

Slopes of the variables with respect to firm leverage at ten levels of efficiency are presented in Table 4.10. The levels are represented by value of 1 to 10 for 0.55, 0.60, 0.65, 0.70, 0.75, 0.80, 0.85, 0.90, 0.95 and 1.00 of efficiency, respectively. The effect of risk and growth is positive and negative, respectively but insignificant for all firms including technically efficient firms. Firm size remains positive and significant while age, board size, composition, institutional and managerial ownership remain negative and significant at all levels of efficiency. Market power and asset tangibility also share negative relationships with leverage but share significant and insignificant at levels 1 and 2, respectively. Generally, more efficient firms do not attract higher leverage based on the relationship of the variables at levels of efficiency.

Table 4.10

Marginal Effects for Leverage

	SV		GROW		FSIZE	
_at	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
1	-.3960	0.222	.00317	0.502	.06744	0.000
2	-.3404	0.223	.00285	0.485	.06552	0.000
3	-.2848	0.227	.00253	0.462	.06360	0.000
4	-.2291	0.235	.00222	0.431	.06168	0.000
5	-.1735	0.255	.00190	0.385	.05976	0.000
6	-.1179	0.309	.00158	0.315	.05785	0.000
7	-.0622	0.483	.00127	0.205	.05593	0.000
8	-.0066	0.935	.00095	0.106	.05401	0.000
9	.04896	0.616	.00063	0.372	.05209	0.000
10	.10460	0.419	.00032	0.792	.05017	0.000
	FAGE		BSIZE		BCOMP	
_at	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
1	-.0086	0.000	-1.0124	0.002	-.5546	0.000
2	-.0085	0.000	-.98114	0.003	-.5457	0.000
3	-.0084	0.000	-.94988	0.003	-.5368	0.000
4	-.0084	0.000	-.91861	0.004	-.5279	0.000
5	-.0083	0.000	-.88734	0.005	-.5190	0.000
6	-.0082	0.000	-.85607	0.007	-.5101	0.000
7	-.0081	0.000	-.82480	0.010	-.5012	0.000
8	-.0081	0.000	-.79354	0.014	-.4923	0.000
9	-.0080	0.000	-.76227	0.020	-.4834	0.000
10	-.0079	0.000	-.73100	0.029	-.4745	0.000
	INST		MANG		CI	
_at	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
1	-1.4572	0.000	-2.3530	0.001	-.3906	0.036
2	-1.4560	0.000	-2.3684	0.000	-.3369	0.044
3	-1.4548	0.000	-2.3839	0.000	-.2833	0.057
4	-1.4536	0.000	-2.3993	0.000	-.2296	0.080
5	-1.4524	0.000	-2.4148	0.000	-.1759	0.123
6	-1.4512	0.000	-2.4302	0.000	-.1222	0.216
7	-1.4500	0.000	-2.4457	0.000	-.0686	0.424
8	-1.4488	0.000	-2.4611	0.000	-.0149	0.845
9	-1.4476	0.000	-2.4765	0.000	.0387	0.588
10	-1.4464	0.000	-2.4920	0.000	.0924	0.202

	TA	
_at	dy/dx	P>z
1	-.1004	0.246
2	-.1308	0.085
3	-.1611	0.014
4	-.1915	0.001
5	-.2219	0.000
6	-.2523	0.000
7	-.2826	0.000
8	-.3130	0.000
9	-.3434	0.000
10	-.3737	0.000

4.8. Robustness of Results

In order to reconcile the findings of the two models, namely agency cost and leverage, other variables instead of efficiency and leverage are used for robustness check. The proxy used for leverage is debt to equity. The results of the efficiency equation are given in Table 4.11. Leverage shows a significant positive relationship with efficiency. Although risk, firm age, board composition and market power have a negative relationship while growth, firm size, board size, duality, institutional and managerial ownership confirm the result of the agency cost model.

Table 4.11

Regression Results for Efficiency

Variables	2SLS
LEV	0.11**
	(0.05)
SV	–0.23
	(0.26)
GROW	0.0006
	(0.0009)
FSIZE	0.06*
	(0.03)
FAGE	–0.006
	(0.005)
BSIZE	0.87
	(0.55)
BCOMP	–0.12
	(0.17)
DUAL	1.03**
	(0.50)
INST	–1.15*
	(0.65)
MANG	–3.50**
	(1.67)
CI	–0.16
	(0.16)
TA	–
Intercept	–0.74
	(1.13)
Observations	1,392
R-squared	–7.377

A similar robustness check is performed for the leverage equation in Table 4.12. The proxy used for efficiency is Tobin Q. In contrast to the results of leverage model; the efficiency shows a positive association with leverage. The rationale behind this is that Tobin Q is a single measure used to assess firm performance, while the efficiency employed information on four inputs and four outputs as discussed earlier. In other words, DEA uses multiple inputs and outputs to assign weights based on the nature of data and measure efficiency. Growth, firm size, age, board size, composition confirms the results of the leverage model.

Table 4.12

Regression Results for Leverage

Variables	2SLS
FE	7.71
	(5.33)
SV	0.81
	(1.25)
GROW	0.01
	(0.01)
FSIZE	0.07
	(0.12)
FAGE	–0.003
	(0.01)
BSIZE	–6.68
	(4.44)
BCOMP	–0.28
	(0.60)
DUAL	–2.74
	(2.59)
INST	0.21
	(2.42)
MANG	14.33
	(11.72)
CI	–1.31
	(1.19)
TA	0.06
	(0.31)
PR	–
Intercept	10.51
	(6.75)
Observations	1,392
R-squared	–26.86

5. CONCLUSION

This study examined the endogenous determination of firm efficiency and leverage. It used DEA to measure the efficiency of the firm by establishing efficient frontier. The analysis was done using a panel data set of 136 non-financial firms listed on the PSX over the period 2002-2012. The data supported the fixed effect model instead of random effect. The leverage and efficiency were found to be endogenously determined. The empirical results obtained through 2SLS method supported *agency cost hypothesis* that leverage is related positively with efficiency. This finding is in line with existing evidence from Pakistan [Ullah and Shah (2014)]. The reverse causality from efficiency to leverage was also examined by considering *efficiency-risk* and *franchise value hypotheses*. The results confirmed the prediction of *franchise-value hypothesis* that efficiency shares a negative association with leverage. The earnings generated through higher efficiency increase the existing retained earnings resulting in lower debt ratio. Efficient firms try to protect their future gains through higher equity capital from possible liquidation [Berger and Bonaccorsi di Patti (2006)].

All the variables have a positive relationship with efficiency except institutional and managerial ownership. On the other hand, all the variables have a negative relationship with leverage except growth, firm size, CEO and market power. Generally, the findings of the study are quite robust.

The findings of this study are based on VRS technology due to varied characteristics of the sample firms. Researchers can consider making a different sample of firms with similar characteristics in terms of the variables included in this study such as assets, debt, size, age etc. The analysis can be carried out using CRS technology to examine how the variables affect firm financing and performance. Similarly, cross-industry comparison can be done to analyse the differences in results across each industry. External factors such as interest rate, technological changes and industry specific factors such as risk can also be considered in future studies. It is important to mention that the role of corporate governance is of utmost importance in corporate finance, especially in the studies of agency theory. So, it can be considered in the future studies, particularly the role of large investors in helping firms to resolve the principal-agent problems to improve firm performance.

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