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BOARD STRUCTURE AND RISK TAKING: EVIDENCE FROM PAKISTAN STOCK EXCHANGE

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ABSTRACT

It is argued that excessive risk taking of firms has resulted in global financial crisis. However results provide conflicting evidence in this regard. Primary aim of this paper is to investigate effect of board characteristic on firm risk taking by using multiple econometric techniques, involving OLS, fixed effect, random Effect and GMM method of regression in our analysis. . We have collected data from 225 non-financial firms listed on Pakistan stock exchange covering the period from 2009-2018. We have used five different measures of risk including total risk, firm risk, market risk, volatility of return and solvency risk. The explanatory variables of board characteristics are Board size, Female board size and CEO duality. The control variables are firm size, leverage, Tobin's Q, current ratio, Return on assets and CEO ownership. Board size has significant negative relationship with total risk and firm risk, while it has a significant positive relationship with beta risk. CEO duality has a positive significant relationship with total risk and firm risk and significant negative relationship with beta risk and volatility of return. Female sizes in board have positive significant relation with total risk and insignificant relationship with all other risk measures. Finding supports hypothesis that board characteristics are significant determinants of firm risk taking. Dynamic generalized method of moment (GMM) specification is robust to all form of endogeneity, once it is employed we can see that result of GMM method are significantly different from pooled ordinary least square method.

KEYWORDS

Board Size, CEO Duality, Risk and Pakistan Stock Exchange.

1. INTRODUCTION

The global meltdown of economies across the world has started new debate about the role of management in risk-taking preferences of firms and its impact on the global financial crisis. (John, Litov, & Yeung, 2008). Board of directors is a body involved in taking vital decisions of the company. Boards are actively involved in decision making which either can worsen firm performance or can enhance it. Purpose of the board is to provide oversight mechanism on the work of owner-manager and to stop them from risking vested parties interest (Hermalin & Weisbach, 2003). Board plays a key role in

devising of strategy, planning, and execution, decisions like dismissal of executives and about their remuneration are taken by board (Fama & jensen, 1983). Board is a basic advisory unit and management act according to the guidance of board and every important decision of management reflects input of the board.

To reduce agency cost, the board has to play an important role of monitoring, approval, punishment, and reward; this may range from firing, hiring of top managers to the strategic implementation of policies (Chumba, 2015). Protecting the interest of all the shareholders is the primary job of the board; however, in reality, it is not possible, many times small shareholders are ignored. In past boards have been blamed for not protecting the interest of shareholders, boards have relied on short term gains ignoring the long term benefits for shareholders (Erkens, Hung, & Matos, 2012). Efficient management practices and improvement in risk reporting can produce better performance by the organization. (Ntim, Lindop, & Thomas, 2013).

One of the solutions towards solving agency problem lies in the efficient working of the board of directors. Board of director's act on behalf of owners and try to reduce conflict between management and owners. The most important duty of the board is to protect the interest of shareholders. A substantial matter that plays a vital role in the performance of the board is the size of the board. All the members of the board together constitute the board and in board, they have the opportunity to play an equal role and protect the interest of the shareholders who have nominated and elected them. (Yermack, 1996) And (Eisenberg , Sundgren, & T.wells, 1998) concluded that smaller boards are more effective and perform better because it is easy to coordinate and communicate. In the small board's decision-making process is easy and less complicated? (Fich & Slezak, 2008) Conducted research and established that smaller boards are smarter in making adjustments to avoid bankruptcy because small boards are distressed. There are fewer conflicts to be solved among a few members in the board; every additional member may bring new advice and strategy which may complicate the decision-making process. On the other hand, few researchers argue that large boards are more suitable as more input is available from the extra members to make critical decisions. (Zahra & Pearce, 1992), (Goodstein, Gautam, & Boeker, 1994). Sometimes it is necessary to see things from different angles, more members bring new ideas and strategies resulting in improved and better decision making.

Research conducted by (Stulz R., 1988) determined that if board diminishes their monitoring role it leads to increase in the role of managers, which results in the implementation of conservative investment policies giving surge to low risk and poor performance. Making plans and strategic decisions are not enough, boards need to play proper monitoring role, as well to see whether their decisions are implemented by the managers or not. Follow up and assessment of management performance put extra pressure on management to implement the board's decision. Traditional it is considered that managers are risk averse due to employment risk and reputational issues. (Meckling & Jensen, 1976); (Fama & jensen, 1983). Managers play safe and invest in projects with minimum risk, however often they have to break barriers and have to make risky investments to increase shareholders wealth. Numbers of options are tried by the owners to push them to limits of taking risk; one method is to tie managerial incentives with firm performance (Baysinger & Hoskisson, 1990); (Jensen & Murphy, 1990). There are

number of methods implied by owners to align interest of managers with of shareholders that range from pay incentives, bonus, and ownership shares to CEO duality.

CEO is one of the most important people in management; key duty of CEO is planning and implementation. Giving CEO dual responsibility of Chairmanship means that board wants to rely more on management for critical decisions of the firm. Giving so much authority and confidence to CEO is one of the strategies to push management to take extra risk to bring good fortunes for the company. In agency theory context, ideally board plays role of monitoring and management implements strategies formulated by the directors. Giving CEO dual role compromises board's role of monitoring and have negative impact on shareholders. (Lipton L. & Lorsch J., 1992), Argued that concentration of power in CEO hands encourages self-interested managerial behavioral and limits boards monitoring role. Few researchers takes argument further and argue that managers risk aversion attitude is invigorated by CEO duality which leads towards lower corporate risk taking (Demsetz & Lehn, The Structure of Corporate Ownership: Causes and Consequences, 1985)

There have been several studies regarding firm performance, Risk taking and board structure in other parts of the world (L.Coles, D.Daniel, & Naveen, 2008); (Eisenberg , Sundgren, & T.wells, 1998) (Yermack, 1996).In America studies relating to corporate risk and board, the structure are also done by (Cheng S. , 2008); (Buchanan & Hee-Kim, 2008) (Pathan, 2009). Inadequate performance of the board can result in poor performance of the firm (Erkens, Hung, & Matos, 2012). Risk management becomes an important factor in firm performance, how much risk is adequate and required is an important aspect (Ntim, Lindop, & Thomas, 2013). Previous studies confirm that firms with high leverage take excessive risk resulting in financial crisis and poor performance (Kirkpatrick, 2009) similar results were inferred by (magnan & Markarian, 2011) they concluded that with increase in debt equity ratio management tends to take higher risk.

Most of the corporate governance codes and regulations in the world stress on significance of board of directors in handling firm risk. However, in the Pakistani context, studies regarding corporate governance are very scarce. Pakistani firms have a different context and environment than the European and American companies and this study will help to provide insight regarding board and risk-taking.

Since board structure and board governance is key to corporate governance, this paper aims to explore the relation of the board on corporate risk-taking. We also control for endogeneity, many researchers have claim that board structure is endogenously determined and many researches ignore this aspect (Hermalin & Weisbach, 2003). We by following (Wintoki, Linck, & Netter, 2012) addresses endogeneity problem and also apply dynamic panel data GMM model to our analysis. We debate that traditional estimation methods like OLS, Fixed effect and Random Effect regression don't control for endogeneity problem and result obtained from them are biased. By applying dynamic panel generalized method of moments, we can control for three kinds of endogeneity i.e. unobserved heterogeneity, simultaneity and dynamic endogeneity, and get reliable results. For robustness of our results we report results from OLS, fixed effect, random effect and dynamic panel GMM Model.

2. RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

2.1 CEO Duality and Firm Risk Taking

In recent times giving CEO dual role of CEO and board chairman has surfaced (Fama & jensen, 1983). This imparts CEO with absolute power and makes him sole captain of the ship.it is vigorously debated that firms planning function which is responsibility of CEO and firm's control which is duty of board chairman must be separated. According to the agency theory Concentration of power in one hand leads shareholders favor towards management resulting in agency loss. On the other hand stewardship theory considers that concentration of power in one hand provides unity of command and control which leads towards smooth decision making as CEO role is clear to both subordinate management and board (Donaldson & Davis, 1991).

One of the studies containing sample of 74 firms concluded that CEO duality concentrates power in one hand which encourages CEO to take more risk which others will avoid in normal circumstances (Lewellyn K.B & Kahle M.I, 2012). One of the studies stated positive association amid CEO duality and insolvency risk (Rachdi H, Trabelsi M., & Trad N., 2013) .Another study determined a positive link among CEO duality and bank risk taking behavior (Salhi & Boujelbene, Effect of the Internal Banking Mechanisms of Governance on the Risk Risk taking by the Tsunami Banks, 2012) giving reasons that CEO duality causes a weak control effectiveness of the board which results in excessive risk taking.Research done in Tunisian concluded the same results that CEO duality causes increase in banks insolvency risk (Dhouibi, 2013). Panel data technique was applied on 120 observations to get the results.

On the other hand few researches concluded opposite results. Analysis related to UK firms leads us that there is a weak positive association between CEO duality and firm performance (Vafeas & Theodorou, 1998), (Weir & Mcknight, 2002), (Florackis c. , 2006) (Florackis, Kostakis, & Ozkan, 2009). (Buchanan & Hee-Kim, 2008) Conducted there research in USA, they gathered data large firms of year 2002 and found result that CEO duality has negative impact on income stream risk. Standard deviation of ROA was used as proxy for the income stream. (Pathan, 2009), Concluded similar research results suggesting that CEO duality lowers bank risk taking in USA. Most of the studies have mixed results, some found positive relationship of Risk with CEO duality and few found negative relation of risk with CEO duality. After examine of literature we came to the following hypothesis

H1: CEO duality has positive relationship with risk taking behavior of the firm
H1a: CEO duality has negative relationship with Risk taking behavior of the firm.

2.2 Board Size and Risk Taking

One of the vital characteristic of board structure is board size; there are two different viewpoints about board size. First view is that large boards provide diversity that help firms to reduce environmental qualms and secure precious resources. Large boards are in a better position to cater big problems and respond effectively towards different stake holders. Large boards can secure more resources and due to large number they can divide responsibilities of director by forming committees to do specific tasks. (Zahra & Pearce, 1992), (Goodstein, Gautam, & Boeker, 1994). The other view point argues (Yermack,

1996) that increase in number of directors causes communication, coordination and decision making problems which hamper companies risk taking. Thus a trade-off subsists between coordination and diversity. (Adam & Mehran, 2003) , established that board size is industry specific and bank holding companies usually have larger boards than manufacturing firms.

(Pathan, 2009) (Ferrero Ferrero, Ángeles , Muñoz, & Torres, 2012) , found that due to weak coordination and communication within the large board decision making process suffers which results in reduction of risk taking by the firm. Similar results were inferred by (Chumba, 2015) that board size has a negative relation with risk taking; earning volatility was used as risk measure. (Nakano, M, & Nguyen, 2012) Found that increase in board size has an inverse relation with bankruptcy, however relation was insignificant. (Rachdi H, Trabelsi M., & Trad N., 2013) Conducted research regarding Tunisian banks and indicated a negative correlation between board size and insolvency risk. (Rachdi, H, & Ben I, 2011) Gathered data of USA banks from 1997 to 2004 and found negative relation between board size and different measures of risk. He took total risk idiosyncratic risk and systematic risk as measure of risk, board structure depicted an inverse relation with all three risk measures. (Minton, Taillard, & Williamson, 2011) , also got similar results that total risk is negatively related to board structure.

(Dhouibi, 2013) In his study found a positive association among board size and bank insolvency risk. Similarly a positive relation was found between board size and bank risk taking by (Salhi & Boujelbene, 2012) ,it was argued that small board have better coordination and communication which aligns results of managers and shareholders resulting in lower risk taking.

2.3 Female Directors and Risk Taking

Representation of female directors in board of directors is a recent phenomenon, especially in context of developing country like Pakistan. Over last few decades' females in Pakistan has started contributing in corporate world of Pakistan and are doing jobs which were previously only held by males. Still presence of female in boards is very small and many companies do not have female directors at all.

It is maintained that female directors work more hard to monitor executive directors in the board. Some studies have been done to measure the impact of board gender on firm performance (Ren, T, Wang, & Z, 2011), (Ujunwa & a, 2012), (Wang, Y, & B, 2009). Some researchers have been done to examine the impact of gender on firm value and financial choices (A.M & Campbell, 2008) (Carter, Simkins, & Simpson, 2003) (Abobakr & Elgiziry, 2015), (P, Couto, & Francisco, 2014).

Few have also examined effect of female directors on firm risk taking. (Adam & Funk, 2016) , conducted research and found a positive relationship between risk taking and female directors. While (Farrell, K.A, & P.L, 2005) , found negative relation between female directors and risk taking concluding that females are risk averse in behavior. In this regard research relating to banking sector has shown mixed results, where findings predict that both risk averse and risk taking behavior is seen by the female directors. (Berger , Kick, & Schaeck , 2012), found a positive relationship between female directors and risk taking showing that female directors are more risk taking than males and it is not essential that females are risk averse in approach. On the other side there are few

researches which support the fact that at large females have a risk adverse attitude. Researchers conducted by (Bowo & Amine , 2014) (Wilson & Altanlar, 2009) and (Gulamhussen & Santa, 2015), found an inverse relation between female directors and risk taking. Presence of female directors reduces firm's bankruptcy risk. Females are careful in choosing projects and take minimum risk to avoid big losses. Largely it has been concluded that females are risk averse and their presence in board brings vigilance and carefulness attitude. We can conclude following hypothesis on the basis of literature.

H3: Female directors in board have a negative impact on firm risk taking.
H3a: Female directors in board have a positive impact on firm risk taking.

3. DATA AND METHODOLOGY

3.1 Population and Sample

Population of the study comprises of all companies of Pakistan listed on Pakistan stock exchange. Initially sample consists of PSE all index companies which are listed on PSE during study period 2009 to 2018. We are including only non-financial firms because financial firms have different reporting structure and results cannot be generalized. The non-financial firms with missing data were excluded from the data. Our final sample consisted of 225 non-financial firms, making total firm years observations to 1800.

Data is collected from various sources. Annual reports and relevant websites of the firms were used to collect data of Board structure. Other financial data like balance sheet measures were also collected from financial reports of the firms or websites. Daily stock prices of the firms are taken from the daily quotations of Pakistan Stock Exchange (PSE). PSE All index values are collected form Vital Information Service (VIS) databases and from website of Pakistan stock exchange.

Data is entailed on only listed firms because such firms have to follow corporate governance code in accordance with requirements of stock exchange and are sufficiently big to monitor the corporate governance practices. Following the codes these firms follow disclosure requirements so it is easy for listed firms to collect the Board data while it is very difficult from private firms to collect ownership data and these firms also don`t have much diversity of ownership as listed firms have. Hence, private firms are excluded from data set and only listed firms are selected and from these listed ones, firms which constitute most of the capitalization of the market are picked (i.e. PSE ALL index firms).

3.2 Definition of Variables

3.2.1 Risk

Traditional financial literature (Modigliani & Miller, 1958) provides excessive understanding concerning risk measures ensuing this works we proxy risk by both market measures and balance sheet/accounting measures. We take numerous proportions of risk in quest to evaluate the likely sensitivity of results. Market measures of risk are categorized into three forms:

1. Total risk
2. Systematic risk/market risk
3. Unsystematic/idiosyncratic/firm specific risk

Annual standard deviation of daily stock returns is used as a proxy for total risk (TR) with maximum 248 days and minimum 30 days in a complete year; same formula was used by (Pathan, 2009). As we consider, stock price emulate the actions of firm so variations in stock prices indicate the risk inferred by firms. It is utmost common proxy of total risk accepted by firms, recognized from numerous preceding studies. Nguyen (2011) considered standard deviation of monthly stock returns in his study.

Single index market model is used to calculate beta (systematic Risk). We in this model use stock values of the firm and PSE all index daily return values (Anderson & Fraser, 2000). (Gadhoum & Ayadi, 2003) , also used single index market model to measure the systematic and firm specific risk. There is an issue of autocorrelation in two index market models and chance of association amid interest rate variations and market return changes. Though such association among interest rate and market returns can be counteracted by orthogonalization (i.e. E (Yit, Xit) = 0) (Chance & Lane, 1980) but it can still cause some degree of biasness in results. So we chose single index model since there is no noteworthy variation in outcomes (Anderson & Fraser, 2000).

$$R_{it} = a1 + B_i R_{mt} + E_{it}$$

In our model i and t represents the firm and time separately, R_{it} is equity return of firm and R_{mt} is the return on PSE All market index. a1 is the intercept term, B is systematic risk which is linked to drive in market factors; it triggers economic and financial circumstances of specific industry and displays compassion of firm stock in connection to market, we can also say it perception of investors about firm`s stock. Alternative common term recognized for systematic risk is beta. Beta value can also be considered as slope of firm return / market index yield at a specific time period. Beta is the instability or risk of a certain stock comparative to the unpredictability of the whole stock market. Beta is a gauge of how risky a specific stock is, and it is used to appraise its probable rate of return.

However duration E represents residuals, Idiosyncratic/ firm specific (IDOR) risk is calculated by standard deviation of residuals, constant with several preceding researches (Anderson & Fraser, 2000) (Pathan, 2009). Firm explicit risk measures stock instability which is innate in firm`s capital arrangement, asset management, policies and investments.

Balance sheet trials of risk are also measured since it stretches vision concerning earnings volatility. We integrate earnings volatility by standard deviation of *ROA using the idea of (Laeven & Levine, 2009). (John, Litov, & Yeung, 2008) , also merged this variable in their study but with changed approach and inspiration. Earnings impulsiveness is risk measure of earnings it can moreover be used to plaid out earnings flattening and reasonable achieves of managers in the existence of revelation necessities. Initially we divide EBIT/Total Assets for every one year to acquire ROA, than we compute standard deviation of earnings for every year by taking moving averages.

$$*\text{ROA} = \frac{\text{Earnings before interest and tax}}{\text{Total Assets}}$$

Z-score is a compound measure of risk, and it specifies distance from bankruptcy (Roy, 1952). It is condition when damages are more than earnings and firm is not capable to pay debts (E< -r) E is equity and (r) are profits. The likelihood of insolvency is when -ROA < CAR, here ROA is R/A and CAR is A/E. The reciprocal of probability of insolvency is Z-score and we used the formula given by (Laeven & Levine, 2009). It displays that how steady is the firm, high value of Z-score directs more stability and it distinguish among firms on the base of asset composition and leverage.

$$\text{Z-score} = \frac{ROA + CAR}{\text{S.d of ROA}}$$

3.2.2 Board Structure

Board size is a measure of total number of directors in a corporate board (Yermack, 1996) . CEO duality is measured through use of dummy variables; Dummy variable is equal to 1 if chairman and CEO are the same person and zero if they are different person (Florackis, Kostakis, & Ozkan, 2009) (Buchanan & Hee-Kim, 2008).Female directors: is the number of females as a percentage of the total number of board directors (Abobakr & Elgiziry, 2015)

3.2.3 Control Variables

One of the utmost active variables is size of the firm it is defined as logarithm of total assets and is consistent with former works (John, Litov, & Yeung, 2008), (Laeven & Levine, 2009). Bigger firms have attained economies of scale and are more diversified. Their activities are extra noticeable owing to media helpfulness henceforth it encourages managerial actions and investor protection. Big firms require additional monitoring and governance mechanism. We also control for liquidity, leverage, and profitability/performance of firm and growth opportunity because these variables influence corporate risk taking. ROA conveys profitability (PROF) of firm and it has been used in numerous studies (Kim & Lu, 2011) because profitability of firm is one of important feature which effect choices concerning risk. Poor acting firms are further liable towards diversification to diminish the risk (Campa & Kedia, 2002). Higher risk taking is linked to higher profitability (Nguyen P. , Corporate governance and risk-taking: evidence from Japanese firms., 2011).

$$\text{ROA} = \frac{\text{Earnings before interest and Tax}}{\text{Total Assets}}$$

Tobin's` Q is essentially an estimate or growth opportunity accessible to firm, choices concerning risky investments also reliant at growth probabilities available to firm. According to (velury, Reisch, & O,Reilly, 2003) institutional investors desire high profitability firms as compare to high growth firms. This outcome is more confirmed by (Hutchinson, Seamer, & L.E., 2015). (Wright P. , Ferris, Sarin, & Awasthi, 1996) verified that institutional owners influence forthcoming risk taking of merely those firms which have growth prospects, whereas manager at little equity stakes effect positively risk taking of firms having growth possibility but this association is inversed at high level of equity. (Laeven & Levine, 2009) , Used following formula to calculate growth opportunities.

$$\text{Tobin`s Q} = \frac{\text{Market value of equity+ book value of debt}}{\text{Book value of assets}}$$

One of significant factor of company`s risk is leverage it also shows tendency of bankruptcy, following the preceding studies (Pathan, 2009), (Paligorova T. , 2010) & (Chen S. , 2011). We go with the formula of:

$$\text{Leverage} = \frac{\text{BV of total Debt}}{\text{BV of total assets}}$$

Firms having a big size have more leverage though risk level is low in those firms (Gursoy & Aydogan, 2002). Liquidity of a firm also effect firms decision making (Laeven & Levine, 2009) & (Kim & Lu, 2011) .The effect of liquidity on risk in Colombian bank was negative and small in magnitude (Martinez & Ramirez, Ownerhip structure and Risk at Colombian Banks, 2011). Liquidity (LEQ) situation of firm is calculated by ratio of current assets and current liabilities of firm i.e.

$$\text{Current Ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

3.2.4 Research Methodology

Apart from other aims and goals one purpose of the study is to control for endogeneity in our empirical model. It is of outmost important because in a dynamic model a lagged dependent is correlated with the firm fixed effect, which results in bias of pooled regression OLS estimator. Many researchers in past have applied pooled OLS regression to see impact of governance measures for example (Mehran, 1995) & (Klein A. , 1998). Strict assumptions are needed for consistency of OLS coefficients estimates. Assumptions required that independent variables are strictly orthogonal to the errors and identically normally distributed with mean of zero and variance equal to $\sigma 2$. Following sources of endogeneity have been identified by (Wintoki, Linck, & Netter, 2012) relating to corporate governance measures.

Dynamic Endogeneity: Dynamic endogeneity exist when present values are affected by past values of variables. In governance measures present values are usually affected by past values for example poor performance of the firm in past may affect the present management to make changes in board structure to get better performance (Hermalin & Weisbach, 2003). In panel data where we have data of firms over time, this kind of endogeneity is a real possibility. However this endogeneity is mostly ignored giving rise to dynamic panel bias. Positive correlation between error term and regressor violates basic assumptions of OLS making OLS estimates inconsistent.

Simultaneity: When two variables are co-determined, so that both variables might influence the other simultaneously stems the issue of endogeneity for example in order to avoid insolvency risk manager may alter the leverage of the company hiding actual risk.

Unobserved-Heterogeneity: It occurs when a relation between two or more variables is affected by some omitted variables such as CEO skills and experience may affect board

structure and other corporate governance variables. For instance manager skill and CEO level of risk taking can affect the firm's performance (Haubrich , 1998).

Fixed effect panel regression was applied by (Yermack, 1996)& (Himmelberg , Hubbard, & Palia, 1999) in order to address endogeneity concerns. If unobservable characteristic are continuous over time for an individual firm, one can use fixed effect model to get consistent results (Petersen, 2009). It is possible to get consistent results in fixed effect, if one has small T series and large cross sections but only under strict assumption of exogeneity. It is likely that a firm is exposed to simultaneity and dynamic endogeneity and, hence strict supposition of exogeneity is debased. Many previous works of governance suggest proof of simultaneity (Coles, Lemmon, & Meschke , 2012) & (Welch, 2003). Incapability to control for dynamic endogeneity and simultaneity exposes fixed effect estimates to hazards of endogeneity. As a result we apply dynamic system GMM model which is robust to all above categories of endogeneity.

3.2.5 GMM Model

GMM model was established by (Hansen , 1982), it uses non parametric approach to estimate model parameters. GMM model doesn't impose distributional restriction on the model and its standard errors are robust to autocorrelation and unknown heteroskedasticity. One most necessary characteristic of GMM model is the use of internal instruments present in the system. In simple words we can say that GMM model built equations and combines moment conditions for each using lags of variables (Roodman, 2009). Method uses lags of dependent and explanatory variables as instruments, we in our analysis will use lag of corporate risk (dependent variable) to estimate the effect of past risk taking on present risk taking.

(Arellano & Bover , 1995)& (Blundell & Bond, 1998) developed a new system of level equation and simultaneous differences in framework of GMM Model that in presence of specific conditions yield more efficient estimators than the difference GMM. This new method estimates by adding a level equation, it is commonly referred as dynamic system GMM. Both GMM methods follows same two steps, Dynamic system GMM produces consistent estimates robust to simultaneity, dynamic endogeneity and unobservable heterogeneity.

We have developed a model following work of (Wintoki, Linck, & Netter, 2012), we assume that all governance variable and control variables are endogenous. Our model to measure the effect of current board structure on corporate Risk is as follow:

$$Yit = a1 + k1yit-1 + \sum i=1 Bj\ BOD\ it + Y\ Control\ it + OX\ it + Ui + E\ it$$

Where Yit is a dependent variable, (all measure of risk Total risk, systematic risk, Firm Risk, Z score and Standard deviation ROA). yit-1 is the first lag of dependent variable, BOD represents all measure of board structure representing Board size, CEO duality and female directors, control it represent all measure of control variables namely leverage, firm size, current ratio, ROA, and Market to book ratio

To confirm a need to apply GMM method on our data a formal test to determine the endogeneity of regressors was done. Durbin Watson Hausman test of endogeneity (Durbin, 1954), (Hausman J. , 1978)& (Wu, 1973) was applied to confirm our deviation

from usual method of OLS and fixed effect regression. Result of Durbin Watson Housman test is reported in table 5. Result show that regressors are endogenous to corporate risk measures of total risk, firm risk, volatility risk and solvency risk, while exogenous to beta risk. Results are reported in table 5, specifying the regressors having endogenous behavior. GMM method of estimation is a useful approach as it only needs realistic assumption of sequential exogenity and also corrects for potential sources of endogeneity. Results of OLS, Fixed effect, difference GMM and system GMM is reported for comparison.

3.2.7 Empirical Model

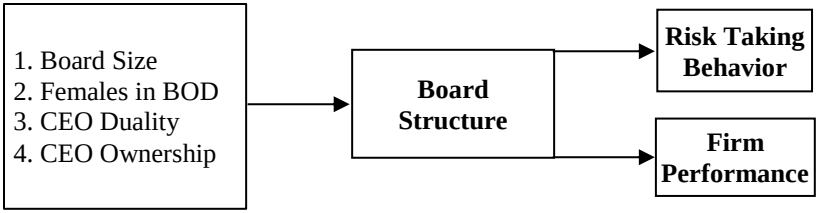
Relationship discussed between board structure and risk taking can be studied with the help of panel data regression technique. We purpose following model in order to evaluate the influence of board structure on risk taking in presence of control variables. Our time-series cross-section model employs the following structure:

$$\begin{aligned} RISK_{i,t} = {} & V_1 Board\ size_{i,t+} V_2 Female\ size_{i,t} + V3 CEO\ duality \\ & + V4 CEO\ ownership\ V_5 Size_{i,t} + V_6 LIQ_{i,t} \\ & + V_7 LEV_{i,t} + V_8 Tobins`Q_{i,t} + V_9 PROF + E_{i,t} \end{aligned} \quad (1)$$

Where:

- **i**= 1, 2, 3… (They are cross sectional identifier).
- **t**= 1, 2, 3… (This is time-series identifier covering period 2008 to 2018).
- **RISK**= risk is represented by different proxies; (TR), systematic (SYSR) and idiosyncratic risk (IDOR) all three are form of Market risks. Volatility of earnings measured by Standard deviation of ROA and Z-score a composite measure of risk are both balance sheet measures.
- **Board size**= number of directors in board of directors.
- **Female size**= number of females in board of directors.
- **CEO Duality**= CEO having dual responsibility (working as CEO and chairman of Board)
- **CEO Ownership=** dummy variable (if CEO owns shares in a company value of 1 is given)
- **Tobin`s Q =** is basically growth opportunity and calculated by Market value of Equity+Book value of debt/Book value of Assets
- **Size** = log of total assets is a proxy for firm size
- **LIQ** = current assets/current Liabilities
- **LEV** = debt/total assets.
- **PROF** = Return on Assets.
- $\mathbf{E_{i,t}}$ = Error term.

3.2.8 Theoretical Model



4. ANALYSIS AND DISCUSSION

Table 4.1
Descriptive Statistic

Panel A Risk measures						
Variable	**Mean**	**SD**	**Median**	**Skew**	**Kurt**	**Range**
Total risk %	4.3	4	3.0	4.2	23.8	7 – 40.8
Firm Risk %	4.2	4.1	3.01	4.9	35.9	0.9- 51
Systematic Risk	0.89	0.72	0.82	1.28	10.5	-3.6- 7.7
Z score	12.8	12.9	9.27	2.92	15.27	0.04 - 131
S.D of ROA %	6.09	7.0	4.3	4.65	30.3	0.063-74
Panel B Board Structure						
Board Size	8.1	1.59	8	1.83	4.08	6-15
Female Director	0.57	0.93	0	1.80	2.92	0-5
Panel c Control Variables						
Total Assets (million)	19846	56622	4332	7.92	91	6.12-924546
Return on Assets %	4.0	11	3.6	0.574	3.80	-43 - 72
TOBINS Q	1.6	2.2	0.987	5.05	41	0.045-30
Debt/Asset	0.67	0.445	0.639	3.01	15.68	0.0059-4.16

Table 4.2
Analysis

Variable	Frequency	Percent
1. CEO Ownership	**1800**	**100**
Present	853	47.4
Absent	947	52.6
2. CEO Duality	**1800**	**100**
present	377	20.9
Absent	1423	79.1

4.1 Descriptive Analysis

Descriptive statistics were applied to get summary of the data. The table 4.1 represents summary of descriptive statistic for our time series and cross sectional data. The data set includes 1800 firm-year observations of 225 non-financial public firms listed on Pakistan stock exchange from 11 different non-financial industrial sectors covering the period from 2009-2018.

The descriptive statistics have included the mean, standard deviation, median, skewness and kurtosis of the key variables used in the analysis. As can be noted in Table 4.1, some mean values are very peculiar due to the extreme values, causing a high standard error. This makes mean values biased so, we also calculate the median values of all the variables including governance and firm-specific variables. Median is a better indicator of average statistics and is more fitting to analyze and draw conclusions from.

Variables are divided into three panels, panel A is consisted of five dependent variables, panel B is consisted of board structure variables which are independent and panel C is constituted of control variables. Descriptive summary of Panel A is presented in Table 4.1, the mean value of total risk is 4.3% per annum, the mean value of idiosyncratic risk is 4.2 %, and both values are very similar. Standard deviation of total risk is 4% and of idiosyncratic risk is 4.1%. Median value for total risk is 3% and for idiosyncratic risk is 3.01%. Total risk has skewness value of 4.2, while value for idiosyncratic risk is 4.9. Kurtosis value for total risk is 23.8 and for idiosyncratic risk are 35.9. Systematic risk is calculated by beta values, mean value for systematic risk is 0.89. Value of 1 indicates that stock prices volatility is equal to overall market stock volatility. Mean value of 0.89 indicates that on average stock prices are 11% less volatile than overall market stock. The Total risk level in Pakistani non-financial firms is less than Japanese firms, according to (Nguyen P. , Corporate governance and risk-taking: evidence from Japanese firms., 2011) in Japan total risk level is 11.9%. Contrariwise total risk in US firms is 2.13% (Anderson & Fraser, 2000) which is meaningfully less than Pakistani firms. The average volatility in balance sheet earnings is 6.09%. The mean (median) value of Z-score is 12.8 (9.27) with a minimum of 0.04 and maximum value of 131. There are significant changes in risk levels (measured by different formulas) over the period of time 2009 to 2018.

The Table indicates that risk measures are rightly skewed distributions with maximum values determined on left of the mean, while extreme values on the right of the mean. Kurtosis indicates evenness and peak values of the distribution. TR, IDOR and Z-Score are leptokurtic distributions and show that distribution is sharper than normal with thicker tails. The standard deviation is the variation of these variables. High standard deviation reflects tendency of the data to lie far from mean values. Standard deviation of all risk measures are close to the mean values, results infer that data varies significantly across time and sections.

Panel C of Table 4.1 shows descriptive statistics of control variables. In terms of financial data and information, the mean of net assets that is, the mean firm size of Pakistani firms is 19846 Million PKR and a median firm has about 4332 Million PKR in net assets. Average return on assets is 4% with standard deviation of 11%, we see a lot of

variation in return on assets, some firms earning very high profit rate while other showing losses.

Tobin's Q is a measure of firm value and a performance measure which is being used by researchers in studying the stock markets behaviors. It is also a proxy for the firm's investment opportunity set and growth opportunities. The use of this measure is extended in recent years as a measure comparative to traditional performance variables. The TOBINS Q is a comparative measure of market value of firms in relation to book value of firm. A value of TOBINS Q greater than one indicates the strength of the firm in the market. Mean value of TOBINS Q is 1.6 in Pakistan which means that the market value of firms in Pakistani market, on average, is greater than their respective book value; firm's level of risk taking is also contingent on the presence of growth opportunities (Wright P. , Ferris, Sarin, & Awasthi, 1996). Pakistani firms on average have less value of TOBINS Q as compared to European firms, which have a value of 1.7. The mean for leverage ratio is 0.67 with a standard deviation of 0.445; it ranges from 0.0059 to 4.16. Range depicts that few firms are self-efficient and few depends too much on debt for financing. The mean (median) of current ratio is 1.5 (1.11) with standard deviation of 1.35. Table 4.1 shows that firm size and TOBINS Q vary significantly over time and other control variables remain constant over time. All control variables vary across industry and are rightly skewed.

4.2 Board Structure

Data of board structure depicts that size of board ranges from 6-15 directors with a mean value of 8.1 and median value of 8. Standard deviation value is 1.59; standard deviation is considerably small indicating that most firms on average have about 8 directors in corporate board.

Female directors in corporate board have a small mean value of 0.57 with median value of 0. In developing countries like Pakistan, society is mainly men dominated. We rarely see women in corporate world, especially at high position like directors. Business families mostly give chance to their relative female members to act as directors in corporate board.

20.9 % firms have given CEO dual responsibility of chairmanship, while 47.4% CEO owns shares in the firms. Most of the countries have strict corporate governance codes which request firms to split role of CEO and chairman (Abobakr & Elgiziry, 2015).

Table 4.3
Regressors Endogeneity test

H0:Regressors are Exogenous					
	Total risk	**Firm risk**	**Beta Risk**	**S.D (ROA)**	**Z score**
DWH Test Statistic	82.3	81.4	11	22	26
p-value	0.000	0.00	0.2	0.009	0.002

Table 4.4
Total Risk and Firm Risk (OLS, Fixed.E & Random.E)

Variables	Total Risk			Firm Risk		
	OLS	Fixed Effect	R.E	OLS	Fixed Effect	Random E
Constant	3.58 (32.3)***	3.97 (5.69)***	3.64 (15.16)***	3.89 (34.4)***	4.09 (5.39)***	3.90 (16.26)***
Board size	-0.018 (-2.63)***	-0.0405 (-2.01)**	-0.025 (-2.51)**	-0.022 (-3.18)***	-0.042 (-2.23)**	-0.029 (-2.81)***
Female Director	-0.00097 (-0.09)	0.025 (0.60)	0.014 (0.63)	0.0056 (0.49)	0.039 (1.08)	0.024 (1.15)
CEO Duality	0.067 (2.53)**	0.173 (2.62)**	0.134 (2.71)***	0.028 (1.03)	0.178 (2.33)***	0.12 (2.13)**
CEO Ownership	0.116 (5.05)***	-0.102 (-1.08)	0.082 (1.91)*	0.122 (5.19)***	-0.081 (-0.80)	0.09 (1.99)***
Firm Size	-0.143 (-21.7)***	-0.147 (-3.16)***	-0.144 (-10.06)***	-0.16 (-24.4)**	-0.158 (-3.08)***	-0.16 (-10.50)***
Leverage	0.157 (5.50)***	-0.101 (-0.82)	0.104 (1.73)*	0.17 (5.84)***	-0.107 (-0.80)	0.104 (1.58)
Return on Asset	-1.07 (-10.04)***	-0.421 (-2.59)***	-0.609 (-3.95)***	-1.06 (-9.67)***	-0.41 (-2.41)**	-0.599 (-3.68)***
Tobin's Q	-0.015 (-3.19)***	-0.0056 (-0.88)	-0.011 (-1.78)*	-0.015 (-3.24)***	-0.0059 (-0.86)	-0.011 (-1.67)*
Current Ratio	-0.043 (-4.88)	-0.0145 (-1.09)	-0.028 (-2.28)***	-0.047 (-5.21)***	-0.0169 (-1.31)	-0.031 (-2.62)***
F-value	162.7***	4.92***	-	185.8***	5.06***	-
Wald-x-statistic	-	-	254.4***	-	-	287.4***
Adj -R	44.7%	30.72 %	43.28 %	48.04 %	35.1 %	46.4 %
No of observation	1800	1800	1800	1800	1800	1800
Breusch Pagon	180.93***	-	-	-	(105.3)***	-
Breusch Godfrey	437.3***	-	-	193.3***	-	-
Xttest 3	-	4448.4***	-	485.7***	-	-
Hausman Test	-	(102)***	-	-	-	-

Fixed effect and random effect estimates are calculated by using clustered robust errors. *** represent significance at 1% level. ** represent significance at 5% level and * represent significance at 10% level. Figure inside the parenthesis represent z and t statistic, while figure above represents coefficient.

Table 4.5
Total Risks and Firm Risk (Dynamic GMM)

Variables		Total Risk		Firm risk	
		Difference GMM	**System GMM**	**Difference GMM**	**System GMM**
L1.		0.47 (64.9)***	0.478 (59.84)***	0.54 (31.9)***	0.55 (50.3)***
No of Director		-0.098 (-20.2)***	-0.081 (-21.83)***	-0.021 (-1.87)*	-0.047 (-7.81)***
Female Director		0.024 (2.52)*-	0.032 (4.78)*	0.0005 (0.03)	0.020 (1.95)
CEO Duality		0.081 (7.59)***	0.062 (6.73)***	0.094 (3.26)***	0.105 (6.58)***
CEO Ownership		-0.15 (-4.7)***	-0.032 (-2.75)***	-0.101 (-2.28)**	-0.032 (-1.67)*
Firm Size		0.08 (11.9)**	-0.021 (-5.72)**	0.139 (6.53)***	-0.019 (-3.06)***
ROA		-0.505 (-19.8)***	-0.88 (-37.4)***	-0.74 (-10.22)***	-0.988 (-22.75)***
Debt/Asset		-0.288 (-16.62)	0.033 (4.67)	-0.315 (-3.76)	0.036 (2.87)
TOBINS Q		-0.008 (-8.21)	0.0053 (5.35)	-0.0069 (-2.07)	0.0041 (1.96)
Current Ratio		-0.039 (-12.77)**	-0.042 (-14.76)**	-0.058 (-6.13)**	-0.025 (-5.25)**
Constant		-0.84 (-3.2)***	1.63 (4.88)***	-1.16 (-3.15)***	1.16 (13.31)***
J/ Sargan		Chi(2) 211 p value=0.28	Chi(2)= 219.6 p value =0.96	Chi(2) 202.8 p value = 0.43	Chi(2) 221 p value = 0.96
Serial Correlation	**1st order**	Z=(-6.8)***	Z=(-7.06)***	(-7.57)***	(-7.54)***
	2nd order	Z=(-0.63)	Z=(-0.32)	(-0.500)	(-0.184)

The parameters are produced using two step GMM estimates with robust standard errors. *** represent significance at 1% level. ** represent significance at 5% level and * represent significance at 10% level. Figure inside the parenthesis represent z statistic, while figure above represents coefficients. L represent lag.

4.3 Total Risk and Board Structure

Total risk is a measure of stock return volatility. Board structure plays important role in devising firm risk. Model measures impact of board size, female director, CEO ownership, CEO duality, firm size, leverage, Return on Assets, current ratio and growth value of firms on total Risk.

Results of Housman test show that fixed effect method is suitable for the model in comparison to random effect model. According to the results of GMM method board size has negative relation with total risk and relationship is statistically significant. This means that smaller boards are more risk taking and larger boards are risk averse. Coordination among the board members plays an important role in decision making. Smaller boards tend to have a better coordination and it's easy to make decisions in smaller board. Smaller board easily develop consensus among the members and invest in

risky projects to earn maximum profit. Our findings are similar to research conducted by (Chumba, 2015), (Ferrero Ferrero, Ángeles , Muñoz, & Torres, 2012) (Nguyen P. , The impact of foreign Investors on the risk taking of Japanese Firms, 2012) their research findings suggested that risk is negatively affected by board size.

Size of female directors in the board has a positive impact on risk taking, however the relation is insignificant. Size of female directors in a board is very small as a result they have a minimal role to play in the board decisions. Overall Pakistani women are not very active in business world of Pakistan, however business families usually include related female members in the board. Family owners have a tendency to take excessive risk to maximize profit.Research conducted by (Abobakr & Elgiziry, 2015) had different results showing that risk measures are negatively affected by female directors.

CEO duality means that CEO having dual responsibility in the board, A CEO also acting as managing director of the board is said to be a CEO with dual roles. A CEO with dual role is very influential and powerful; he has control over management and enjoys much influence over board of directors. CEO with dual roles is in ideal position to influence decision making and enjoys greater power. It will be interesting to see preference of dual CEO regarding risk taking. Results for OLS, fixed and Random regression are statistically significant. All result shows statistically significant positive relation with total risk. This means that presence of dual CEO in the board tend to increase total risk level. Power concentrated in hands of CEO increases firm risk level and CEO with power usually takes higher risk to get better results. A powerful CEO has a clear mind and authority to take decisions. It is easy for dual CEO to convince other members of the board, as he has both direct link with the management and board. A dual CEO can easily influence board members to invest in risky projects and board members usually rely on dual CEO because he is in a better position to access company's needs. Similar results regarding CEO duality were inferred by (Abobakr & Elgiziry, 2017) in context of Egyptian firms. This research has contrary findings with the previous studies which infer that CEO duality decreases risk taking behavior (Buchanan & Hee-Kim, 2008), (Pathan, 2009)& (Akbar, Kharabsheh , Hughes, & Shah, 2017). Return on Assets and current ratio has a significant negative relationship with total risk.

4.4 Firm Risk and Board Structure

Firm risk is part of total risk; total risk consists of firm risk and market risk. A firm has a total control over firm risk because it totally depends on risk choices of the firm. Market risk depends on market situation, which is not in the hand of the firm.. Result show that small board tends to be risk taking and large boards tend to be risk averse. Results are similar to the outcomes in total risk. Small boards have less issue of coordination and debates within the board are easy to resolve. Small boards take high risk and try to invest in risky projects to maximize return.

Results regarding size of female directors in the board show that their effect is positive to firm risk but relation are insignificant. In Pakistan very small number of companies has female directors in the board and their number is often very small. Mostly they are representing private families and protect their interest. Private families have a tendency to maximize their interest by taking excessive interest.

CEO duality is another important variable to have impact on firm risk. CEO with dual role is very powerful and strong. Result shows that CEO duality has a significant impact on firm risk. According to the results CEO duality increases firm risk level. It is easy for

CEO with dual roles to influence board and management. Decision making process becomes much easy and less complicated. A dual CEO is a center of power and decision making within the board is easy and smooth. Less complications within the board and concentration of power in one hand makes decision making process easy. This usually increases firms risk level, because unnecessary analysis regarding projects is avoided and decisions are made by looking at the face values of the project. Return on Asset and current ratio has a significant negative relationship with firm risk.

Table 4.6
Beta Risk and S.D ROA (OLS, Fixed .E & Random.E)

Variables	Beta Risk			S.D ROA		
	OLS	Fixed Effect	OLS	Fixed Effect	OLS	Fixed Effect
Constant	2.30 (140.9)***	2.205 (43.98)***	2.29 (79)***	0.996 (10.24)***	-0.34 (-0.83)	0.495 (2.04)**
Board Size	0.00040 (0.39)	0.0025 (1.50)	0.0002 (0.16)	0.00024 (0.04)	0.00026 (0.02)	-0.0053 (-0.48)
Female Director	0.00051 (0.31)	0.00095 (0.32)	0.0016 (0.64)	-0.024 (-2.46)**	0.0096 (0.41)	0.0041 (0.21)
CEO Duality	0.0055 (1.43)	-0.0137 (-2.37)**	-0.0041 (-0.81)	-0.025 (-1.07)	-0.108 (-2.96)***	-0.089 (-2.65)***
CEO Ownership	0.00087 (0.26)	-0.023 (-2.43)**	-0.00059 (-0.11)	-0.016 (-0.80)	-0.014 (-0.19)	0.002 (0.04)
Firm Size	0.0043 (4.43)***	0.0091 (2.99)***	0.0046 (2.69)***	-0.035 (-6.04)***	0.051 (1.98)**	-0.00082 (-0.06)
leverage	0.0206 (4.89)***	0.0373 (3.34)***	0.029 (3.62)***	0.204 (8.16)***	0.213 (3.23)***	0.203 (4.39)***
Return on Asset	-0.069 (-4.40)***	0.0048 (0.30)	-0.0265 (-1.58)	0.2701 (2.87)***	0.241 (1.63)	0.210 (1.53)
Tobins Q	0.00063 (0.89)	0.0029 (2.70)***	0.0021 (2.11)**	0.0187 (4.43)***	0.026 (3.09)***	0.026 (3.47)***
Current Ratio	-0.0018 (-1.37)	0.00098 (0.71)	-0.00052 (-0.41)	0.00099 (0.13)	-0.0015 (-0.13)	0.0007 (0.06)
F-value	-	7.22***	-	17.3***	6.50***	-
Wald-x-statistic	-	-	63.02***	-	-	42.27***
Adj -R	-	1.41%	5.08%	7.56%	0.54%	5.27 %
No of Observation	1800	1800	1800	1800	-	-
Hausman Test	-	(48.75)***	-	-	(32.26)***	-
Breusch Pagon	7.31***	-	-	5.21**	-	-
Breusch Godfrey	114.2***	-	-	742.5***	-	-
Xttest 3	-	65128***	-	-	120000**	-

Table 4.7
Beta Risk and S.D ROA (Dynamic GMM)

Variables		Beta Risk		S.D ROA	
		Difference GMM	**System GMM**	**Difference GMM**	**System GMM**
L1.		-0.099 (-5.38)***	-0.074 (-5.66)***	0.417 (32.51)***	0.518 (122)***
No of Director		0.0068 (4.80)**	0.0044 (3.68)**	-0.01 (-1.62)	0.0039 (2.93)
Female director		-0.0052 (-1.90)	0.0049 (2.66)	0.024 (3.6)*	0.0182 (8.03)*
CEO duality		-0.01 (-2.4)*	-0.022 (-5.44)**	-0.04 (-2.89)**	-0.0131 (-2.71)**
CEO ownership		0.0054 (0.66)	0.05 (9.38)**	0.352 (6.34)**	0.0091 (1.83)**
Firm size		0.011 (4.95)**	0.0041 (3.20)**	-0.015 (-3.41)***	-0.041 (-22.21)***
ROA		0.087 (6.45)**	-0.0061 (-0.62)*	0.255 (7.81)***	0.198 (24.28)***
Leverage		0.111 (11.76)***	0.052 (14.22)**	0.089 (6.41)***	0.087 (21.9)***
TOBINS Q		0.011 (19.7)**	0.0062 (16.2)**	0.011 (16.5)***	0.011 (49.3)***
Current Ratio		0.001 (4.95)	-0.0002 (-0.15)	-0.026 (-8.85)***	-0.01 (-9.2)***
Constant		2.28 (41.07)***	2.39 (67.7)***	0.479 (5.50)***	0.86 (24.6)***
J/ sargan		Chi(2) = 196, p value=0.55	Chi(2)=218.6 p value=0.9	Chi(2) 200 P value 0.4	Chi (2) 196 P value 0.229
Serial Correlation	1st order	Z=(-2.8) ***	(-2.8)***	(-5.06)***	(-5.3)***
	2nd order	Z=(0.52)	(1.09)	(-0.18)	(-0.45)

4.5 Beta Risk and Board Structure

One very important measure of risk is beta. Beta will give us insight regarding market risk. Total risk constitutes firm risk and market risk. Performance of the market plays a significant impact on firm performance and risk. It is of utmost importance to analyze risk in term of market.

Results show that board size has positively significant relation with market risk. Large boards take high market risk, as diverse advice is available from different members of the board; market risk is well understood and tackled well by large boards. Due to confidence from board members, large board takes high market risk to maximize the profit.

Size of female members in the board has an insignificant relationship with the market risk. We have discussed earlier that in context of Pakistan, mostly females in the board are due to family ownership structure and they don't play active role in the board. Secondly only few companies have female directors in the board and number of females directors is also very fewer.

According to the results CEO duality has negative relationship with beta risk and it is significant. Practically CEO is actively involved in management related work and keeps close eye on the market and industry. He has first-hand knowledge of the market, because he is involved with day to day work of the firm and is the person who mostly communicates with third parties. One can say that due to nature of his position he can be the best person to analyze the market. So most boards depend on CEO and give him authority to access market and take required risk accordingly. Results show that CEO duality results in less market risk taking. This is because being solely responsible for accessing market and taking decisions regarding it make CEO little conservative in approach. They tend to avoid market risk so that unfavorable setbacks can be avoided. Market forces are totally external factors which can affect the firm, CEO with dual roles tends to play safe and become risk averse. Previous researches (Pathan, 2009) & (Stulz R., 1988) are consistent with our findings. Firm size and leverage have a significant positive relation with beta risk.

4.6 Standard deviation (ROA) and Board Structure

Standard deviation of Return on Assets is a balance sheet measure of risk. Fluctuation in return on assets is one measure of risk. Return on Asset is a popular measure used by all the stake holders to access firm performance. Variability in return on asset is a balance sheets measure which can be used as a proxy of risk.

Result shows that size of board and size of female directors in the board does not have a significant relationship with the variability of ROA. Return on asset is the actual earning of the company and it reflects both short term and long term investments of the companies. Size of board keeps on changing, few member of the board are temporary and join the board as consultant. However size of the board does not affect variability of return because most of the ROA is dependent on long term projects which provide continuous stream of return to the company. Size of board keeps on changing depending on the election results, few board members make to the board every time, while few replaced/added depending on the election. However it is difficult for new entrants in the board to make extreme changes in the company policy which can affect variability in ROA. Female directors are mostly representing family owners in the board and have very minimal role. So relation of female directors is insignificant.

CEO duality has a significant negative relation with variability of return on assets. A dual CEO is a powerful person and usually serves the board for long period of time. He is a focal person to negotiate for long term and valuable projects of the company. Long term projects usually yields constant and continuous returns for the company which reduces variability and risk. So it is logical to conclude that CEO with dual responsibility reduces balance sheet variability. Variability of ROA has positive significant relationship with return on asset, leverage and Tobin's Q, while relationship with firm size is significantly negative.

Table 4.8
Z score (OLS, Fixed.E, Random.E & Dynamic GMM)

Z Score					
Variables	**OLS**	**Fixed Effect**	**Random E**	**Difference GMM**	**System GMM**
L1	-	-	-	0.498 (129)***	0.68 (118.9)***
Constant	0.743 (6.62)***	3.92 (4.75)***	1.98 (3.18)***	2.78 (82.8)***	0.937 (17.2)***
Board Size	-0.019 (-2.73)***	0.0089 (0.71)-	0.011 (0.80)	0.027 (12.7)	0.01 (3.35)
Female Director	0.015 (1.36)	-0.0087 (-0.42)	-0.011 (-0.56)	-0.021 (-9.85)	0.0015 (0.28)
CEO Duality	0.032 (1.21)	0.003 (0.06)	0.024 (0.52)	0.0021 (0.49)	-0.042 (-4.17)
CEO Ownership	-0.04 (-1.73)*	0.021 (0.21)	-0.0288 (-0.49)	-0.53 (-44.5)**	0.096 (8.95)**
Firm Size	0.032 (4.83)***	-0.17 (-5.94)***	-0.052 (-1.24)	-0.13 (-71.2)**	-0.049 (-14.6)**
Leverage	-0.35 (-12)***	-0.74 (-5.94)***	-0.57 (-5.64)***	0.64 (79.3)***	0.43 (14.6)**
Return on Asset	1.25 (11.57)***	0.832 (5.20)***	0.975 (5.53)***	-0.522 (-79.9)***	-0.13 (-17.2)
TOBINS Q	-0.043 (-8.97)***	-0.033 (-3.43)***	-0.038 (-3.92)***	0.013 (55.4)**	0.0004 (0.49)
Current Ratio	0.039 (4.32)***	0.019 (1.46)	0.021 (1.74)*	0.045 (29)**	0.031 (16.37)***
F-value	88.13***	9.14***	-	-	-
Wald-x-statistic	-	-	94.7***	-	-
Adj -R	30.3%	11.62%	24.2%	-	-
No of observation	1800	-	-	-	-
J/Sargan Test	-	-	-	Chi(2) 207 P value 0.33	Chi (2) 173 p value 0.15
Serial Correlation	1st order 2nd order	-	-	Z= (-3.94) *** Z=(0.53)	(-4.14) *** (0.86)
Hausman Test	-	(123.5)***	-	-	-
Breusch Pagon	45.27***	-	-	-	-
Breusch Godfrey	872.3***	-	-	-	-
Xttest 3	-	56908***	-	-	-

4.7 Z score and Board Structure

Z score is a measure to calculate solvency position of the firm. Debt policy of the firm plays big role in determining solvency position of the firm. If we get high value of Z score, it means that distance from solvency is more and firm is in a strong financial position. If Z score value is small, it means that a firm has threat of solvency and is at high risk.

Debt plan of the firm is a long term policy; firms typically take long term and short term loans. Usually long term loans are taken because of low interest rate and to support long term projects which streams uniform returns. It can be inferred that debt policy of the firm is made for long term and it does not change over short period in normal circumstances.

Results show that board size, female director's size and CEO duality does not have a significant relationship with Z score. Z score depends on firm debt choice which is a topic of long term policy of the firm. It does not changes over period of short time, as a result the above independent factors does not have a significant impact on z score. Board of directors can potentially vary in every election, so does the female directors size and role of CEO. Firm size and ROA has a negative significant relation with the Z score, which means that larger firms have more solvency risk than smaller firms due to their aggressive debt policy. While leverage and current ratio has a positive relation with Z score meaning that high leverage and current ratio results in decrease of solvency risk.

4.8 GMM Method

In presence of serial correlation and hetroskedsacity, when one have large N and small T using clustered /robust standard error option in fixed effect can control for hetroskedsacity and serial correlation (Driscoll & Kraay, 1998). However all type of endogeneity is well controlled by using GMM method. Result of OLS, Fixed effect and Random effect are also reported in tables. Result of GMM method show that significant relations inferred from OLS method are biased due to presence of endogeneity. While result of fixed effect are different to GMM but very close and similar because fixed effect technique can account for unobservable heterogeneity and in data with small T and large N can also control for serial correlation using clustered/robust standard errors, both of which are major sources of endogeneity. GMM method is more reliable because it controls for all possible forms of endogeneity and also requires weak assumption of exogeneity. So in corporate governance relation to firm risk taking, important issue of endogeneity must not be ignored, as without addressing it one will get spurious relations that will lead towards conclusions difficult to interpret and rely on.

5. LIMITATIONS

There were few limitations in the research that should be taken into concern in future research. One limitation was that only data of non-financial firms were taken into consideration. Future researches can take data of financial firms and a comparison can be made of risk preferences between non-financial firms and financial firms. Other determinants of board structure can be included in future research like board independence. One can also make industry wise comparison in future research.

6. CONCLUSION

The aim of the study is to test the relationship between board structure and risk measures by using a sample of 225 non-financial firms operating in Pakistan during period of 2008-2018 with total number of 1800 observations. We have used five different proxies for risk; total risk, firm risk and beta risk are measures of risk representing stock prices, while Z score and volatility of return are the accounting based proxies for risk. To the researcher knowledge it is the first study in Pakistan to investigate relationship of board structure and risk measures. Findings of this study will not only be useful for Pakistani policy makers but for their counterparts in other developing countries. Findings for board size show that large boards result in reduction of total risk and firm risk. In large boards usually we have problem of coordination and communication which hampers risk taking. Small boards due to better coordination, communication and swift decision making are in a better position to make decision and hence take higher risk. .Our findings are consistent with previous studies conducted by (Chumba, 2015), (Nguyen P. , 2012), (Rachdi, H, & Ben I, 2011). While in case of market risk large boards take more risk, large boards have more resources and can divide the work between them, they are in a better position to access market risk and take decisions accordingly (Zahra & Pearce, 1992) & (Goodstein, Gautam, & Boeker, 1994).

Findings show that female director size has a positive relation with total risk measures including total risk, while relationship with other risk measures is insignificant. Females usually represent business families and try to pursue interest of families by taking excessive risk. Our research is consistent with finding of (Adam & Funk, 2016) (Berger , Kick, & Schaeck , 2012).

CEO duality has a positive significant relationship with total risk and firm risk, while relationship with beta risk and volatility is negative. CEO is a powerful person and giving him additional duty of chairmanship gives him extra power, CEO tries to align interest of management with shareholders and take extra risk to increase firm value. Our findings are consistent to (Lewellyn K.B & Kahle M.I, 2012), (Rachdi H,, Trabelsi M.,, & Trad N.,, 2013) & (Salhi & Boujelbene, 2012).

Accessing market risk is a big challenge, CEO with dual responsibility take calculated risk regard to market in order to avoid undue risk as a result risk averse attitude towards market risk is seen. CEO with dual roles are appointed for long time and investing in large term projects yield constant returns over time, which reduces variability and risk level (Pathan, 2009)& (Buchanan & Hee-Kim, 2008).

We also controlled for endogeneity and used GMM method for results. Results from OLS, Fixed Effect, and Random Effect are also reported for purpose of comparison and robustness. Results suggest that for large N and small T observations using clustered/robust standard errors in fixed effect control for serial correlation and hetroskedascity. Results of GMM method vary slightly from fixed effect showing possible endogeneity, which is not controlled in fixed effect estimate.

Control variable show that firm size has a negative relation with total risk and firm risk, while leverage has a positive association with risk measures, while current ratio has a negative relation with total risk level. CEO ownership is a dummy variable and result

show that CEO with ownership shares reduces firm's risk taking. Finally the empirical evidence suggests board size, female member size and CEO duality are significant determinants of risk taking in non-financial firms.

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