Impact of Firm Level Accounting Variables on the Market, Interest and Exchange Rate Risk: Evidence from Pakistan's Non-Financial Firms

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CERTIFICATE

This is to certify that this thesis entitled **"Impact of firm level accounting variables on the market, interest rate and exchange rate risk: evidence from Pakistan's non-financial firms"** submitted by **Mr. Muhammad Haroon Shah** is accepted in its present form by the Department of Business Studies, Pakistan Institute of Development Economics (PIDE) Islamabad as satisfying the requirements for partial fulfillment of the Degree of Master of Philosophy in Economics and Finance.

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ABSTRACT

This study examines the impact of firm specific variables on the market, interest rate and exchange rate risk. This is achieved in two folds. In the first step, the sensitivities of the returns to market, Interest rate and Exchange rate changes are estimated. In the following step, relationship between these sensitivities and firm specific variables is examined. The study employs, based on market capitalization, a sample of 104 non-financial firms listed on Pakistan Stock Exchange. In the first step, Simple Linear Regression Model is used to estimate the sensitivities (β) of the firms. In the second step, the study incorporates Generalized Method of Moments (GMM) model to estimate a relationship between the sensitivities and firm specific variables. The study finds that the return of a firm is sensitive only to the market rate changes, and neither interest rate nor exchange rate changes have any impact on the return of a firm. The study also finds that firm size, financial leverage, growth of the firm, earnings variability and accounting beta have a significant impact on the market beta.

CHAPTER 1

INTRODUCTION

The prime objective of an investor a manager or a stockholder, who is faced with uncertainty about the future outcome of their decisions, is value maximization of end-of-period wealth for his initial investment. According to portfolio theory of Markowitz, for a rational economic agent the risk assessment of a capital asset is in line with his "value maximization" objective. While bearing non-systematic risk is not rewarded in the market because it can be diversified away, an individual – in his efforts to maximize his end-of-period wealth – is always looking for different estimates of systematic risk. The Capital Asset Pricing Model (CAPM) regards systematic risk as the only determinant of stock returns.

One common measure used to estimate such risk is known as 'beta'. Beta (β) is that risk which is common to all the securities across the market and cannot be diversified away. It is defined as the covariance between return on a security and return on market portfolio divided by the variance of return on market portfolio. However, the insiders (managers) as well as the outsiders (investors/shareholders) to a firm use different financial accounting variables extracted from a firm's annual financial statements in addition to Beta measure to assess the riskiness of a firm and treat such measures as basis for their future investment decisions. This is so because research in the literature finds the financial and investment decisions of the firms to have an impact on the returns and profitability of firm (Breen and Lerner (1973); Eldomiaty et al. (2009). In this line of practice, a breakthrough is the seminal work by Beaver, *et al.* 1970, who demonstrates the significance of financial accounting variables as containing important information related to systematic risk. Thus, establishing an association between beta and financial accounting variables provides individuals more than one type of risk measure to look upon for their investment decisions. These measures – when they are substitutes and point toward the same corporate decision or event – can be used in place of one another as per the monetary and physical ease of the investors. On the other hand, when they are of complementarity in nature these measures – if used together – could provide a full range of risk-return analysis. While huge resources are devoted by previous researchers into establishing a relationship between market-determined and accounting-determined risk measures (Beaver et al. (1970); Logue and Merville (1972); Hamada (1972); Breen and Lerner (1973); Patel and Olson (1984); Delcoure and Dikens (2004); Kim & Gu (2004); Lee and Jang (2006); Rowe and Kim (2010); Olib et al. (2007)), most of these efforts suffer various deficiencies that motivates the focus of this study.

The systematic risk (β) of one firm may usually differ from that of another because these firms might have different risk exposures. This difference, at least in the theory, is attributed for one to the changes in the capital structure of the firm (i.e., firms that are more debt-dependent tend to have greater levered component in their beta as compared to those that are less debt-dependent) and secondly to the changes in the foreign exchange exposure of these firms. The sensitivity of the systematic risk to these changes is reflected in the event of an interest rate change, for instance, when a change in financing cost due to change in interest rate triggers a consequent change in the value of financial assets and liabilities of the firm (Bartram 2002), thereby changing the systematic risk based on market perceptions. Similarly, a firm operating in the international markets must face foreign exchange exposures. Hence, exchange rate volatility influences the earnings of the firm. The implication then follows that both interest rate and exchange rate changes may have an impact on the systematic risk of firm. The fact that interest rate and exchange rate risk, in addition to market risk, influences the value of non-financial firms is not only theoretically but also empirically evidenced by many (Hyde 2007, Jorion 1990, A and S 2012, Gordon and M. 2003, N Hussain and Khan 2014). Previous studies that attempt to find an association between the market measures of systematic risk and accounting determined risk measures do not consider interest rate and exchange rate risk as proxies to systematic risk (Beaver, et al. 1970, Melicher 1974, Beaver, et al. 1975, Brimble 2007, Hamada 1972, Bowman 1979).

Moreover, most of such efforts to relate firm specific and market measures of systematic risk have been impeded in many other ways. For one, a lack of knowledge about the complete set of firm specific accounting variables that could adequately be used as surrogates for market risk represent a major problem and renders the association between the two less than perfect. Previous studies have used both hit-and-trial and factor analysis techniques to find the most relevant accounting variables (Beaver, *et al.* 1970, Gonedes 1973, Beaver & Manegold 1975, Melicher 1974, Zion *et al.* 1975).

Additionally, the sheer concentration of empirical focus on the developed capital markets like US, Japanese, and Australian stock markets to build an association between systematic risk and firm level accounting variables has created an evident gap in the literature for a similar association to be studied under the distinct features of developing capital markets which might possibly provide some additional insights into the relationship. Where a lot of work has been done on the determinants of risk, the efforts to link systematic risk to the firm specific accounting variables is either very limited or non-existent in developing capital markets. In the particular case of Pakistan, no previous study incorporates a comprehensive set of firm level accounting variables that could sufficiently explain variations in the systematic risk measures. Nishat et al. (2000) and Akhtar et al. (2012) provide only a univariate analysis of risk determinants from Pakistan's capital market.

The study adds a multi aspect empirical evidence to the existing literature on the research topic from Pakistan's capital market. First, we propose to capture the impact of interest rate and exchange rate risk on the expected returns on a stock. We, therefore, use market, interest and exchange rate risk as market determined measures of systematic risk. Secondly, we use a multivariate analysis of only those firm specific variables that are most relevant to a given risk dimension in a firm, based on the suggestions of empirical literature. Finally, the study provides insights into the distinct features of developing capital markets by providing evidence from Pakistan non-financial firms.

1.1. Research Problem

A general perception prevails that the systematic risk of the firms is measured by the beta. This beta, the multifactor models argue, is affected by macroeconomic factors. Given the fact that recent years have witnessed much sensitivity in the interest rates and exchange rates, there arises a need of an insight on the risk of firms caused by such macroeconomic uncertainties.

1.2. Research Objectives

The core objective of the study is to explore a link between market, interest rate and exchange rate beta and several most-representative financial accounting variables of a given risk dimension in a firm. The study also aims at finding the degree of explanatory power of these financial variables in explaining variation in the beta. More precisely, the study would draw upon the objectives in two succeeding steps. First, the sensitivities of the firms' return to market, interest rate and exchange rate changes will be estimated. For obtaining these beta estimates, single period market model will be used. In the second step, the relationship between these sensitivities and accounting variables is examined. Here linear regression is run to check the impact of firm specific variables on the estimated betas.

1.3. Contribution of the Study

A relationship between the two kinds of risk measures is essential because beta, as we know, is related to the cost of equity. Cost of equity in turn relates to the capital budgeting decisions of a firm, and to the pricing of instruments that are traded in the market. Furthermore, it is also related to the required rate of return. Thus, whether an investor or a shareholder or the manager within the firm can use risk relevant variables, so identified, in their respective decisions. For an investor the study will identify those accounting variables that are most risk relevant which can be used in selecting efficient portfolios with the purpose of diversification leading to value maximization of their investments. Furthermore, establishing an association in such a way will provide the management of a firm an idea about the variables that go into the decision processes of investors so that it is possible for the management to increase the reliability of their signals that are reflected through firm's income numbers, and also to increase the disclosures where they are most needed and relevant.

1.4. Research Questions

While the purpose of this study is to build an association, the research questions investigated are

- Do accounting variables impound information that explains the market determined beta changes?
  - Does firm growth affect the risk factors?
  - Does Size of the firm bear any significant impact on risk measures?
  - Does dividend pay-out ratio of a firm influence risk measures?
  - Whether firm leverage impact the risk measures?
  - Does liquidity within a firm bear any significance towards the market determined risk measures?
  - Whether the earning variability of a firm affects the risk factors?
  - And finally, if the accounting beta of a firm has any influence on the market measures of risk?

1.5. Gap Analysis

Previous literature on the topic examines the relationship predominantly in the context of developed capital markets and mostly financial firms from among them. The pioneer work on the relationship is presented by Beaver et al. (1970). Few other studies incorporate non-financial firms, however, these studies examine the relationship from a very limited dimensions of the firm. This means that these studies examine the impact of either profitability or liquidity or size etc. dimensions of the firm, or some of these dimensions taken altogether upon the risk factors of the firms. In the case of Pakistan, Nishat et al. (2000) examines the relationship between the Systematic risk and Leverage effects for financial firms. Thus, there arises a need for an insight into this relationship evidenced from non-financial firms within less developed capital markets that exhibit distinct characteristics.

1.6. Structure of the Study

The rest of this study is organized into following chapters:

Chapter 2: Literature Review

This chapter presents a review of the relevant previous work on association between firm specific and market specific risk measures both in the pretext of developing as well as developed capital markets.

Chapter 3: Research Methodology

The methodology used in the study to estimate beta coefficients and subsequently the determinants of beta is reviewed here in this chapter.

Chapter 4: Empirical Results

The results of this study are presented in chapter 4. Section 1 presents the results of different tests for panel data. Descriptive statistics is displayed and discussed in section 2. Finally, the results for model are reported and discussed in section 3. This chapter concludes with the main summary of core findings.

Chapter 5: Summary and Conclusions

The major findings of this study and conclusion of the study are presented in this chapter, in addition to recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

A summary of both theoretical and empirical literature on the association between systematic risk measures and accounting variables is presented here. Literature offers a considerable amount of both the empirical and theoretical research focusing mainly on the developed capital markets. It is observed in these previous studies that Capital Asset Pricing Model of Sharpe and Lintner provides theoretical framework for studies on risk. The bottom line of CAPM is that the rate of return expected by a risk-averse individual on a risky asset is equal to the risk premium plus the risk-free rate. This expected risk-premium varies in direct proportion to beta in a competitive economy. Mathematically,

$$R_i = R_f + (R_m - R_i)\beta_i \quad (2.1)$$

R_i represents the expected return on *i*th security; R_f shows the risk-free rate; R_m is the return on market portfolio where β_i shows the estimated beta of the ith security; the expression $(R_m\text{-}R_f)\ \beta_i$ is the risk premium.

The slope of regression line between expected return on individual asset and market portfolio, β_i, represents the systematic risk. This beta is mathematically expressed as follows

$$R_i=\beta_0+\beta_i R_m+\varepsilon_i \quad (2.2)$$

It is argued that since true beta cannot be observed its estimate is derived as in equation 2.2. the validity of this beta obtained from historical return data is confirmed by many including Breen and Lerner (1973) who argues that such beta provides unbiased information if and only if these betas are stationary over time. Beaver and Manegold (1975) argues beta can be efficiently estimated from historical data. It, therefore, serves the purpose of a true surrogate for systematic risk.

Beta is a potential source of information for insiders as well as outsiders to a firm about the financial and investing policies of the firm. The effects of macroeconomic conditions and shocks are studied by investors because the historical returns represent the current and potential earning power of the firm. Beta also changes in response to a change in financial operating and investing policies of the firms through market perception (Breen and Lerner, 1973; Mao, 1976). Thus beta, in essence, indicates how market values the different financial and operating policies.

Previous studies though verify an association between systematic risks and accounting numbers, they greatly differ on the strength of relationship. There seems to be little agreement over the reasons for a difference in the degrees to which accounting variables can explain systematic risk. The seminal work by Beaver *et al.* (1970) establishes a contemporaneous association between beta and seven accounting variables out of which only three are identified in the model as significant predictors. These three accounting measures namely dividend payout ratio (negatively related), asset growth (positively related), and earnings variability (positively related) explains 45 per cent of the cross-sectional variations in the market beta. However, this low fit of the model encourages researchers to investigate the model misspecifications, measurement errors, and diverse economic conditions that may have caused less than perfect association between market measure and alternative measures of risk.

To this end, Gonedes, (1973) investigates the information contents of accounting income numbers by examining correlations between variability in transformed income numbers and market beta, and concluded that if, properly transformed, these accounting income numbers can explain 20 per cent of total cross-sectional variation in the market beta. To account for measurement errors that would consequently improve the strength of association, Beaver & Manegold, (1975) alter the model and incorporate market and accounting betas corrected for measurement errors through aggregation and adjustment procedures. Though there is no significant improvement as Bayesian adjusted accounting betas could explain only up to 25 per cent cross sectional variations in the market beta, Bayesian adjustment procedure proved to be superior to aggregation procedure. As the research developed in this area, different accounting variables are being used to explain variability in systematic risk.

Based on theoretic constructs, many other researchers use specific accounting variables that are conceived important to the investors in the risk assessment of security or asset and are selected based on either intuition or some statistical techniques. Hamada, (1972) supporting MM proposition on the effects of corporate leverage, establishes that 21 – 24 per cent of the systematic risk can be explained using leverage. Lev, (1974) provides evidence on the significance of operating leverage. Melicher, (1974) employs factor analysis to identify seven financial dimensions existing in an industry, namely financial leverage, size of the firm, earning trends and stability and operating efficiencies, financing policies, return on investment and market activity. It further reports a positive and significant relationship between size, financing policy, return on investment and market activity dimensions with market beta, and a negatively significant relationship between earning trend and stability with market beta. However, in the face of controversy in the finance literature over the type of relationship between financial leverage and risk, financial leverage could not be significantly related to estimated beta due to the linear form of model. Nishat, *et al.* (2000) and Akhtar *et al.* (2012) demonstrate financial leverage in the corporate sectors of Pakistan to be a systematic risk determinant using linear relationships whereas, Zion, *et al.* (1975) conclude a positive relation between risk and leverage, and a negative relation between risk and size of the firm and dividend record. Systematic risk and firm's leverage and its accounting beta are theoretically associated by Bowman, (1979).

It is also believed that macroeconomic factors prevailing at industry level and country level may act as sources of variation in the systematic risk. In this regard, Melicher, (1974) concentrates on firms operating in the homogeneous electric industry and documents that the relationship may to some extent vary by industry factors. Brimble, (2007) argues that industry and firm size play a role in determining the strength of association.

While previous work on non-financial firms directs its focus mainly towards the association between systematic risk estimates – derived from static asset pricing model – and a number accounting measures of risk, both under different specifications and diverse macro-economic conditions but mostly from the perspective of developed capital markets, present study intends to add to the current empirical literature by extending its focus on the risk relevance of financial accounting variables in explaining systematic risk in the context of developing capital markets. To this end, we derive the estimates of market and exchange rate risk and regress such betas over firm specific variables.

The most common suggestions in the literature related to risk dimensions existent in an industry are as follows: 1) Financial Leverage, 2) Size, 3) Earnings Trend and Stability, 4) Operating Policy, 5) Return on Investment, 6) Market Activity.

2.1 Leverage

One of the most important variables in the literature, containing information related to systematic risk of a security, is financial leverage. Financial leverage is incorporated in the model because according to Miller and Modigliani theory the introduction of leverage in the capital structure of a firm makes the income stream of equity shareholders volatile. Theoretical and empirical evidence confirm a positive impact of leverage on systematic risk of the firm, i.e., higher the debt in the capital structure of the firm, higher would be the risk to common stocks (Miller and Modgiliani, 1958) implying a direct relationship between the two. Beaver, et al. (1970) finds the impact to be significantly positive for the US stocks. Hamada (1972) shows that conditional upon the correctness of MM theory, leverage can explain (positively) 21 to 24 per cent of systematic risk. Bowman (1979) establishes theoretically the results of MM theory and demonstrates that the systematic risk of a levered firm is equal to the systematic risk of same firm without leverage times one plus the leverage ratio. Similarly, several other empirical studies have found a positive relationship between leverage and systematic risk (Melicher, 1974; Lee and Jang, 2006; Hong and Sarkar, 2007; Amit and Livnat, 1988; Kim et al., 2002; Mnzava et al., 2009; Logue and Merville, 1972) It is believed that Pakistani firms are highly levered firms. Bowman (1979) establishes theoretically the results of MM theory and demonstrates that the systematic risk of a levered firm is equal to the systematic risk of same firm without leverage times one plus the leverage ratio. Shehla, et al. (2012) and Bhatti, et al. (2010) provide evidence from Pakistan of the positive impact of leverage on systematic risk and financial performance.

The testable hypothesis developed here is:

H1: There is a positive association between leverage and firm beta.

2.2 Firm Growth

The growth dimension of a firm is said to be dependent on three factors: 1) availability of excessive earnings opportunities, b) difference between several consecutive *ex post* and *ex ante* rates of return, and c) retained earnings proportion. Factors (a) induce positive relationship between the growth rate and risk, while such characteristic for factor (b) is difficult to ascertain due to existence of risky securities. As for third factor, the firms that maintain a higher retention rate have higher growth rates but at the same time are considered to be riskier. Thus, abnormal growth opportunities for a firm in a competitive economy are not expected to be consistent for long, and if dividend payout policies of the firms are static, then growth is largely determined by factor (a). Growth refers to growth in total sales of the firm in present study. Gu and Kim (2002) argue that the systematic risk of the firm goes higher as the growth opportunities surface for these firms. Similar results are found by Roh, (2002) who argues that because growth for a firm implies new investment opportunities, it requires them to maintain sufficient funds to finance these projects. To meet such expenditures, firms resort to external financing which raises the risk for the common stock in these firms. One prime argument raised by Logue and Merville, (1972) is that growing firms are usually understood to be weak in economic changes. Somewhat same arguments are raised by Cosh and Hughes, (1994). Fama and French, (2008) finds a negative significant relationship between asset growth and stock returns of small stocks (microcaps), whereas the relationship is found insignificant for large stocks. Similarly, Cooper, et al. (2008) finds a substantial effect of asset growth on the returns of US stocks.

H2: The growth of the firm impacts the firm beta positively.

2.3 Dividend Pay-out ratio

Dividend payout ratio refers to that proportion of earnings or profits which is paid out to the common shareholders. It is widely believed that firms with low dividends are riskier than others and as Sorter, et al. (1966), reports risk taking behavior by investors is in line with low payout ratios. Bevear, et al. (1970), and Rosenberg and Mckibben, (1973) report that dividend payout is an important determinant of systematic risk of US stock returns. One argument presented by Ang et al., (1985) in favor of a negative relationship between dividend payout and systematic risk is that high dividend payout minimizes the agency cost. According to Logue and Merville, (1972) such an inverse relationship stems from investors' preference to the flow of funds from dividends given its certainty over funds inflow from higher but uncertain prices. Similar results are found by others (Gu and Kim, 2002; Breen and Lerner, 1973; Bord, 1998). However, for Australian stock returns dividend payout ratio is found to be insignificant by Brimble 2007).

H3: There exists a negative impact of the dividend pay-out ratio on the firm beta.

2.4 Earnings Variability

Earnings Variability as a variable measures the variance in earnings stream of the firm. Specifically, this is defined as the standard deviation of an earnings-price ratio. A complete discussion of earnings variability as a risk measure is provided by Beaver et al. (1970). This variable is suggested to be most strongly associated with risk of an asset by Beaver, et al. (1970). Bildersee, (1975) in an attempt to find alternate risk measures reports earnings variability to be positively associated with the systematic risk. Similarly, Brimble, (2007) states that earning variance is the most consistent risk factor for Australian stock returns.

2.5 Accounting Beta

Accounting beta is computed from accounting earnings data and measures the co-variability of security i's earnings to the average earnings of the market, Mt. Beaver, et al. (1970) finds accounting beta to be positively significant in explaining the systematic risk and provides a detailed discussion of the variable. Bildersee, (1975) finds the association between accounting beta and systematic risk to be significant and negative. Brimble, (2007) finds a positive association between the two for Australian stocks.

2.6 Asset Size

Asset size is supposed to have a significant impact on the systematic risk of the firm. Empirical studies find mixed results on the relationship between firm's size and stock returns. Where portfolio theory specifies larger firms to be more efficient than smaller firms and the only factor on which riskiness of a firm depends is beta, it rules out the widely held belief of larger firms being less risky than smaller ones. Generally, it is believed that if individual assets are independent of each other, then the risk of the firm is a direct function of size of the firm. However, a less than perfect correlation would mean that larger firms are less risky than smaller firms. The empirical evidence is largely suggestive of a negative relationship between the systematic risk and the size of the firm, and provides several justifications in this regard. It is the economies of scale of production that allows the firms with bigger size to have lower unit costs and prevail infant firms, (Olib et al., 2008). Many other studies find a negative relationship (Logue and Merville, 1972; Breen Lerner, 1973; Gu and Kim, 2002). Slliven, (1978) reports a negative relationship based on the fact that large firms have more potential to avert the effects of economic crises. Brimble, (2007) and Melicher, (1974), on the other hand, find a positively significant relationship between size and systematic risk for Australian and US stock returns respectively. Amihud (2002) reports a negative impact of firm size on the stock returns of NYSE. Similarly, Fama and French (1995) demonstrate a significant relationship between size and earnings of the NYSE, AMEX, and NASDAQ stocks. Hwang et al. (2014) specifies a negative relationship between the two for UK stocks returns. Brailsford and Grant (2010) specifies negative relationship between size and return of the 300 small capitalized firms in Australian stock market. Similarly, Shafana investigated an association between the size and stock return for four sectors of Pakistan Stock Exchange and concluded that large capitalized firms have, on average, lower return and vice versa. Yet, Beaver, et al. (1970) and Zion (1975) finds an insignificantly negative relationship. Bildersee, (1975) also finds it insignificant.

2.7 Liquidity

Liquidity refers to the rate or pace with which a firm can convert its assets into cash to meet its short-term liabilities. A firm that can assure its potential investors of the ability to meet its short-term obligations, can be said to impact the risk assessment of the investors. Thus, a highly liquid firm is supposed to be less risky than others. Generally, liquidity is measured by a current ratio (current assets divided by current liabilities). As opposed to intuition, the empirical literature has a division on the impact of liquidity on a firm’s stock returns. While many studies report a negative relationship between firms’ liquidity and systematic risk (Logue and Merville, (1972); Moyer and Charlfield, (1983); Gu and Kim, (1998) and (2002); Lee and Jang, (2006); Eldomiaty et al., (2009)). Jansen, (1984) concludes a positive relationship.

CHAPTER 3

RESEARCH METHODOLOGY

3.1. Hypothesis Development

As described previously our approach towards selecting explanatory variables is largely guided by the empirical literature. We choose those accounting variables that are most representative of a given dimension in a firm or industry. The empirical evidence for the chosen firm specific variables is presented in the previous section. Here hypothesis developed are presented

The testable hypotheses developed here are:

3.1.1. Leverage

H1: There is a positive association between leverage and firm beta

3.1.2. Firm Growth

H2: The growth of the firm impacts the firm beta positively.

3.1.3. Dividend Pay-out ratio

H3: There exists a negative impact of the dividend pay-out ratio on the firm beta.

3.1.4. Earnings Variability

H4: There is a positive relationship between earnings variability and firm beta.

3.1.5. Accounting Beta

H5: The accounting beta affects the firm beta positively.

3.1.6. Asset Size

H6: There is a negative association between the asset size and firm beta.

3.1.7. Liquidity

H7: The liquidity of the firm affects the firm beta negatively.

3.2 Description of Data

The variables are defined as following:

1. The average *Leverage ratio* will be calculated by the following formula

$$FL = \frac{\sum_{t=1}^{T} \frac{Total\ LongTerm\ Debt_t}{Total\ Assets_t}}{T}$$

Leverage is defined in this fashion due to the superiority of this form over others for the prediction of systematic risk (Beaver, et al. 1970).

2. Average *Sales Growth* is determined by the following formula

$$G = \frac{n\left[\frac{Total\ Sales_T}{Total\ Sales_0}\right]}{T}$$

3. The average *Dividend Payout* ratio can be found as follows:

$$D = \frac{\sum_{t=1}^{T} Cash\ Dividends\ paid\ to\ the\ common\ shareholders,_t}{\sum_{t=1}^{T} Income\ available\ for\ common\ shareholders,_t}$$

4. *Earnings Variability* is calculated by the formula

$$EV = \left(\frac{\sum_{t=1}^{T} \left(\frac{E_t}{P_{t-1}} - \left[\frac{\overline{E}}{P}\right]\right)^2}{T}\right)^{\frac{1}{2}}$$

Where

$$\frac{E_t}{P_{t-1}} = \frac{Income\ available\ for\ common\ shareholder_t}{market\ value\ of\ common\ stock_{t-1}\ (valued\ at\ fiscal\ year - end)}$$

$$\left[\frac{\overline{E}}{P}\right] = \frac{\left(\sum_{t=1}^{T} \frac{E_t}{P_{t-1}}\right)}{T}$$

5. *Accounting Beta* is given by the formula

$$AB = \frac{\sum_{t=1}^{T} \left(\frac{E_t}{P_{t-1}} - \left[\frac{\underline{E}}{\underline{P}}\right]\right)(M_t - \underline{M})}{\sum_{t=1}^{T} (M_t - \underline{M})(M_t - \underline{M})} \simeq \frac{covar\ (E_t/P_{t-1}, M_t)}{var\ (M_t)}$$

Where

$$M_t = \frac{\left(\frac{\sum_{t=1}^{N} E_{it}}{P_{it-1}}\right)}{N},$$

$$\underline{M} = (\sum_{t=1}^{T} M_t)/T$$

T = number of years

N = number of non-financial firms listed on Pakistan Stock Exchange market for which earnings and price data were available

6. *Asset Size* will be calculated in the following manner

$$S = \sum_{t=1}^{T} \frac{n(total\ assets_t)}{T}$$

7. *Liquidity* of the firm is given by the formula;

$$L = \frac{\sum_{t=1}^{T} \frac{Current\ Assets_t}{Current\ Liabilities_t}}{T}$$

3.3 Data and Sample

3.3.1 Data Source and Sample Selection

To achieve the objectives of this study, we try to obtain a sample over a period for which data is available for most of the firms. The firms included in this study are selected based on the highest capitalization rate. Almost 20 sectors of the economy are presented in our sample, i.e., we chose about 50 per cent the number of firms listed. The data sources for financial accounting variables and macroeconomic variables are multiple. One major source is the annual publications of state bank regarding the financial statements of listed firms and the data on macroeconomic variables of the study. The stock prices of these firms are obtained from Pakistan Stock Exchange and from www.khistocks.com. The frequency of the return series of different firms used in the study is annual. This is obtained from the monthly prices of the stocks. The study uses annual key rates as proxy to interest rate, whereas for exchange rate the study incorporates real effective exchange rate as proxy.

We obtained the data for 100 non-financial firms over a period of 16 years from 2000 until 2015 for this study. There were no specific restrictions on the inclusion of firms except that firms should be listed on Pakistan Stock Exchange over the period of the study. However, some firms that were born beyond 2000 were also included in the study because these firms occupied a significant market share. The data used in our study is panel in nature, therefore, we employ panel data methodology. Panel data methodology implies pooling all the observation in a cross-section of units over several time periods. Panel data methodology gives the kind of results that are simply not detectable in pure cross-sectional or pure time-period studies.

3.3.2 Sample Description

The firms included in our sample belong to 15 major non-financial sectors. This table display the number of firms in our sample from each sector.

Table 3.1: Number of Pakistan's Non-Financial Firm in the Period 2000-2015

SECTOR	NUMBER OF FIRMS
CEMENT	9
AUTOMOBILE ASSEMBLERS	6
AUTOMOBILE PARTS & ACCESSORIES	4
CABLE & ELECTRICAL GOODS	4
CHEMICALS	10
ENGINEERING	5
FERTILIZER	2
FOOD & PERSONAL HEALTHCARE PRODUCTS	11
OIL & GAS EXPLORATION	4
OIL & GAS MARKETTING	4
PAPER & BOARD	4
PHARMACEUTICALS	3
POWER GENERATION & DISTRIBUTION	5
REFINERY	4
SUGAR & ALLIED	12
TECHNOLOGY & COMMUNICATION	2
TEXTILE COMPOSITE	10
TOBACCO	3
TRANSPORT	2

3.4 Issues with Panel Data

3.4.1 Panel Data

Panel data analysis is popular among social and behavioral science researches. It is repeated observations over time for same set of cross sectional units. According to Lee (2006) panel data analysis is widely used in economics and finance. Such analysis enables us to study the dynamics of change with short time series (Yaffee, 2002). Time series together with cross section enhances not just the quantity but also the quality of the data such that would not have been possible with any one of these two dimensions alone (Gujrati, 2003). It provides multiple observations on each sampling unit. This is generated by pooling the time series observations across several cross sections that may include countries, region, firms or individuals and households (Baltagi, 2002).

Panel takes the following form:

X_{it}, i=1 and Nt=1, …, T, where 'i' represent cross sections and 't' represent the time dimension. Of the two categories, our study uses unbalanced short panel. The number of cross sections examined is 100 whereas, the time series are only 16 for each cross section.

3.4.2 Models – Panel Data

Panel data mostly use linear regression with the disturbance term as follows:

$$Y_{it} = \alpha + \beta_i x'_{it} + \mu_{it} \tag{3.1}$$

$$\mu_{it} = \mu_i + \gamma_{it} \tag{3.2}$$

Where 'i' represents cross section and 't' denotes time-periods aspect. α is a scalar, β is a kx1 vector of coefficients and x'it shows vector of observation of k independent variables. μi is individual specific random effect, γit is the disturbance term varying over time and observations (Baltagi, 2002).

The Constant Coefficient Model

Constant coefficient model or Pooled OLS model is a category of panel where the constant coefficient refers to constant slopes and constant intercepts across individuals. Here data is pooled and OLS is run. Though, the coefficients are usually not constant but if not a single of these is statistically significant OLS model can still be used (Yaffee, 2002).

Fixed Effects Model

Since pooled OLS assumes no heterogeneity among different cross sections the model cannot be practically applied to real world data, for most of these data are for different individuals having certain differences in their characteristics. Fixed effects model assumes constant slopes, but the intercepts are allowed to change over cross section or over time (Yaffee, 2002). Here in this model the individual specific effect is a random variable which can be correlated with explanatory variables (Schmidheiny, 2011).

The μ_i term in equations (3.1) and (3.2) is assumed to be fixed. The disturbance is stochastic with γ_{it} being iid, IID (0, $\gamma^2\sigma$).

The Random Effects Model

Here it is assumed that the individual specific effect is random and uncorrelated with other regressors (Schmidheiny, 2011). Random effects model is a regression with random constant term (Greene, 2000). μ_i~IID (0, $\mu^2\sigma$), γ_{it}~IID(0, $\gamma^2\sigma$) in equation (3.1) and (3.2) where μ_i independent of γ_{it} and x'_{it} independent of μ_i and γ_{it} for all *i* and *t.*

Hausman Specification Test

Hausman test is applied to decide between the fixed effects and random effects model. Hausman test checks for the correlation between the regressors and individual random effects. More specifically, it checks for strict exogeneity of the regressor. If no correlation is detected the null hypothesis of Hausman test is accepted and random effects model is applied, otherwise fixed effects model is employed. The test makes following hypothesis

H_0: cov(x_{it}, γ_k) = 0

H_1: cov(x_{it}, γ_k) $\neq$ 0 (3.3)

where x_{it} are regressors, and γ_k is error term.

3.5 Panel Data Model Estimation

Endogeneity becomes a potential problem due to the dynamic nature of panel data. This can be treated with the employment of instrumental variables technique such as Two Stages Least Squares (2SLS) or Generalized Method of Moments (GMM). The Hausman test for endogeneity is conducted, if validated GMM estimation technique is used. This technique is explained in the next section.

3.5.1 Generalized Method of Moments (GMM)

Dynamic panel data model is used by this study upon Pakistani firms in respect of years from 2000 to 2015.

When financial data is used in particular avoiding endogeneity between the independent variables and error term becomes a problem.

Due to the potential existence of endogeneity among variables the direction of the effect (causality) becomes unclear.

When independent variables impound random effect, usually the GMM model is used because it serves as an instrumental variable estimation method

GMM solves the simultaneity bias problem in beta and independent variables, and also solves issues related to measurement errors.

Furthermore, the static model is inherent with unobserved individual effects, the usage of GMM cures all such problems.

Above all, the significant contribution of using a GMM model is that homoscedasticity and serial independence is no more required. (Bond and Arellanno, 1991; Bover and Arellanno, 1995; Hansen, 1982).

To cure the individual effect present GMM, basically, runs first differencing of the subject variables. Similarly, it cures time-effect by using dummies for every year of the study. (Hansen, 1982).

Consider the following model:

$$y_{it} = \alpha y_{it-1} + \beta X_{it} + \gamma f_i + \mu_{it} \tag{3.4}$$

$$\mu_{it} = \eta_{it} + \nu_{it} \quad and \ \ E\left(\frac{\nu_{it}}{x_{i0},\ldots,x_{iT},\eta_i}\right) = 0 \tag{3.5}$$

η_{it} shows observed individual effect and ν_{it} represents error term. In this model, unrestricted serial .correlation in ν_{it} demonstrates that y_{it-1} is an endogenous. variable.

This study uses GMM to estimate the model because it determines simultaneously and reversing causality between explanatory variables and beta of the model.

Therefore, the model is no longer bound to the assumption of strict exogeneity

GMM uses instrumental variables in a way that the unobserved effect are not related to the instruments. The study employs system estimators of Arellano and Bover's (1995) to avoid the disadvantages of GMM in difference. Blundell and Bond (1998) demonstrates that the persistence of explained and explanatory variables make the lagged values weak instruments, even when unobserved individual effects issue is solved with the employment of GMM in difference. Combination of moment conditions for model in first-differences and those for the model in levels is undertaken by the GMM in system estimation. If instruments uncorrelated with the individual effects are present, these can be used for equation in levels. Here lagged difference values of the endogenous variables are used as instruments. Additionally, this estimator assumes that these differenced values are uncorrelated with the unobserved individual specific effects.

In brief the system estimator controls the unobserved effects specific to firms which renders the OLS estimators biased and inconsistent.

Model is based on following equation

$$y_{it} = \alpha_i + \beta_1 x_{1it} + \cdots + \beta_k x_{kit} + Time_t + \eta_{it} + \nu_{it} \tag{3.6}$$

Where, y_{it} shows dependent variable,

the beta at time t

x_{kit} represents explanatory variables at time t

$Time_t$ (with t=1, ..., T) represent time dummies used for controlling time effect on beta of individual firms

η_{it} is constant over time and represents individual specific effects

υ_{it} is the error term.

The possibility of correlation between explanatory variables across the firms and specific effects (η_{it}).becomes very high in dynamic models like equation 3.5. Inconsistency and biasness of the OLS estimators result due to cov (x_{it}, η_{it})≠0 (Hsiao, 1986).

First-differencing equation 3.6 will result in consistent estimator through elimination of fixed effects (η_{it}) (Arellano and Bond, 1991).

$$y_{it} - y_{it-1} = \alpha_i + \beta_1(x_{1it} - x_{1it-1}) +, \ldots, +\beta_k(x_{kit} - x_{kit-1}) + Time_t - Time_{t-1} + \nu_{it} - \nu_{it-1} \quad (3.7)$$

3.6 Tests for Panel Data

3.6.1 Test of Linearity

The linearity of the model is tested by Ramsey's Regression Equation Specification Error Test. Hypothesis of the test are as follows:

$H_0: \hat{\gamma}^2 = 0$

$H_1: \hat{\gamma}^2 \neq 0$ (3.8)

The null hypothesis state that the model is linear, whereas the alternate hypothesis state non-linearity of the model. If null hypothesis is not accepted, it will imply that a non-linear model is appropriate.

3.6.2 Panel Unit Root Test

The data is stationary when it has the power to absorb external shock and the effect over time is eliminated as the series return to its mean values in the long run. Non-stationary data is where the effects of a shocks persist over time and in some cases the mean in the long run is not permanent. Variance in the data is time-dependent and approaches infinity as time approaches infinity (Asteriou and Hall, 2011).

We use Augmented Dickey Fuller test for panel unit root based on the following equation.

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} \delta_1 \Delta y_{t-1} + \ldots + \delta_{p-1} \Delta y_{t-1+1} + \varepsilon_t \quad (3.9)$$

Hypothesis are as:

H_0: All panels contain unit root

H_1: At least one panel is stationary

3.6.3 Collinearity Test

Multicollinearity occurs between different regressors when they are very closely and linearly related to each other and are conveying essentially the same information. The results obtained in its presence are biased and the effects of individual regressors cannot be observed. To detect whether such relationship between the variables exist Variance Inflation Factor (VIF) test is used which is calculated as:

$$VIF = 1/R^2 \quad (3.10)$$

If the value of VIF is equal to one, we conclude that the variables are not collinear with each other. If the value is above 5 or close to 10, we conclude the data has multicollinearity problem.

3.6.4 Autocorrelation Test

Autocorrelation refers that situation where in our model the errors are correlated on one another. According to the assumptions of Linear Regression the disturbance term should not be correlated or dependent.

Here we use DW test for independent errors by testing the existence of serial correlation of error terms. This statistic has a range between 0 and 4, where values equal to and above 0 refer to positive correlation, 2 refers to no correlation and values above 2 refer to negative correlation among error terms.

3.6.5 Homoskedasticity Test

Constant variance of the error terms refers to homoskedasticity and when the variance is not .same across every level of the independent variables, there exists the problem of heteroskedasticity.

We employ white test to check for heteroskedasticity which is a general L-M test that doesn't assume prior determination of heteroskedasticity and isn't based on normality condition. The equation for white test is given as:

$$y_i = \beta_1+\beta_2 x_{2i}+\beta_3 x_{3i}+\mu_i \qquad (3.11)$$

an auxiliary regression is run by obtaining residuals from above equation

$$\hat{\mu}_i^2 = a_1 + a_2 x_{2i} + a_3 x_{3i} + a_4 x_{2i}^2 + a_5 x_{3i} + a_6 x_{2i} x_{3i} + \gamma_i \qquad (3.12)$$

Here every squared residual, regressor, squared regressor and their cross products are regressed on a constant.

$$H_0: a_1 = a_2 = \ldots = a_p = 0 \qquad (3.13)$$

the alternative is the at least on a_i is different from zero. If L-M test results higher than the critical value, the null hypothesis is rejected, and there is significant evidence of heteroskedasticity (Asteriou and Hall).

3.7 Model Analysis

The study provides empirical evidence on association between market, interest and exchange rate risks and accounting variables in two stages. In the first stage, risk factors are estimated through a multiple linear regression model. These estimates are then be regressed each on the selected accounting variables using GMM model in the second stage.

Most of the prior work, Beaver, et al. (1970), Beaver, et al. (1975) have estimated risk factor coefficient (beta) using OLS regression from a static market model, and some with few modifications and additional tests to account for the stationarity of the parameters (Gonedes 1973). According to the assumption of CLRM, the residuals are homoscedastic, uncorrelated, and that the coefficients are stationary over time. Since financial return volatility is time varying, i.e., current volatility depends on past volatility, the traditional linear models give heteroskedastic and leptokurtic residuals which lead to large standard errors of the parameters, and thus the BLUE property of parameters is violated. However, panel data framework sufficiently deals with such problems. The specific model is given as follows:

$$R_{it} = \beta_0 + \beta_i R_{Mit} + \beta_i I_{it} + \beta_i F_{Xit} + \varepsilon_{it} \tag{3.14}$$

where R represents return series, RM represents market return, I shows interest rate and Fx represents foreign exchange rate variables. The subscript 'i' represents ith firm whereas 't' represents time period. In the first stage of estimation, annual return series of different firms (dependent variable) is generated from monthly prices of the stocks, since the data on independent variables (risk factors) was also annual. Subsequently, regression was run between the dependent variable and independent variables moving over three years. This gave 12 observation points on the coefficients of risk factors of each firm.

In stage 2, a model of association between risk factors and accounting variables is constructed where each estimate of risk appear as dependent variable and accounting variables appearing on the left-hand side are independent variables. The variables included in equations (3.14) (3.15) and (3.16) are average asset size (S), average liquidity (L), average payout ratio (D), average sales growth (G), financial leverage (FL), earning variability (EV), and finally accounting beta (AB). The relationships between the two are estimated using Generalized Method of Moments (GMM) model that deals with the problem of endogeneity. The frequency of independent variables in stage two is also annual. To make a panel three years moving averages of each independent variable are obtained. In this stage, the estimates of risk factors obtained from stage 1 estimation are regressed over 3 years moving averages of the independent variables.

The beta model used in stage two is specified as under;

$$\beta^M = \beta_0 + \beta_1 S_{it} + \beta_2 L_{it} + \beta_3 D_{it} + \beta_4 G_{it} + \beta_5 FL_{it} + \beta_6 EV_{it} + \beta_7 AB_{it} + \epsilon_{it} \quad (3.14)$$

$$\beta^I = \beta_0 + \beta'_1 S_{it} + \beta'_2 L_{it} + \beta'_3 D_{it} + \beta'_4 G_{it} + \beta'_5 FL_{it} + \beta'_6 EV_{it} + \beta'_7 AB_{it} + \epsilon_{it} \quad (3.15)$$

$$\beta^F = \beta''_0 + \beta''_1 S_{it} + \beta''_2 L_{it} + \beta''_3 D_{it} + \beta''_4 G_{it} + \beta''_5 FL_{it} + \beta''_6 EV_{it} + \beta''_7 AB_{it} + \epsilon_{it} \quad (3.16)$$

$S_{i,t}$ = size of firm "*i*" at time "*t*"

$L_{i,t}$ = Leverage of firm "i" at time "t"

$D_{i,t}$ = Dividend Payout of firm "i" at time "t"

$G_{i,t}$ = Assets Growth of firm "i" at time "t"

$FL_{i,t}$ = Financial Leverage of firm "i" at time "t"

$EV_{i,t}$ = Earnings Variability of firm "i" at time "t"

$AB_{i,t}$ = Accounting Beta of firm "i" at time "t"

CHAPTER 4

EMPIRICAL RESULTS

4.1 Introduction

The results of the panel model conducted on our selected sample are presented here in this chapter. Basically, the impact of accounting determined risk measures on the market determined risk measures is checked through two consequent stages. In the first stage market measures of systematic risk are estimated using multiple linear regression technique. For this purpose, the returns of each firm – moving over 3 years from year 2000 to 2015 – were regressed over a 3-year corresponding market, interest rate and exchange rate indices. This included running 10 regressions for each firm and obtaining 10 observation points for each firm. Overall, for 100 firms included in our sample we ran 1000 regressions to obtain the estimates of market, interest rate and exchange rate betas. It was observed that market beta turned out significant for almost all the firms in the sample. However, exchange rate and interest rate beta failed to show any significant impact on the returns of most of these firms. Due to space reasons, the results of first stage regression are not reported here. We only report the results of second stage regression for market beta model. Although, the interest rate and exchange rate betas were not significant in impacting the returns of non-financial firms, we regressed them over accounting variables anyways. The results were not significant and so are not reported here. The sequence of pre estimation test presented in Section 4.2 is as follows: fixed and random effects model test, linearity test, the normality. test, Multicollinearity and Autocorrelation tests.

The descriptive statistics for entire sample of Pakistan's non-financial firms are displayed in Section 4.3. Next, the results of GMM model are presented. However, the results are presented for only model (1) which examines the impact of firm specific variables on the market risk measure, beta. The results for exchange rate beta model and interest rate beta model are not reported because no significant effect was found on these types of market risk measures. In other words, firm specific accounting variables failed to explain variations in foreign exchange risk or interest rate risk.

4.2 Specification Test Results

4.2.1 Hausman Specification Test Results

The choice between random and fixed effects model is based on the results of Hausman specification test. Table 4-1 displays these results.

Table 4.1: Hausman Specification Test Results

Cross Section Random Effects	Chi Square Statistic	Chi Square d.f.	*p-value*
Cross-Section Random	18.74	7	0.0090

P-value less than that 0.05, reject the null hypothesis that random effects model .is appropriate. This suggest the appropriateness of fixed effects model (Brooks, 2009).

4.2.2 Linearity Test Results

For deciding whether market beta and firm specific variables stand in a linear relationship, we conducted Ramsey's RESET test. The results suggested that the null hypothesis should be accepted, that is, the relationship between dependent and independent variables is linear.

Table 4.2: Ramsey Reset Test Results

Test for Linearity	F – statistic	F-statistic d.f.	P-value
Ramsey Test	0.72	(3, 1320)	0.5393

P value suggest that the null hypothesis – model has no omitted variables – be accepted, and hence, the normality be considered.

4.2.3 Normality Test Results

4.2.4 Collinearity Test

Correlation Matrix

Table 2 provides correlation between different covariates to check for the existence of multicollinearity. For if multicollinearity is detected, the BLUE property of linear regression does not hold. The presence of collinearity between different covariates serves the parameter estimates to be inefficient and unreliable with large standard errors, and the true impact of each covariate is concealed (Anderson et al. 2008). In practice, however, it is not possible to find variables that have zero correlation among themselves. Therefore, Hair et al. (2006) and Malhotra (2007) argue, respectively, that a correlation below 0.9 and 0.7 does not cause the problem of multicollinearity.

The table below shows that the highest correlation in our study exists between firm growth and beta which is way below the standard level for the existence of multicollinearity.

Table 4.3: Correlation Matrix for Entire Sample (2000-15)

	β_{Mar}	β_{XR}	β_{INT}	GR	SZ	DPS	LEV	LIQ	EV	AB
β_{Mar}	1									
β_{XR}	0.0107	1								
β_{INT}	0.0410	0.0616	1							
GR	0.0352	0.0479	-0.0216	1						
SZ	0.3593	0.0077	0.0624	-0.0971	1					
DPS	-0.0279	0.0744	0.0082	0.0157	0.0827	1				
LEV	0.0109	-0.0017	-0.0384	-0.0435	0.0782	0.0734	1			
LIQ	0.0096	0.0906	-0.0139	0.0098	-0.1032	0.0276	0.1500	1		
EV	-0.1242	-0.0174	0.0083	-0.0475	-0.0542	0.0527	0.1344	0.0281	1	
AB	-0.0717	-0.0689	-0.0427	-0.0049	-0.0875	-0.0515	-0.0507	0.0140	0.0780	1

β_{MAR}=market beta; β_{XR}=exchange rate beta; β_{INT}=interest rate beta; GR=sales growth; SZ=asset size; DPS=dividend pay-out; LEV=financial leverage; LIQ=liquidity; EV=earnings variability; AB=accounting beta

Variance Inflation Factor

The table below presents VIF to detect collinearity. It can be seen from the table that VIF for all the variables pose no serious problem since highest VIF is far below the benchmark level of 10. Therefore, we conclude that multicollinearity is not an issue in our dataset.

Table 4.4: Variance Inflation Factor (Independent Variables)

Variable	VIF	1/VIF
LIQ	2.04	0.490
LEV	1.99	0.503
EV	1.05	0.950
DPS	1.05	0.954
AB	1.03	0.969
SZ	1.03	0.969
GR	1.01	0.986
Mean VIF	1.31	

β_{MAR}=market beta; β_{XR}=exchange rate beta; β_{INT}=interest rate beta; GR=sales growth; SZ=asset size; DPS=dividend pay-out; LEV=financial leverage; LIQ=liquidity; EV=earnings variability; AB=accounting beta

4.2.5 Panel Unit Root Test Results

The results of Augmented Dickey Fuller for each series of our sample showed that the p-value of null hypothesis was far below 0.05 or 0.01 level thereby rejecting the null hypothesis that all panel have unit roots. That is, we conclude that there is no unit root and all the series are stationary.

4.2.6 Heteroskedasticity – White Test Results

The presence of heteroskedasticity is confirmed by various tests, namely, White test and Breusch-Pagan / Cook-Weisberg test. In both cases the p value for null hypothesis of homoskedasticity falls below 5 per cent level. Thus, null hypothesis is not accepted, and we conclude that there exits heteroskedasticity in our data.

The results of tests are presented in the below tables:

Table 4.5: White Test for Heteroskedasticity

White Test of homoskedasticity	chi^2	d.f.	P-value
Results	48.62	35	0.006

Table 4.6: Cameron & Trivedi's decomposition of IM-test

Source	Chi^2	d.f.	P-value
Heteroskedasticity	49.29	35	0.0552
Skewness	6.64	7	0.4670
Kurtosis	3.94	1	0.0471
Total	59.88	43	0.0450

Visual inspection of Heterogeneity (Cross-sectional)

100 non-financial firms in the study are selected based on highest market capitalization rate. These firms belong to different sectors which provides a strong reason to suspect that firms are heterogeneous in terms of their riskiness. To confirm the existence of heterogeneity over different cross-sections, visual inspection is carried out in figure 1. The green dots in figure 1 show the riskiness of individual firms whereas, the red line joining the red dots shows their average values. It is evident from the up-down movement of red line that the cross sections are heterogeneous in terms of both their relative and absolute riskiness. The fact that these cross sections are heterogenous guides the incorporation of Fixed Effects methodology to be appropriate for estimating the impact of firm level accounting variables on the market, interest rate and exchange rate risk. Graphical representation of market and interest rate risk over different cross sections is shown in the Appendix.

Visual inspection of Heterogeneity (Time period)

The time-period chosen for the analysis has experienced a major global financial crisis and, in reference to Pakistan, many political crises coupled with the global financial crisis of 2008. Such volatile socio-economic conditions provide good reasons to suspect the presence of heterogeneity among these firms over time. This, too, is confirmed with visual inspection in figure 2. Just like figure 1, the green dots show individual firms as opposed to red line showing the average values over time. Again, there is an evidence of heterogeneity that becomes most intense towards 2008 financial crisis.

Figure 4.1: Heterogeneity - Cross Sections

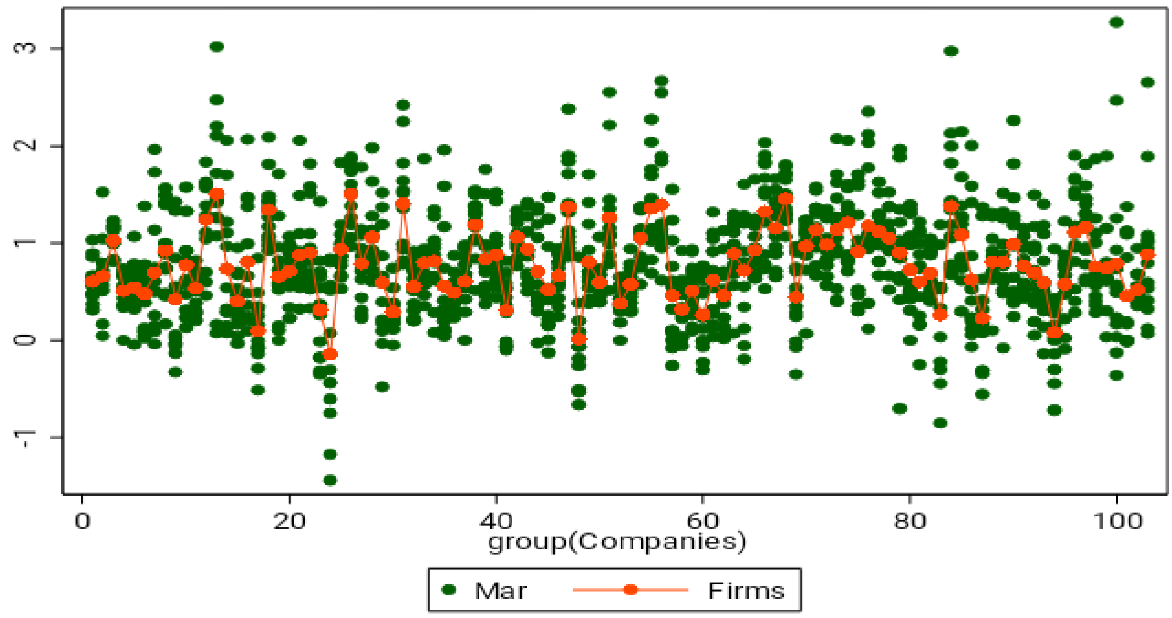

Figure 4.2: Heterogeneity - Over Time

4.2.7 Durbin Watson Test Results

Wooldridge test for autocorrelation in Panel data

The table 4-7 provides results of Wooldridge test that detects autocorrelation in panel data sets.

Table 4.7: D-W test results for Autocorrelation

Wooldridge test for Autocorrelation	F-statistic	d.f.	Prob
Results	62.574	(1, 75)	0.0000

4.2.8 Hausman Test for Endogeneity

The Hausman test was conducted by running two regressions. First the dependent variable was regressed over each independent variable and a residual series from this regression is predicted and a series of fitted values is obtained through developing new variables that are equal to the actual values minus residuals. These fitted observations for each regressor is then regressed over the dependent variable which is market beta in second regression. The fitted values for every independent variable are significant in the market beta equation. This suggests that the independent variables are endogenous.

4.3 Descriptive Statistics

This section presents the summary statistics of all the dependent and independent variables for 100 non-financial firms listed on PSX from year 2000 onwards until 2015. In table 4-8, we present the distribution of all the variables, including measures of central tendency (Mean, Median) and measures of dispersion (Standard Deviation, Skewness and Kurtosis). Column 2 of the table provides the number of observations each variable takes.

First three of these variables are market measures of riskiness of firms (dependent variables of our study). The market beta for Pakistan’s non-financial firms show a mean value of .78 during the period of the study (2000-15). This implies that the firms included in this study are, on average, 20 per cent less risky than the market. However, there are firms that are more than 300 per cent risker than the overall market.

The exchange rate beta is -0.078, implying that the exchange rate exposure of these firms on average is 7.8 per cent less than the market exchange rate exposure. However, for some firms the exposure can be as high as 15.09 and as low as -12.20. Similarly, the average interest rate beta of 1.31 shows that these firms on average are 31 per cent riskier than the market. Again, there exists for some firms a very high and low deviation in terms of sensitivity to the interest rate.

Table 4.8: Descriptive Statistics for all variables over period 2000-15

Variables	Observations	Mean	Std. dev.	Skewness	Kurtosis
β_{Mar}	1331	0.779	0.554	0.358	3.977
β_{XR}	1331	-0.078	2.742	0.099	7.219
β_{INT}	1331	0.166	38.308	2.779	28.733
GR	1331	0.208	0.281	5.094	45.038
SZ	1331	8.501	1.695	-0.118	3.148
DPS	1331	0.312	0.784	1.417	37.431
LEV	1331	0.422	0.425	-5.390	70.570
LIQ	1331	1.938	3.167	13.076	249.699
EV	1331	0.228	0.228	-1.183	30.998
AB	1331	1.006	6.321	0.698	22.028

β_{MAR}=market beta; β_{XR}=exchange rate beta; β_{INT}=interest rate beta; GR=sales growth; SZ=asset size; DPS=dividend pay-out; LEV=financial leverage; LIQ=liquidity; EV=earnings variability; AB=accounting beta

4.4 Estimation of beta models (step 2)

The pre-estimation diagnostic tests are conducted here to provide a guidance towards final selection of estimation strategy that would effectively deal with the data specific problems and give reliable results for our analysis. It is found that our data encounters two major econometric problems namely, the heteroskedasticity and endogeneity. For panel data analysis several techniques like Pooled OLS, Between Estimator, Fixed Effects Model, Random Effects Model, IVLS, PCSE, FGLS and GMM can be used. However, given the data specification here we prefer to incorporate GMM because it can effectively deal with both the problems identified.

4.4.1 The Market Beta Model

Table – 4.9 shows the results of GMM model for equation (3.14) the market beta model where dependent variable is market beta and independent variables are firm specific variables. As a priori to interpreting these results, the general appropriateness of the fitted model and estimation technique is confirmed. For this purpose, Arellano-Bond AR (2) and Sargan-Hansen's tests of overidentification of the model are checked. The null hypothesis of Arellano-Bond AR (2) states that there is no autocorrelation in lag 2. The reported P-value (0.655) for Arellano-Bond AR (2) is above the benchmark level, and therefore, leads to the acceptance of null hypothesis. The null hypothesis of Hansen test, on the other hand, specifies that the instruments as a group are exogeneous. Again, the reported P-value (0.235) here is above the benchmark level of 5 per cent, leading to the acceptance of null hypothesis, and to the conclusion that the instruments used as a group are exogeneous.

Table 4-9: GMM Results - Determinants of Market Risk

Explanatory Variables	**Coefficients**
Growth	**0.955***** (.267)
Size	**0.584***** (.185)
Dividend Pay-out	**0.757** (.729)
Leverage	**3.092*** (1.653)
Liquidity	**-0.011** (.302)
Earning Variability	**1.183**** (.566)
Accounting Beta	**0.125**** (.060)
Intercept	**-6.074***** (2.123)
Arellano- Bond AR (2) ***(P-value)***	0.655
Hanse test of overid. restrictions (*P-value*)	0.235
No of observations	913

The results suggest that all the variables are significant except for the dividend pay-out ratio and liquidity. while the sign pertaining to dividend is not consistent with our expectations and previous studies, it is not a concern since significance of dividend pay-out ratio together with liquidity measure cannot be achieved. The coefficients pertaining to growth, firm size, leverage, earning variability and accounting beta are all significant and their signs, except for firm size, are consistent with prior expectations of the study.

Among the significant variables, the impact of capital structure of the firm on market risk is the largest. As hypothesized, our results show that leverage is positively and significantly associated with market beta. This result is consistent with the theory and prior empirical evidence (Modigliani and Miller, 1958; Beaver et al. 1970; Hamada, 1972; Rosenberg and McKibben, 1973; Mandelker and Rhee, 1984; Melicher, 1974; Lee & Jang, 2006, Hong and Sarkar, 2007; Amit and Livnat, 1988; Kim et al., 2002, Olib et al., 2008; Mnzava et al., 2009; Logue and Merville, 1972) suggesting that with more debt in the capital structure of the firm, the market risk tends to increase because of the increased default risk associated with the common stock earnings. The results indicate 3.092 units change in the market risk of the firm for a unit change in the leverage. Such a high sensitivity of firm’s market risk to the leverage effect calls forth the attention of management towards the capital structure of the firm in rationalizing the risk.

According to our results, the second most important accounting determined risk measure is earnings variability of the firm. Defined as the standard deviation in the common stock earnings of the firms in this study, earnings variability is positively and significantly associated with the market beta. The result in terms of direction and significance is consistent with the findings of Beaver et al., (1970) and Brimble (2012); Brimble, (2007) implying that as the variance in the common stock of the firm increases (decreases) the market risk of the firm tends to increase (decrease) in response. Results convey that for a unit change in the earnings variability, the market risk changes by 1.183 units.

The growth of the firm, measured here by the growth in total sales, is also positively significant at 1 per cent level. The finding is in line with the previous work (REFERNCES) indicating that as firm faces increase in growth opportunities, the market risk of the firm will rise. This is due to several reasons. As Beaver et al. (1970) argue that in a competitive market firms with high growth opportunities will have to face increased competition as there are no barriers on entry/exit from the market, so these growth opportunities may die out soon. Additionally, there is a very high probability that when faced with growth opportunities these firm will seek additional capital. Such an appetite for financing the operations of firm in the face of increased growth rate may either be fulfilled by internal financing thereby reducing the pay-out ratios, or it may be fulfilled through external financing and thereby increasing the default risk of the firm. It is evident from the table – 4.9 that the sensitivity of market beta towards growth of the firm is almost unitary, i.e., for a unit change in the growth rate of the firm, the market risk will change by 0.95 units.

One exception to the results of the study is the positive significant relationship between firm size and market risk. Unlike the findings and arguments of previous studies regarding firm size (Amit and Livnat, 1988; Borde, 1998; Bowman, 1979; Gu & Kim, 2002; Kim et al., 2002; Moyer & Chartield, 1983; Scherrer and Mathison, 1996; Olib, 2008; Ang Peterson 1985; Ali Shah, ; Logue and Merville, 1972; Breen and Lerner, 1973; Slliven, 1978) the firm size is found to be in a paradoxical relationship to the market risk of the firm. This implies that larger the size of these non-financial firms, higher will be their market risk. Such finding is supported by Melicher, (1975); Kim & Gu, (2004); Lee, (2007); Watson et al. (2002). According to Melicher, (1975) such a relationship between firm size and market risk, as opposed to the often-hypothesized negative relationship, may actually exist due to the industry specific characteristics – high regulations, lower business risk, and lower than average betas. These characteristics do not suggest that smaller firms are more likely to fail as compared to larger firms because size may reflect past growth. The results also seem intuitively appealing under the limit pricing hypothesis which postulate that when large firms – especially those of monopolistic in nature – fail to bar the entry of competitors through their pricing strategies, the market risk of these firms increase. Similar results were found by Kim and Lee, (2007); and Kim and Gu (2004) who argue that higher than usual operating leverage and deep economic crises post 9/11 terrorist attacks bore negative impacts on the profitability of major US airlines. These were so severe in intensity that such events induced high financial leverage and bankruptcy risks to these major carriers. They argue that national and regional carriers, on the other hand, were less prone to such hikes in operating costs and took advantage of less profitable routes for major carriers. In short, a paradoxical relationship between the firm size and market risk, as found in this study, can be understood in the pretext of prevailing economic environment. We find that for a unit increase in the firm size, the market risk will increase by 0.584 units, and vice versa, and believe that a positive association between firm size and market risk is a plausible explanation for the fact that bigger firms face relatively increased monitoring and agency cost in the presence of asymmetrical information.

Finally, we find that accounting beta – the co-variability between firm’s and market’s earnings – is positively related to the market risk. This is similar to the findings of Beaver et al. (1970); Bowman, (1975); Bildersee, (1975); Elger, (1980); Lavern et al. (1997) and Brimble, (2007). This suggest that the earning variability of the firm does have an impact on the market risk directly. Specifically, a unit change in the earning variability measure would reflect 0.125 unit change in the market risk of the firm.

4.4.1.1 Summary

To summarize these results, the study finds that there exists a significant impact of the firm specific variables on the market risk of the firm. Results, as in previous studies, are suggestive of the fact that accounting determined risk measures can be used as surrogates for market determined risk measure, β_m.

CHAPTER 5

SUMMARY & CONCLUSION

We learn, first of all, that it is only market beta, a measure of systematic risk, of the firms that affects the investor's required rate of return. The returns of different non-financial firms included in the study are not sensitive to exchange rate and interest rate beta. A plausible explanation for this may be the fact that Pakistan's foreign sector is not very robust and hence they do not have to face such exposures on a tremendous level. As far as the interest rate insensitivity is concerned, Pakistan has a stagnant interest rate regime especially over the period of the study, therefore, interest rate volatility whatsoever may not be a matter of concern to these firms. The insignificant impact of interest rate and exchange rate regime on the returns of these stocks may also be associated to the ownership patterns existing in Pakistani firms. Because of the concentration of ownership, the management is only concerned with market risk of the firm and not with the risks that may prevail at macro level. However, the major finding of the study is concerned with firm specific factors that may act as surrogates for the systematic risk of the firm. On this front, the findings of the study are in line with those of the previous work for developed capital markets.

The core objective of the study is to find whether firm level accounting variables impound any risk relevant information. The major argument of CAPM is that it is only the systematic risk that is priced in the capital markets because it affects the value of the firms. The results of this study show that the financial leverage is a significant risk factor which implies that higher the debt in the capital structure of the firm, greater will be the risk associated with equity. Hence, it follows that leverage is priced in the market since it disturbs the cashflow stream of equity holders. The study, therefore, suggests that these non-financial firms should attempt to reduce their dependency on external financing and should resort more to equity for expansion of the firm.

The growth of the firm is also found to impound information related to market risk. According to our results, we find that growing non-financial firms tend to have higher market risk. This is so because growth of the firm means that these firms face profitable investment opportunities that would require firms to maintain sufficient funds to uptake these projects. Firms raise additional debt capital to meet required fund levels which, in turn, raise the financial risk. So, a significant relationship here implies that the firm growth is a significant risk determinant and market regards high growth stocks risky for their association with increasing the financial risk. A policy suggestion of this study is that while expansion and growth of the firm should continue it should be aligned so that there exists a balance between the internal and external financing of the firm to help reduce financial risk.

An unusual positive relationship between the size of the firm and its market risk implies, contrary to previous studies, greater risk for larger firms. This seems appealing in times of deep economic crises when the operating cost of large firms exceed the bearable limits. The capital markets price firm size to increase the systematic risk of the firms during financial and economic distress. Earnings variability, the variance in total earnings stream is positively associated to market risk. An increase or decrease in earnings variability is considered to be the strongest signal in changing market perception regarding the risk of the firm. Finally, we find that the accounting beta, referring to the co-variability between stock return and market return, is also a significant factor in determining the systematic risk of the firm. According to our results, it is suggested that as the co-variability between the returns on stock and market portfolio increases this will lead to higher market risk. This is because the effects of macroeconomic environment are more likely to affect the returns of a particular stock since the co-variability between such is high.

We believe that the findings of the study are expected to be used in evaluating the financial and operating strengths of firms. Particularly, these findings are expected to aid the management in the capital budgeting decisions which are dependent on the cost of equity for a firm. As beta determines the cost of equity, a knowledge of the determinants of beta will surely provide valuable inputs. These determinants are also expected to provide valuable insights to investors who are concerned with the required rate of return.

Finally, a policy implication for the management concerned with the information asymmetry prevailing in the market is that risk of the company can effectively be managed if such firm specific factors are taken into consideration while deciding upon the operations and financing of future projects. In short, the value maximization objective can be achieved, in essence, by taking care of all the risk measures.

5.1 Future Research Recommendations

This study suggests that future research may extend beyond these firm specific variables to be included in order to completely assess the systematic risk determinants of non-financial firms. This may include stock turnover ratios and efficiency ratios. Future research should also focus on the determinants of nonsystematic risk since it can not be completely ignored. Finally, there is a need to take into consideration the impact of socio-political environment of developing countries which may offer additional explanation as to why and how are the risk determinants in these countries different from those in the developed capital markets.

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