

Estimating Exchange Rate Exposure: An Analysis of Non-Financial Listed Firms in Pakistan



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Reg. No. 03/M.Phil-EAF/PIDE/2013

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A dissertation submitted to Pakistan Institute of Development Economics Islamabad in the partial fulfillment of the requirement for the degree of Master of Philosophy in Economics and Finance.

DEPARTMENT OF ECONOMICS & FINANCE PAKISTAN

INSTITUTE OF DEVELOPMENT ECONOMICS (PIDE)

ISLAMABAD

2016

To Abu and Ami

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Abstract

This study measures exchange rate exposure in developing and small open economy at firm level and also investigated both linear and nonlinear relationship of stock returns and exchange rate variations. OLS technique is used for time series data set for each firm individually. It is observed that many listed firms from across the 22 sectors are meaningfully exposed. The nonlinear exposure in companies are found larger than linear exposure. For the time span started in Jan- 1999 and ends in Dec-2013, so far 288 nonfinancial listed firms estimated out of which twenty five percent linearly and forty five percent are nonlinearly exposed to exchange rate vulnerability. The average number of firms having negative exposure is greater which shows that most of the firms are net importing firms while very few firms from specific sectors are positively exposed which shows that these firms are net exporting firms. Firms with positive exposures belong to Textile, Leather and Food sector.

CHAPTER 1

INTRODUCTION

Exposure elasticity can be defined as the change in the market value of the firm resulting from a unit change in the exchange rate (Adler & Dumas, 1984). It is remained an unsolved puzzle since breakdown of the Bretton Woods's system of fixed exchange rate in the early 1970s. Extensive use of financial derivative due to involvement of firms in foreign operation is an obvious evidence why it is so important to measure the correct exchange rate exposure of any firm, industry or whole economy. Volatility in exchange rate and its impact on firm value interestingly increased for US economy and throughout the world, but there are very few studies which partially investigates firms' exchange rate exposure in developing countries.

It is believed that firms with foreign operations are more exposed to exchange rate risk (Jorion, 1990), but firms with purely domestic operations are also exposed to currency risk due to imports competition (Hodder, 1982; Adler and Dumas, 1984). Foreign exchange rate risk comprises three types of exposures; transaction exposure, translation exposure and economic or operating exposure. Economic exposure occurs mostly to price taking firms which is referred to the uncertainty in the future profits (Ware and Winter, 1988). With specific characteristics, exchange rate exposure is different across countries, industries and within firms (e.g. Bodnar and Gentry, 1993; Williamson 2001).

As every firm responses differently to unexpected exchange rate therefore it is quite reasonable to examine firm-specific exposure. Studies in the linear model framework show significant relationship for very small number of firms or no relation between returns on stocks

and exchange rate at all¹. As the examination of linear exposure has been motivated for hedging with forwards and futures i.e. instruments with linear payoffs, there are also hedging instruments with nonlinear payoffs exists such as options and portfolio of options. Contrary to the linear framework studies also argued that exchange rate risk exposure is inherently non-linear². The theoretical evidence in literature on nonlinear relationship is available, but it is neither tested empirically nor is taken into account while estimating total exposure of the firms until Bartram (2004) has empirically examined the nonlinear part of the total exchange rate risk exposure and the results he produced are statistically significant and more pronounced than that of estimated in linear framework.

Future cash flows of firms are exposed to foreign and domestic exchange rate fluctuations in many ways. Local customer or supplier may default if his business is directly or indirectly affected by currency fluctuations, resulting exposure is nonlinear. A nonlinear exposure may be a result of asymmetric response of firms to the movement of exchange rate. Non-linear exposure may also occur due to regime switching effects. The above discussion proves that measurement of exact exposure is quite difficult and that is the reason why is it known to be an “exchange rate exposure puzzle” till this day. One reason that why empirical studies are not successful in reporting exposure against currency fluctuations in developed countries because these countries trade with developed nations who already has stable currencies. Suppose US trades mostly with Japan, Germany, France and UK. Stable currencies means less risk.

To investigate correct measure of currency exposure, it is important to understand first the country culture of corporations and its management policies. Pakistan is a small open

¹ Studies that show linear significant results for very small numbers of firms are Jorion, 1990; Bartov and Bodnar, 1994; (Chow, Lee, & Solt, 1997); (Griffin & Stulz, 2001); He and Ng, 1998

² Empirical studies which have examined the nonlinear presence of exchange rate exposure are Bodnar and Gebhardt, 1999; Stulz, 2003; Bartram, 2004; Marston 2001; Priestley and Ødegaard, 2007

economy but contributes to international market thorough a wide range of products. Still most of the firms are import dominant firms but it also enormously exports in few sectors like textile, leather and food which trades internationally in raw and semi-finished goods. By stepping into floating exchange rate in 1998 and opening its economy for international investors the listed firms on KSE became exposed to currency vulnerability. The presence of financial derivatives in the market is an evidence that investors are aware of currency risk. Pakistan is a small open economy which mostly exports primary goods and imports capital goods and mixture of semi and finished goods. Trade openness makes Pakistani firms exposed to currency exchange risk either by depreciation or appreciation in home currency i.e. rupee. Pakistan adopted a floating exchange rate in order to adjust the purchasing power of currency by free international currency trading market.

Pakistani currency fluctuates very frequently thus risk of firms must be there. Studies partially suggest that Pakistani firms are exposed to exchange rates because these studies analyse the exposure on Industrial level (e.g. Rashid, 2009; Hussain and Khan, 2014).

1.1. Research Question

The empirical investigation of this study seeks answers for the following questions:

- If nonfinancial listed firms in Pakistan are exposed?
- If firms are exposed linearly?
- If firms are exposed nonlinearly?

1.2. Research Objectives

There are two objectives of this studies as following:

- To estimate whether a nonfinancial listed firms in Pakistan are linearly exposed to unexpected exchange rate fluctuations
- To estimate whether nonfinancial listed firms in Pakistan are nonlinearly exposed to unexpected exchange rate fluctuations

1.3. Significance of Study

As the dynamics of exchange rates changes thus it is reasonable to study them periodically. There are very few studies available which measures exchange rate exposure in developing countries. Pakistan is a very important country for exploring exchange rate exposure puzzle. As the country have many features in the compliance with the theory which makes it very evident choice for studying exposure e.g. i) Floating exchange rate adopted by Pakistan in 1998 ii) Trade openness with developing and developed countries iii) Having purely domestic and publicly owned companies iv) Presence of multinationals due to cheap labour and agricultural raw materials. The research area in line with currency exposure is untapped in developing countries and especially in Pakistan. Two studies have investigated the economic exposure so far in Pakistan. Rashid 2009 studied exchange rate exposure on industrial level and Hussain and Khan (2014) studied currency exposure in pharmaceutical sector. To our best knowledge there is no literature available in Pakistan that investigates non-linear economic exposure and which studies exposure at firm level. Investigation at firm level is important because each firm possess different profiles and characteristics, also each firm reacts to exchange rate fluctuation in a different way. So there exposure will also be different (Jorion, 1990; Bartram, 2004).

This is the first study of its kind that examines linear and non-linear economic exposure of individual firms at such a large scale in Pakistan. The study is limited to non-financial firms as the basic concept of mitigation of risk is quite different in financial sector. We excluded financial sector on the basis of the basic notion that financial institution uses the derivatives for the purpose of investment and very less they purchase derivative contracts for mitigating currency risk.

1.4. Organisation of the Study

Organisation of the Thesis is as follows; Chapter 2 discusses the theoretical facets and reviews the past studies briefly, Chapter 3 explains the data issues, sources, construction of variables and describes the methodology used for the estimation, Chapter 4 explains the empirical findings and discussions and Chapter 5 draws some important conclusions, Limitations and policy implications.

CHAPTER 2

THEORETICAL AND EMPIRICAL LITERATURE REVIEW

2.1. Theoretical Background

The theory of global finance is largely similar with that of inland financial theory which starts from individual portfolios which one obtains through market clearing, involving equilibrium prices, and risk-return adjustment. The theory of exchanging firms demonstrates several key aspects that govern the choices of international firms in general. Kenen (1966) assumes a firm which exploits an objective with two urgings: one is the present net value and second is the exposure to exchange risk and basically both are hated by firm.

The theoretical assessment of Shapiro (1974) became ground breaking research on exchange rate exposure literature. He contends that the values of multinational units that operate within the functions of varied economic circles are exposed to the consequences of economic instabilities. He continues to argue that, the likeliness of these entities to be influenced by the dynamics of foreign currency movement is unconditionally a factor which is helpless on the level of inflation, or the degree of currency devaluation on the dollar value of these organizations; in comparison to the traditional historical accounting definition of the entities net current assets.

Hodder (1982), in his observed findings, establishes a landmark between company value and foreign currency exposure mostly those with international transactions. The development continues up to the inspiring work of Adler and Dumas (1984) who opposed the findings of the two earlier researchers. They reasons that corporate organisations that operate in domestic markets can also be influenced by exchange rate fluctuations.

The efficient market hypothesis (EMH) is related with the impression of a random walk, which is a word used to describe price chains, where changes in prices randomly withdrawals from preceding prices. The notion in a random walk is that the stream of information is unrestricted and information is instantaneously reflected in stock prices, and hence the price change tomorrow will only reflect tomorrow's news and is independently of price changes today (Malkiel, 2003). The EMH is momentous when analysing exchange rate exposure and the effect on firm value, as all expected exchange rate changes should, according to the EMH, already be incorporated in stock prices, and it is thus only unexpected changes in exchange rates that could, in theory, cause changes in firm value.

The currency risk lies in the fact that it is a random walk, and that surprizing changes occurs (Adler & Dumas, 1984). Exchange rates have been determined to be random walks (Poole, 1967) and thus a basis of risk, as exchange rate threat comes from unexpected changes in exchange rates. This risk has nothing to do with the currency being strong or weak, meaning higher or lower likelihood of a devaluation of the currency, as this is expected. The exposure is defined as what is at risk, and hence what is exposed to unexpected changes in exchange rates (Adler & Dumas, 1984).

Adler and Dumas (1984) propose a methodology that measure the exchange rate exposure in a general CAPM frame work. Though their model is the first break-through in empirical research, their work is only limited to the understanding of exposure, removing confusion between exposure and risk and to propose a suitable measurement technique. Their study also confines to the linear assumption but suggests that there may be a nonlinear exposure which cannot be hedged by financial instruments only with their linear profiles e.g. forwards and future.

2.2. Empirical Literature Review:

Jorion (1990) is the pioneering study that first empirically investigates firm exchange rate exposure for 287 US multinationals by using monthly data of returns on common stocks and multilateral nominal exchange rates, where the data period starts from January 1971 and ends in December 1987. He employs OLS technique for estimating time series regressions and GLS for joint cross sectional regressions with orthogonalized market return where the former reports very few firms significantly at 5% level exposed to exchange rate risk i.e. 15 firms out of 287 and the later reports strong cross sectional relationship for the foreign firms which provides evidence for estimating a separate regression that whether foreign sales determines exchange rate exposure.

Luetherman (1991) studies how the proposed belief that native currency depreciation provides a benefit for the competitive opportunity of the domestic country manufacturers comparable to foreign competitors. The conclusion of the author is found to be contrary to the traditional hypothesis that depreciation of domestic currency supports the competitive capacities of home companies. He then argues that firms do not obtain significant or insignificant advantages from devaluation of their national currency. However, a large fall in the revenue of their industries is found as a result of the depreciation of the homebased currency.

Bodnar and Gentry (1993) investigates exchange risk exposure at industry level jointly for Canada, USA and Japan. They estimates joint equation for Canada and USA by using seemingly unrelated regressions technique over the ten year period starting from January 1979 to December 1998. For Japanese Industries they employs an OLS technique to run a single regression for each industry for the period starting from September 1983 to December 1988. The OLS technique is used because the time period is very short for Japanese industries. The

result confirms exposure at ten percent significance level in 28 percent US industries, 21 percent Canadian industries and 35 percent Japanese industries. They also estimate an economy wide equation for all industries and reports significant exposure which confirms that exposure is different when individually industries are considered.

Choi and Prasad (1995) develops a new model to analyse the exchange rate exposure of 409 US multinationals during the period a 1978-1989. The results of this study appears quite significant and concludes that volatility in exchange rate affect firm value. They used cross sectional OLS estimation. The study also concludes that exposure sensitivity is associated with the firm specific variables i.e. sales, assets and foreign operating profits and all these determinants are positively related. These results are not significant at aggregate level. The study also analyses and concludes that in weak dollar the exposure sensitivity was higher. The research also observe that 60% of the firms under their survey to be widely influenced by foreign currency variability.

Choi and Elyasiani (1997) estimates the interest rate and exchange rate exposures of 59 commercial banks in US for the period of 1975 to 1992, also the bank-specific determinants of these risk exposures. Following the same methodology used by Adler and Dumas (1998), this study uses a modified seemingly unrelated simultaneous method that identifies cross-equation dependencies and corrects for serial correlation and heteroscedasticity. As a whole the exchange rate risk betas are more significant than the interest rate risk betas.

Taking into account the weaknesses of other studies, Chow and Chen (1998) centred their work on selection of short and long run horizon by controlling hedging activities while estimating determinants of exchange rate exposure , they report that out of 1110 Japanese listed firms 80% are negatively exposed due to exchange rate uncertainty while less than 30% are

significantly exposed. The number of exposed firm increases with the increase in horizon as the study claims.

Ng (1998) divides the time period into equal sub periods rather focusing on short and long horizons reports that 25% multinationals firms out of 171 firms included in the sample in Japan are positively and significantly exposed and the number increases from 41 firms to 81 in the second time period. Their results contradict with previous study done by Chow and Chen (1998) which reports that appreciation of Yen benefits firms. This may be because the firms are not studies categorically. The study also indicates no lagged impact on exposure of these firms.

However dissimilarly with previous studies which use single proxy variable for exchange rate, Miller and Reuer (1998) inspects the aftermaths of the effects of the variations in industrial hedging practises and strategies of firm's exposure to foreign currency oscillations. Their results tell that 13 to 17 percent of U.S. real sector corporate units are influenced by foreign exchange rate inconsistency. The authors also indicate that the impact of foreign direct investment will cut the degree of firm's exposure by stifling foreign exchange instability.

Choi and Cheol (2002) inspects the exposure of US companies working in the Asian continents. Their influential work came after the 1997 Asian financial crisis. The outcomes of the authors reveals that there are signs of both contemporaneous as well as lagged disparities in the level of exposure particularly during the crisis period. The authors further declared that the track of foreign currency oscillations are categorised into negative and positive coefficients and this means that there is a clear replication of the vigorous nature of exchange rate movement.

Bodnar and Wong (2003), inspect a large sample data set of US nonfinancial listed firms comprising 910 entities for the period January 1977 to December 1996. The author

emphasizes that with the increase in horizon from 1 month to 18 months, 24 and 60 months. About 15% of firms show significant exposure in one month horizon and the number increases to 20% in 24 months horizon and 50% in 60 months horizon respectively.

So far the empirical studies have estimated only linear exposure of the firms which may be the only reason why earlier studies have not reported a large significant results. Bartram (2004) is the first empirical study of its kind that analyses a comprehensive data set of 447 German financial firms for the period starts from 191 and ends December 1995 and for the sub periods. This study employs OLS technique by correcting standard errors with Newey West technique. The study has not reported a major significant result but the nonlinear estimations are significantly more exposed than the linear.

Aguiar (2005), in his findings, shows that the fall in the worth of a domestic currency can disturb corporate units in two directions; mostly through competitive effect and the total overall corporate value or balance sheet effect. The author continues to proclaim that, in some cases, devaluation has a competitive result when it is shadowed by a rise in export which also spurs financial growth. However, if currency devaluation is followed by a decay in production, such as tradable or exportable goods, then business entities will be flawed by a severe deprivation of value due to shrinkage in cash inflows.

Motivated by their own study (Muller and Verschoor 2005) in which they review a large number of studies, Muller and Verschoor (2005) estimates the linear and nonlinear exposure in the light of introducing asymmetries. They argues that the relationship between stock prices and exchange rate is nonlinear and affected by small and large, and negative and positive movements of exchange rate. The result shows that the number of exposed US multinationals increases with the inclusion of sign and size asymmetries in the model.

Doidge et al (2006) examines the nature and the economic magnitude of exchange rate exposure using a unique firm-level database that covers 18 countries for a sample period started in January 1975 and ends in July 1999. By employing time-series regressions over 5-year periods, they discover that more companies are exposed to exchange rate fluctuations than can be credited to chance; yet, exchange rates do not clarify a great portion of the difference in individual firm returns.

Bartram (2007), in his important empirical work examines the impact of foreign currency, and its management in relative to cash flow. The author established how foreign exchange rate exposures can be mitigated to provide a hedging process at the firm level. As a result of this, the remaining net exposure on firms will be economically and statistically insignificant, and this will hold mainly, when functioning cash flow of the firms are extremely exposed to the industry risk position.

Priestley and Odegaard (2007), in their innovative industry level empirical research work identifies flaws in previous studies and argued that the relationship between firm value and exchange rate is nonlinear. By incorporating macroeconomic variables and employing OLS techniques their results show that firms are more significantly exposed in nonlinear estimation than linear. But overall the number of industries exposed to exchange rate vulnerability is very low.

Rashid (2009) examines the exchange rate exposure of 22 industries in Pakistan for the time span starts in June 1991 and ends in December 2007. By employing OLS technique and using monthly data the study finds the significant lagged response of share price to exchange rate volatility. Further the author concludes that capital intensive industries are more exposed than labour intensive.

Aysun and Guldi 2011 investigates a large daily sample data for the period 1995 to 2006 of 367 US firms to measure the exchange rate exposure with unique nonparametric methodologies and to compare the results with those result coming from linear and nonlinear estimation. Their results show that nonparametric estimations comprises more economically and statistically significant firm level exposure. Thus they argues that previous literature is failed to claim significant results because they are not to allow a suitable functional form for each firm.

The exposure evidence on small open economies are very less or never investigated thoroughly so far but Olufem 2011, studies the foreign exchange rate exposure of 117 Nigerian nonfinancial listed firms for the period 1998 to 2007. The study reveals that Nigerian firms are significantly exposed to the vulnerability of foreign exchange rate especially to US dollar.

Agyei-Ampomah et al (2011) examines exposure in 269 UK nonfinancial firms by employing different market based methodologies. Their result shows that about 14 percent firms are exposed in the capacity of general model specification recommended by Jorion (1990). Although the number of exposed firms increases to 85 percent when time varying orthogonalized feature estimated.

Koutmos and Martin (2013) presents a theoretical and empirical confirmation of US firms by inclusion an asymmetric behaviour of exchange rates and firm value. Their results document a asymmetric behaviour in 40% exposed firms. Interestingly asymmetries are more commonly found in financial sector which may be the cause coming from hedging activities of asymmetric nature.

In the line of latest literature, Baur and Miyakawa (2014) studies the foreign exchange rate exposure in Australian firms. Their results are consistent with financial theory and reports

exposure in the firms who are open to foreign markets. The time varying exposure model documents more significant than that coming from constant exposure model estimation.

Shboul and Anwar (2014) explores the foreign currency exchange rate exposure in Canadian industries for the period 2003 to 2011 by using weekly sample data. Following the methodology adopted by Bartram (2004), this paper studies the exchange rate vulnerability and its impact on firm value in three perspective; the linear, non-linear and asymmetric exposure. The result shows that little nonlinear relationship exists while number of industries exposed increases in linear estimations also asymmetric exposure is reported in very industries. Interestingly estimation results from a single model which includes both linear and nonlinear the number of industries with significant exposure increases.

Hussain and Khan (2014) investigates the exchange rate exposure of pharmaceutical firms in Pakistan in the long and short run for the period 2003 to 2012. Using Unit root test, Error correction model and cointegration techniques for the quarterly data they concludes that in the long run the relationship between stock returns and exchange rate exposure is significant while ECM results shows that in the short term there is significant negative relationship between stock prices and exchange rate exposure.

Rao (2015) also examines the exchange rate exposure of Indian software industry by inducing firm level analysis. The OLS estimation for time series monthly data starting from January 2001 to December 2013 of 66 listed software companies report that on average 60% companies show significant sensitivity towards composite exchange rate.

Summarizing the reviews it is observed that currency risk is not so far studied in small open economies and developing countries which are more impulsive to exchange rate fluctuation which may be the only reason why studies failed in developed nations.

2.3. Hypothesis:

Following are the hypothesis for both models that is linear model and non-linear model. The relationship why it should be negative or positive is based upon the previous studies which is provided in *methodology* section of this study:

H₁: The firm has a significant linear exchange rate exposure

H₂: The firm has a significant non-linear exchange rate exposure

CHAPTER 3

METHODOLOGY AND VARIABLES DEFINITION

3.1. Methodology

The following section includes the methodology which is adopted to estimate the linear and nonlinear regressions. The study presents this section in details in order to give a very transparent picture of the econometric analysis. Model specification, econometric technique, preliminary tests and data construction are the main parts to be presented in this section.

The main objective of this study is to measure the exchange rate risk of all non-financial firms operating in Pakistan limited to the availability of data and time period selected for this study. The study analysed the exposure in two ways i.e. linear exchange rate exposure and Non-linear exchange rate exposure. Thus in the line with the extensive literature two separate time series regression models are estimated for each firm.

3.1.1. Linear Model Specification:

Jorion (1990) which is an extension of the Adler and Dumas (1984) is the leading study for most research works to detect exchange rate exposure. This is specified as following;

$$R_{it} = \beta_{i0} + \beta_{im}R_{mt} + \beta_{is}\Delta S_t + \varepsilon_{it} \quad (1)$$

Where R_{it} is the return on stock i and R_{mt} is the return on market portfolio m ; ΔS_t represents the percentage change in an exchange rate; β_{i0} is a constant that varies across firms; β_{im} is a firm stock exposure with respect to the market; β_{is} measure firm foreign exchange rate exposure. A positive value of β_{is} implies that a depreciation of the domestic currency leads to

an increase in the value of firm or i industry and vice versa. ε_{it} is the error term with a zero mean and a constant variance.

In equation (1), R_{mt} is used as control variable. But later argued by Jorion, (1991) that market return also has currency exposure component so it must be orthogonalized in order to separate the exchange rate component. Supporting his argument Priestley and Ødegaard (2007) suggest that orthogonalized, rather than actual market returns should be used to estimate the exchange rate exposure. This procedure is also followed by Allayannis (1996), Griffin and Stulz (2001), Ballester (2011) and Ampomah et al (2012). Taking these developments into account we estimate the following equation;

$$R_{mt} = \alpha_0 + \alpha_{is}\Delta S_t + \mu_{mt} \quad (2)$$

μ_{mt} is the orthogonalized market return which is extracted part of the market return that is not correlated with the change in exchange rate. Thus we modify the Eq. (1) by incorporating μ_{mt} , to avoid any estimation bias occurring due to multicollinearity between independent variables as following;

$$R_{it} = \theta_{i0} + \theta_{im}\mu_{mt} + \theta_{is}\Delta S_t + \varepsilon_{it} \quad (3)$$

In this case, the parameter θ_{is} can be interpreted as the total exposure of stock i to the exchange rate fluctuations. By total exposure we mean here that correlation between independent variables are orthogonalized.

3.1.2. Non-Linear Model Specification

A linear exposure can result for example due to contractual payment commitments or claims in foreign currency (e.g. foreign currency receivables), which are fulfilled with certainty free of the foreign exchange rate (no default risk). The worth of a firm, however, could depend in a very complex way on changes in foreign exchange rates. Indeed, regression scrutiny with

linear foreign exchange rate variables has first been suggested by Adler and Dumas (1984) to analyse the exposure of a foreign currency receivable. They demonstrated that if the foreign currency cash flow is uncertain, a regression with a linear foreign exchange rate variable determines only the part of the exposure that can be eliminated with linear risk managing instruments in order to curtail the variance of the whole position. However, Adler and Dumas (1984) neither ponder nonlinearities in the exposure, nor intend to estimate the entire foreign exchange rate exposure.

Each firm has dissimilar exposure shape thus it is argued that both linear and nonlinear regressions specifically do not suggest a single common profile. Because every firm has different features which depends on intensity of exports and imports, debt, total assets, nature of competition, pricing strategies in response to exchange rate appreciation or depreciation and use of financial derivatives. Thus it is quite difficult to suggest a different functional form for each different firm. Bartram (2004), suggests that cubic root function may be consistent with the idea of real options moderating the effect of large exchange rate movements. However, with this cubic functional form small exchange rate arrangements have a very strong effect on firm value, which might not appear very reasonable. The cubic function, on the other hand, may not be stable with real options, however it accommodates the impression that small exchange rate movements are controlled by other price relevant information. Bartram (2004), Bartram (2002) and Ballester et al, (2011) used cubic function to estimate the nonlinear equation as they argued that there is convex exposure. Contrary to these studies Priestley and Ødegaard (2007) employed quadratic function and concluded that both convex and concave exposure will result.

Thus it is obvious that selecting a right functional form is a troublesome job, as every firm will have different exposure profile thus having different functional form. By using simple cubic form of exchange rate to capture nonlinearities, we are also oversimplifying our analysis

that relationship between exchange rates and stock return is symmetric but it may not be the case and nonlinearities might be coming from asymmetric relationship. In this study we have assumed that relationship is symmetric.

Thus following regression model is estimated to find nonlinear relationship between exchange rate movements and firm value.

$$R_{it} = \theta_{i0} + \theta_{im}\mu_{mt} + \theta_{is}f(\Delta S_t)^3 + \varepsilon_{it} \quad (4)$$

where $f(\cdot)$ denotes a nonlinear function of the changes in exchange rates and the parameter θ_{is} measures the effect of nonlinear movements in exchange rates on the returns of asset R_{it} .

3.2. Preliminary Tests

Time series analysis requires few tests to be conducted before estimations. As this study analysed a very wide range of analysis on firm level and estimated 590 regression equations for all firms thus it is quite troublesome to have separate test for each regression.

3.2.1. Stationarity

Augmented Dicky Fuller (ADF) test is conducted in order to test whether the series is stationary. The extensive literature available has never reported nor mentioned that they tested for stationarity in their time series data analysis. The obvious justification for this avoidance is because financial researchers use mostly a log return which automatically makes the series stationary.

3.2.2. Autocorrelation and Heteroscedasticity:

The second issue with the time series comes from interdependency of current observation on their past and that is serial autocorrelation. To address this issue we estimated the regressions with Newey-West (1978) standard errors which adjusts the problem of both

issue coming from autocorrelation and Heteroscedasticity. Bartram (2004) also used the same Newey-West standard error methodology to tackle this issue.

3.2.3. Multicollinearity

Multicollinearity is the last and very important issue which cause the regression analysis spurious. Multicollinearity happens when two independent variables are highly correlated. To address this issue we orthogonalized the return on market index by regressing return on exchange rate on return on market index. This method is proposed by Jurion (1990) which is followed by Priestley and Ødegaard (2007) Allayannis (1996), Griffin and Stulz (2001), Ballester (2011) and Ampomah et al (2012). The process is briefly discussed in the linear model specification section of this study.

3.3. Data Source

Stock prices data for all nonfinancial firms listed in KSE (based on the 2013 list of KSE) considered for this thesis which comprises total 613 nonfinancial firms. Further the number of nonfinancial firms sample reduced, as the complete monthly data for stock prices for the time span starts in Jan-1999 and ends in Dec-2013 is only available for 288 firms. We excluded all those firms that merged, acquired or delisted over the time period of 1999 to 2013. Monthly stock prices data which makes 168 observation for each firm (Total 48384) are collected from KSE website and Business Recorder. The data for monthly Stock prices Index has taken from KSE 100 Index. The data for monthly Exchange rate (nominal) has taken from State Bank of Pakistan website.

3.4. Variables Definition and Construction

So far we have used three variables in the model i.e. stock return, exchange rate return and return on stock market index. These variables are briefly discussed below:

3.3.1. Stock Return (R_t):

This study used a return on stock for each firm as a dependent variable which is a proxy for firm value. Monthly stock prices are taken from the Karachi Stock Exchange for thirteen years starting from January 1999 and ends in December 2013. The closing stock of the end of each month is considered to be the stock price for that month. It made 168 observation or data points for each firm. To calculate return for stock prices indices we use continuously compounded return formula as described;

$$R_t = \ln(P_t / (P_{t-1})) \times 100\%$$

where R_t is the return at time t and P_t is a stock price at time t and \ln denotes the natural logarithm. Log-returns have the nice property that they can be interpreted as continuously compounded returns, so that the frequency of compounding of the return does not matter and thus returns across assets can more easily be compared.

3.3.2. Market Return (R_m)

Market return as earlier defined is the independent variable which is used as a control variable for macroeconomic shocks and impact on exchange rate (Jorion 1990). Following formula log return difference has been used to calculate the return on market.

$$R_m = \ln(P_t / (P_{t-1})) \times 100\%$$

where R_m is the return at time t and P_t is a stock market price indices at time t and \ln denotes the natural logarithm.

3.3.3. Exchange Rate (S)

Log difference return of monthly nominal exchange rate data is used which is published by State Bank of Pakistan for the time span started in Jan-1999 and ended in Dec-2013. The

exchange rate is specifically in Pakistan context is defined as the Pak rupee units required to purchase per one unit of US dollar i.e. PKR/ 1 US Dollar. It is calculate as follow:

$$R_S = \ln(P_t / (P_t - 1)) \times 100\%$$

Where R_{ms} is the return at time t and P_t is an exchange rate at time t and \ln denotes the natural logarithm.

CHAPTER 4

EMPIRICAL RESULTS AND DISCUSSION

The analysis here are presented for each individual firm which are further classified into 22 sectors. The sample of firms chosen from each sector is truly based on the data availability for the whole time span considered for this study. Those firms who resulted insignificant coefficients which are not documented in discussion but their names are given in the Appendix A. Positive coefficient suggests that the firm is net exporting while negative coefficient suggests that the firm is net importing. In the following tables in this chapter the coefficient is only given for exchange rate (ΔS_t) while the other coefficient of return on market index (Rm_t) variable is not reported as we are only concerned with the exchange rate variable. Although, Rm_t is highly significant for all 288 firms which confirms the CAPM basic hypothesis.

Table 4.1: Exchange rate exposure of Firms of Auto Parts Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Agri Auto	-1.239***	0.005	0.000	-.017***	0.000	0.000
Baloch W				-.009***	0.000	0.001
Exide Pak	-1.782**	0.041	0.013			
General Tyres				-.013***	0.000	0.000

Note: The table 4.1 reports the nonfinancial firms from Auto Parts sector that exhibits only significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

At one percent significance level table 4.1 shows that four (60 %) out of five firms are exposed in Auto Parts sector. Only two firms out five in this sector are significantly and negatively exposed in linear regression estimations while three out five firms are significantly and negatively exposed in the nonlinear regression estimation.

Table 4.2: Exchange rate exposure of Firms of Automobiles Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Al-Ghazi				0.003***	0.003	0.000
Ghandhara N	-1.549***	0.000	0.000	-0.019***	0.000	0.000
Honda Atlas	-1.790***	0.000	0.000	-0.019***	0.000	0.000
Indus motor	-1.418***	0.003	0.000	-0.017***	0.000	0.000
Millat Tractor				0.005*	0.084	0.000
Pak Suzuki	-1.850***	0.000	0.000	-0.017***	0.000	0.000

Note: The table 4.2 reports the nonfinancial firms from Automobiles sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.2 shows that in the Automobiles sector total six (75 %) out of total eight firms are significantly exposed to exchange rate vulnerability. The potential reason why this sector is highly exposed is because due to the competition factor coming from used imported cars. The currency appreciation in recent years boost the imports of such cars. Four out eight firms possesses linear exposure while six out of eight possesses nonlinear exposure. 90 % of firms out of this sample are negatively exposed. Where Al-Ghazi Tractors and Millat Tractors shows only positive and nonlinear exposure while Gandhahara Nissan, Honda Atlas, Indus Motors and Pak Suzuki shows both negatively linear and nonlinear exposure.

Table 4.3: Exchange rate exposure of Firms of Cables and Electric Goods Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
John Philips				-. 017***	0. 056	0. 134
Pak Electron	-1. 602***	0. 001	0. 000	-. 015***	0. 008	0. 000
Siemens	-0. 989***	0. 007	0. 001	-. 007***	0. 007	0. 004

Note: The table 4.3 reports the nonfinancial firms from Cables and Electric Goods sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.3 shows the empirical results for five firms of sector Cable and Electric goods. Three out of five firms are significantly and negatively exposed. Two firms out five are negatively and linearly exposed while three firms out of total five are nonlinearly and negatively exposed. The negative coefficient suggests that these firms are net importing firms. John Phillips is nonlinearly and negatively exposed while the other two companies i.e. Pak Electron and Siemens Corporation shows both negatively linear and nonlinear exposure.

Table 4.4: Exchange rate exposure of Firms of Cement Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
DG Ct.	-1. 625***	0. 001	0. 000	-. 013***	0. 000	0. 000
Dadabhoy Ct.				-. 014***	0. 000	0. 000
Dandot Ct.				. 029***	0. 000	0. 000
Fauji Ct.	-1. 714***	0. 000	0. 000	-. 018***	0. 000	0.000
Fecto Ct.				. 009***	0. 001	0.000
Gharibwal Ct.				-. 012***	0. 001	0. 002
Javedan Ct.				-. 005*	0. 058	0. 157
Lucky Ct.	-1. 459***	0. 002	0. 000			
Maple Leaf	-1. 054***	0. 006	0. 000	-. 007**	0. 012	0. 000
Zeal Pak Ct.				. 031***	0. 003	0. 000

Note: The table 4.4 reports the nonfinancial firms from Cement sector that shows a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.4 reports the empirical results for Cement sector. The very obvious reason why 72% (10 firms out of 14) are significantly exposed for this sector is their openness to international trade. Where the export growth in this sector is continuously increasing since 2001. Cement industry has many opportunities in terms of transportation cost which increases their exports less producing cement countries in our neighbourhood like Iran, Afghanistan, India Bangladesh and Sri Lanka. Although there are more firms that are nonlinearly exposed (9 out of 10 are significantly exposed firms) and fewer that linearly exposed (4 out 10). The negative coefficient for all these firms suggests that this sector is still net importing.

Table 4.5: Exchange Rate Exposure of Firms of Chemical Sector

Firm	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Berger Paints	-1.332*	0.059	0.000	-.011*	0.051	0.000
Biafo Ind.				-.014**	0.023	0.006
Colgate Palm				-.028***	0.000	0.000
Dynea Pak				-.007**	0.039	0.072
ICI	-1.113**	0.042	0.000			
Nimir Ind.	-1.324***	0.003	0.001	-.013**	0.021	0.000
Pak Gum				-.004**	0.022	0.000
Pak PVC	1.191*	0.077	0.194			
Shaffi Chem				.019***	0.000	0.000
Sitara Chem	-0.466**	0.046	0.000	-.004***	0.003	0.000

Note: The table 4.5 reports the nonfinancial firms from Chemical sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

The table 4.5 explains the exposure in Chemical sector where ten firms out of total sample fifteen are significantly and negatively exposed to exchange rate. This sector is largely dependent on imports of raw materials. Eight firms out ten significantly exposed firms have nonlinear exposure profile while five out these ten firms shows linear exposure. Three firms having both linear and nonlinear exposure but statistically nonlinear relationship between stock prices and exchange rate fluctuations is more significant.

Table 4.6: Exchange rate exposure of Firms of Engineering Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Ados Pak				-. 008**	0. 028	0. 0397
Gauhar Engg	-3. 506*	0. 078	0. 0256			
Huffaz Pipe				-. 009***	0. 003	0. 0000

Note: The table 4.6 reports the nonfinancial firms from Engineering sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

The table 4.6 shows the result for total ten firms of engineering sector out of which only 30 percent firms are negatively exposed. The potential reason for this sector that the number of exposed firms is quite little is because engineering sector mainly produce and sell their goods locally in Pakistan. The exports are negligible while the industry dependent on only one time purchasing goods like equipment, machinery or transport vehicles. Also demand side prefers using local goods that is why they also have very little competitive risk.

Table 4.7: Exchange rate exposure of Firms of Fertilizers Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Dawood Fert.				-. 013***	0. 000	0. 000
Engro Chem.	-1. 385***	0. 000	0. 000	-. 017***	0. 000	0. 000
Fauji Fert.	-1. 397***	0. 000	0. 000	-. 013***	0. 000	0. 000

Note: The table 4.7 reports the nonfinancial firms from Fertilizers sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.7 above explains the estimation results for Fertilizer sector. Total three firms are selected which represents the fertilizer sector and all of them are significantly and negatively exposed to exchange rate fluctuations. The sector is highly exposed to the competitive risk coming from exchange rate fluctuations and making imports cheaper.

Table 4.8: Exchange rate exposure of Firms of Food and Personal Care Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Clover Pak	-1.115**	0.036	0.095			
Gillette Pak				.007**	0.026	0.0000
Goodluck Ind.				-.004*	0.065	0.0000
Mitchell				-.010*	0.082	0.0000
Murree brew	-1.567***	0.000	0.000	-.013***	0.000	0.0000
Nat foods	-2.597*	0.058	0.000	-.021**	0.015	0.0000
Quice food				-.009***	0.000	0.0000
Rafhan				.005***	0.001	0.0000

Note: The table 4.8 reports the nonfinancial firms from Food and Personal care sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.8 exhibits results for 12 firms, out of them 8 firms are negatively and significantly exposed. Firms having nonlinear exposure are dominant in this sector which shows that industry is an imports dominant and exports very less. Clover Pakistan is the only firm with linear exposure. Gillet Pakistan, Good Luck Industries, Mitchell Foods Quice Foods and Rafhan Foods possess nonlinear exposure while Murree Beverages and National Foods having both linear and nonlinear exposure.

Table 4.9: Exchange rate exposure of Firms of Glass and Ceramics Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Baloch Glass				.025***	0.000	0.000
Emco Ind.	-1.539***	0.010	0.000	-.013**	0.018	0.000
Frontier Cer.	-1.109**	0.051	0.143			
Ghani Glass				-.003*	0.070	0.022
Medi Glass	-2.199**	0.060	0.007	-.012**	0.011	0.028
Shabbier tile				.018**	0.012	0.000
Tariq Glass	-1.161**	0.029	0.000			

Note: The table reports the nonfinancial firms from Glass and Ceramics sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Large portion (7 out of total 8 firms) of the sample in Glass and Ceramics Industry (GCI) is exposed to exchange rate fluctuations. While five out seven are significantly exposed firms shows nonlinear relationship and four firms are linearly related. Most of these firms are negatively exposed which gives a gesture of import dominancy. A SBP reports says that GCI increased imports by 83 percent during five years covering 2005 and 2010. Baloch Glass, Ghani Glass and Shabbier Industries have nonlinear exposure while the farmer two are negatively related the latter is positively related. Two firms Emco Industries and Medi Glass are both linearly and negatively exposed and shows negative relationship. Frontier Ceramics and Tariq Glass are negatively and linearly exposed.

Table 4.10: Exchange rate exposure of Firms of Jute Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Crescent jute	-1.352*	0.067	0.097			
Latif jute	-.875***	0.009	0.004	-.003**	0.023	0.069
Thal jute	-1.286*	0.097	0.000	-.011***	0.006	0.000

Note: The table 4.10 reports the nonfinancial firms from Jute sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Four firms were so far included in the sample from Jute sector, where out of four firms three shows negative and significant exposure (Table 4.10). Crescent Jute reported only linear exposure while Latif Jute and Thal Jute shows both linear and nonlinear exposure.

Table 4.11: Exchange rate Exposure of Firms of Leather and Tanneries Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Bata	-.985**	0.018	0.005	-.008*	0.020	0.009
Pak Leather				.008***	0.001	0.000
Service Ind.	-1.408**	0.025	0.007	-.011*	0.051	0.006

Note: The table 4.11 reports the nonfinancial firms from Leather and Tanneries sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Three firms in the total sample of five are significantly exposed. Firms with nonlinear exposure profiles are dominant in this industry. Pak Leather which has positive coefficients in both linear and nonlinear exposure presents an evidence of net exporting firm.

Table 4.12: Exchange rate exposure of Firms of Oil and Gas Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Pak oil fields				-. 014***	0. 000	0. 000
PSO	-. 005**	0. 034	0. 000	-. 005*	0. 057	0. 000
Sui North	-1. 302***	0.010	0. 000			

Note: The table 4.12 reports the nonfinancial firms from Oil and Gas sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.12 reports a combine result for two sectors related to Oil and Gas i.e. Oil and Gas Marketing and Oil and Gas Exploration sector where only three out six firms from both sectors are significantly and negatively exposed to exchange rate. Pak Oil Fields reports nonlinear exchange rate exposure and Sui North reports linear exposure. While PSO resulted both linear and nonlinear relationship.

Table 4.13: Exchange rate exposure of Firms of Board and Paper Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Cherat Paper	-1. 480***	0. 006	0. 000	-. 013***	0. 008	0. 000
Dadabh Sack	.775**	0. 026	0. 059			
Merit Pack	-1. 179**	0. 027	0. 028			
Sec Paper				-. 005***	0. 000	0. 000

Note: The table 4.13 reports the nonfinancial firms from Board and Paper sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.13 shows the result for Board and Paper sector. Where four out of ten (40 %) firms are significantly exposed. Linearly related firms are dominant in this industry analysis.

Table 4.14: Exchange rate exposure of Firms of Pharmaceutical Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Abbott Lab				-. 007**	0. 016	0. 000
Glaxo Lab	-. 970***	0. 008	0. 000	-. 014***	0. 000	0. 000
High Noon	-1. 209**	0. 038	0. 000	-. 018***	0. 000	0. 000
Searle Pak	-. 869**	0. 031	0. 000	-. 013***	0. 000	0. 000

Note: The table 4.14 reports the nonfinancial firms from Pharmaceuticals sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.14 categorises as above, linear and nonlinear exposure results for the pharmaceutical industry in Pakistan. Most of the firms in this sector are significantly exposed to exchange rate fluctuation. Multinational Corporation (MNC) Glaxo is highly statistically exposed in both linear and nonlinear framework which is in the line with the traditional theory which stated that MNCs must have exposure due to its international operations in different countries. These firms also exhibits translation risk when financial statements of subsidiary firms consolidates with the parental firm. Abbot Laboratory shows that it is negatively and nonlinearly exposed. While other three firms namely Glaxo Laboratory, High Noon and Searle Pak shows both linear and nonlinear exposure. The negative coefficients suggests that all these four firms are net importing firms and highly exposed.

Table 4.15: Exchange rate exposure of Firms of Power Generation Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat.	Coff.	<i>p</i> -value	<i>p</i> -fstat.
Gen Tech Pak	-. 965**	0. 033	0. 000	-. 009***	0. 006	0. 000
Hub power	-. 729*	0. 076	0. 000	-. 009***	0. 000	0. 000
Japan power				-. 013***	0. 000	0. 000
Kohinoor En.				-. 006***	0. 007	0. 000
SG power				-. 008***	0. 003	0. 002
Sitara En.	-. 865***	0. 006	0. 000			
Southernel	-1. 908*	0. 001	0. 000	-. 016***	0. 000	0. 000
Tri-star Pow				-. 024***	0. 000	0. 000

Note: The table 4.15 reports the nonfinancial firms from Power generation and Distribution sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Power generation and Distribution sector plays an important role in the industrial production. If this sector is not directly affected by exchange rate movement it does indirectly by cost push mechanics coming from other sector to whom power sector sells electricity and other sources of energy. The table 4.15 exhibits that eight out of twelve firms representing this sector, which are significantly exposed to currency oscillation. Generators Technology Pak, Hub Power and Southern Electric Energy shows that these firms are negatively and both linearly and nonlinearly exposed. While Japan Power, Kohinoor Energy, SG Power and Tri-Star Power are negatively and nonlinearly exposed. The only firm in this sector that is Sitara Energy are significantly linearly exposed.

Table 4.16: Exchange rate exposure of Firms of Refinery Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Attock Ref	-1.600***	0.000	0.000	-.016***	0.006	0.000
Nat Refinery	-1.241***	0.000	0.000	-.012***	0.000	0.000
Pak Refinery				-.005**	0.016	0.000

Note: The table 4.16 reports the nonfinancial firms from Refinery sector that shows a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.16 exhibits the results for refinery sector. All the three representative firms in this sector are significantly exposed to currency risk. All of them possess nonlinear exposure but two firms are also related linearly. Attock Refinery and National Refinery reported both significant linear and nonlinear exposure while Pakistan Refinery shows only nonlinear exposure.

Table 4.17: Exchange rate exposure of Firms of Sugar Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Asha Ghazi				.029***	0.000	0.000
Adam sugar				-0.003*	0.066	0.184
Al-Abbas Sug				0.005***	0.000	0.000
Al-Noor Sugar				-0.005*	0.052	0.026
Ansari Sugar				0.006*	0.091	0.009
Crescent Sugar	-1.571***	0.000	0.000	-0.018***	0.000	0.000
Dewan Sugar				-0.010***	0.000	0.000
JDW Sugar				-0.009***	0.000	0.000
Mirpur Sugar				-0.051***	0.000	0.000
Mirza Sugar	-1.316**	0.038	0.006	-0.009*	0.086	0.027
Pangori Sugar				-0.008**	0.016	0.054
Sakandar Sug				-0.006**	0.030	0.007
Sanghar Sugar				-0.013***	0.004	0.001
Shah Murad				-0.007**	0.018	0.031
Shahtaj Sugar				0.012***	0.000	0.000
Shakerganj	-1.424**	0.048	0.000	-0.012***	0.002	0.000
Tandlianwal	-1.318***	0.006	0.000	-0.014***	0.000	0.000

Note: The table 4.17 reports the nonfinancial firms from Sugar sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

The Sugar sector comprises 28 firms out of them seventeen firms are significantly exposed to currency risk. As sugar sector does import mostly they are still exposed to

government frequent regulations and interference into the pricing of this sector. Government hedge imports and subsidised imported sugar. As currency depreciates, they are still not able to sell abroad due to subsidised imported sugar.

Table 4.18: Exchange rate Exposure of Firms of Synthetic and Rayon Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Dewan sal	-1.887***	0.000	0.000	-0.012***	0.000	0.000
Gatron Ind	-1.113*	0.087	0.000			
Ibrahim Fib	-0.672*	0.051	0.000	-0.003*	0.084	0.000
Pak Synth	-1.066**	0.016	0.000	-0.010***	0.004	0.000
Tristar Poly	-2.056**	0.026	0.006			

Note: The table 4.18 reports the nonfinancial firms from Synthetic and Rayon sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

The Synthetic and Rayon sector is represented by eight firms out of them five firms are significantly exposed to currency risk. Firms having nonlinear exposures are fewer in this sector. Dewan, Ibrahim Fibbers and Pak Synthon are negatively and both linearly and nonlinearly exposed. While Gatron Industries and Tristar Poly are negatively and linearly exposed to exchange rate vulnerability.

Table 4.19: Exchange rate Exposure of Firms of Telecommunication Sector

Name	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Pak Data	-1.853***	0.002	0.000	-0.015***	0.010	0.000
Tele Card	-2.160**	0.036	0.000	-0.036***	0.000	0.000

Note: The table 4.18 reports the nonfinancial firms from Telecommunication sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Few listed firms operating in Telecommunication in Pakistan. Table 4.19 describes that two firms out of total three firms so far included in this sector are significantly and negatively exposed also currency exchange rate impacts both linearly and nonlinearly the firm value.

Table 4.20: Exchange rate Exposure of Firms of Textile Composite Sector

Name	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Artistic Deni	-1.047*	0.051	0.000	-0.006***	0.005	0.000
Aruj Garment	0.714*	0.051	0.138			
Colony Thal				-0.009***	0.009	0.000
Fateh Textile				0.002*	0.088	0.222
Ghazi Fabrics				0.006*	0.055	0.000
Jubilee Spinn	-1.137*	0.092	0.019	-0.007**	0.031	0.028
Kohinoor Ind				-0.034***	0.000	0.000
Kohinoor Te				0.011***	0.000	0.000
Mohd Farooq	-2.728***	0.002	0.000	-0.017**	0.031	0.001
Nishat mills				-0.012***	0.000	0.000
Reliance Wea				-0.005**	0.041	0.011
Sapphire Fib				0.005*	0.094	0.049
Suraj Cotton				-0.005**	0.043	0.061
Zahur Cotton				0.011**	0.024	0.000

Note: The table 4.40 reports the nonfinancial firms from Textile Composite sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

The table 4.20 exhibits the results for textile composite sector, where out of total thirty eight firms only fourteen firms (37 %) reported significant exposure and these have mostly nonlinear exposure profiles. Interestingly this sector have also firms with positive coefficients contrary to other sector. As this sector has huge exports firms showing positive coefficients also it gives a gesture of net exporting firms.

Table 4.21: Exchange rate Exposure of Firms of Textile Spinning Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
Alqadir Tex				-0.005*	0.052	0.044
Alqaim Tex				-0.010**	0.019	0.005
Ali Asghar	-1.751**	0.050	0.044			
Babri Cotton				-0.010**	0.050	0.145
Bilal Fibres				-0.007*	0.053	0.123
DM Tex	-1.147*	0.076	0.119	-0.004***	0.100	0.192
Dar Salaam				-0.005*	0.086	0.000
Dewan Khal				0.017***	0.000	0.000
Dewan Tex				-0.006***	0.003	0.000
Din Tex				0.009**	0.081	0.042
Elahi Cotton	1.701*	0.090	0.166			
Gadoon Tex				-0.005**	0.015	0.002
H.Mohdin Mil	-1.220*	0.096	0.095			
Ideal Spinning				-0.006**	0.018	0.001
Khurshid Sp				0.044***	0.000	0.000
Kohat Tex	2.186**	0.042	0.002	0.025***	0.000	0.000
Kohinoor Sp	2.004*	0.059	0.162			
Maqbool Tex	1.004**	0.023	0.004	0.013***	0.001	0.000
Nagina Cott.				-0.005*	0.063	0.176
Saif Tex				-0.006*	0.070	0.004
Salfi Tex				-0.042***	0.000	0.000

Sargoda Sp	-1.797**	0.037	0.033	-0.008**	0.032	0.088
Shahzad Tex				-0.004**	0.090	0.084

Note: The table 4.21 reports the nonfinancial firms from textile spinning sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

So far total twenty three firms estimated in Textile Spinning sector where only seventy three firms (31 %) reported significant exposure (table 4.21) mostly with nonlinear exposure profiles and small coefficients. The less number of firms exposed may be due to a reason that these firms mostly exports and in order to minimise the risk cash flows they use financial instruments. For example if we look into the Financial Statements of Saif Textile Mills, the report has clearly mentions that the firm hedge their currency risk by employing financial derivatives. This is in the line with the study of Ware and Winter (1988) which says that firms having derivatives should have lesser exposure. Ali-Azhar Textile, Ellahi Cotton, Haji Mohiddudin Mills and Kohinoor Spinning are exposed linearly while Al-Qadir Textile, Al-Qasim Textile, Babri Cotton, Bilal Fibers, Dar-e-Salam Mills, Dewan Khalil Mills, Dewan Textile, Din Textile, Gadoon Textile, Ideal Spinning, Khurshid Spinning, Nagina Cotton, Saif Textile, Salfi Textile and Shahzad Textile shows nonlinear exchange rate exposure. The remaining firms of this sector i.e. DM Textile, Kohat Textile, Maqbool Textile and Sargodha Spinning shows both linear and nonlinear exchange rate exposure. As contrary to other sectors the results of this sector provides more positive signs i.e. Dewan Khalil, Ellahi Cotton Khurshid Spinning Din Textile, Kohat Textile, Maqbool Textile and Kohinoor Textile which gives an indication of more net exporting firms, this is in the line with the study of Rashid (2009) who also provides the evidence that he found a positive exposure of textile sector.

Table 4.22: Exchange rate Exposure of Firms of Textile Weaving Sector

Firms	Linear Model			Non-Linear Model		
	Coff.	<i>p</i> -value	<i>p</i> -fstat	Coff.	<i>p</i> -value	<i>p</i> -fstat
ICC Tex				-0.022***	0.000	0.000
Prosperity				-0.005**	0.024	0.048
Samin Tex	-1.373*	0.088	0.000	-0.012**	0.038	0.000
Shahtaj Tex				-0.010***	0.000	0.000

Note: The table 4.22 reports the nonfinancial firms from textile weaving sector that show a significant linear and nonlinear foreign exchange rate exposure. The steric ***, ** and * represents significance level at 1%, 5% and 10% respectively.

Table 4.22 shows results for four firms of Textile Weaving Sector. Where all firms shows a negative exposure, ICC Textile, Prosperity Textile and Shahtaj Textile are nonlinearly related. Only one firm that is Samin Textile which shows both linear and nonlinear relationship with exchange rate fluctuations.

Summary and quick snap shot of all the exposed firms that significantly reported in 22 sectors is given in table 4.23 (next page). Sector name, total numbers of firms listed in KSE in each sector, percentage of firms selected from the whole sector, percentage of firms linearly exposed β , percentage of firms nonlinearly exposed β^3 , firms with negative and positive exposures are shown in the table accordingly. The number of listed firms (non-financial) available on KSE website are 613. Only 288 (47 % of total 613) firms have complete data for the time period Jan-1999 to Dec-2013 available on KSE website. Out of 288 firms only 69 % (201 firms) firms have reported significant results. Automobile Assembler, Chemicals, Cement, Food, Glass, Leather, Paper and Textile are positively exposed to exchange rate fluctuations which shows that these sectors are net exporting firms.

Table 4.23: Summary of Exchange rate Exposure for All Sectors

S.No.	Sector Name	Total (#)	Sample %	β %	β^3 %	-ve %	+ve %
1	Automobile Parts	16	31	40	60	80	0
2	Automobile Assembler	16	56	33	56	11	11
3	Cable & Electrical Goods	15	33	40	60	60	0
4	Cement	30	47	29	57	57	7
5	Chemical	34	44	33	53	53	13
6	Engineering	19	53	10	20	30	0
7	Fertilizer	6	50	100	100	100	0
8	Food & Personal Care	32	38	25	67	58	17
9	Glass & Ceramics	13	62	50	63	63	25
10	Jute	8	50	75	75	75	0
11	Leather & Tanneries	10	50	60	60	40	20
12	Oil & Gas Companies	12	50	17	50	50	0
13	Paper & Board	15	67	30	20	30	10
14	Pharmaceuticals	18	33	67	67	67	0
15	Power Generation	22	55	33	67	67	0
16	Refinery	5	60	67	100	100	0
17	Sugar	44	66	14	59	45	14
18	Synthetic & Rayon	25	32	63	50	63	0
19	Communication	17	18	67	67	67	0
20	Textile Composite	69	55	11	34	21	16
21	Textile Spinning	157	46	11	26	22	10
22	Textile Weaving	30	33	10	40	40	0
	TOTAL	613	47 (288)	45	40	9	18

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusion

This study gives a very wide and clear picture of exchange rate exposure of nonfinancial listed firms in Pakistan. The motivation behind this analysis is the exchange rate exposure puzzle which complains if exchange rate changes affect firm value or it is just a myth. As we have studied a wide range of literature available so far we found that currency risk exposure is far studied in developed and large economies. Developed countries for example US trades mostly with other developed countries like Japan, Germany, France, UK etc. Exchange rate in developed countries mostly do not fluctuate and can be easily predicted which is already adjusted in the share price according to efficient market hypothesis. The currency risk is subject to the happening of unexpected exchange rate that is why these studied not reported satisfactory results. This study not only measured exposure in developing and small open economy at firm level for the first time but also navigated both linear and nonlinear relationship of stock returns and exchange rate fluctuations. We found that many listed firms from across the 22 sectors are significantly exposed statistically and economically. The nonlinear exposure in firms are found greater than linear exposure. For the time span started in Jan-1999 and ended in Dec-2013, 288 nonfinancial listed firms out of which 25 percent linear and 45 nonlinear are significantly exposed. The average number of firms having negative exposure is higher which shows that most of the firms are net importing firms while very few firms from specific sectors are positively exposed which shows that these firms are net exporting firms. Firms with positive exposures belongs to Textile, Leather and Food sector.

The negative coefficient in such a large number of firms reported so far shows that in Pakistan more firms are net importing firms. Where depreciation of local currency has negative on firms stock prices this evidence is against the mainstream theory that depreciation of currency has a positive impact on stock price and vice versa. This is because that firms who are dominant in imports, the depreciation of currency makes imports more expensive, thus more variable costs and hence lower stock returns.

5.2. Policy Recommendations

- The presence of large number of firms that are negatively exposed suggests that most of the firms are net importing firms and very few are net exporting. Government should subsidise such sector to boost their exports.
- Almost 60 percent of firms that linearly or nonlinearly exposed is an evidence that corporation are not using derivatives properly to mitigate their currency risk. This may be the reason that Pakistan is not having an established market for derivatives. Government should work with KSE to establish a full-fledged market for derivatives.
- Nonlinear exposure which is statically stronger than linearly estimated exposure, suggests that there is an absence of financial derivatives with nonlinear profiles such as Options. Such instruments should be introduced in order to encourage firms to address their risk issues.

5.3. Future Research

The insignificant results that observed in firms may be due to the fact that we used a single foreign exchange rate as a proxy for all firms. Each firm trades with different countries

in different currencies. So this study suggests that a currency Index of different exchange rates that Pakistani firms mostly trade with them, would be suitable to be made.

Second the study has oversimplified the methodology to capture nonlinear exchange rate exposure by just taking only a cube on exchange rate. The nonlinearity may be due to asymmetries in exchanger rate which are assumed to be symmetric in this study. As a firm level study is quite time taking so we left this side of the analysis.

As the dynamics of exchange rate changes overtime thus it is quite reasonable to study them periodically. As the pattern of firm decision making changes over time due to external and internal economic an firm specific shocks thus one can extend the time period to 2015 in order to capture these shocks and exchange rate variations,

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Appendix

Appendix A: Companies Included In the Sample

Sector	Company	Symbol	Market Cap
1 Automobile Assembler			
	Al-Ghazi Tractors Limited	AGTL	[111,525,000]
	Atlas Honda Limited	ATLH	[145,977,000]
	Ghandhara Nissan Limited	GNL	[100,000,000]
	Ghani Automobile Industries Limited	GAIL	[50,000,000]
	Honda Atlas Cars (Pakistan) Limited	HCAR	[420,000,000]
	HinoPak Motors Limited	HINO	[124,006,000]
	Indus Motor Company Limited	INDU	[786,000,000]
	Millat Tractors Limited	MTL	[80,094,000]
	Pak Suzuki Motor Company Limited	PSMC	[491,312,000]
2 Automobile Parts & Accessories			
	Agriautos Industries Limited	AGIL	[120,000,000]
	Atlas Battery Limited	ATBA	[24,725,000]
	Baluchistan Wheels Limited	BWHL	[115,950,000]
	Exide Pakistan Limited	EXIDE	[54,057,000]
	General Tyre and Rubber Company of Pakistan Limited	GTYR	[170,775,000]
3 Cable & Electrical Goods			

Johnson and Phillips (Pakistan) Limited	JOPP	[54,500,000]
Pak Elektron Limited	PAEL	[185,418,000]
Pakistan Cables Limited	PCAL	[31,218,000]
Siemens Pakistan Engineering Co. Limited	SIEM	[78,263,000]
Singer Pakistan Limited	SING	[52,471,000]

4 Cement

Cherat Cement Company Limited	CHCC	[481,326,000]
D.G. Khan Cement Company Limited	DGKC	[1,323,914,000]
Dadabhoy Cement Industries Limited	DBCI	[398,688,000]
Dandot Cement Company Limited	DNCC	[262,500,000]
Fauji Cement Company Limited	FCCL	[1,713,105,000]
Fecto Cement Limited	FECTC	[456,000,000]
Gharibwal Cement Limited	GWLC	[168,764,000]
Javedan Corporation Limited	JVDC	[88,000,000]
Kohat Cement Limited	KOHC	[219,333,000]
Lucky Cement Limited	LUCK	[2,450,000,000]
Maple Leaf Cement Factory Limited	MLCF	[1,302,294,000]
Mustehkam Cement Ltd	MUCL	[123,200,000]
Pioneer Cement Limited	PIOC	[954,371,000]
Zeal Pak Cement Factory Limited	ZELP	[87,120,000]

5 Chemical

Bawany Air Product Limited	BAPL	[28,657,000]
Berger Paints Pakistan Limited	BERG	[30,834,000]

Biafo Industries Limited	BIFO	[140,000,000]
Buxly Paints Limited	BUXL	[14,400,000]
Colgate Palmolive (Pakistan) Limited	COLG	[122,304,000]
Dynea Pakistan Limited	DYNO	[72,586,000]
I.C.I. Pakistan Limited	ICI	[7,886,494,000]
Leiner Pak Gelatine Limited	LPGL	[75,000,000]
Nimir Industrial Chemicals Limited	NICL	[377,500,000]
Pakistan Gum and Chemiclas Limited	PGCL	[29,260,000]
Pakistan PVC Limited	PPVC	[49,860,000]
Sardar Chemical Industries Limited	SARC	[60,000,000]
Shaffi Chemical Industries Limited	SHCI	[120,000,000]
Sitara Chemical Industries Limited	SITC	[165,687,000]
Wah Noble Chemicals Limited	WAHN	[37,500,000]

6 Engineering

Ados Pakistan Limited	ADOS	[43,884,000]
Bolan Casting Limited	BCL	[55,253,000]
Crescent Steel & Allied Products Limited	CSAP	[200,850,000]
Gauhar Engineering Limited	GAEL	[22,392,000]
Huffaz Seamless Pipe Industries Limited	HSPI	[122,002,000]
International Industries Limited	INIL	[128,860,000]
K.S.B. Pumps Co. Limited	KSBP	[120,000,000]
Metropolitan Steel Corporation Limited	MSCL	[81,777,000]
Pakistan Engineering Company Limited	PECO	[56,902,000]
Quality Steel Works Limited	QUSW	[17,718,000]

7 Fertilizer

Dawood Hercules Corporation Limited	DAWH	[400,320,000]
Engro Fertilizers Limited	EFERT	[1,007,510,000]
Fauji Fertilizer Company Limited	FFC	[2,684,958,000]

8 Food & Personal Care Products

Clover Pakistan Limited	CLOV	[39,000,000]
Gillette Pakistan Limited	GLPL	[192,000,000]
Goodluck Industries Limited	GIL	[3,000,000]
Ismail Industries Limited	ISIL	[72,600,000]
Mitchells Fruit Farms Limited	MFFL	[35,000,000]
Murree Brewery Company Limited	MUREB	[39,832,000]
National Foods Limited	NATF	[42,506,000]
Noon Pakistan Limited	NOPK	[6,000,000]
Quice Food Limited	QUICE	[106,875,000]
Rafhan Maize Products Limited	RMPL	[61,576,000]
Shield Corporation Limited	SCL	[30,000,000]
Treet Corporation Limited	TREET	[41,822,000]

9 Glass & Ceramics

Baluchistan Glass Limited	BGL	[55,000,000]
Emco Industries Limited	EMCO	[115,000,000]
Frontier Ceramics Limited	FRCL	[77,412,000]
Ghani Glass Limited	GHGL	[149,500,000]

Karam Ceramics Limited	KCL	[109,118,000]
Medi Glass Limited	MGL	[75,938,000]
Shabbir Tiles and Ceramics Limited	STCL	[74,991,000]
Tariq Glass Industries Limited	TGL	[100,000,000]

10 Jute

Crescent Jute Proudcts Limited	CJPL	[150,635,000]
Latif Jute Mills Ltd.	LATM	[32,340,000]
Suhail Jute Mills Limited	SUHJ	[37,450,000]
Thal Jute Mills Ltd.	THALJ	[69,566,000]

11 Leather & Tanneries

Bata Pakistan Limited	BATA	[75,600,000]
Fateh Industries Limited.	FIL	[20,000,000]
Leather Up Industries Limited	LEUL	[60,000,000]
Pak Leather Crafts Limited	PAKL	[34,000,000]
Service Industries Limited	SRVI	[120,288,000]

12 Oil & Gas Companies

Mari Petroleum Company Limited	MARI	[367,500,000]
Pakistan Oilfields Limited	POL	[380,250,000]
Pakistan State Oil Company Limited	PSO	[992,590,000]
Shell Pakistan Limited	SHEL	[350,658,000]
Sui Northern Gas Pipelines Limited	SNGP	[3,282,233,000]
Sui Southern Gas Company Limited	SSGC	[4,613,675,000]

13 Paper & Board

Abson Industries Limited	ABSON	[31,000,000]
Baluchistan Particle Board Limited	BPBL	[30,000,000]
Central Forest Products Limited	CEFP	[30,000,000]
Century Paper and Board Mills Limited	CEPB	[314,213,000]
Cherat Packaging Limited.	CPPL	[40,800,000]
Dadabhoy Sack Limited	DBSL	[40,000,000]
Merit Packaging Limited	MERIT	[27,495,000]
Packages Limited	PKGS	[411,577,000]
Pakistan Paper Prouducts Limited	PPP	[10,000,000]
Security Paper Limited	SEPL	[175,854,000]

14 PHARMACEUTICALS

Abbot Laboatories (Pakistan) Limited	ABOT	[175,245,000]
Ferozsons Laboratories Limited	FEROZ	[35,330,000]
GlaxoSmithKline (Pakistan) Limited	GLAXO	[335,507,000]
Highnoon Laboratories Limited	HINOON	[79,860,000]
Otsuka Pakistan Limited	OTSU	[100,000,000]
The Searle Company Limited	SEARL	[139,991,000]

15 Power Generation

Altern Energy Limited	ALTN	[221,000,000]
Genertech Pakistan Limited	GENP	[180,000,000]
Hub Power Company Limited	HUBC	[11,571,544,000]

Ideal Energy Limited	IDEN	[80,000,000]
Japan Power Generation Limited	JPGL	[1,332,000,000]
K-Electric Limited	KEL	[1,782,470,000]
Kohinoor Energy Limited	KOHE	[1,303,528,000]
Kohinoor Power Company Limited	KOHP	[120,000,000]
S.G. Power Limited	SGPL	[178,332,000]
Sitara Energy Limited	SEL	[190,920,000]
Southern Electric Power Company Limited	SEPCO	[931,880,000]
Tri-Star Power Limited	TSPL	[150,000,000]

16 Refinery

Attock Refinery Limited	ATRL	[270,000,000]
National Refinery Limited	NRL	[666,388,000]
Pakistan Refinery Limited	PRL	[200,000,000]

17 Sugar & Allied Industries

Abdullah Shah Ghazi Sugar Mills Limited	AGSML	[146,667,000]
Adam Sugar Mills Limited	ADAMS	[57,636,000]
Al-Abbas Sugar Mills Limited	AABS	[173,623,000]
Al-Noor Sugar Mills Limited	ALNRS	[185,703,000]
Ansari Sugar Mills Limited	ANSM	[244,073,000]
Baba Farid Sugar Mills Limited	BAFS	[94,500,000]
Chashma Sugar Mills Limited.	CHAS	[191,280,000]
Crescent Sugar Mills & Distillery Limited	CSMD	[190,022,000]
Dewan Sugar Mills Limited	DWSM	[125,730,000]

Faran Sugar Mills Limited	FRSM	[125,515,000]
Haseeb Waqas Sugar Mills Limited	HWQS	[324,000,000]
Husein Sugar Mills Limited	HUSS	[110,000,000]
J.D.W. Sugar Mills Limited	JDWS	[205,772,000]
Khairpur Sugar Mills Limited	KPUS	[160,175,000]
Kohinoor Sugar Mills Ltd	KOHS	[94,868,000]
Mehran Sugar Mills Limited	MRNS	[98,438,000]
Mirpurkhas Sugar Mills Limited	MIRKS	[63,888,000]
Mirza Sugar Mills Limited	MZSM	[141,000,000]
Noon Sugar Mills Limited	NONS	[51,707,000]
Pangrio Sugar Mills Limited	PNGRS	[108,500,000]
Premier Sugar Mills and Distillery Company Limited	PMRS	[37,500,000]
Sakrand Sugar Mills Limited	SKRS	[223,080,000]
Sanghar Sugar Mills Limited	SANSM	[119,460,000]
Shahmurad Sugar Mills Limited	SHSML	[211,188,000]
Shahtaj Sugar Mills Limited	SHJS	[120,112,000]
Shakerganj Mills Limited	SGML	[292,860,000]
Sind Abadgar Sugar Mills Limited	SASML	[104,250,000]
Tandlianwala Sugar Mills Limited	TSML	[249,316,000]
Thal Industries Corporation Limited	TICL	[75,116,000]

18 Synthetic & Rayon

Al-Abid Silk Mills Limited	AASM	[59,400,000]
Dewan Salman Fibre Limited	DSFL	[1,603,823,000]

Gatron Industries Limited	GATI	[383,645,000]
Ibrahim Fibre Limited	IBFL	[2,000,000,000]
Liberty Mills Limited	LIBM	[148,947,000]
Pakistan Synthetics Limited	PSYL	[560,400,000]
Rupali Polyester Limited	RUPL	[340,685,000]
Tri-Star Ployester Limited	TRPOL	[214,650,000]

19 TECHNOLOGY & COMMUNICATION

Pakistan Telecommunication Company Limited	PTC	[37,740,000,000]
Pak Datacom Limited	PAKD	[59,400,000]
Telecard Limited	TELE	[250,000,000]

20 Textile Composite

(Colony) Sarhad Textile Mills Limited	COST	[40,000,000]
Artistic Denim Mills Limited	ADMM	[140,000,000]
Aruj Industries Limited	ARUJ	[27,520,000]
Thal Textile Mills Ltd	COTT	[44,550,000]
Crescent Textile Mills Limited	CRTM	[387,327,000]
Fateh Textile Mills Limited	FTHM	[12,500,000]
Ghazi Fabrics International Limited	GFIL	[326,356,000]
Gul Ahmed Textile Mills Limited	GATM	[286,260,000]
Hafiz Limited	HAFL	[12,000,000]
Hala Enterprises Limited	HAEL	[37,800,000]
Hamid Textile Mills Limited	HATM	[132,716,000]

Husein Industries Limited	HUSI	[106,258,000]
International Knitwear Limited	INKL	[30,000,000]
Ishaq Textile Mills Limited	ISTM	[96,600,000]
Jubilee Spinning and Weaving Mills Limited	JUBS	[70,169,000]
Khyber Textile Mills Limited	KHYT	[12,275,000]
Kohinoor Industries Limited	KOIL	[288,596,000]
Kohinoor Textile Mills Limited	KTML	[271,649,000]
Libaas Textile Limited	LIBT	[40,000,000]
Masood Textile Mills Limited	MSOT	[160,000,000]
Mehmood Textile Mills Limited	MEHT	[90,673,000]
Mian Textile Industries Limited	MTIL	[147,368,000]
Mohammed Farooq Textile Mills Limited	MFTM	[188,892,000]
Mubarak Textile Mills Limited	MUBT	[27,000,000]
Nina Industries Limited	NINA	[220,000,000]
Nishat Mills Limited	NML	[1,113,444,000]
Paramount Spinning Mills Limited	PASM	[100,000,000]
Quetta Textile Mills Limited	QUET	[31,250,000]
Redco Textiles Limited	REDCO	[212,926,000]
Reliance Weaving Mills Limited	REWM	[109,550,000]
Safa Textiles Limited	SFAT	[40,000,000]
Sapphire Fibers Limited	SFL	[140,000,000]
Sapphire Textile Mills Limited	SAPT	[74,382,000]
Shams Textile Mills Limited	STML	[43,200,000]
Suraj Cotton Mills Limited	SURC	[90,000,000]
Taj Textile Mills Limited	TAJT	[334,418,000]

Towellers Limited	TOWL	[170,000,000]
Zahoor Cotton Mills Limited	ZHCM	[98,600,000]

21 Textile Spinning

Al-Azhar Textile Mills Limited	AZTM	[85,504,000]
Al-Qadir Textile Mills Limited	ALQT	[75,600,000]
Al-Qaim Textile Mills Limited	AQTM	[74,530,000]
Ali Asghar Textile Mills Limited	AATM	[95,747,000]
Annoor Textile Mills Limited	ANNT	[8,712,000]
Apollo Textile Mills Limited	APOT	[82,847,000]
Asim Textile Mills Limited	ASTM	[81,770,000]
Babri Cotton Mills Limited	BCML	[20,000,000]
Bilal Fibres Limited	BILF	[100,000,000]
Brothers Textile Mills Limited	BROT	[98,010,000]
Chakwal Spinning Mills Limited	CWSM	[79,200,000]
D.M. Textile Mills Limited	DMTX	[30,524,000]
Dar-es-Salaam Textile Mills Limited	DSML	[80,000,000]
Dewan Khalid Textile Mills Limited	DKTM	[29,160,000]
Dewan Mushtaq Textile Mills Limited	DMTM	[17,622,000]
Dewan Textile Mills Limited	DWTM	[69,300,000]
Din Textile Mills Limited	DINT	[134,796,000]
Elahi Cotton Mills Limited	ELCM	[13,000,000]
Ellicot Spinning Mills Limited	ELSM	[87,600,000]
Fatima Enterprizes Limited	FAEL	[71,155,000]
Fazal Cloth Mills Limited	FZCM	[63,360,000]

Fazal Textiles Mills Limited.	FZTM	[61,875,000]
Gadoon Textile Mills Limited	GADT	[234,375,000]
Glamour Textile Mills Limited	GLAT	[116,400,000]
Globe Textile Mills Limited	GLOT	[66,426,000]
Gulistan Spinning Mills Limited	GUSM	[100,000,000]
Gulistan Textile Mills Limited	GUTM	[126,360,000]
Gulshan Spinning Mills Limited	GSPM	[126,500,000]
Haji Mohammed Ismail Mills Limited	HMIM	[90,720,000]
Hajra Textile Mills Limited	HAJT	[68,750,000]
Ideal Spinning Mills Limited	IDSM	[99,200,000]
Idrees Textile Mills Limited	IDRT	[150,400,000]
Indus Dyeing Manufacturing Company Limited	IDYM	[91,529,000]
Ishtiaq Textile Mills Limited	ISHT	[42,500,000]
Island Textile Mills Limited	ILTM	[5,000,000]
J.A. Textile Mills Limited	JATM	[70,000,000]
J.K. Spinning Mills Limited	JKSM	[96,932,000]
Janana-de-Malucho Textile Mills Limited	JDMT	[28,777,000]
Khalid Siraj Textile Mills Limited	KSTM	[107,000,000]
Khurshid Spinning Mills Limited	KHSM	[131,748,000]
Kohat Textile Mills Limited	KOHTM	[80,246,000]
Kohinoor Spinning Mills Limited	KOSM	[146,250,000]
Land Mark Spinning Industries Limited	LMSM	[121,237,000]
Maqbool Textile Mills Limited	MQTM	[84,000,000]
Mehr Dastgir Textile Mills Limited	MDTM	[92,000,000]

N.P. Spinning Mills Limited	NPSM	[105,000,000]
Nadeem Textile Mills Limited	NATM	[89,000,000]
Nagina Cotton Mills Limited	NAGC	[93,500,000]
Nazir Cotton Mills Limited	NCML	[180,000,000]
Olympia Spinning and Weaving Mills Limited	OLSM	[24,000,000]
Olympia Textile Mills Limited	OLTM	[108,040,000]
Premium Textile Mills Limited	PRET	[61,630,000]
Quality Textile Mills Limited	QUAT	[125,760,000]
Ravi Textile Mills Limited	RAVT	[70,380,000]
Reliance Cotton Spinning Mills Limited	RCML	[102,920,000]
Resham Textile Industries Limited	REST	[114,927,000]
Ruby Textile Mills Limited	RUBY	[70,000,000]
Saif Textile Mills Limited	SAIF	[189,129,000]
Sajjad Textile Mills Limited	SJTM	[106,339,000]
Salfi Textile Mills Limited	SALT	[30,387,000]
Sally Textile Mills Limited	SLYT	[87,750,000]
Salman Noman Enterprises Limited	SANE	[39,760,000]
Sana Industries Limited	SNAI	[40,000,000]
Sargodha Spinning Mills Limited	SRSM	[312,000,000]
Saritow Spinning Mills Limited	SSML	[132,750,000]
Service Textile Industries Limited	SERT	[44,492,000]
Shadab Textile Mills Limited	SHDT	[25,000,000]
Shadman Cotton Mills Limited	SHCM	[131,250,000]
Shahzad Textile Mills Limited	SZTM	[135,525,000]
Sunrays Textile Mills Limited	SUTM	[60,000,000]

Sunshine Cotton Mills Limited	SUCM	[78,511,000]
Taha Spinning Mills Limited	THAS	[40,500,000]
Tata Textile Mills Limited	TATM	[131,000,000]

22 Textile Weaving

Ashfaq Textile Mills Limited	ASHT	[69,970,000]
Hakkim Textile Mills Limited	HKKT	[53,948,000]
I.C.C. Textile Limited	ICCT	[100,008,000]
Prosperity Weaving Mills Limited	PRWM	[96,000,000]
Sadoon Textile Mills Limited	SDOT	[30,000,000]
Saleem Denim Industries Limited	SDIL	[39,018,000]
Samin Textiles Limited	SMTM	[133,640,000]
Service Fabircs Limited	SERF	[157,548,000]
Shahtaj Textile Mills Limited	STJT	[84,000,000]
Yousuf Weaving Mills Limited	YOUW	[151,400,000]