Exposure of non-financial industries to Exchange Rate and Interest Rate:

An evidence from Pakistan

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Financial control
Interest rate
exchange rate

In the name of ALLAH, The most Gracious, The most merciful.

APPROVAL SHEET

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Dedication

To my family and friends whose prayers and encouragement are always with me.

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ABSTRATCT

In this study we examined the sensitivity of Pakistani Non-financial industries to exchange and interest rate exposure from the year 2000 to 2014 using autoregressive exponential GARCH-in-mean (EGARCH-M) model. It is found that Pakistani non-financial industries are highly affected by the fluctuations in exchange rates and interest rates. The results showed that the number of statistically significant industries in the exposure of US dollar exchange rate and long term interest rate are equal, but the industries are more exposed to the exposure of the fluctuations in terms of long term interest rate.

Furthermore, for most Pakistani industries, increased risk does not necessarily lead to an increase in returns and persistence of volatility is much higher in some industries.

Key words: Exchange rate, Intersect rate, EGARCH-M, Pakistan

Chapter 1

Introduction

The main purpose of this study is to examine the impact of fluctuations in the interest rate and the exchange rate on stock returns, these fluctuations create volatility in returns, so the potential and existing investors become skeptical about their investment returns. As according to Olugbode *et al.*, (2013) the interest rate and the exchange rate are two important factors that play main role in the value of a firm. Variations in both are of a great concern to the researchers. El-Marsy and Hyde (2007) and Bartram (2002) stated that exchange rate and interest rate fluctuations can affect cash flows of exporters, importers, multinational firms and also the domestic firm and have its implications for the financial system of a country especially the stock market. Hence, from the perspective of the interest rate and exchange rate impacts, a sharp indirect movement or negative increase in these measures makes stock returns more risky or volatile.

Since the appreciation or depreciation of domestic currency has strong affect on stock returns of firms, (Adjasi*et al.*, 2008).Kiymaz (2003) stated that changes in currency value affect a firm's value and the economies that are suffering from inflation highly suffer from unexpected changes in exchange rate. According to the results of available literature, the relationship between exchange rate and stock returns can be considered as either negative, positive or a weak relation (Olugbode *et al.*, 2013). Since foreign exchange rate exposure is sensitive to the characteristics of firms and industries but the most important factor is the extent to which these firms or industries are involved in foreign transactions. But according to Aggarwal and Harper (2010) pure domestic firms can also be affected by exchange rate fluctuations. It means that being directly affected by the exchange

rate fluctuations does not merely depend on international activities. In broad terms, a definition for exchange rate exposure can be stated as the change in the firm value emanating from the fluctuations in the exchange rates. There is a high possibility that the exchange rate exposure is related with foreign currency denominated balance sheet items. The negative balance sheet foreign exchange exposure indicates that Pakistani industrial firms holds, on average, more foreign currency denominated liabilities than foreign currency denominated assets. This indicates currency mismatching on the balance sheet.

Exchange rate exposure depends upon the size of the firms, large firms are less exposed as compared to smaller firms because they hedge their risk more efficiently. Moreover structure of the industry also has an important role in the degree of a firm's exposure to exchange rates' variations, (Dominguez and Tesar, 2006). According to the results of various studies, including (Bradley and Moles, 2001; Adjasi et al., 2008 and Caglayan and Demir, 2014) we can say that if the exchange rate of concerned currency is less volatile then there will be a positive impact on the economy and the industries will face less competition.

Similarly Interest rate is an important macroeconomic variable and is directly related to the economic growth and can also affect the cash flows of the firms, its variability generates a direct affect to the market i.e. an increase in interest rate leads investing decisions to alter the structure of investment, (Czaja *et al.*, 2010). According to Alam and Uddin (2009) Interest rate is defined as the cost of capital that is the price which has to be paid for the use of money. Interest rate is the cost of borrowing money for the borrower known as the borrowing rate. On the other hand interest rate is the fee that is charged by the lender for lending money, known as the lending rate. Rational investors always search for investing in an efficient

market. While, in an inefficient market only a few investors become able to earn an extra ordinary profit.

Martínez et al.,(2013), Ferrer *et al.*, (2010) and Alam and Uddin (2009) stated that interest rate is expected to have indirect or negative influence on stock market index. According to Zafar *et al.*, (2008) a decrease in the interest rate because of the expansionary monetary policy may cause to stimulate the stock market due to an increase in the economic activities. Likewise, an increase in the interest rate due to the tight monetary policy may cause to slow down the stock market due to a decrease in the economic activities, leads to a bearish stock market. Because when interest rate goes up, it causes required rate of return and the risk of a particular investment to increase and profits of a firm tend to decrease due to an increase in cost of capital which in turn causes the stock value to fall down.

In his study, Bartram (2002) stated that not only the financial corporations become the victim of interest rate fluctuations, these fluctuations also affect the stock returns of non-financial sector. Returns of industry tend to decrease when interest rate rises and vice versa because fluctuations in interest rates influence the value of a company's shares, stocks and returns.

The dynamics of the long term and short-term interest rate correctly is an important issue in financial economics due to its importance in the interest rate derivative assets, assessment of interest rate sensitive securities, asset pricing and in risk-free management, (Hou and Suardi, 2011; Olugbode *et al.* 2013; Koutmos, 2012). Since, incorrect estimation of interest rate volatility leads to unhedged risks and pricing errors. In the previous literature, several types of models, such as autoregressive conditional heteroscedasticity (ARCH) and GARCH family models, autoregressive (AR), moving average (MA), have been used to forecast the

expected volatility. According to Hegerty (2014) volatility in interest rate leads to uncertainty among the investors about the returns of their investment, for the economic development, it is not a good sign.

Fluctuations in exchange rate and interest rates lead to volatility in the stock returns, volatility creates more risk, because it creates unpredictable and unexpected changes in the stocks. In order to measure the relationship between volatility and stock prices, many studies i.e. Léon (2008), Campbell (1987),Koutmos (2012), El-Masry and Hyde (2007), Hou and Suardi (2011) have been done. Understanding and modeling the stock price, interest rates and exchange rate volatility is one of the major concerns for the investors and policy makers. Fluctuations in these variables are complex and unpredictable. According to Bruni (1983) interest rate and exchange rate volatility are caused due to the crisis taking place over the time and to capture these volatilities are of a great concern to the economists. Modeling of these unpredictable changes in financial series has become a challenge to researchers. Shocks like Asian crisis (1997-1998), stock market crash (1987), attack of 9/11 and global financial crisis (2007-2009) affected the mechanism of interest rate and exchange rate market.

Basically, exchange rate and interest rate volatility directly influences the economy by affecting the decisions of the government about market regulations and it also affects consumer's income and the business firms. Financial series have some characteristics like volatility shifts, heterogeneity, volatility clustering and long memory of the volatility, which persists over a long period of time. Volatility does not give a good signal to the investors, as it also affects the stock market and stock market works as a barometer of the economy, it reflects the economic and financial position. If the stock market reflects less volatility then it can attract the foreign

investors, because due to higher volatility, returns become uncertain, and foreign investors show reluctance to invest in such economy, (Zafar *et al.*,2008; Alam and Uddin, 2009 and Adjasi *et al.*, 2008).

Bartram (2002) and Olugbode *et al.* (2013) stated that fluctuations in interest rate and exchange rate can affect the competitiveness of firms. Firms can minimize their risk through adopting different hedging techniques, such as [1]forwards, swaps, options and futures. Different firms use different hedging strategies to mitigate the risk, so the degree of exposure may also vary from firm to firm. Bradley and Moles (2001) explained that mostly [2]financial firms use efficient techniques to hedge their interest rate and exchange rate exposure that's why these firms face less risk as compared to non-financial firms. So in this paper we studied only about the non-financial firms to measure the effect of exchange rate and interest rate fluctuations on their stock returns.

Therefore, the main aim of this study is to model and estimate the interest rate and the exchange volatility of Pakistani non-financial industries, by using the most appropriate methodology for financial data, which is exponential GARCH in mean in order to summarize the conditional heteroscedasticity. Moreover, the purpose of this study is to display a comprehensive analysis of the vulnerability of Pakistani non-financial industries to short term and long term interest rate exposures and indirect exchange rates exposure of US dollar and £ to Pakistani rupee.

[1] Contracts between two trading parties to sell or buy an asset at a specific future date at a price agreed upon today to avoid risk.

[2] Financial firms are those firms who provide financial services. Agyei-Ampomah et al.,(2013)

1.1 Exchange rate and interest rate in Pakistan:

Regarding population Pakistan is the 6th largest country of the world, on the scale of nominal GDP Pakistan is at 44th place. In the past few decades the economic growth of the country seems to be very slow because of the social and economic problems like trade imbalance, law in order situations, military operations, war against terrorism, natural disasters i.e. floods, earthquakes, unemployment, political situation, energy crisis and hyperinflation. Thus the volatile behavior of exchange rate and interest rate further expanded the situation of low economic growth.

Fluctuations in exchange rate and interest rate affect stock market, importers and exporters differently. Exchange rate tends to fluctuate because of the changes in demand and supply of currencies involved in the foreign trade. If the indirect exchange rate[3] depreciates because of an appreciation in the value of home currency then this will not be beneficial for the exporters because now imports will become comparatively cheaper, and people will increase demand for imports and vice versa, (Adjasi et al., 2008; Caglayan and Demir, 2014).

Exchange rate market links a country with the world in terms of trade, it has a strong impact on the external and internal sectors of any country. Furthermore, Pakistan is an export oriented country, so the Exchange rate changes used to stimulate the exports and leave a significant impact on the local and foreign investors. Since the great Recession was a period of general economic decline observed in world markets during the late 2000s and early 2010s. The scale and timing of the recession varied from country to country. In terms of overall impact, the International Monetary Fund concluded that it was the worst global recession

[3] Indirect Exchange rate= Foreign currency/ Home currency

since World War II. The Great Recession was related to the financial crisis of 2007–08 and U.S. subprime mortgage crisis of 2007–09. The Great Recession has resulted in the scarcity of valuable assets in the market economy and the collapse of the financial sector in the world economy.

The financial crisis ravaging the global economy is naturally a serious cause for concern to policy makers of Pakistan. The ripple effect has led to job losses, speculative burbles in stock markets and commodities markets, reduction in manufacturing as consumption and demand continues to fall. Igbal (2010) reported that global economic meltdown has badly affected foreign direct investment, portfolio investment and exports of developing nations.

Before 1970, there was fixed exchange rate system in the world. A significance increase in the exchange rate volatility took place after the failure of the Bretton Wood system. Before 9 January 1982 Pakistan exchange rates were fixed and Pakistani currency was pegged with dollar but then government detached their currency from the dollar and eventually the fixed[4] exchange rate of PKR became floating[5] one, which created a depreciation in the currency by 38.5%.nuclear tests in 1998 again created a depreciation so in order to lessen the financial crisis the multiple exchange rate system, which was composed of floating interbank rate, official rate and composite rate was adopted in Pakistan.

Usually fluctuations in exchange rate affect the decisions of monetary policy so the central bank has to adjust monetary variables in the economy. If the currency of Pakistan tends to depreciate in the foreign market then it pressurizes the State Bank

[4] Fixed Exchange rate : when the currency is pegged with the dollar or gold
[5] Floating exchange rate: when a currency is set by its demand and supply in the foreign exchange market.

to decrease the money supply by applying quantitative controls or through changes in interest rate. In order to maintain the stability in the money supply State Bank of Pakistan determines the official interest rate with the help of economic observers. Monetary authorities also play an important and significant role in its determination. Moreover, the government regulates exchange rates only indirectly. That's because most exchange rates are set on the open foreign exchange market.

Pakistan's government has various tools to influence Pakistani rupee exchange rate against foreign currencies, it can control exchange and interest rates by altering demand and supply of the money. The Treasury Department is a government agency that also indirectly affects the exchange rate. It prints more money, which increases the supply, weakening the Pakistani rupee.

It can also borrow more money from other countries. That's done by selling Treasury notes. That not only increases the money supply, but it also increases the debt. Both will send the rupee's value down

The third government tool is expansionary fiscal policies. They typically weaken the rupee by increasing the money supply. Similarly, higher interest rates will cause hot money flows and increase demand for the currency

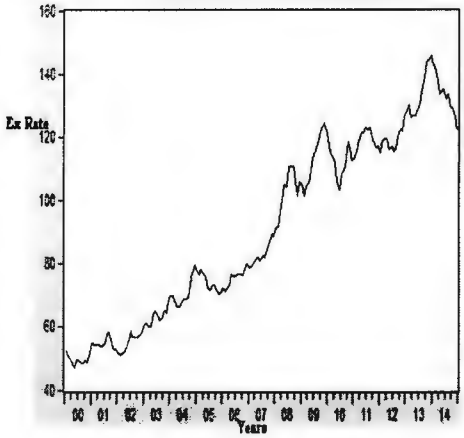
In Pakistan there are many interest rates i.e, coupon rate[6], discount rate[7], Karachi Interbank Borrowing Offer Rate (KIBOR)[8], Call money rate[9] and T-bills rate. The

[6] Coupon Rate: The yield that is paid by the fixed income security
[7] Discount Rate: The minimum rate of interest which is determined by the central banks for lending to commercial banks.
[8] KIBOR: Karachi Interbank Offered Rate, which is used as a benchmark for corporate lending rates
[9]Call money rate is the rate of money market at which short term funds are lent and borrowed.

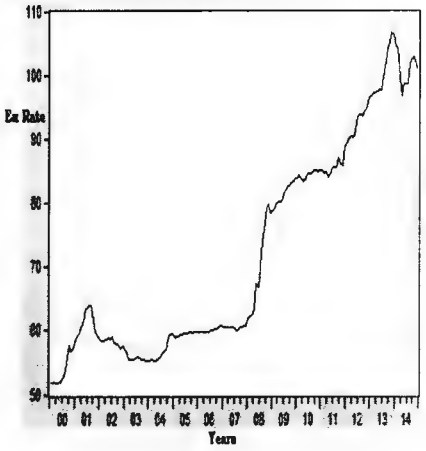
interest rate's rigidity has a negative impact on the growth of market of bonds and savings. State bank used to increase the interest rate when it wants to reduce the money supply in the economy to control the inflation. Since the local investors are also sensitive to the changes in the interest rate.

Following are the graphs of long term and short term interest rate and exchange rates:

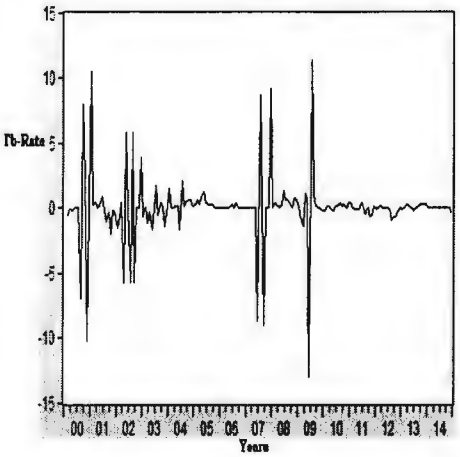
Euro Exchange rate:



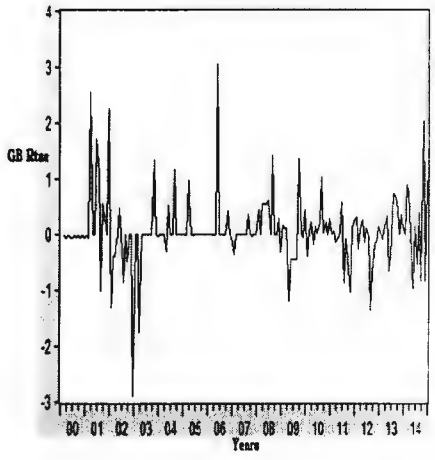
US$ Exchange Rate:



3-Months T-bill Rate: (short term interest rate)



GB Rate: (long term interest rate)



A number of researches including (Kiymaz, 2003; Bartram, 2004; Agyei-Ampomah et al., 2013; Zafar et al., 2008 and Priestley and Odegaard, 2007) have

investigated the exchange rate and interest rate exposure and its effect on the stock returns due to fluctuations in both, they produced different results; some studies showed a large influence of exchange rate and interest rate exposure on stock returns while some showed just a minor influence. There can be a number of reasons behind these different results because different researchers use different estimation methods and frequency of sample period.

1.2 Significance of the Study:

By modeling and forecasting the volatility of the stock returns and by capturing the fluctuations in the exchange rates and interest rates variables will help the economic observers and policy makers in making decisions about the economic policies in order to get rid of the problems that are arising due to volatile behavior of these variables. This study will help the potential investors who wish to understand the relationship between policies that affect exchange rates and relative wealth effects. This study will also help the existing investors to examine the reaction of stock returns of various sectors to exchange rate and interest rate variations in making financial decisions, and will also be proved useful for financial managers when measuring exposure to foreign exchange rate variations. As the relationship between stock returns' fluctuations and the market risk have important implications for the firms in financial operations as well as for the decision-making process of international investors. Therefore, it would be interesting to explore the affect of interest rate and foreign exchange volatility on stock market of a developing country. Moreover, this study will help the economic observers and policymakers to capture very heterogeneous affects of the interest rate and foreign exchange rates on the returns of the industries.

1.3 Literature Gap:

As a number of studies Bartram (2002), Campbell (1987), Elyasiani and Mansur (1998), Hou and Suardi (2011), Bodnar and Gentry (1993) have been done to measure the exposure of the industries due to fluctuations in exchange rate or interest rate individually but only a few measured the exposure of both at the same time as both of them affect industrial returns equally having the same importance. So, in this study considered the exposure of exchange rate along with interest rate. According to Bartram (2002) the influence of interest rate exposure on the value of non-financial firms has rarely been studied, since most of the studies considered exchange rate exposure. Moreover almost all studies measured only the short run interest rate exposure i.e. Hou and Suardi (2011) but in this study measured the impact of both, short run as well as well long run interest rate exposure. According to Bartram (2002) long-term interest rates have special relevance for the private and public sector from investment point of view. Moreover, this study is done on the non-financial firms rather than financial firms, which is a rare phenomenon in the existing literature, as Bruni (1983), Mansur and Elyasiani (1998), Chan *et al.*, (1992), Faff *et al.*, (2013) and Adcock *et al.*, (2014) investigated the impact of exposure of interest rate and exchange rate on financial industries. This study is done for a developing country like Pakistan rather than developed countries. As Pakistan is an emerging developing economy and has not been studied much. In this regard our study will serve as an addition. Moreover, this study aims to provide a more comprehensive and detailed analysis of exchange rate exposure and interest rate exposure of non-financial industries of Pakistan.

1.4 Research Objectives:

The objectives of this study are following:

1. To measure the affect of volatilities of interest rate and exchange rate on stock returns.

2. To predict future volatility patterns by examining the presence of the leverage and asymmetric effects of these variables.

Moreover, our research objectives are to analyze the Impact of exchange rate and interest rate fluctuations on stock returns of Pakistani non-financial industries to check the possible divergent reactions of investors between small and large interest rate and exchange rate fluctuations. We will also check which exposure has comparatively stronger effect on stock returns?

1.5 Research Questions:

(i) Do Exchange rate and Interest rate exposures have any significant effect on industrial returns?

(ii) If the above one holds then which exposure has stronger effect? Interest rate exposure or exchange rate exposure?

1.6 Research Hypothesis:

To investigate our research questions, we have formulated the following hypotheses:

H^1_o: Exchange rate and interest rate exposure affect Pakistani non-financial industries

H^1_o: Interest Rate exposure has stronger effect than exchange rate exposure.

1.7 Structure of the Thesis:

The remaining study is divided into four sections: Section 2 describes the review of related literature, section 3 describes model specification and methodology, section 4 represents Estimation Results and section 5 describes conclusion, policy implications and recommendations.

Chapter 2

Literature Review

Though the impact of fluctuations in exchange and interest rates on a firm's value has significant importance but different studies produced mixed results. As we have already mentioned that most of the studies measure the impact of exchange rate and interest rate exposure separately, only a few measured both. So we divided our literature review in three parts i.e. section 2.1reviews the impact of exchange rate exposure, section 2.2describes the impact of interest rate exposure and section 2.3 reviews the impact of both on stock returns.

2.1. Exchange Rate Exposure:

Generally firms that are involved in foreign transactions are supposed to suffer from the fluctuations in exchange rates, that's why most of the studies focused on exposures of multinational or internationally involved firms, such as Bodnar and Gentry (1993) investigated exchange rate exposure for industries of three countries USA, Canada and Japan, they discovered that the fluctuations in exchange rate has strong impact on industries of three nations. For all countries included in the sample, they found that fluctuations in exchange rate were strongly depending upon the activities of their industries. Likewise Bradley and Moles (2001) investigated the effects of exchange rate movements of non-financial UK firms, this research was conducted through two surveys in 1996 and 1997 to examine the nature of exposure that firms usually face and the indirect and direct economic currency exposure, the questionnaire was given to all listed companies to get the firm's own estimates about the exchange rate sensitivity they faced. Their result showed that when the value of sterling decreased there was an increase in profit

margins of export firms. This result is similar to Kiymaz (2003) who investigated the foreign exchange exposure of firms by taking sample of 109 firms listed on the Istanbul Stock Exchange during the period of 1991-1998. This study showed that imports and exports oriented firms have highest exposure to exchange rate risk which reduces their mean returns.

Since the value of stock and returns are sensitive to the changes in exchange rate movements but interestingly, most of the studies assume that the unexpected changes of exchange rate shocks do not affect the stock returns that is the impact of exchange rate fluctuations is symmetrical. As a research by Jorion (1990) which is often supposed to be the pioneer in the investigation of exchange rate risk, found that only a few multinational firms have significant exposure with regard to changes in exchange rates. This result contradicts with the study of Koutmos and Martin (2003) which showed that depreciations and appreciations of currencies can asymmetrically affect stock returns. Asymmetric responses of stock prices to currency variations may occur due to the different behavior of investors. Likewise, Muller and Verschoor, (2006) investigated the asymmetric foreign exchange risk exposure by using U.S. companies and tested the hypothesis that whether the stock returns react differently to negative and positive news from exchange rate markets and to currency shocks. Results showed that the presence of both size and sign asymmetries significantly increases the number of U.S. companies that showed a significant sensitivity to currency fluctuations. Similarly, Miao *et al.* (2013) investigated asymmetric [10]Renminbi exchange rate exposure for Chinese industries. The results showed that seven out of sixteen industries were found to be exposed by the fluctuation in exchange rate which shows that there is a strong

[10] Currency system of China, introduced in 1948. It is another term for Yuan.

relationship exists between fluctuations in Renminbi exchange rate and stock returns. Measuring the impact of foreign exchange exposure on stock return returns has always been a very pressing issue for the researchers, but different studies produced different results, there can be a number of reasons behind this weak relationship, as explained by Bartram (2002), who investigated linear and non-linear exposure of German non-financial industries. The study showed that the reason behind the weak relationship in past studies may be related to the use of foreign exchange rate indices for the estimation of exposure and these currencies indices may result in a biased exposure, as the weighting of many different currencies do not represent individual firms. In confirmation a recent study by Priestley and Ødegaard (2007) investigated linear and non-linear exposure of exchange rate, the study showed that the industries with extensive international trade have greater and significant linear and non-linear exposure. The study also suggested that estimation of exchange rate exposure must be done by using individual currencies instead of a currency basket. Likewise, Martin and Mauer (2005) investigated foreign exchange rate exposure by using different common methods i.e. cash flow and capital market method by using a sample of large U.S banks, they found that cash flow exposures are significant while capital market exposures are insignificant because the advantage of cash flow approach is that it can decompose exposure into long and short -term components. Moreover capital market participants can also take advantage from the information revealed by the cash flow method. Similarly El-Masry et al.,(2007) investigated the exchange rate exposure puzzle, they observed that only a small number of firms showed significant exchange rate exposure because the researchers used variety of methodologies, approaches by using different time periods. This study suggested

that firms can minimize or remove their exposure by using suitable hedging techniques such as options and future derivatives. Similarly, Ageyei-Ampomah *et al.*, (2013) investigated the foreign exchange exposure of UK non-financial firms by comparing market-based methodologies, in order to investigate the relationship between stock returns and exchange rate exposures and the methodology. The results suggested that foreign exchange rate exposure of a firm strongly sensitive to estimation method, they used GARCH-TVC and orthogonalized GARCH-TVC model and all of them gave different results, the results are consistent with Baur and Miyakawa (2014) investigated the foreign exchange exposure of Australian firms, for this purpose they used daily, weekly and monthly data to check the effect of currency fluctuations on the value of firms. The results showed that the exchange rate exposure depends upon the depreciation and appreciation of home currency and on the frequency of the sample time period that is used and they also showed that the investors need time to accept the changes in firms value due to changes in exchange rate. Similarly, Al-Shboul and Anwar (2013) investigated foreign exchange rate exposure by including thirteen industries of Canada. They observed the effect of exchange rate exposure by comparing pre and post global financial crisis periods, considering linear and non-linear exposures. They found that effect of linear exchange rate exposure is relatively weak in the pre- global financial crisis period as compared to post global financial crisis. The results suggested that after the global financial period financial sector has become more exposed than market sector. We can say that exchange rate effect on stock returns is heterogeneous, as a study by Rashid, A. (2010), which examined the economic exchange rate exposure, by taking 22 financial and non-financial Pakistani industries, US dollar exchange rate was used in the study and the results showed

that some industries found to be highly exposed to foreign exchange rate change while some industries including financial have not significant exchange rate exposure. It means that the highly capital intensive industries have greater risk to fluctuations in exchange rate as compared to less capital intensive industries.

Muller and Verschoor (2007) investigated the Asian foreign exchange rate risk exposure, their results showed that the long term foreign exchange rate risk is stronger than short run, because long term exchange rate exposure is related to unknown transactions, which are difficult to hedge.

Not only the multinational firms, domestic companies also face foreign exchange exposure because of international competition in the market of their outputs and inputs,most of the previous studies usually focused on the effect of exposure on multinational companies but Aggarwal and Harper (2010) investigated the foreign exchange exposure of domestic corporations, but in this paper the authors argued that domestic firms also face the exchange rate exposure, they examined US domestic companies and the findings showed that small domestic firms located in highly competitive industries face more exposure to foreign exchange risks. But US' domestic firms face less exchange rate exposures as compared to other multination firms, the reason behind this is explained by Hutson and Laing (2014) they investigated the multinationality and foreign exchange exposure of 935 US firms, the results showed that firms face serious financial risk because of indirect exposure but, as mostly firms do their international transactions in terms of dollars so the US multinational firms face less direct exposure as compared to the multinational firms of other countries.

2.2. Interest Rate Exposure:

Similar to exchange rate, we cannot deny the importance of interest rate; it serves as an important factor to estimate stock returns of industries. According to the economic situation of the country, monetary policy used to determine the interest rates. If the interest rates are high then the investors keep their money deposited in their bank accounts to get high interest instead of investing it into risky stock market. Higher interest rate reduces the profitability of firms so the stock prices tend to decrease. Impact of interest rate fluctuations on financial firms has been studied much because financial firms are often supposed to be interest rate sensitive. In contrast, the impact of interest rate risk on nonfinancial companies has rarely been studied. Nevertheless, as Bartram (2004) pointed out, interest rate risk affects the value of nonfinancial corporations as well. Thus, interest rate fluctuations have a direct effect on the cash flows and the market value of their liabilities and financial assets.

Existing literature discusses the link between interest rate and stock returns in different ways. Similar to exchange rate, interest rates can also have asymmetric effect on stock returns, such as, larger interest rate fluctuations may affect the firm value differently as compared to the smaller interest rate fluctuations, Dinenis and Staikouras (1998) investigated Interest rate changes and common stock returns of financial institutions, the results of their study showed that the fluctuations in interest rates have a significant negative impact on the returns of UK's financial companies. Likewise, Faff *et al.* (2005) investigated the impact of interest rates and its volatility on Australian financial sector stock return distributions by using GARCH model, the results showed that there is a consistent relationship between risk and return, finance firms and small banks are highly exposed by shocks in

financial sectors as compared to large banks. This is consistent with the study of Brewer *et al.,* (2007), they investigated the equity value and interest rate risk of life insurance companies, they observed that volatility changes over time and it has a cluster pattern. This study suggested that life insurers with low market betas presents significant interest rate sensitivity and their equity returns are more sensitive to fluctuations in the interest rates. Similarly, a study by Elyasiani and Mansur (1998) in which they examined the sensitivity of the bank stock returns model to investigate the impact of interest rate fluctuations on banks by using 3 portfolios of banks. They found that the fluctuations in the interest rate are an important determinant of the bank stock return volatility. Moreover the long term interest rate has a significant and negative effect on the stock returns of banks and the degree of shocks is related with the monetary policy regime and nature of the bank portfolio. Likewise, Ferrer *et al.,* (2010) investigated the linear and nonlinear interest rate exposure in Spain, they found that for all Spanish industries' interest rate exposure was heterogeneous, that is the industries with high leverage, banking industry and regulated industries, are the most sensitive to interest rate fluctuations.

Zafar *et al.,* (2008) investigated the relationship between interest rate fluctuations and stock returns by using monthly returns of KSE and three months T-bill rates. In this study they used two different GARCH equations. The results showed that interest rate has a strong influence on the stock returns.

2.3. Interest Rate and Exchange Rate Exposures:

According to Jorion (1990) exchange rates are four time as volatile as interest rate, to investigate that which exposure is stronger? Many studies compared exchange rates and interest rates exposures and produced mixed results. Such as, Olugbode

Chapter 3

Model Specification and Methodology

In order to measure the impact of interest rate and exchange rate exposure on the stock returns, in this study we used , EGARCH-M model, findings of previous studies revealed that the stock prices, interest rates and exchange rate series contain some stylized facts like fat tails, mean reversion ,volatile prices, asymmetry ,persistence and volatility clustering.

This chapter describes the description of data and its sources in Section 3.1, GARCH family models are discussed in Section 3.2, Methodology and the procedure used for the estimation are described in Section 3.3.

3.1. Data Description and Sources:

In this study, we used monthly data (range from January-2000 to December- 2014) of stock returns of the industries which are listed in Pakistan Stock Exchange. There are two fold advantages of using monthly data. Firstly, monthly data allows to include a long historical period, which used to reflect better long term movements in the volatility. Secondly, with the help of monthly data, settlements and clearing delays, which are less relevant and can easily be ignored. Monthly data of 20 non-financial industries are selected for empirical testing. The purpose to not to include financial industries, according to Bradley and Moles (2001) the financial firms use complex strategies to manage the risk for their interest rate and foreign exchange rate exposures.

Data is taken from different sources like [11]Karachi stock exchange-100 index; historical exchange rate will be taken from [12]State Bank of Pakistan and [13]Daily Business Recorder.

(i) 3 months treasury bills will be used as a proxy for short term interest rate and 10 years investment bonds will be used as a proxy for long term interest rate. this choice of this proxy for the long term interest rate has become much popular in the previous literature (Elyasiani and Mansur, 1998; Martinez et al., 2013: Olugbode *et al.,* 2013; Faff et al., 2005 and Bartram, 2002). Long-term interest rate helps to incorporate market expectations about the future prospects for the economy and it is also useful in the determination of the cost of borrowing funds.

(ii) Exchange rates that are US$/PKR and Euro £/PKR for comparison purpose, will be used and we will consider indirect exchange rates of these currencies individually rather than using a currency basket because with the use of it a large part of exchange rate exposure remains uncovered (Priestley and Ødegaard , 2007), the purpose of using these two currencies' exchange rate is that the Dollar has become a universal currency, and mostly the transactions occur in terms of Dollar and Euro is also an important and strong currency in terms of exchange.

The exchange rates of both currencies are converted into returns series because return series have statistical properties such as stationarity and normality. The returns for stock price indices are calculated by using the formula developed by Rogalski (1984):

[11] www.kse.com.pk
[12] www.sbp.org.pk
[13] www.brecorder.com

$$Y_{it}=100 \times [(\frac{X_t}{X_{t-1}}) - 1]$$

Where Y_{it} represents the return of underlying exchange rate at time t, X_t represents exchange rate at time t and X_{t-1} shows the exchange rate of previous time period.

3.2. Specification of GARCH family Models:

In this study, in order to check the relationship between interest Rates and Exchange rate's fluctuation on stock returns of non-financial industries, firstly the observations were tested by using OLS, but with the detection of heteroscedasticity, we used EGARCH(1,1)-M model. Basically, the asymmetric effects of stock markets' volatility can be described by the EGARCH-M model very well.

Existing literature i.e. Elyasiani and Mansur (1998), Brewer *et al.* (2007) and Léon (2008) reveals that stock prices, interest rates and exchange rate series have certain properties like volatile prices, fat tail, asymmetry and volatility clustering, which justifies the reason behind the application of GARCH family models. So by following these previous studies, we used this method in this study.

A brief introduction of this model is as follows:

3.2.1. The EGARCH-M Model:

The Exponential GRACH or EGARCH model is proposed by Nelson (1991) seems to be superior to GARCH model, because it has certain advantages over the GARCH model, since it is very useful to measure the relationship between expected returns and volatility. Moreover, it also captures asymmetric effects between conditional volatility and equity returns, and that asymmetric is separated by leverage effect, showing that bad news or negative surprises causes an increase

in the volatility more than the good news or positive surprises, while for asymmetric effects positive good news generates more volatility than bad or negative news. Moreover, the EGARCH model does not impose restrictions on the coefficients like the GRACH model. This model is in log linear so the collinearity problem of the parameters exists in other models is removed. When the variance is being incorporated in the mean equation, the model becomes EGARCH-M or EGARCH in mean. We used EGARCH-M in this study. Following are the mean and variance equations of EGARCH in mean model.

Mean equation:

$$R_{it} = \alpha_t + \beta_{r,i}\Delta EX_t + \beta_{m,i}KSE_t + \beta_{s,i}SR_t + \beta_{l,i}\,LR_t + \delta \ln(\sigma^2_{i,t}) + \varepsilon_{i,t} \quad \text{(i)}$$

In equation (i) R_{it} represents the returns of industry i at time t, α_t represents the intercept term, ΔEX_t represents changes in the exchange rate, for comparison purpose, here we are taking real exchange rate of two currencies that are US dollar and Euro. In order to control the market movements ,by following the model of Jorion (1990), market index, denoted by KSE_t is included in the model, which shows the rate of return of the market portfolio,$SR_t$and LR_t represent short term and long term interest rates respectively.$\sigma^2_{i,t}$ represents the log of conditional variance and δ represents risk pattern to measure the relationship between return and risk, it is used to measures the relationship between volatility and industry returns. Engle *et al.*, (1987) describes that the nature of the trade-off parameter depends upon the risk preference of the investors. Taing and Worthington (2005) suggested that δ is a measure of total risk, and if the unsystematic risk generates volatility then δ can adopt any sign, positive or negative. According to their study, it is not necessary that higher volatility always follow higher returns. If this parameter is positive and

significant, this shows that increase in the volatility leads to higher average return, it means that increased risk causes an increase in the conditional volatility which in return leads to a rise in the mean returns. Hence, industry returns fluctuate in response to the changes in the volatility of the stock returns.

If the value of $\delta < 0$ and statistically significant then it implies that the decrease in the mean returns is the consequence of decline in the conditional variance. Glosten *et al* (1993) explain the reasons behind the negative risk and return trade off parameter. Firstly, the riskier periods move along with the periods when the investors are able to bear the risk. And Secondly, if the investors used to save their capital during the riskier time periods and all assets are risky, then the competition raises the prices of assets by lowering their risk premia.

And when $\delta=0$ then it indicates that there is no relationship exists between the risk and return. Since, different studies generate different results, related to the sign of risk-return trade off parameter. In their study, Campbell and Hentschel (1992) found δ to be statistically significant and positive while, Elyasiani and Mansur, (1998), Campbell (1987), Glosten *et al.*, (1993)and Breen *et al.*, (1989) found it statistically significant but negative. While, Chan *et al.* (1992) and Léon (2008) could not find any significant risk and return trade off parameter.

Variance equation:

$$\ln(\sigma_{i,t}^2) = \alpha_o + \alpha_1 \frac{\varepsilon_{t,t-1}}{\sigma_{t,t-1}} + \alpha_2 \left(\left|\frac{\varepsilon_{t,t-1}}{\sigma_{t,t-1}}\right|\right) + \beta \ln(\sigma_{t,t-1}^2) \quad \text{(ii)}$$

Where $\alpha_o$represents the constant term, it is helpful in measuring the volatility when the coefficients of ARCH and GARCH are not significant. ($\sigma_{t,t-1}^2$) denotes the conditional variance, which is the forecast of the current volatility, depends upon the past conditional variance and the error term.α_1 captures the asymmetric effect

of previous innovations on present volatility, it measures the impact of good and bad news on the stock, depends upon its sign. If $\alpha_1 < 0$ then it represents leverage effects and when $\alpha_1$positive but non-zero then it represents asymmetric effects. And when its value is equal to zero, it shows that effect of positive and negative news on the volatility have same magnitude.

α_2 denotes the ARCH term which connects the current volatility (conditional variance) to the asymmetric function of previous fluctuations. A significant and positive ARCH coefficient represents the existence of volatility clustering which has a long persistent tendency of shocks. And this volatility rises if the absolute value of the standardized error is larger and when the absolute value of standardized error is small, the volatility tend to decrease and β represents the GARCH term which shows the persistence parameter that links the current volatility with past period volatility, it means it measures the influence of old news on the volatility. Moreover GARCH (p,q) measures the degree of continuity in the volatility, so the significant GARCH term means that all the stock returns are showing persistence shocks. Hence, the value of the GARCH terms is always greater than ARCH terms, because the previous period's volatility shocks in the stock returns have a lesser effect on its future volatility as compared to the previous surprises .The system is only stable when $\beta < 1$ and $\alpha_2 + \beta < 1$.

Hence, equation (ii) describes that the log of the conditional variance or present period's volatility is an asymmetric function of previous period's innovations and the log of last period's conditional variance or past volatility.

3.3. Estimation Procedure:

In order to determine suitable lag length for the conditional variance and conditional mean, in this study we used auto-regressive moving average, known as ARMA (p, q) model, purposed by Box and Jenkins (1976). The plots of Autocorrelation function (ACF) and Partial Autocorrelation function (PACF) of return series, by visualizing correlogram and partial correlogram were also taken into account in determining the order of ARMA and EGARCH model.

Most common patterns of ACF and PACF:

Model	Pattern of ACF	Pattern of PACF
AR(q)	Exponential decay or the pattern of damped sine wave or both	Significant spikes through lags p
MA(p)	Significant spikes through lags q	Exponential Decline
ARMA(p,q)	Decays exponentially	Decays exponentially

Since the industrial returns were non-stationary, so by taking their first differences, we made them stationary. The correlogram generates the correlation coefficients of two types: autocorrelation (AC) and partial autocorrelation (PAC). The ACF represents the correlation of current returns with their values at many lags. The PACF represents the partial correlation between time series and its lags.

In order to identify the appropriate type of ARMA model, the Box-Jenkins methodology uses both these correlation coefficients. Initially we tried different lags and the best model is chosen on the bases of ARMA order, the best ARMA model is that in which the EGARCH model approaches normal distribution, and the minimum AIC (Akaike information criterion), purposed by Akaike (1974), is used for suitable lag length for EGARCH in mean model, AIC is superior as compared to SIC(Schwarz information criterion) because it generates least estimates for

probability, Gaussian or students't distribution is used, in this study we used Marquardt optimization algorithm technique. ARCH-LM test is used to detect ARCH effect. Q-statistics is used to check the correlation and Q^2-statistics of Ljung-Box-Pierce test is applied to detect the volatility clustering.

3.4. Model Selection Criteria:

On the bases of minimum AIC and maximum log likelihood value, the best model is selected for this study. In the study, we tested many order of ARCH and GARCH, but the order (1, 1) turned out to be suitable, so we used EGARCH (1,1)-M model.

Chapter 4

Estimation Results

In this chapter, we present our empirical findings. Section 4.1 describes the results of descriptive statistics of all the variables. In Section 4.2, graphical analysis of the variables is discussed. Analysis of Unit root test is presented in Section 4.3. Section 4.4 presents the results of the ARCH effect and also describe the autocorrelation function (ACF) and partial autocorrelation function (PACF). Section 4.5 shows the discussion of the empirical results obtained from EGARCH-M model.

After emerging the same industries, we had 20 industries in our sample, and the number of firms in each industry is as follows:

Industry	Number of firms
Textile Composite	263
Pharmaceuticals	17
Miscellaneous	35
Vanaspati & Allied Industries	18
Engineering	18
Transport	08
Synthetic & Rayon	24
Chemicals & Fertilizer	40
Food & Personal Care products	30
Cement	29
Cable & electric goods	14
Tobacco	06
Technology & communication	17
Sugar & Allied industries	44
Oil exploration, Marketing & Refinery	17
Paper & Board	17
Leather & tanneries	10
Glass & ceramics	13
Power generation	20
Automobile assembler, parts & accessories	28

The monthly return index of firms included in the final sample was used to construct average stock returns for each industrial sector.

Initially we had stock returns of 20 industries in our sample but only 10 industries which showed ARCH effects, are selected for further empirical testing, the results of the industries that showed ARCH effect are reported in table 4.1.

Table 4.1. Presence of ARCH effect:

Industry	ARCH effect
Textile Composite	Yes
Pharmaceuticals	Yes
Miscellaneous	Yes
Vanaspati & Allied Industries	No
Engineering	No
Transport	No
Synthetic & Rayon	No
Chemicals & Fertilizer	No
Food & Personal Care products	Yes
Cement	Yes
Cable & electric goods	No
Tobacco	Yes
Technology & communication	No
Sugar & Allied industries	Yes
Oil exploration, Marketing & Refinery	No
Paper & Board	Yes
Leather & tanneries	Yes
Glass & ceramics	No
Power generation	No
Automobile assembler, parts & accessories	Yes

4.1. Descriptive Statistics:

Descriptive statistics are used to investigate the normality of residuals of dependent and independent variables. The descriptive statistics of dependent variable and independent variables are presented in the table 4.2 and 4.2.1.

Table 4.2: Descriptive Statistics of Stock Returns

Industry	Mean	Max	Min	Std. dev	Skewness	Kurtosis	JB
Miscellaneous	9.635	120.636	-14.075	16.622	2.494	14.329	1142.96***
Cement	5.927	99.554	-24.638	15.391	1.481	9.377	368.800***
tobacco	23.806	318.161	-17.210	60.675	3.093	11.988	888.115***
Sugar & allied industries	5.309	31.775	-10.719	8.765	0.727	3.070	15.814***
Paper & board	8.648	113.788	-19.642	17.764	2.326	11.355	682.175***
Leather & tanneries	52.874	467.443	-23.676	115.066	2.340	7.444	310.746***
Pharmaceuticals	52.877	446.765	-15.227	116.624	2.310	7.039	281.003***
Food & personal care products	152.366	3241.427	-18.773	355.805	4.364	33.407	7464.304***
Auto mobile	34.588	406.836	-18.912	68.123	2.170	8.359	354.767***
Textile composite	6.676	48.928	-12.778	11.928	1.043	3.923	38.864***

Note: *,**,*** representing 10%, 5% and 1% level of significance.

Standard Deviation represents the deviation of values from their mean, if its value approaches zero then deviations are lesser and if the value of standard deviation is higher, it means the deviation from the center is higher. Kurtosis measures degree of peakedness or flatness of the probability distribution. Skewness shows the departure from symmetry[14] , skewness can be negative as well as positive. Jarque-Bera (abriviated as JB) test measures the normality on the basis of skewness and kurtosis of sample. Its null and alternative hypothesis is as follows:

$\mathbf{H_0}$: Stock returns are normally distributed

$\mathbf{H_A}$: Stock returns are NOT normally distributed

To test the above null hypothesis Jarque-Bera test follows chi-square asymptotic[15]distribution with 2 degrees of freedom. If the results show to not to reject null hypothesis at 1% , 5% or 10% level of significance then the values of skewness and kurtosis are expected to be closer to zero. And if their values

[14]Symmetry shows a balanced normal distribution having equal area on both sides say 50% each.

[15] Asymptotic means a line moves along a curve but never touches the axis.

deviate from zero, it causes an increase in the value of JB test. It means higher the deviation from zero will cause a greater value of JB test.

The maxima and minima values show the dispersion or scatteredness around the mean. If their values are closer to the value of mean then the dispersion is low and vice versa. In the above table 4.2, Sugar and allied industries shows the lesser mean, which is 5.309 and its minima and maxima range from -10.719 to 31.775, which shows a lesser dispersion around the mean value as compared to other industries. Moreover, the value of standard deviation of this industry is also less than the other industries, which shows stock returns of this industry are less volatile. While, Food and personal care products' industry showed a higher mean value which is 152.66 and its minima and maxima range from -18.773 to 3241.427, which shows the higher amount of scatteredness from mean. And the value of standard deviation of this industry's stock returns is higher, that is 355.805 which is an evidence of higher volatility. Signs of skewness show that all the industries' stock returns are positively skewed, showing right flatter tails. The skewness of Sugar and allied industries is closer to zero, that is 0.727, near to normal distribution. The value of skewness of Food and personal care products is higher that is 4.364, which shows highly positive skewness.

Values of excess kurtosis showing that all of the returns is lepto-kurtic, since no value is lesser than zero. the value of Food and personal care products' kurtosis is higher among all, which is 33.407, showing excess kurtosis. Having higher value of kurtosis means the extreme changes will occur more rapidly, it also gives the evidence of heavier tails. JB test reveals that the distribution is not normal, on rejecting null hypothesis, as the values are highly significant at 1%

level of significance, showing, the rapid and unpredictable changes and higher volatility among stock returns.

Since the results show that all the stock returns are non-normal except sugar and allied industry.

Following table 4.2.1. shows the descriptive statistics of independent variables:

Table 4.2.1: Descriptive Statistics of Independent Variables:

Variables	Mean	Max	Min	Std. dev	Skewness	Kurtosis	JB
US$/RS	72.101	106.797	51.868	16.722	0.560	1.804	20.157***
£/RS	90.600	145.514	47.117	29.158	0.127	1.593	15.325***
TBR	8.119	13.843	0.000	4.160	-0.739	2.386	19.221***
GBR	9.130	14.560	2.790	3.605	-0.319	1.777	14.267***

Note: *** represents significance at 1% level of significance. US$/RS and £/RS representing indirect Exchange rates of US dollar and Euro respectively, while TBR and GBR are representing the interest rates of three-month T-bill rate (short term) and 10 years Govt. bond rates(long term) respectively.

The results of the above table show that exchange rates of both currencies are positively skewed while interest rates of long term and short term are negatively skewed. Measure of excess kurtosis show that all independent variables are lepto-kurtic, as values of kurtosis are greater than zero in all variables. In the above table treasury-bills have the smallest mean, its minima and maxima 0.000 and 13.843 and maxima and minima values of 10 years Govt. bonds rate are also showing less dispersion around mean.

Results of JB tests showing the rejection of hypothesis of normality, it means series of independent variables are also non-normal in nature.

4.2. Graphical Analysis:

In order to check the volatility patterns and the nature of the series, in this section we displayed line graphs and histogram respectively. A set of adjacent

rectangles is said to be histogram, it shows statistical properties of the data and gives information about mean, maxima, minima, skewness and kurtosis.

4.2.1. Graphs of the industrial returns:

In graphical analysis the left panel shows graphs of monthly returns and in the right panel , we displayed volatility graphs of six industries i.e. cement, tobacco, textile composite, sugar and allied industries, automobile and paper and board, showing monthly return series, remaining graphs are shown in appendix A.

In the left panel, graphs of monthly return series of all industries are showing significant spikes and clusters, which shows that period of high volatility is followed by another period of high volatility and period of low volatility is followed by another prolonged period of low volatility. It means, period of great shocks generates another bigger shock to the future, which creates more volatility in the future, greater volatility represents greater risk, and the situation is called volatility clustering. In the right panel, graphs of volatility are also giving the evidence of volatility clusters, showing the existence of ARCH effect. Hence, in such situation the assumption of homoscedasticity or constant variance seems to be violated, and in such cases it is preferable to observe the patterns that allow the variance to depend upon its past. So, the ARCH, GARCH family models are best to be applied in such situation, because these models are appropriate to capture the volatility.

Figure 4.1: Graphs of Monthly Returns and Volatility Series of different industries:

Fig.4.1.1: Monthly Returns of Textile Composite:

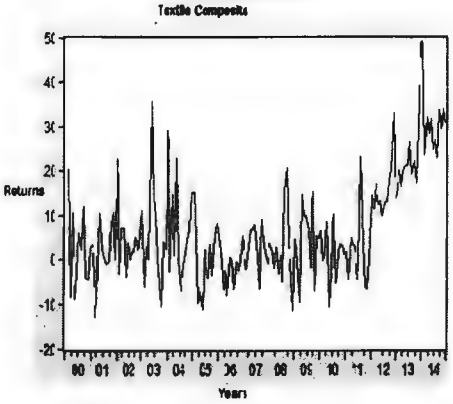


Fig.4.1.2: Volatility Graph of the industry:

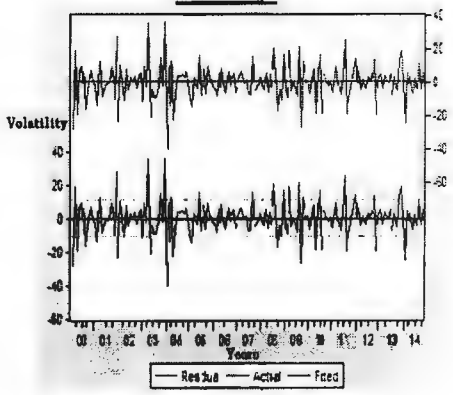


Fig.4.1.3: Monthly Returns of Cement Industry:

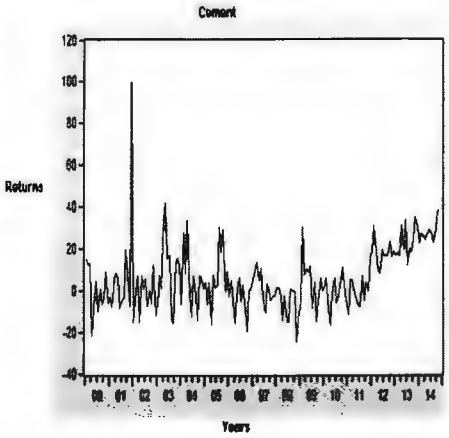


Fig.4.1.4: Volatility Graph of Cement industry:

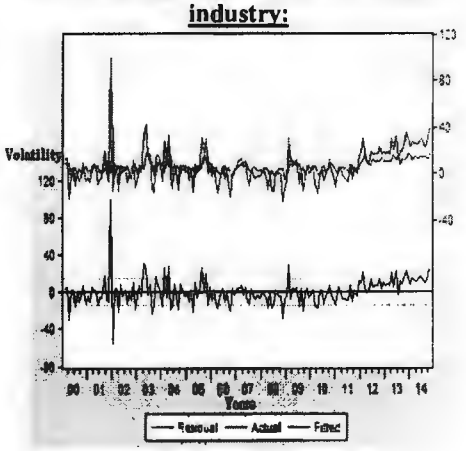


Fig.4.1.5: Monthly Returns of Tobacco Industry:

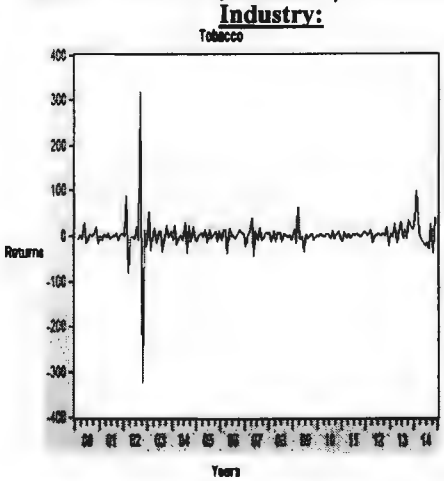


Fig.4.1.6: Volatility Graph of Tobacco industry:

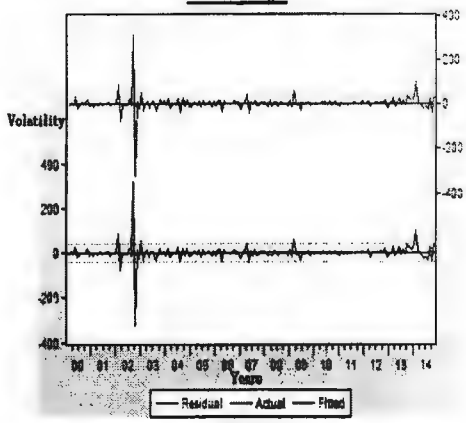


Fig.4.1.7: Monthly Returns of Sugar& Allied Industry:

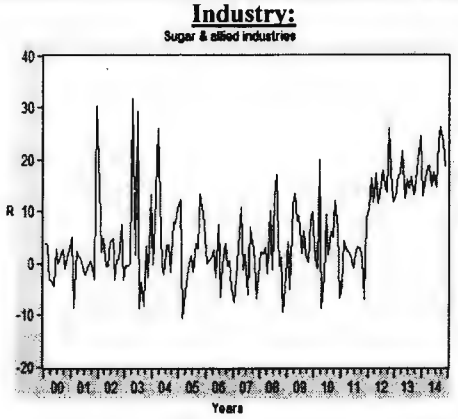


Fig.4.1.8: Volatility Graph of Sugar& Allied industry:

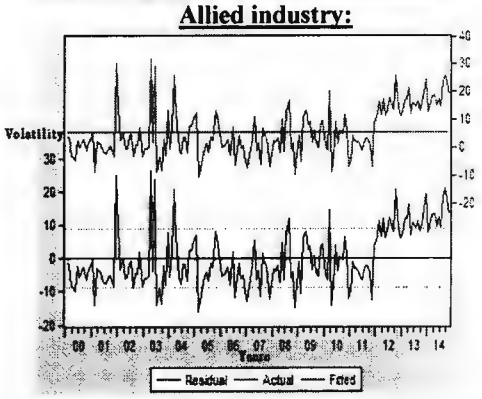


Fig.4.1.9: Monthly Returns of Auto-Mobile Industry:

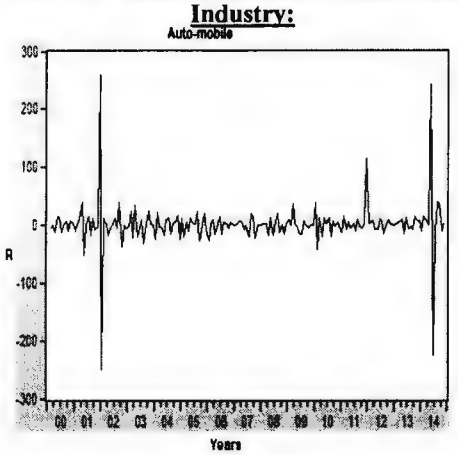


Fig.4.1.10: Volatility Graph of Auto-Mobile Industry:

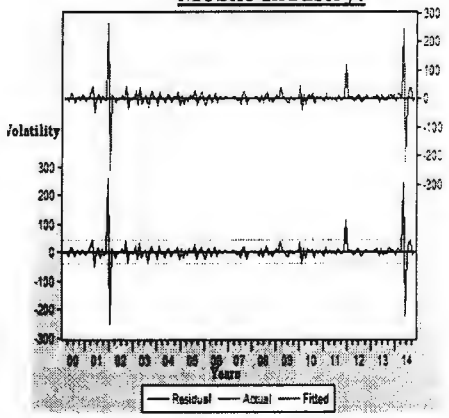


Fig.4.1.11: Monthly Returns of Paper & Board Industry:

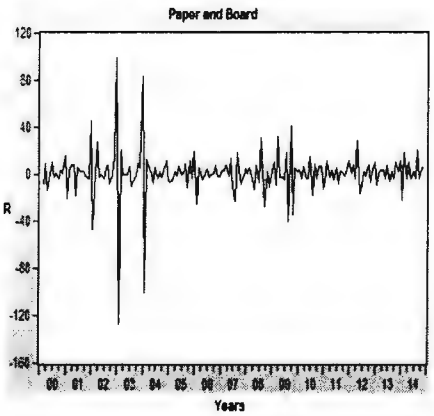
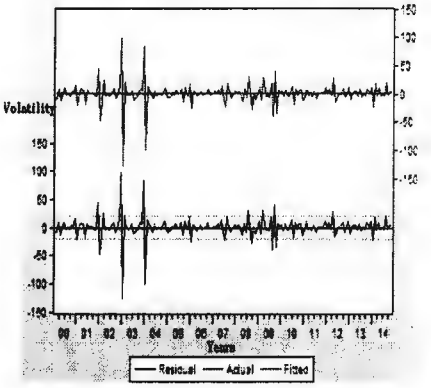


Fig.4.1.12: Volatility Graph of Paper & Board Industry:



4.2.2. Histograms of the Price Return Series:

Following are the histogram of six industries' stock returns. Others are displayed in appendix section A. With the help of histogram we can easily see that whether the distribution is positively skewed, negatively skewed or symmetric. All the diagrams are showing that stock returns are non-normal positively skewed, except one industry.

Histogram of cement and textile composite industries are showing positively skewed distribution with one outlier each, tobacco and automobile industry are also showing positive skewness with six and one outliers respectively. Moreover, sugar and allied industries' histogram is approximately asymmetric with no outlier and paper and board industry is showing positively skewed histogram with three outliers. Since, it gives evidence that the distribution is non-normal, highly peaked, having heavier tails, so the students't distribution is most appropriate to use.

Figure 4.2: Histograms of the Stock Return Series of different industries:

Fig. 4.2.1: Cement Industry:

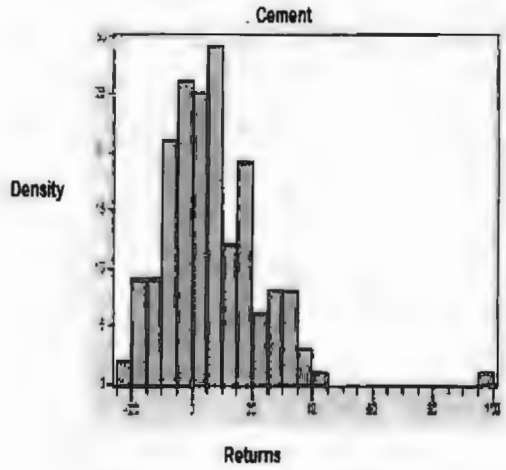


Fig. 4.2.2: Textile Composite:

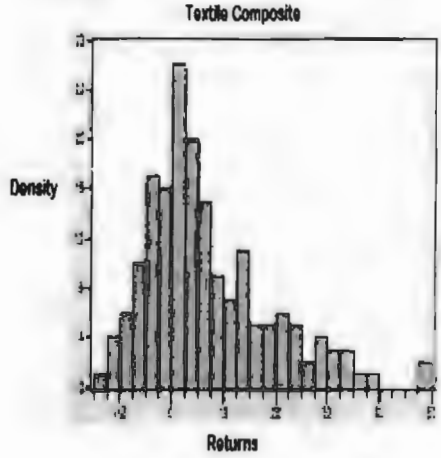


Fig.4.2.3: Tobacco industry:

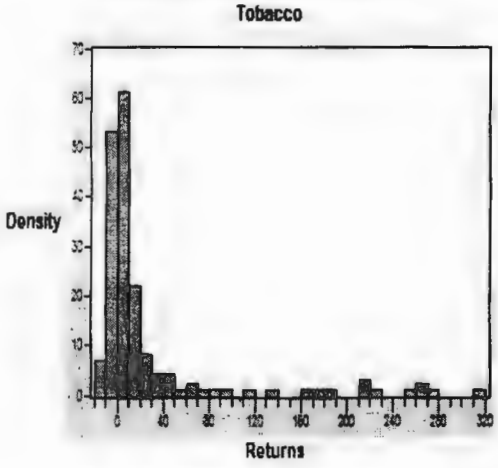


Fig. 4.2.4: Auto-Mobile industry:

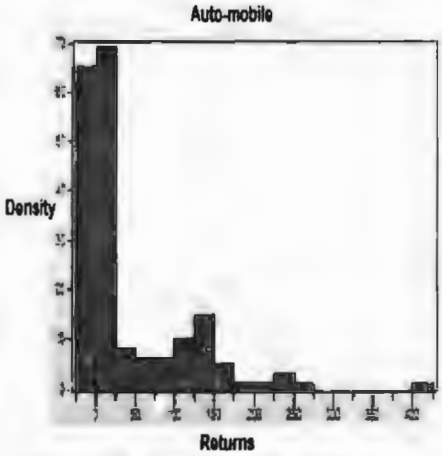


Fig. 4.2.5: Paper & Board industry:

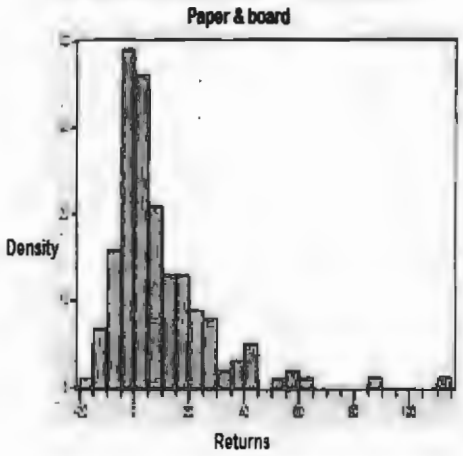
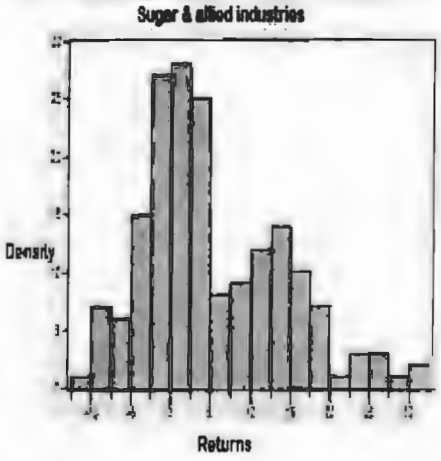


Fig. 4.2.6: Sugar & Allied industry:



4.3. Unit Root Test:

A data is said to be stationary, if its statistical properties i.e. mean, autocorrelation and variance remain constant over time, it means the data have no unit roots. Stationarity is a most common assumption in time series techniques. To check the stationarity of the data, in this study we applied Augmented Dickey-Fuller (ADF) introduced by Augmented Dickey-Fuller (1979).

Null and alternative hypothesis of ADF unit root tests are as followed:

H_O : Series in non-stationary

H_A : Series is stationary

Results of ADF unit root test are displayed in the following table 4.3 and table 4.3.1.

Table 4.3: Results of the Augmented Dickey-Fuller Test: For stock returns

Industries	Level 1st Difference	
Miscellaneous	-7.851***	-11.920
Cement	-5.541***	-15.512
Tobacco	-1.869	-11.281***
Sugar & allied industries	-4.932***	-10.520
Paper & board	-1.988	-8.486***
Leather & tanneries	-2.523	-13.003***
Pharmaceuticals	-0.349	-19.041***
Food & personal care product	-0.767	-11.545***
Auto mobile	-0.502	-11.948***
Textile composite	-0.483	-9.712***

Note: ***, ** , * denote the significance at the 1% , 5% and 10% level respectively. On the basis of AIC, the optimal lag length for the returns of all industries is 13, while for auto-mobile and tobacco, lag length is 15.

Table 4.3.1: Results of the Augmented Dickey-Fuller Test: For Independent variables

Variables	Level	1st Difference
EUR/PKR	-1.029	-9.966***
US$/PKR	-0.075	-8.790***
TBR	-2.010	-16.144***
GBR	-1.305	-13.910***

Note: ***, ** and * denote the significance at the 1% level, 5% level, at the 10% level respectively. The results of EUR/PKR, US$/PKR and GBR (Govt. bond rates) are significant at the lag length of 13. While, TBR (three-month T-bill rates) becomes significant at lag length of 15. All variables are highly significant at first difference.

The results of ADF show that only three industries, that are miscellaneous, cement and sugar and allied industries are stationary at levels, while remaining seven industries become stationary by taking first differences. While for independent variables all become stationary after taking the first differences.

4.4. EGARCH-M Model Estimation:

Estimation of the EGARCH (1, 1)-M model is as follows.

4.4.1. Diagnostic testing for ARCH Effects:

Before applying the GARCH family models, the most important task is to check the presence of ARCH effect and serial correlation. In order to detect conditional heteroscedasticity, we need to apply some qualitative and quantitative tests. Forqualitative check, plots of the sample autocorrelation function (ACF) and the partial-autocorrelation function (PACF) of the returns are used. For quantitative check, Ljung-Box–Pierce Q-statistics purposed by the Ljung and Box (1978) (for returns series) is applied to check the presence of serial correlation of higher order and the Q^2 -statistics (for squared residuals) to capture the conditional heteroscedasticity. The following hypothesis are being tested under 1%, 5% and 10% level of significance:

H_o: There is NO serial correlation in stock returns

H_A: There is serial correlation in stock returns.

The results are showing the rejection of null hypothesis of no serial correlation in the stock returns of all industries, providing the evidence of serial correlation in the residuals for all the variables upto 5^{th}, 10^{th}, 20^{th}, and 30^{th} lags.

ARCH-LM test are applied to detect the volatility clustering and heteroscedasticity of squared returns, the null and alternative hypothesis of ARCH-LM test is as followed:

H_o: There is NO ARCH effect in stock returns

H_A: There is ARCH effect in stock returns.

The results shown in table 4.4support the presence of ARCH effect among all stock returns upto 2^{nd}, 5^{th} and 20^{th} lags and table 4.4.1 represents the diagnostic results for the presence of ARCH effect and serial correlation among independent variables, the results show that heteroscedasticity and serial correlation is present in all variables.

Table 4.4: Diagnostics checking for stock returns:

	ARCH effect			Q-statistics for returns				Q-statistics for squared returns			
Industry	ARCH(2)	ARCH(5)	ARCH(10)	Q(5)	Q(10)	Q(20)	Q(30)	Q(5)	Q(10)	Q(20)	Q(30)
Tobacco	56.835*** (0.000)	69.968*** (0.000)	73.183*** (0.000)	49.135*** (0.000)	47.622*** (0.000)	70.392*** (0.000)	76.779*** (0.000)	43.338*** (0.000)	44.102*** (0.001)	44.655*** (0.001)	45.109*** (0.038)
Automobile	54.371*** (0.000)	64.964*** (0.000)	67.306*** (0.000)	39.527*** (0.000)	40.161*** (0.000)	42.250*** (0.003)	45.886** (0.032)	41.420*** (0.000)	41.589*** (0.000)	42.175*** (0.003)	43.193** (0.000)
Leather & tenn.	7.984** (0.018)	13.632** (0.018)	22.615** (0.012)	24.934*** (0.000)	30.354*** (0.000)	57.672*** (0.000)	63.118** (0.000)	14.060** (0.015)	28.246*** (0.002)	46.406*** (0.006)	43.363** (0.018)
pharmaceuticals	42.698*** (0.000)	48.873*** (0.000)	56.670*** (0.000)	23.482*** (0.000)	33.791*** (0.000)	35.836*** (0.016)	36.475* (0.073)	35.541*** (0.000)	42.358*** (0.000)	43.408*** (0.000)	44.892** (0.040)
Sugar& allied in	12.442*** (0.002)	12.949** (0.024)	17.861** (0.057)	116.63*** (0.000)	212.12*** (0.000)	308.36*** (0.000)	322.76*** (0.000)	17.803*** (0.003)	24.030*** (0.008)	40.276*** (0.005)	45.445** (0.035)
Miscellaneous	34.486*** (0.001)	13.075** (0.023)	13.067** (0.021)	17.989*** (0.003)	31.107*** (0.001)	49.208*** (0.000)	59.768*** (0.001)	33.285*** (0.000)	34.404*** (0.000)	36.254*** (0.014)	36.869** (0.021)
Cement	12.532*** (0.000)	15.013*** (0.000)	7.8626*** (0.000)	21.154*** (0.001)	33.436*** (0.000)	49.593*** (0.000)	83.341*** (0.002)	11.600** (0.041)	12.155*** (0.000)	16.127*** (0.002)	17.623*** (0.000)
Paper & Board	43.969*** (0.000)	46.329*** (0.000)	45.354*** (0.000)	48.954*** (0.000)	54.815*** (0.000)	121.27*** (0.000)	139.87*** (0.000)	35.987*** (0.000)	37.011*** (0.000)	113.66*** (0.000)	117.06*** (0.000)
Food & Personal care prod.	57.530*** (0.000)	71.637*** (0.000)	76.212*** (0.000)	50.425*** (0.000)	50.863*** (0.000)	50.940*** (0.000)	52.099*** (0.007)	44.139*** (0.000)	44.275*** (0.000)	44.286*** (0.001)	44.303** (0.045)
Textile& composite	26.794*** (0.000)	30.412*** (0.000)	36.334*** (0.000)	47.890*** (0.000)	60.016*** (0.000)	68.914*** (0.000)	84.288*** (0.000)	23.164*** (0.000)	32.529*** (0.000)	47.264*** (0.001)	62.047*** (0.001)

Note: *, **, *** represents significance level at 1%, 5% and 10% respectively. Results showing the presence of ARCH effect and serial correlation upto different lags.

Table 4.4.1: Diagnostic checking for independent variables

	ARCH effect			Q-statistics for returns				Q-statistics for squared returns			
Ind. Var.	ARCH(2)	ARCH(5)	ARCH(10)	Q(5)	Q(10)	Q(20)	Q(30)	Q(5)	Q(10)	Q(20)	Q(30)
T-bills	16.528*** (0.000)	17.567*** (0.003)	17.542** (0.032)	33.560*** (0.000)	34.338*** (0.000)	51.894*** (0.000)	57.384*** (0.002)	26.014*** (0.000)	29.145*** (0.001)	39.678*** (0.005)	61.964*** (0.001)
GB	155.30*** (0.000)	153.94*** (0.000)	147.85*** (0.000)	789.79*** (0.000)	1356.7*** (0.000)	42.250*** (0.003)	2003.0** (0.000)	569.55*** (0.000)	684.86*** (0.000)	790.83*** (0.003)	908.13** (0.000)
£/Rs	171.29*** (0.000)	168.46** (0.018)	164.13** (0.012)	848.00*** (0.000)	1572.1*** (0.000)	2677.4*** (0.000)	3399.0*** (0.000)	732.25*** (0.000)	1165.8*** (0.000)	1539.7*** (0.000)	1657.7*** (0.000)
US$/Rs	72.101*** (0.000)	171.84*** (0.000)	167.31*** (0.000)	836.46*** (0.000)	1549.9*** (0.000)	2605.1*** (0.000)	3278.1*** (0.073)	723.66*** (0.000)	1225.5*** (0.000)	1629.1*** (0.000)	1671.4*** (0.000)

Note: *,**,*** represents significance level at 1%, 5% and 10% respectively. T-bills stands for three month-t bill rates, GB stands for govt bond rates, £/Rs shows Euro Exchange rate and US$/Rs shows US dollar Exchange rate. Results showing the presence of ARCH effect and serial correlation of independent variables up to different lags.

4.4.2. Autocorrelation Functions and Partial Autocorrelation Functions:

The mean equation of the model is estimated through Box-Jenkins methodology and the order of p and q for the conditional mean and variance equation is determined by the autocorrelation function (ACF) and partial autocorrelation function (PACF). Some patterns of ACF and PACF are shown in the figure 4.3, the patterns are showing the correlograms up to 20^{th} lag:

Figure 4.3: ACF and PACF of the Monthly Return Series of the industries:

Figure 4.3.1: ACF and PACF of the monthly returns series of Textile composite industry

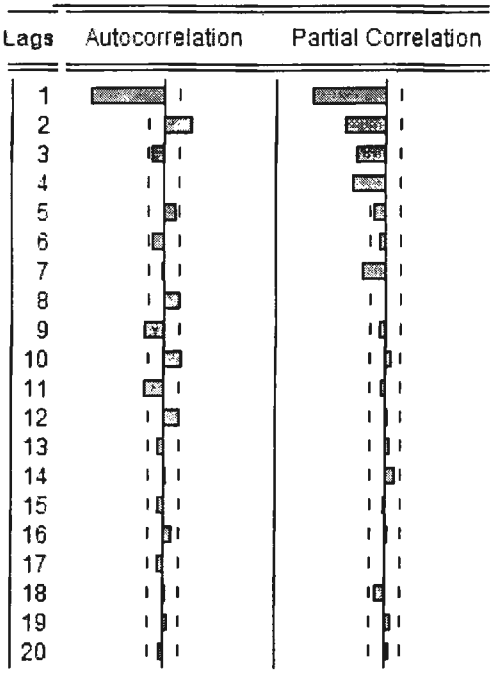


Figure 4.3.2: ACF and PACF of the monthly returns series of Auto-mobile industry

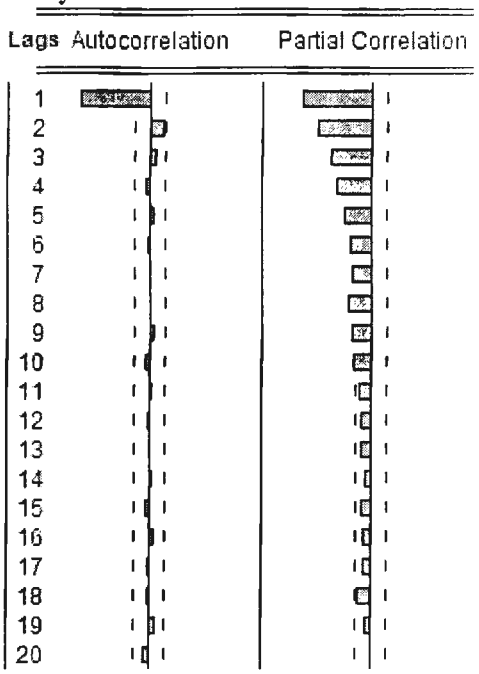


Figure 4.3.3: ACF and PACF of the monthly returns series of Tobacco industry

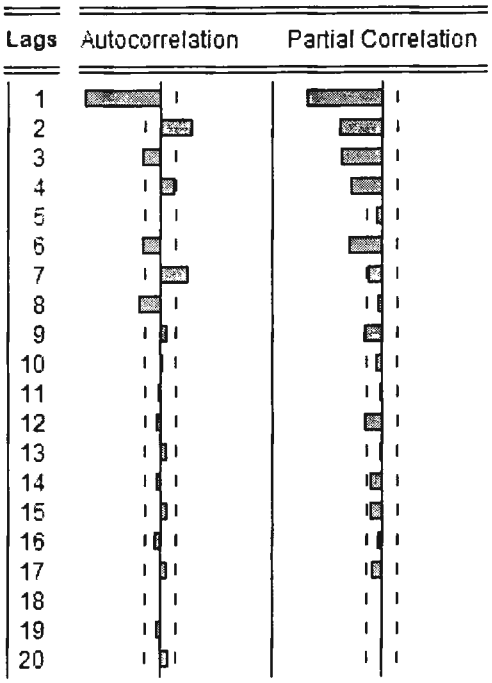


Figure 4.3.4: ACF and PACF of the monthly returns series of Cement industry

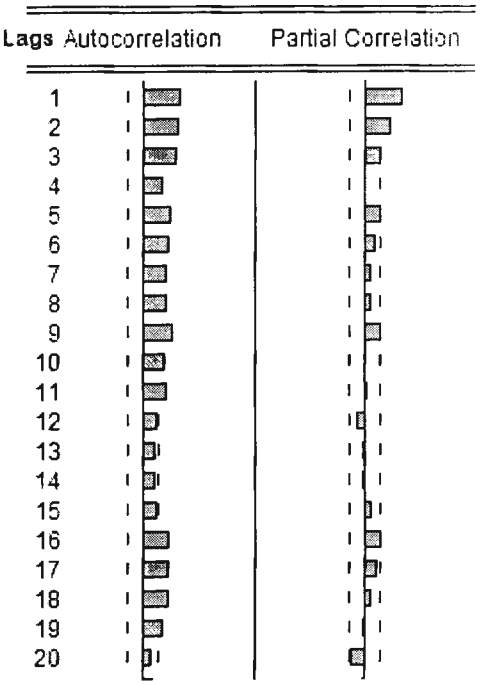


Figure 4.3.5: ACF and PACF of the monthly returns series of Sugar & allied industries

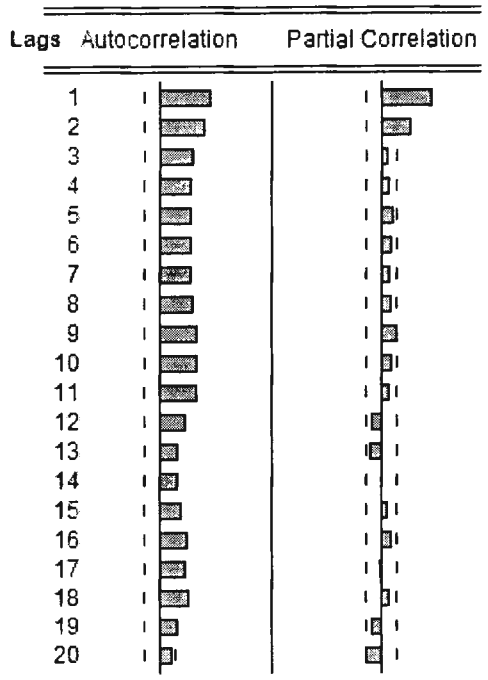
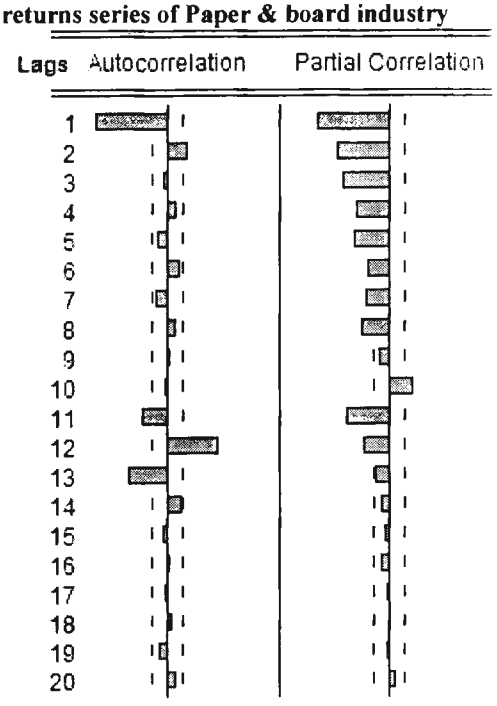


Figure 4.3.6: ACF and PACF of the monthly returns series of Paper & board industry



4.5. Empirical Results for the EGARCH (1,1)-M Model:

The empirical results of the exposure of exchange rate and interest rate upon stock returns are shown below. Table 4.7 shows the results of exposure of exchange rates and interest rates, table 4.7.1 shows the diagnostic checking for it.

4.5.1. Estimation Results for unexpected changes in Exchange Rate and Interest Rates :

The mean equation (equation (i), chapter 3) for US dollar and Euro exchange rate and long and short term interest rates, is estimated by using the Box-Jenkins ARMA methodology. By using the plots of autocorrelation function (ACF) and partial autocorrelation function (PACF), the order to p and q for the conditional variance and conditional mean is determined, on the bases of minimum AIC. The order of ARMA for the EGARCH (1, 1)-M model with student's t-distribution is used for the equation is presented in tables 4.5 :

Table 4.5: ARMA order of US Dollar, Euro Exchange Rate and Long and Short term interest rate Exposures for Industrial Returns:

Industry	ARMA order
Miscellaneous	(1,2)
Cement	(0,2)
Food & personal care products	(1,0)
Tobacco	(0,1)
Sugar & allied industries	(2,2)
Paper & board	(1,1)
Leather & tanneries	(1,4)
Pharmaceuticals	(0,1)
Auto mobile	(1,3)
Textile Composite	(0,1)

The results in table 4.7 show that 80% of the industries showed significant exposure to US dollar. Since, the significant negative coefficients represent that

the industry returns increase when exchange rates tend to fall and the industry return decreases when exchange rate rises, while a significant positive coefficient implies that industry returns increase with an increase in the exchange rates and the industry returns tend to decrease when exchange rate of the concerned currency tends to fall. One industry i.e food and personal care product showed significant negative coefficient, which means this industries is getting profit due to decrease in the exchange rate of US dollar and vice versa, because when the US dollar tends to depreciate, the manufacturing inputs of this industry become cheaper, and this industry can import those inputs at a lower cost now, and when the exchange rate of US dollar tend to increase, it causes to increase its input costs. Since, other seven industries showed a significant positive coefficient which indicates that these industries are taking benefits on the appreciation of US dollar, the reason behind is that now their products are cheaper in foreign market, which stimulates their exports, and they earn profits. While in the case of Euro exchange rate Seven industries showed statistically significant exposure for the £/Rs. Since, two industries, that are miscellaneous and paper & board showed significant negative coefficients, which shows negative relationship between Euro exchange rate and returns, which implies that when the exchange rate in terms of Euro falls, stock returns tend to increase and vice versa. Moreover, five industries exhibit significant and positive coefficients, which means that industry returns increase with the increase in the exchange rate of Euro.

The results for Short term interest rate is shown in table 4.7 of the ten industries are as follows:

Five industries showed statistically significant Short term interest rate exposure, such as miscellaneous, food and personal care products, sugar and allied

industries and paper and board industries and cement, showed negative coefficient. While, in the case of long term interest rate (results are shown in table 4.7) nine out of ten industries showed statistically significant and negative exposure, which implies that the relationship between interest rate fluctuations and the returns is negative, it means when interest rate goes up the stock returns tend to decrease and vice versa. It generally shows that with an increase in the interest rates, risk averse investors prefer to deposit their savings in bank accounts rather than to invest them in the stock market, which leads to a reduction in the profitability of the firms so the stock prices go down. Or we can say that when the interest rate goes down, the stock market index tend to increase and vice versa. The reason behind this is the investors used to shift their money from their fixed deposits or saving accounts to the stock market in order to have a higher return. Another reason could be that if the commercial banks used to increase their interest rate which they usually pay to their depositors, on the consequences the investors switches their money from stock market to the bank in order to be paid more. This phenomenon will lead to a decrease in the demand and price of the share and vice versa. similarly, when the interest rate which is paid by the commercial banks to their depositors tend to increase, eventually the lending rate of interest also increases which lead to a decline in the investments of the economy, which is also a reason of decreasing the share price and vice versa. So, we can say that there is an inverse relationship exists between share price and the interest rate.

The results (table 4.7) show that seven industries exhibit significant risk-return trade off parameter, (denoted by δ in the mean equation (i) chapter 3) , in which three industries such as miscellaneous, food and personal care product industries, textile composite showed statistically significant and negative parameter, showing a negative relationship between risk and return, which implies that during the period of higher volatility, the investors prefer to save their money, instead of investing it into the risky stocks, they become risk averse. It also shows that decrease in the volatility is followed by a decline in the mean return. That is less volatility leads to less returns. And in terms of interest rate, the negative coefficient implies that during the period of higher volatility, the investors prefer to save their money, instead of investing it into the risky stocks, showing that investors are risk averse. They don't want to invest into the riskier stocks. While, remaining industries in short term interest rate exposure did not show any significant risk-return trade off parameter, showing that there is no relationship between risk and return of these three industries. While for positive coefficient, it means the investors are risk taker.

The overall market return, denoted by KSE, has also been included to measure the economic exchange rate and interest rate exposure after taking into account the overall market's exposure against currency fluctuations, which is highly significant for all industries.

Table 4.7: Mean Equation of Exchange rates and Interest Rates Exposure:

Industry	Constant	δ	KSE	£/Rs	US$/Rs	TB	GB	AR	MA
Miscellaneous	0.766** (0.029)	-0.009*** (0.004)	0.010*** (0.000)	-0.331*** (0.001)	0.837** (0.020)	-0.335* (0.050)	-0.217*** (0.029)	0.803*** (0.000)	-0.663*** (0.000)
Cement	2.428*** (0.001)	-0.007* (0.061)	-0.319*** (0.001)	0.042 (0.866)	0.647** (0.010)	-0.317* (0.081)	-0.513* (0.068)		-0.761*** (0.000)
Food & personal care products	76.899*** (0.000)	-0.003*** (0.000)	1.578** (0.023)	8.481** (0.012)	-63.673*** (0.000)	-3.557*** (0.000)	-0.616** (0.013)	0.243*** (0.000)	0.591*** (0.000)
Tobacco	0.632** (0.015)	0.009*** (0.004)	0.315*** (0.000)	0.383*** (0.000)	0.717** (0.027)	0.345 (0.499)	-2.155** (0.032)		0.212*** (0.000)
Sugar & allied industries	0.045 (0.876)	-0.006 (0.637)	0.108*** (0.010)	-0.139 (0.157)	0.714*** (0.010)	-0.409* (0.076)	-1.218** (0.023)	-0.930*** (0.000)	-0.849*** (0.000)
Paper & board	-0.138 (0.761)	0.008** (0.034)	0.117*** (0.000)	-0.271** (0.024)	0.985*** (0.000)	-0.003** (0.043)	-2.469*** (0.000)	0.990*** (0.000)	0.979*** (0.000)
Leather & tanneries	-1.511*** (0.000)	-0.004 (0.544)	0.384*** (0.000)	0.487*** (0.000)	1.688*** (0.000)	0.057 (0.203)	-1.827*** (0.001)	0.492*** (0.000)	-0.709*** (0.000)
Pharmaceuticals	5.274*** (0.000)	0.009*** (0.003)	-0.172*** (0.000)	0.032 (0.823)	1.237*** (0.004)	0.485 (0.807)	-28.558*** (0.000)		0.189** (0.024)
Auto mobile	0.054 (0.346)	-0.003 (0.679)	0.490*** (0.000)	0.261*** (0.000)	-0.215 (0.276)	0.251 (0.201)	0.356 (0.722)	-0.235*** (0.000)	0.298*** (0.000)
Textile Composite	18.573*** (0.005)	-0.323*** (0.003)	-0.036*** (0.000)	0.450** (0.024)	0.248 (0.624)	-0.048 (0.801)	-0.953** (0.012)		0.474** (0.016)

Note: *, ** and *** showing significance level at 10%, 5% and 1% level respectively. US$/RS representing indirect Exchange rates of US dollar.

KSE shows overall market return, δ shows risk-return trade off parameter.

In the variance equation (equation (i), chapter 3) seven, out of ten industries showed significant asymmetric coefficient (denoted by α_1, variance equation (ii), chapter 3). Three industries, such as miscellaneous, tobacco and textile composite, showed α_1 statistically significant and negative coefficient (results are displayed in table 4.7.1), giving the evidence of leverage affect, which implies that when the stock prices go down, it causes to decrease the value of equity relative to corporate debt and this sharp decrease in stock prices, increases the level of their leverage , it means lower stock prices lead to an increase in leverage, it also shows that the impact of unexpected bad surprises increases volatility more than the unexpected good surprises, consistent with the findings of Olugbode *et al.*, (2013). A decline in the stock value increases financial leverage, which used to make the stock more risky by increasing its volatility. The leverage effect refers to the negative correlation between returns and the volatility.

While the industries, such as, Food and personal care products, paper and board, leather and tanneries and auto-mobile showed a significant positive α_1 showed statistically significant and positive asymmetric coefficient, which shows that the impact of a good news is higher on the volatility of returns than bad news i.e. during a market boom volatility tend to increase than when the market declines, consistent with Léon, 2008. Remaining industries, which did not show significant coefficients, which shows their magnitude do not change during a good or a bad news, which implies that positive and negative news' do not effect these industries' volatility, and unfavorable movements in interest rate and exchange rate does not make their returns more volatile and risky.

In the table 4.7.1 almost all the industries, except sugar and allied industries showed significant and positive ARCH coefficient, (denoted by α_2 ,variance equation (ii), chapter 3), depicting the existence of volatility clustering, showing that the conditional volatility has a tendency to rise when the absolute value of the standardized error is larger and vice versa.

The results in the table 4.7.1 showed GARCH parameter (denoted by β, variance equation (ii), chapter 3) to be statistically significant for all the industries giving the evidence of volatility clustering among industry returns. Table 4.7.1 showing that three industries, such as miscellaneous, sugar and allied industries, textile composite have the value of the sum of ARCH and GARCH parameters (variance equation (ii), chapter 3), close enough to one, which shows that their shocks will continue far in the future.

Table 4.7.1. Variance Equation of Exchange rates and Interest rates exposure:

Industries	α_0	α_1(arch)	Υ	β(garch)	$\alpha_1\beta$ (Average)	AIC	LLH
Miscellaneous	1.020 (0.108)	0.141*** (0.000)	-0.180** (0.023)	0.571*** (0.000)	0.356	7.398	642.741
Cement	6.338*** (0.000)	0.359*** (0.000)	-0.246*** (0.005)	0.403*** (0.007)	0.381	7.848	687.530
Food & personal care products	10.369*** (0.000)	0.001*** (0.000)	-0.938*** (0.000)	0.626*** (0.000)	0.313	13.20	1150.05
Tobacco	0.543*** (0.000)	0.089 (0.2782)	0.507*** (0.000)	0.883*** (0.000)	0.486	8.248	923.293
Sugar & allied industries	1.395 (0.104)	0.275 (0.102)	0.153 (0.167)	0.551** (0.037)	0.413	6.669	578.257
Paper & board	2.320*** (0.000)	0.407*** (0.000)	0.266*** (0.000)	0.446*** (0.000)	0.426	7.757	670.686
Leather & tanneries	1.966** (0.017)	0.362 (0.364)	0.343 (0.295)	0.603*** (0.000)	0.482	8.552	739.619
Pharmaceuticals	3.392*** (0.000)	0.406*** (0.000)	-0.035 (0.512)	0.401*** (0.000)	0.404	8.751	8.265
Auto mobile	3.642*** (0.004)	0.195 (0.570)	0.742** (0.025)	0.381** (0.035)	0.288	8.377	720.039
Textile Composite	2.850*** (0.000)	0.025 (0.449)	0.214*** (0.003)	0.307*** (0.006)	0.166	7.122	619.351

Note: *, ** and *** showing significance level at 10%, 5% and 1% level respectively. AIC shows Akaike information criteria and LLH stands for log likelihood.

The results of the diagnostic tests are shown in table 4.7.2. The results showed that the value of JB test statistics is still high for most of the industries, giving the evidence of non-normal distribution. The positive values of skewness and the value of excess Kurtosis, which is greater than zero for all the industries, exhibiting the leptokurtic distribution. Presence of leptokurtic distribution means that the distribution has thin peaks and heavier tails for all the industries. There is no evidence of serial correlation up to 30 lags as indicated by the Q-statistics on standardized and squared standardized residuals. The ARCH-LM test provided evidence of no ARCH effect up to 20^{th} lag. It means that after applying the EGARCH (1, 1)-M model to the stock returns, the problem of heteroscedasticity has been removed successfully.

Table 4.7.2: Diagnostic checking for EGARCH (1,1)-M:

	Q-Statistics on Raw data				Q-Statistics on Squared data				ARCH LM test (F-Statistics)			Normality Test		
Ind Returns/Lags	5	10	20	30	5	10	20	30	2	5	20	Skewness	Excess kurt	JB Test
Leather& tanneries	3.041 (0.385)	13.544 (0.904)	29.738 (0.403)	40.443 (0.363)	0.741 (0.981)	4.884 (0.899)	10.926 (0.948)	27.032 (0.622)	0.281 (0.869)	0.811 (0.976)	8.845 (0.984)	2.909	14.278	181.01 (0.000)
Tobacco	1.072 (0.784)	14.319 (0.638)	18.352 (0.433)	20.730 (0.836)	0.054 (1.000)	1.399 (0.999)	1.549 (1.000)	1.676 (1.000)	0.020 (0.989)	0.053 (1.000)	1.315 (1.000)	8.158	9.693	37.198 (0.000)
Automobile	0.849 (0.837)	1.825 (0.986)	4.385 (1.000)	8.304 (1.000)	0.218 (0.999)	0.322 (1.000)	0.617 (1.000)	3.158 (1.000)	0.112 (0.945)	0.218 (0.999)	0.896 (1.000)	6.174	48.138	166.84 (0.000)
Pharmaceuticals	2.610 (0.456)	9.629 (0.292)	12.580 (0.816)	15.040 (0.978)	0.124 (1.000)	1.719 (0.998)	2.003 (1.000)	2.405 (1.000)	0.055 (0.975)	0.124 (0.999)	1.724 (1.000)	5.595	50.243	176.3 (0.000)
Sugar & allied industries	3.654 (0.301)	6.164 (0.629)	17.826 (0.467)	22.299 (0.767)	1.347 (0.930)	3.308 (0.973)	45.717 (0.376)	57.409 (0.223)	0.477 (0.787)	1.437 (0.920)	38.794 (0.701)	1.505	10.120	438.310 (0.000)
Textile composite	7.295 (0.121)	14.196 (0.116)	24.658 (0.172)	32.426 (0.301)	5.181 (0.394)	13.629 (0.191)	24.028 (0.241)	30.981 (0.416)	3.631 (0.162)	5.045 (0.410)	23.153 (0.281)	1.029	5.200	66.948 (0.000)
Food& Personal care prod.	4.480 (0.345)	5.248 (0.812)	5.607 (0.999)	7.974 (1.000)	0.039 (1.000)	0.073 (1.000)	0.079 (1.000)	0.113 (1.000)	0.009 (0.995)	0.037 (1.000)	0.291 (1.000)	11.81	151.15	16.2 (0.000)
Paper & Board	10.676 (0.104)	21.877 (0.532)	36.537 (0.633)	47.930 (0.235)	0.614 (0.987)	2.525 (0.990)	16.438 (0.689)	26.956 (0.626)	0.049 (0.975)	0.601 (0.987)	12.743 (0.888)	0.811	4.600	38.071 (0.000)
Miscellaneous	8.420 (0.308)	12.223 (0.142)	22.016 (0.231)	30.878 (0.323)	0.890 (0.971)	1.961 (0.997)	4.226 (1.000)	5.218 (1.000)	0.572 (0.751)	0.870 (0.972)	3.763 (1.000)	2.817	17.120	174.68 (0.000)
Cement	2.785 (0.426)	4.497 (0.810)	16.049 (0.589)	26.998 (0.518)	0.282 (0.998)	0.527 (1.000)	6.524 (1.000)	7.353 (1.000)	0.211 (0.899)	0.245 (0.988)	4.881 (0.999)	2.583	20.245	241.83 (0.000)

CHAPTER 5

Conclusion

In this study we examined simultaneously the sensitivity of Pakistani non-financial industries to fluctuations in interest rates and exchange rates. The analysis is done by using OLS model first, but because of the existence of heteroscedasticity and residual autocorrelation, the AR(1)-EGARCH-M is applied as this is the more efficient model in order to capture the volatility and this model is also useful in capturing the time-varying properties of the data used in the study. We used monthly data from January 2000 to December 2014.

The findings of this study showed that Pakistani non-financial industries are highly affected by the fluctuations in the exchange rates and the interest rates, which is a sign that these industries are not using appropriate hedging techniques and risk managing strategies.

The finding of the study also revealed that, for most Pakistani non-financial industries, the number of industries with positive risk return trade off parameter is greater than negative coefficient, it means that the increase in exchange rate of US dollar leads to an increase in the return, while in case of British pound mostly industries showed this coefficient to be negative, which means increased risk in terms of Euro does not necessarily creates an increase in the returns. The number of significant industries by the exposure of US$ exchange rate is higher than the exposure of Euro exchange rate. Which shows that in Pakistan, mostly industries are more affected by the fluctuations in the US dollar exchange rate than British pound, the reason might be, as US dollar

has become a universal currency, and is easily acceptable in the whole world, mostly transactions in the world occur in terms of US dollar, and may be Pakistani investors used to do their transactions in terms of US dollar, so when its value tend to fluctuate, it affects the manufacturing sector positively or negatively, because of their imported inputs. The negative balance sheet foreign exchange exposure indicates that Pakistani industrial firms holds, on average, more foreign currency denominated liabilities than foreign currency denominated assets. This indicates currency mismatching on the balance sheet. We can surely say that industrial firms, on average, do not hedge their positions with on-balance sheet activities.

However, the number of the industries which shows the presence of leverage affect is less, means that good news or surprises creates more volatility in the returns as compared to negative or bad news.

In case of long term and short term interest rate exposures, number of significant industries is higher in long term interest rate, all the coefficients are negative, it means with an increase in the interest rate, stock returns tend to decrease. Long term exposure is higher as compared to short term interest rate exposure, According to Muller and Verschoor (2006), because long term exchange rate exposure is related to unknown transactions, which are difficult to hedge. Zhou (1996) investigated the relationship among interest rates and the stock prices by using regression analysis. He suggested that the interest rates have an important influence on the stock returns, specifically in terms of long horizons. Moreover, his findings showed that the long-term interest rate explains a major part of the volatility in the price to dividend ratios and that the higher volatilities of the stock market is related to the higher volatilities of the long-term bond yields.

The findings in terms of short run and long run interest rates showed the evidence of leverage affect is greater than exchange rate. So we can conclude that bad surprises create larger influence on volatility of the stock market and trading volume in terms of interest rate fluctuations as compared to exchange rate fluctuations. One explanation can be that the investors become risk averse to the down side risk, so they used to react faster to bad news. According to Bartram (2002) firms with high leverage are expected to have a higher financial distress cost which makes them more exposed to the risk of fluctuations in interest rate. The author considered the leverage as an important determinant of the risk, which can be measured easily and it belongs to liability side.

We can say that the long-term interest rates have a critical influence on the investment decisions and the profitability of firms and their stock market performance. The findings suggest that the volatility might be affected by changes in the long-term interest rates more than short term interest rates. Moreover, the magnitude of GARCH parameter is greater than the significant ARCH parameter, showing that the stock market has a longer memory which more than one single period, it means that the volatility is more sensitive to the old news as compared to the news about previous period's volatility. The results showed that the number of statistically significant industries in the exposure of US$ dollar exchange rate and long term interest rate are equal, but the industries are more exposed to the exposure of the fluctuations in terms of long term interest rate, because all industries showed negative coefficient, which means that the increase in the interest rate leads to a decrease in returns. Only one industry that is cement industry did not show any exposure to interest rate and

exchange rate fluctuations, the coefficient appeared to be negative but was not statistically significant.

5.1. Suggestions and Policy Implications:

The main aim of the study is to determine how allied and manufacturing industries can minimize the impact of the depreciating their local currency in terms the cost of imported manufacturing inputs. The study is helpful on how managing the opposite effects can help in improving the competitiveness within the local market and against other key industry players.

According to the findings of the study, it is highly recommended for Pakistani multinational firms, especially those firms or industries which used to import their raw material, that they need to adopt suitable operational hedging techniques to reduce the interest rate and exchange rate risk exposure to a bearable level because multinational firms have to deal in foreign currencies so they have significant costs and revenues in foreign currency. The firms that are facing unbalanced costs and revenue system due to larger interest rate and exchange rate fluctuations, can low the magnitude of interest rate and exchange rate exposure by matching their proportion in costs and revenues of foreign currency.

Pakistani non-financial industries are advised to adopt suitable financial hedging techniques to mitigate their interest rate and exchange rate risk. Investors should closely observe the interest rate and exchange rate patterns and before investing their capital in KSE 100 they should forecast the future interest rate and exchange rates so that they can maximize their profits. Moreover, shareholders of a risky stock must be offered a compensation or reward for investing in, by making their investments more exposed to the risk of higher

interest rates. For the further research the recommendations for the researchers are, that they can add more variables in order to find out the influence of the other variables on stock returns.

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Appendix A

Figure-A 4.1: Graphs of Monthly Returns and Volatility Series of different industries:

Figure-A 4.1.13: Monthly Returns of Pharmaceutical industry:

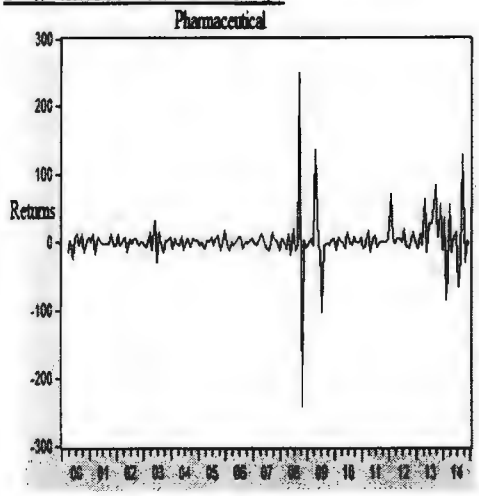


Fig-A 4.1.14: Volatility Graph of Pharmaceutical industry:

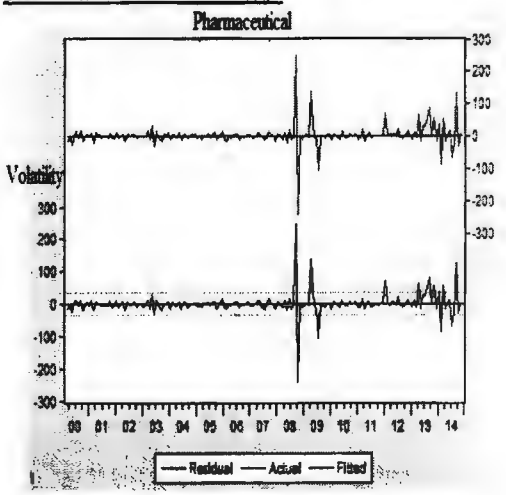


Fig.-A 4.1.15: Monthly Returns of Food& personal care products' industry:

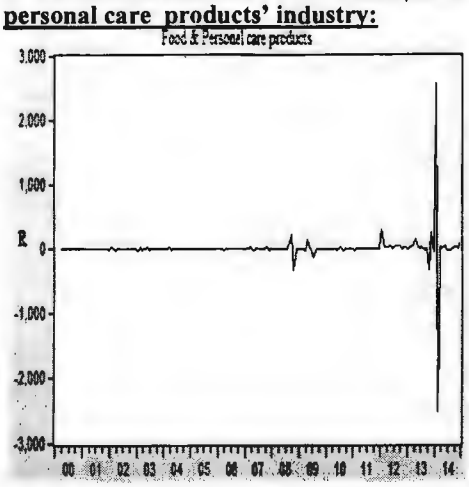


Fig. A- 4.1.16: Volatility Graph of Food& personal care products' industry:

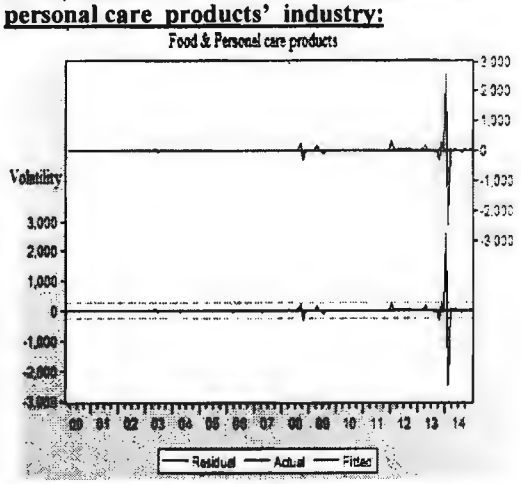


Fig.-A 4.1.17: Monthly Returns of Leather & tanneries industry:

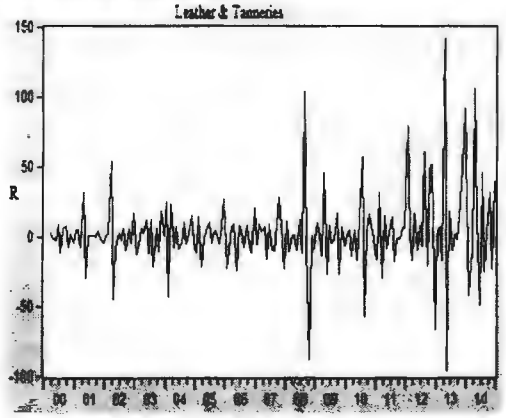


Fig.-A 4.1.18: Volatility Graph of Leather & tanneries industry:

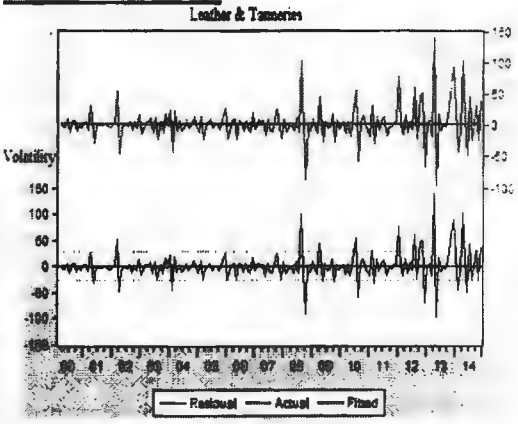


Fig.-A 4.1.19: Monthly Returns of Miscellaneous industry:

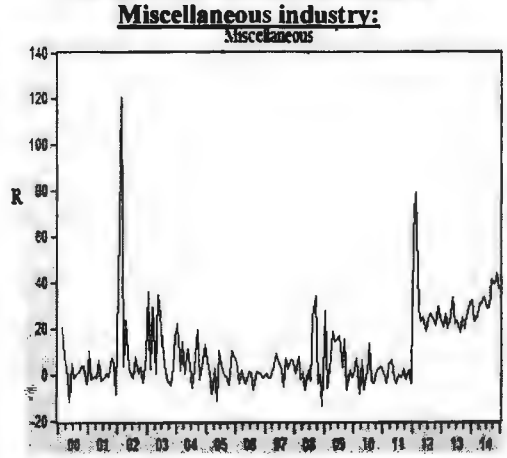


Fig. –A 4.1.20: Volatility Graph Miscellaneous industry:

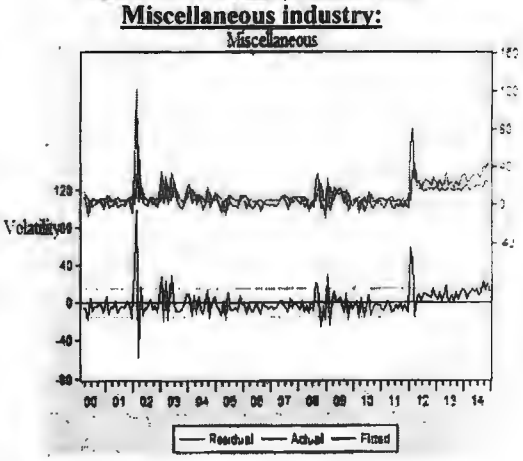


Figure-A 4.2: Histograms of the Stock Return Series of different industries:

Fig –A 4.2.7: Histogram of Pharmaceutical industry:

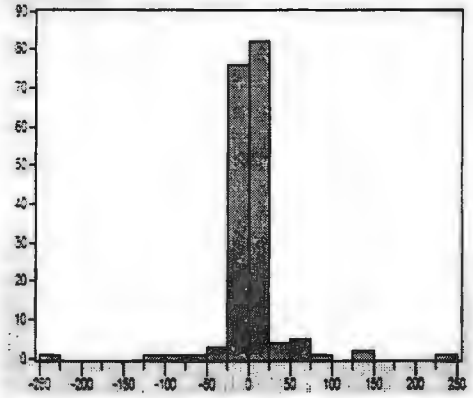
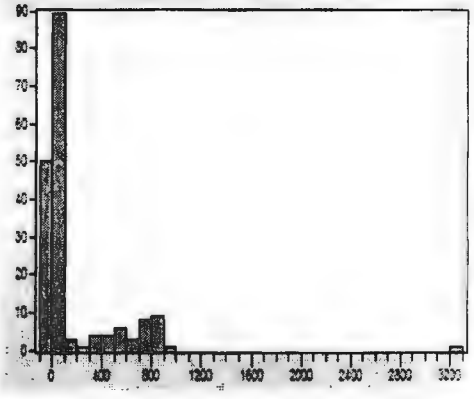


Fig-A 4.2.8: Histogram of Food & personal care products' industry:



Fig–A 4.2.9: Histogram of Leather & Tanneries industry:

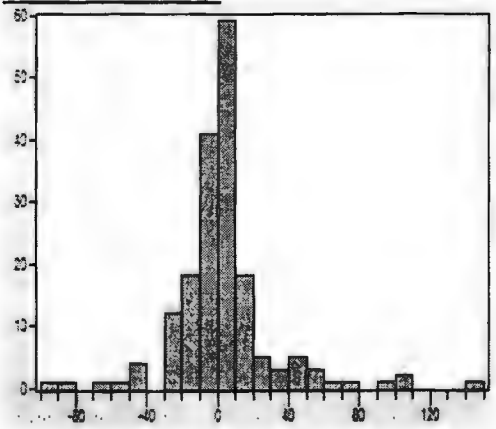


Fig-A 4.2.10: Histogram of Miscellaneous industry:

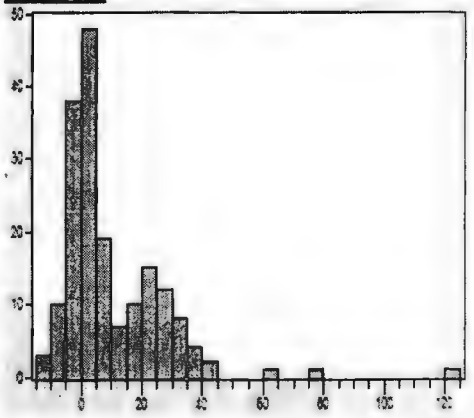


Figure-A 4.3: ACF and PACF of the Monthly Return Series of the industries:

Figure-A 4.3.6: ACF and PACF of the monthlyreturns series of Pharmaceutical industry:

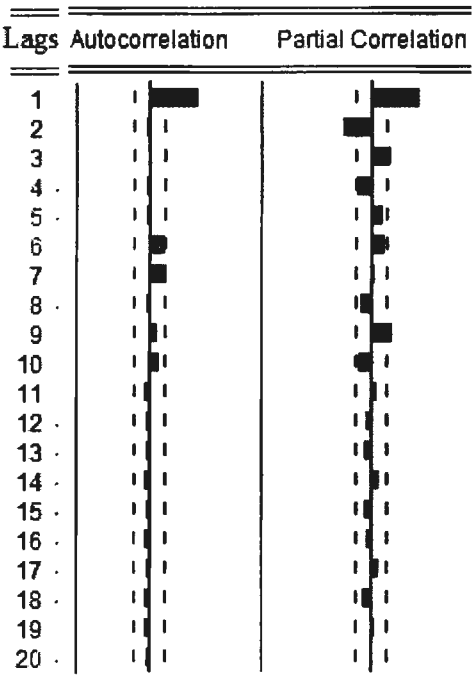


Figure-A 4.3.6: ACF and PACF of the monthly returns series of Food & personal care products' industry:

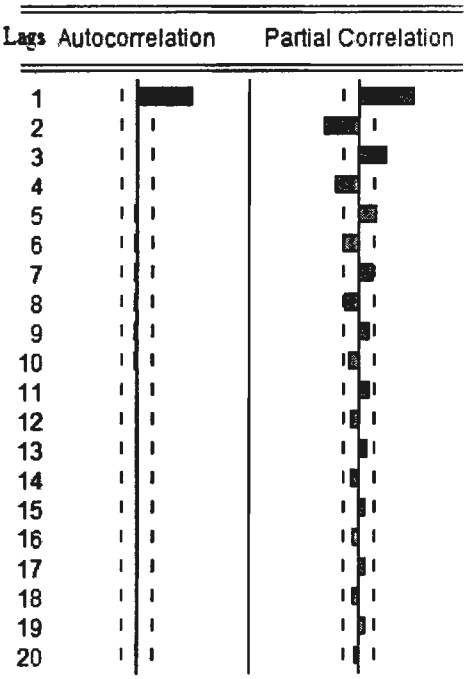


Figure-A 4.3.6: ACF and PACF of the monthly returns series of Leather & Tanneries industry:

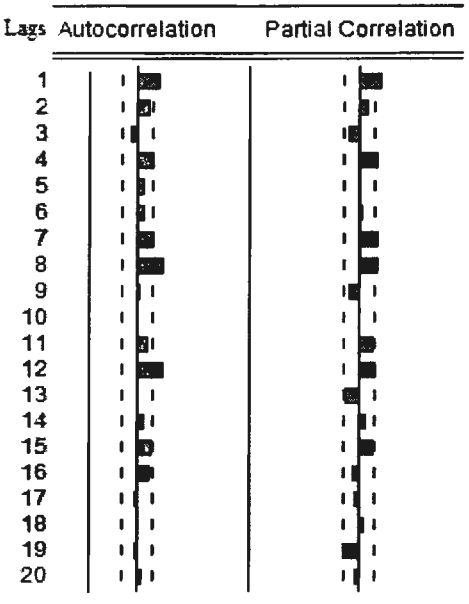


Figure-A 4.3.6: ACF and PACF of the monthly returns series of Miscellaneous industry: