The Stock Market Liberalization and Aggregated Stock Return Volatility in Karachi Stock Exchange

By

Ayyaz Ahmad

36-SE/MS (EF) 2/F12

Supervisor:

Dr. Arshad Ali Bhatti

Assistant Professor, IIIE

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Department of Economics and Finance

International Institute of Islamic Economics

International Islamic University Islamabad.

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Ayyaz Ahmad

36-SE/MS (EF) 2/F12

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International Islamic University,

Islamabad

Supervisor

Dr.Arshad Ali Bhatti

In the name of Allah, the most merciful and beneficent

DEDICATION

I dedicate this thesis to my parents, family and my supervisor whose support has enabled me to complete this research study successfully

Forwarding Sheet

The thesis entitled —The Stock Market Liberalization and Aggregated Stock-Return Volatility in Karachi Stock Exchange.

The Stock Market Liberalization and Aggregated Stock-Return Volatility in Karachi Stock Exchange submitted by Ayyaz Ahmad in the partial fulfilment of M.S degree in Economics and Finance, has completed under my guidance and supervision. I am satisfied with the quality of student's research work and allow him to submit this thesis for further process as per IIU rules and regulations.

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Registration Number: 36-SE/MS (EF) 2/F12

Name of Supervisor: Prof.Dr. Arshad Ali Bhatti

Approval Sheet

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By

Ayyaz Ahmad
Registration No.36-SE/MS EF-2/F12

Supervisor:
Dr. Arshad Ali Bhatti
Assistant Professor, IIIE
International Islamic University, Islamabad

Internal Examiner:
Dr. Abdul Rashid
Assistant Professor, IIIE
International Islamic University, Islamabad

External Examiner:
Dr. Fazal Hussain
Dean,
Faculty of Social Sciences
PIDE, Islamabad

Head
School of Economics, IIIE
International Islamic University,
Islamabad

Director General
International Institute of Islamic Economics
International Islamic University,
Islamabad

Date of Viva Voce Examination 5th of May 2015

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Ayyaz Ahmad

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Abstract

The aim of study is to explore the relationship between aggregated volatility and stock market liberalization in case of Karachi Stock Exchange (KSE) Pakistan. We use monthly return data of 43 firms which are listed at KSE-100 Index for the year 2000-2013. We use Size, Turnover, Profitability and Age as control variables in our analysis. The study shows a positive relationship between aggregated volatility and stock market liberalization. The impact of variable size, profitability and age on aggregated volatility is negative. Despite of positive relation between aggregated volatility and stock market liberalization, we are not against liberalization. For example, there are many factors other than liberalization that may cause aggregated volatility to increase like weak financial structure, lack of regulatory reforms and inefficient corporate governance. In order to take benefits from stock market liberalization, Government may be advised to introduce advanced regulatory reforms and financial structure.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

We are passing through an era of globalization. World is becoming like a global village from last few decades. Therefore, lot of countries liberalize their markets. This liberalization has a huge impact on the economy of these countries like lower cost of capital which causes investment boom and increase in economic growth (Chari and Henry, 2004; Bekaert and Harvey, 2000; Henry, 2000;Moshirian, 2008; Bekaert et al. 2005).Financial liberalization is the removal of cross border restriction over time. A lot of American and European countries liberalize their markets by lifting trade barriers and making free trade zones like NAFTA, LAFTA, EU etc. As a result, gains from trade of these countries increase after liberalization. Stock market volatility is also affected as a result of changes in financial liberalization and change in the cost of capital occurs as a result of changes in volatility (Umutlu et al.2010; Henry and Chari, 2004; Bekaert and Harvey, 2000).Therefore, this issue need to be addressed properly.

A huge literature shows the positive aspects of financial liberalization by showing negative relationship between volatility and stock market liberalization (Ahimud and Mendelson, 1997; Samy et al. 2008; Fernandus and Ferreira, 2008; Foerster and Karoly, 1999; Henry, 2000; Kwan and Reyes, 1997; Umutlu et al, 2010; Wang, 1997).Liberalization causes improvement in risk sharing; as a result, volatility decreases because as number of investors increase information becomes more complete and accurate (Merton, 1987). Moreover, market imperfections are reduced

after liberalization and external finance becomes cheaper, as a result economic growth increases (Bekaert et al., 2001).

There are many positive aspects of stock market liberalization for the emerging markets too. For example, Liberalization decreases the cost of capital, as a result economic growth increases that causes a boom in the economy (Henry and Chari, 2004; Bekaert and Harvey, 2000;Moshirian, 2007; Bekaert et al., 2005; Henry, 2000). On the other hand, some of the studies show that there is a positive relationship between volatility and liberalization, which means that investment risk increases as a result of liberalization in emerging markets (Merton 1987; Calvo 1996, Easley, et al, 1998; Barro 2001; Kim 2001; Bae et al, 2004; Stiglitz, 2004; Aymen and Boughrara, 2009; G Mougni 2012).Merton (1987) shows that stock return reduces and risk increases as a result of incomplete information. Stiglitz (2004) shows that foreign capital outflows are pro cyclical in nature that causes an increase in output and consumption volatility especially, if market imperfections like information asymmetry and incomplete information are present. Aymen and Boughrara (2009) show that often, countries do not take benefits from liberalization because of weak financial and regulatory structure and volatile markets. Premature financial liberalization in the presence of weak regulatory system causes misallocation of resources. Mougani (2012) shows that financial liberalization puts huge burden in order to make other policies of economy in case of African countries.

While some of the literature shows little or no impact of liberalization on volatility (De Santis and Imrohoroglu 1997, Kim & Signal 2000, O'Donnell 2001, Edwards 2001, Hargis 2002, Edison et al. 2002, Gentzoglanis 2007). Overall studies show mixed results regarding the relationship between stock market liberalization and

volatility. So, there is a room for further work on this important issue. Our study provides some additional insights regarding the relationship between aggregated volatility and stock market liberalization.

1.2 Problem Statement

A problem in the literature regarding aggregated volatility and liberalization is the nature of relationship between them. The literature shows a mixed relationship between the two variables. Second problem in the literature related to liberalization is the dating of liberalization. In the last decade, liberalization is considered as an event in the literature and researches assume that, there is no change in the speed and intensity of liberalization (Edison and Warnock, 2003). Different researchers used different liberalization dates. For example, regulatory reform date is used in some studies (Signal and Kim 2000; Imrohoroglu and De Santis; 1997; Henry and Chari 2004) and some of them uses announcement of 1st country fund date as the date of liberalization (Karoly and Foerster 1999; Umutlu et al; 2007). These changes in the dates may be one of the reasons of obtaining different results on this particular issue (Umutlu et al; 2010). However, some of the studies consider the speed and intensity of liberalization as a gradual process and not only an event, and its intensity varies with the passage of time (Harvey and Bekaert, 2002; Edison and Warnock 2003; Bae et al, 2004). We also consider stock market liberalization as a gradual process by using ratio analysis in our study in order to avoid the dating problem.

Another problem of the previous literature is that it analysed market portfolio's return variance in order to make inferences about average stock of return variance. This approach can cause problems in our results because variance of portfolio can change due to change in covariance of stock forming portfolio, without a change in

variance of individual stocks (Umutlu et al; 2010). Our study estimates the variance of individual stocks rather than market portfolio in order to avoid this problem.

1.3 Objectives of the Study

On the basis of above discussion, this study attempts to explore the nature of relationship between stock market liberalization and aggregate stock-return volatility, that is, whether there exists a negative, positive or no relationship between them for Karachi stock exchange. Specifically, we aim;

- To investigate whether stock market liberalization is desirable for stock market or not?
- To describe the channels through which aggregated volatility is affected as a result of stock market liberalization. For this purpose, we decompose volatility into three components namely market, industry and Idiosyncratic volatility.
- To estimate volatility of individual stocks rather than volatility of market portfolio for our analysis.

The main purpose of our research is to answer the question that "Whether stock market liberalization is desirable for Karachi Stock Exchange (KSE) or not?" In order to answer this question, first we have to find that what is the impact of stock market liberalization on aggregated volatility? Our question needs to be answered because it has some policy implications. For example, Government may have to adopt restriction on investment policy in order to prevent from adverse effects of volatility or it may have to lift the trade barriers by removing the cross border restrictions, in order to take advantage from liberalization. This relationship is important for financial managers because cost of capital increases as a result of increase in volatility (Umutlu et al, 2010). This particular relationship is also

important for portfolio managers because they have to adjust their portfolios according to the risk preferences of investors which changes with the degree of stock market liberalization.

1.4 Significance of the Study

Our study is important because it provides some additional insights for investors and portfolio managers by addressing the relationship between stock market liberalization and aggregated volatility. This particular relationship is important for portfolio managers because they have to adjust their portfolios according to the risk preferences of investors which changes with the degree of stock market liberalization.

Some of the advantages of liberalization are a developed and sound financial system which would reduce volatility. Our research question needs to be answered because Stock market volatility is affected as a result of changes in stock market liberalization and change in the cost of capital occurs as a result of changes in volatility (Umutlu et al.2010; Henry and Chari 2004; Bekaert and Harvey 2000). It will be helpful for government in policy making. Stock market liberalization has some financial and real implications too. Some of the financial implications are, increase in equity prices (Harvey and Bekaert 2000), decrease in cost of capital (Stulz 1999), and reduction in risk.premium (Ahimud et al; 1997). While increase in investment and economic growth are considered as real implications of liberalization (Henry, 2000; Harvey et al. 2001). Our study will provide insights that whether liberalization is desirable for stock market or not.

Our study is different from most of the previous studies in the way that, we use aggregated volatility which is the sum of idiosyncratic, industrial and market

volatility rather than simple measure of aggregated volatility in case of Pakistan. This measure broadly explains the stock market volatility by considering industrial as well as market factors of volatility. In most of the previous studies, simple measure of volatility is used. Our study is related to the impact of stock market liberalization on aggregated stock market volatility of Pakistan. According to the best of our knowledge, no other study in the literature regarding the impact of stock market liberalization on aggregated volatility in case of Pakistan. We use the methodology proposed by Campbell et al (2001) on Karachi Stock Exchange (KSE), by decomposing aggregated volatility into market, industry and firm volatility. So, our study provides some additional insights regarding volatility dynamics.

1.5 Scheme of the Study

Our scheme of study is as follows. Chapter 2 describes the literature review. Chapter 3 comprises of data and methodology. Chapter 4 shows estimation results and discussion. Chapter 5 shows the conclusion and the policy implications of our study. References of our study and appendix are also given at the end.

CHAPTER 2

LITERATURE REVIEW

2.1. Background of the Literature

Our study focuses on the impact of stock market liberalization on aggregated stock return volatility in case of Karachi Stock Exchange (KSE) Pakistan. Variable size, turnover, profitability, age and crisis are considered as the control variables in our study. There is a difference of opinion about the impact of stock market liberalization on aggregated volatility in the literature. There are three stands regarding the relationship between aggregated volatility and stock market liberalization.

Some studies analyse that stock market liberalization is desirable for markets (Wang, 1997; Ahimud and Mendelson, 1997; Kwan and Reyes,, 1997; Foerster and Karoly, 1999; Henry, 2000;Samy et al. 2008; Fernandus and Ferreira, 2008; Umutlu et al, 2010). On the other hand, some studies examine that stock market liberalization have negative impacts on the market (Shleifer and Vishny, 1986; Merton, 1987; Calvo 1996; Easley et al., 1998; Kim, 2001; Stiglitz, 2004; Achy 2005; Aymen and Boughrara, 2009; Mougani 2012).While some of the literature shows little mixed or no impact of financial liberalization on markets (De Santis and Imrohoroglu, 1997; Kim & Signal, 2000;O'Donnell 2001; Edwards 2001;Hargis 2002; Edison et al. 2002;Gentzoglanis 2007).

Some of the researchers analyse that the financial is desirable for markets. Beakert et al. (2005) show a 1% annual increase in the real economic growth as a result of financial liberalization. Moreover, financing constraints reduces as a result of

financial liberalization because more availability of foreign capital. As a result, corporate governance improves and external and internal finance becomes cheaper. Hence cost of capital reduces after liberalization. Levine (2001) analyse that financial liberalization put performance pressures on financial managers, which leads to improve corporate governance. La Porta et al., (1997) analyse that economic growth and financial development improves as a result of investor protection and good corporate governance.

Financial Liberalization of stock market causes booms in private investment (Henry 2000). According to the study, Investment growth is recorded an increase of more than 22%. Another study claims that the cost of capital declines after liberalization (Ahimud and Mendelson 1997). This is happened due to three reasons. First, after liberalization net capital inflows increase and risk free rate decreases. Second, risk sharing between investor increases as a result risk premium declines. Finally, more capital inflows cause liquidity to increase, so equity premium reduces.Samy et al. (2008) examine that there is a positive impact of liberalization on market development in the long run.

There are a lot of positive aspects of stock market liberalization for the emerging markets too. Liberalization decreases cost of capital as a result economic growth increases which causes a boom in the economy (Henry and Chari 2004; Bekaert and Harvey 2000, Moshirian, 2007; Bekaert et al. 2005, Henry, 2000).

Fernandus and Ferreira (2008) show a positive relationship between price in-formativeness and cross-listing. The study shows that increasing analyst coverage has a positive impact on price in-formativeness of the emerging market firms. They also claim that added analyst coverage produces market wide information instead of firm

specific information. A study finds that non US firms earn abnormal profits, when cross listed to US exchanges (Foerster and Karoly; 1999). It shows that cross-listing has a positive impact on firm's information environment.

On the other hand, some studies examine that liberalization have negative impacts on the market (Shleifer and Vishny 1986, Merton 1987; Calvo 1996; Easley, Paperman and O'Hara 1998; Kim 2001; Barro 2001,Stiglitz 2004; Achy 2005; Aymen and Boughrara 2009, Mougani 2012). Shleifer and Vishny (1986) argue that financial liberalization may leads to mis allocation of resources and weak corporate governance. This happens because incentives to share holders reduce after financial liberalization. Merton (1987) analyzes that liberalization has no advantages in the presence of incomplete information. Calvo (1996) states that, the excessive capital inflows is the major reason of Asian financial crisis.

IMF (1998) says that most of the developing countries having small markets with limited capacity do not absorb excess capital inflows. As a result volatility of the market increases. A study claims that analyst activity for private information is not a good proxy because analysts are like "showcasing" devices and often they have not enough private information (Easley, Paperman and O'Hara 1998). According to the evidence given above, we can say that cross listing is still a debateable phenomenon.

Stock market liberalization should not be pre mature and inconsistent in nature. International monetary fund (IMF 2001) says that liberalization is desirable for market if and only if the liberalization is prudent and gradual. Barro (2001) shows that, the economic growth decreases as a result of financial instability and financial instability occurs as a result of excessive capital inflows and outflows in the market. Kim (2001) analyses that, the added disclosure after cross-listing should crowd out

the private in-formativeness. So, firm specific information is not fully reflected into stock prices. Stiglitz (2004) examines that if there is a trend of less savings and information asymmetries in the market, foreign capital does not make profitable investments. Achy (2005) assesses the impact of financial liberalization on economic performance for MENA countries. Study shows the negative impact of liberalization on economic and investment growth in case of Turkey, Egypt, Morocco, Jordan and Tunisia.

A sound and effective regulatory and supervisory structure and a stable market are essential in order to take benefits from stock market liberalization. Samy et al. (2008) says that first of all financial reforms should be introduced at domestic level before liberalizing the market. Aymen and Boughrara (2009) show that often, countries do not take benefits from liberalization because of weak financial and regulatory structure and volatile markets. Premature financial liberalization in the presence of weak regulatory system causes misallocation of resources. Financial liberalization is considered as one of the cause of Asian Crisis. So in order to take benefits from liberalization one must keep in view the regulatory and supervisory system of the market which is going to be liberalized.

Mougni (2012) analyse that financial instability, crisis and poverty increases as a result of financial liberalization. The study shows that financial liberalization puts huge burden in order to make other policies of economy in case of African countries. Moreover, open countries have to face more instability as compare to close countries.

Some of the studies show mixed or no impact of financial liberalization on markets. O'Donnell (2001) shows that capital account liberalization does not accelerate

economic growth. The study shows the impact of financial liberalization vary from country to country. Edwards (2001) also examine that financial liberalization has no impact on economic growth in case of developing countries. Edison et al. (2002) says that the impact of capital account liberalization on economic growth is mixed. Gentzoglanis (2007) examines the relationship between financial liberalization and economic growth. Study shows that the relationship is significant only for the high income countries and weak for low income countries. Samy et al; (2008) shows the liberalization of stock market has no impact on investment and economic growth in the short run.

There can be liberalization of different types. Some markets are fully liberalized and some are more gradual. If countries are polled according to the types of liberalization more accurate results can be obtained regarding liberalization (Edison, Warnock 2003). Samy et al. (2008) show that financial liberalization has positive impacts on stock market development in the long run if economy is partially open for foreign investors. On the other hand, Edison and Warnock, (2003) proves that partial liberalization can be dangerous, because the cost of capital increases as a result of partial liberalization, but a huge decline in cost of capital and increase in net capital inflows are recorded in case of full liberalization.

If a market is completely segmented then security prices are determined by local market portfolio. On the other hand, if market is fully integrated, the security prices are determined by global market index. Generally, most of the markets are neither fully integrated nor fully segmented. In such cases prices of securities are derived from both global and local portfolios (Umutlu et al.2010). We consider partially integrated/segmented markets because of partially integrated/segmented nature of many markets.

A problem in the literature related to financial liberalization is the dating of liberalization. In the last decade, financial liberalization is considered as an event in the literature and researches assume that, there is no change in the speed and intensity of financial liberalization (Edison and Warnock, 2003). Different researchers used different liberalization dates. For example regulatory reform date is used in some studies (Signal and Kim 2000; Imrohoroglu and De Santis; 1997; Henry and Chari 2004) and some of them uses announcement of 1st country fund date as the date of liberalization (Karoly and Foerster 1999; Umutlu et al; 2007). These changes in the dates may be one of the reasons of obtaining different results on this particular issue (Umutlu et al; 2010). However, some of the studies consider the speed and intensity of liberalization as a gradual process and not only an event, and its intensity varies with the passage of time (Harvey and Bekaert, 2002; Edison and Warnock 2003; Bae et al, 2004).

In order to proxy liberalization different measures are used which is categorized into two groups, capital flow base and restriction base measures. Accurate quantification of liberalization is hard to calculate in restriction base measures because of the binary use of classifications (Liberalized/Non liberalized). Capital flow base measures broadly explain the intensity of openness (Umutlu et al. 2010). Moreover, in capital flow base measures, financial liberalization is treated as a continuous measure and liberalization is considered as a process rather than an event. Hence there is no problem of dating the financial liberalization in capital flow base measures.

Bekaert, et al. (2001) and Samy et al. (2008) use the ratio of sum of imports and exports to GDP as a proxy of openness and liberalization. Lane and Milesi-Ferretti

(2007) use a proxy (LMF) of liberalization as the sum of foreign equity outflows and inflows and FDI outflows and inflows as a share of country's GDP. Umutlu et al. (2010) use Foreign Equity Liabilities (FEL) as a proxy of liberalization, which is the value of foreign equity portfolio to market capitalization of local stock market. We use modified FEL ratio in our study in order to calculate financial liberalization. FEL is the ratio between numbers of shares held by foreigners to total number of outstanding shares held by the firm. We modify FEL ratio in local prospective.

The use of the ratios in order to measure stock market liberalization has a lot of advantages. These measures treat stock market liberalization as a continuous variable, which can be measured quantitatively. This use of ratio analysis eliminates the dating problem in previous literature because, these ratios consider liberalization as a time varying process (Umutlu et al.; 2010). So, we use capital flow base measures by using the ratios to calculate stock market liberalization in order to avoid the dating problem.

Aggregated volatility is considered as the sum of global, local and idiosyncratic volatility in an international prospective (Ferreira and Gama; 2005, Umutlu et al; 2010). On the other hand, aggregated volatility can be divided into three components namely market, industry and firm volatility in the local prospective (Campbell et al. 2001). Campbell et al; 2001 consider industry and market adjusted model, while Ferreira, Gama and Umutlu consider country and world adjusted models. Campbell et al; (2005) introduces a flexible method (CLMX) to decompose aggregated volatility that does not require estimation of the covariance and market beta terms. This approach is a better measure of estimating volatility, because market beta is not concise and stable over time (Umutlu et al; 2010).

The use of CAPM model in order to calculate volatility may lead to inconsistent and inaccurate results because of the properties of that model (Bali et al. 2008). First property of CAPM is that all investors hold all the risky assets available in market. Second property is that investors hold the risky assets in same proportion. However, these properties are against the market experience. First, there is a difference in investment strategy of every investor and they do not held all assets having same risk in their portfolio. Second, a rational investor does not put his all investment in the risky assets because of several reasons like incomplete information, institutional restrictions, transaction cost, indivisibility of investment and liquidity constraints. So, in order to obtain accurate results, we use modified covariance free CAPM model as suggested by the Campbell et al. (2000).

Campbell et al. (2005) analyse that aggregated measure of volatility is much better than simple measure of volatility because, simple measure of volatility only captures the market dynamics of volatility. On the other hand, aggregated volatility captures market as well as industry and idiosyncratic components of volatility. There are many reasons to consider these components of volatility. First, a lot of investors hold a large number of such individual stocks which may not diversify the risk as suggested by the financial theory. Such investors are affected by industry and idiosyncratic components of volatility. Second, conventional theories say that a portfolio is said to be well diversified if all the idiosyncratic volatility is eliminated. Third, the price of option of stock depends upon aggregated volatility of stock return which includes industry and idiosyncratic volatility. So in the light of above discussion, we use aggregated volatility rather than simple volatility.

Bali et al. (2008) also introduce model independent idiosyncratic volatility that is based on portfolio diversification gains and independent from covariance's and market betas. CLMX shows greater volatility and an upward trend in volatility as compare to new approach. Both approaches show that upward trend in volatility is stronger for low priced, small and younger firms. We estimate the impacts of stock market liberalization on aggregated volatility by decomposing volatility into three components proposed by Campbell namely market, industry and Idiosyncratic volatility.

Most of the studies consider idiosyncratic volatility as a main source of risk. Campbell et al. (2001) use firm level data in order to test idiosyncratic volatility. The study finds that the market becomes volatile only at firm level. Ferreira and Gama (2005) extended the volatility model of Campbell. They find that risk at world and country level remains stable during the period of observation (1974-2001). Industry risk is higher as compare to world and country risk. Bali et al. (2008) indicate significant level of idiosyncratic volatility at firm level. Study shows that higher idiosyncratic volatility is a result of increase in the number of shares in market, and growth in expected earning of individual stocks.

CLMX (2005) shows an upward trend in idiosyncratic volatility only at firm level during the period 1962-1997. There is no significant changes are recorded in market and industry volatility. Schwert (1989) also shows that market volatility do not significantly change during the period 1859-1987. Xu and Malkiel (2003) also show an upward trend in idiosyncratic volatility in case of NASDAQ market. Bali et al. (2008) analyse that the upward trend in idiosyncratic volatility is because of the low correlation of individual stocks and increase in the number of shares.

Bekaert et al; (2005) and Brav et al ;(2005) shows that idiosyncratic volatility is higher for that firms only which have low stock price or having low institutional ownership. Brown and Kapadia (2007) show that idiosyncratic volatility increases only in case of new cross listed firms. Wei and Zhang (2006) examine a decline in return on equity as a result of high idiosyncratic volatility for new listed firms.

Idiosyncratic volatility is highly affected by the change in size, age and price of the firms. Wei and Zhang (2006) find that idiosyncratic volatility of a firm increases as a result of a decrease in corporate earnings of the firm. They also analyse that the old firms are less volatile as compare to new firms. Brav et al; (2005)show that idiosyncratic volatility of low priced firms is high as compare to high priced firms. Bali et al. (2008) shows a high trend of idiosyncratic volatility for small size, younger and low priced firms as compare to large size, old and high priced firms. The study shows that the NASDAQ stocks are more volatile as compare to NYSE stocks because NYSE market is bigger in size and higher in price as compare to NASDAQ stock market. So, in the context of above discussion, we calculate volatility on the basis of size, age and price.

Another problem of the previous literature is that it analysed market portfolio's return variance in order to make inferences about average stock of return variance. This approach can cause problems in our results because variance of portfolio can change due to change in covariance of stock forming portfolio, without a change in variance of individual stocks (Umutlu et al; 2010). Our study estimates the variance of individual stocks rather than market portfolio in order to avoid this problem.

There are many variables other than stock market liberalization that can affect the aggregated volatility like Size, Profitability, Efficiency and Age. All these variables

are considered as control or mediating variables. It is essential to include all those variables which can affect our dependent variable in order to obtain accurate and reliable results. So in order to obtain more accurate results, we include size, profitability, efficiency and age as control variables in our study.

Variable Size shows the total size of the firm relative to the stock market. Size is used frequently in the previous literature as a control variable (Umutlu et al, 2010; Samy et al. 2008, Bali et al. 2008 and Campbell et al. 2005). Variable size is used to test development of stock market on volatility (Umutlu et al. 2010). The impact of variable size on volatility is mixed in the literature. Bali et al. (2008) and Campbell et al. (2005) show that the upward trend in volatility is stronger for low priced, small size and younger firms. They show that the larger firms are less volatile. On the other hand, Umutlu et al. 2010 shows the negative relationship between aggregated volatility and stock market liberalization especially for small size markets. So, the impact of size on volatility is mixed in the literature.

Bali et al. (2008) examine that size is an important component for determining volatility of the market. The study analyse that the volatility of small sized firms is high as compare to small size firms. They show that the NASDAQ stocks are more volatile as compare to NYSE stocks because NYSE market is bigger in size and higher in price as compare to NASDAQ stock market. So in the light of above discussion, we can conclude that the size of the firm is an important factor of determining volatility. Samy et al. (2008) and Umutlu et al. (2010) define variable size as the ratio between market capitalization of stock market and country's GDP. The ratio of market capitalization to GDP determines stock market size in

international prospective. We modify variable size in domestic prospective as the log of total assets of a firm.

The profitability ratio shows that how much profit is earned by the firm. Profitability ratio is important for our study because it is an important determinant of volatility. Wei and Zhang (2006) find that idiosyncratic volatility of a firm increases as a result of a decrease in corporate profit of the firm. It is examine that generally high priced firms are more profitable as compare to low priced firms. Brav et al; (2005) show that idiosyncratic volatility of low priced firms is high as compare to high priced firms. Bekaert et al; (2005) and Brav et. al; (2005) shows that idiosyncratic volatility is higher for that firms only which have low stock price or having low institutional ownership. Bali et al. (2008) shows a high trend of idiosyncratic volatility for small size, younger and low priced firms as compare to large size, old and high priced firms. From the above discussion, we find that profitability ratio can also affect the volatility. So, we include profitability ratio as a control variable in our study.

More efficient markets or firms are less volatile as compare to the less efficient markets or firms (Umutlu et al. 2010). Turnover ratio tells us the efficiency and the liquidity of the market or a firm. So, in order to control liquidity effects, Turnover (TO) variable as the ratio between total values of shares traded during specific period to average market capitalization is used in literature (Umutlu et al. 2010).Turnover ratio is also used as the control variables in our study.

Age is another important component that can affect the market volatility. Wei and Zhang (2006) analyse that the old firms are less volatile as compare to new firms. They examine a decline in return on equity as a result of high idiosyncratic volatility for new listed firms. Brown and Kapadia (2007) show that idiosyncratic volatility

increases only in case of new cross listed firms. Bali et al. (2008) shows a high trend of idiosyncratic volatility for small size, younger and low priced firms as compare to large size, old and high priced firms. The firms which are established before 1980 are considered as the old firms and the other firms are considered as the younger firms. We assign the value '1' to the old firms and assign zero to the younger firms as used in the literature. The variable Age tells us that either old firm are less volatile than new firms or not.

2.2. The Relationship between Variables

There are three stands in the literature regarding relationship of stock market liberalization and aggregated volatility. First stand show positive aspects of stock market liberalization by showing a negative relationship between stock market liberalization and volatility. Umutlu et al; (2010) show a negative relationship between volatility and financial liberalization, which means that reduction in risk, occurs after liberalization. Wang (2007) extends the Merton (1987) investor base broadening phenomenon. Study analyses that increase in the number of investors after financial liberalization; cause a decrease in volatility because as number of investor increases, the information becomes complete and accurate. A study shows that there is a reduction in volatility as the number of investor increases, if investors have heterogeneous information (Kwan and Reyes; 1997).Samy et al. (2008) examine that there is a positive impact of liberalization on market development in the long run. Konstantinos Kassimatis (2002) finds that stock market volatility decreases as a result of financial liberalization in emerging countries (Pakistan, India, South Korea, Argentina, Philippines and Taiwan).

Aymen and Boughrara; (2009) suggest that in case of emerging markets financial liberalization does not accelerate stock market volatility. The probability of crisis as well as volatility tends to decrease after financial liberalization in case of Pakistani stock market. After analysing a three dimensional relationship between stock market volatility, financial liberalization and financial crisis, the study suggests that financial liberalization is beneficial for stock market because of two reasons. First, stock market volatility has a negative relationship with financial liberalization. Second, the probability of financial crisis decreases after financial liberalization.

On the other hand, some of the studies show the negative impacts of financial liberalization on markets by showing positive relationship between financial liberalization and aggregated volatility (Merton 1987; Calvo 1996, Easley, Paperman and O'Hara 1998;, Barro 2001, Kim 2001, Bae et al; 2004; Stiglitz, 2004; G Mougni 2012). Stiglitz (2004) shows that foreign capital outflows are pro cyclical in nature that causes an increase in output and consumption volatility especially, if market imperfections (information asymmetry and incomplete information) are present. Merton (1987) shows reduction in stock return and increase in risk as a result of incomplete information.

Kim (2001) analyses that, the added disclosure after cross-listing should crowd out the private in-formativeness. So, firm specific information is not fully reflected into stock prices. A study claims that analyst activity for private information is not a good proxy because analysts are like "showcasing" devices and often they have not enough private information (Easley, Paperman and O'Hara 1998). According to the evidence given above, we can say that cross listing is still a debateable phenomenon.

IMF (1998) says that most of the developing countries having small markets with limited capacity do not absorb excess capital inflows. As a result volatility of the market increases. Mougni (2012) analyse that financial instability, crisis and poverty increases as a result of financial liberalization. Barro (2001) shows that, the economic growth decreases as a result of financial instability and financial instability occurs as a result of excessive capital inflows and outflows in the market. Calvo (1996) states that, the excessive capital inflows is the major reason of Asian financial crisis. According to Aymen and Boughrara; (2009) financial liberalization is one of the cause of Asian Crisis, and volatility increases as a result of financial crisis.

Some of the studies show mixed results regarding relationship between stock market liberalization and volatility. Domovitz et al (1998) examine the impact of firm level liberalization on volatility. They show that liberalization at a firm level may cause increase or decrease the volatility depends on transparency of information. If price information is available freely than number of investors increase in both markets and volatility decreases. On the other hand, imperfect informational linkages cause increase in volatility. Fernandos and Ferreira (2008) shows that after cross-listing, there is an improvement in the price information for the developed markets only it has a negative impact on emerging market firms. While some of the literature shows little or no impact of financial liberalization on volatility (De Santis and Imrohoroglu 1997, Kim & Signal 2000, and Hargis 2002).

Financial liberalization varies from market to market. Some markets are fully liberalized, whereas some are more gradual. If countries are polled according to the types of liberalization, more accurate results can be obtained regarding liberalization (Edison and Warnock 2003). Samy et al. (2008) show that financial liberalization has

a positive impact on the stock market development in long run if economy is partially open for foreign investors. On the other hand, Edison and Warnock (2003) prove that partial liberalization can be dangerous, because the cost of capital increases as a result of partial liberalization. However, a huge decline in the cost of capital and increase in net capital inflows are recorded in case of full liberalization. Financial liberalization can affect idiosyncratic and systematic volatility through different channels. Change in systematic volatility occurs as a result of changes in market dynamics, which occurs because of shifting from segmented markets to integrated markets. There is high volatility in most of the emerging markets and global markets are more stable in nature. So, shifting from segmented markets to global market causes global volatility to increase and local volatility to decrease (Umutlu et al.2010).

Idiosyncratic volatility can also be affected through financial liberalization because changes in accuracy of information flow (Umutlu et al.2010). A study suggests that analyst coverage increase as a result of liberalization, which as a result produce firm specific information (Lundholm and Lang 1996). Literature also shows that firm specific information causes increase in idiosyncratic volatility (Xu and Malkiel; 2003). On the other hand, Fernandus and Ferreira (2008) examine that increase in number of market participant as a result of liberalization improves the public information (market information rather than firm specific information). As a result idiosyncratic volatility decreases. According to modern portfolio theory idiosyncratic volatility does not affect the return if an investor holds a portfolio which is fully diversified. However, the evidence given by Lorne and Picard (2013) regarding the relationship between idiosyncratic volatility and return is mixed. Stock returns of developed markets do not affected by idiosyncratic volatility but emerging market

stock returns are positively correlated with idiosyncratic volatility. So, liberalization may increase or decrease idiosyncratic volatility depends on information accuracy.

Firm size, age and price are important components to explain high firm level volatility (Bali et al. 2008). Bekaert et al; (2005) and Brav et al; (2005) shows that idiosyncratic volatility is higher for that firms only which have low stock price or having low institutional ownership. Cao et al. (2007) examine that after controlling of growth options upward trend of idiosyncratic volatility reverses or eliminates. Brown and Kapadia (2007) show that idiosyncratic volatility increases only in case of new cross listed firms. Wei and Zhang (2006) examine a decline in return on equity as a result of high idiosyncratic volatility for new listed firms.

Idiosyncratic volatility is highly affected by the change in size, age and price of the firms. Wei and Zhang (2006) find that idiosyncratic volatility of a firm increases as a result of a decrease in corporate earnings of the firm. They also analyse that the old firms are less volatile as compare to new firms. Brav, and Graham (2005) show that idiosyncratic volatility of low priced firms is high as compare to high priced firms. Bali et al. (2008) shows a high trend of idiosyncratic volatility for small size, younger and low priced firms as compare to large size, old and high priced firms. So, in the context of above discussion, we calculate volatility on the basis of size, age and price.

Above discussion provides mixed results regarding the effects of stock market liberalization on aggregated volatility. So there is a room for further investigation on this issue. Our results will add more awareness and understanding about the volatility dynamics. Table A.1 in appendix shows the summary of some famous

studies regarding the relationship between aggregated volatility and stock market liberalization.

2.3. Gap Identification

We use aggregated volatility which is the sum of idiosyncratic, industry and market volatility rather than simple measure of volatility. This measure broadly explains the stock market volatility by considering industry as well as market factors of volatility. In most of the previous studies simple measure of volatility is used. We decompose aggregated volatility by using method proposed by Campbell, into market, industry and firm volatility in order to check stock market volatility of Pakistan, by focusing on KSE. According to the best of our knowledge, no other study examines the impact of stock market liberalization on aggregated volatility regarding KSE. So, our study will fill the literature gap in this regard.

CHAPTER 3

DATA AND METHODOLOGY

3.1. Data

In this chapter we discuss the data and estimation methodology to be used for the analysis of aggregated volatility and stock market liberalization. Our study focuses on the relationship between stock market liberalization and aggregate stock-return volatility in KSE, Pakistan using annual panel data (constructed on the basis of monthly observations) for the selected stocks listed on KSE-100 index over the period 2000-2013. Forty-three firms are included in our analysis. We chose only those firms which are included continuously in the KSE-100 index. Aggregated volatility is taken as the dependent variable; whereas stock market liberalization is used as an independent variable in our study.

We consider KSE-100 Index as the market index. Top ten trading sectors of KSE are considered as industry index, because these sectors capture more than 80% of the transaction volume of KSE. The firms which are repeatedly listed in the construction of KSE-100 during 2000-2013 are considered as the firm index.

We pool our data into three pools (Liberalized/non-liberalized, Large/Small, and Old/New firms) on the basis of Liberalization, Size and Age because Umutlu et al. (2010) examine that if the data is polled according to the common characteristics, more accurate results can be obtained. Our study comprises of the sample of 43 firms out of which twenty-three firms are liberalized and twenty firms are non-liberalized.

Table 3.1: Volume of the top sectors of KSE

This table shows the volume of the sectors which are included in our study. We consider the following top ten sectors for our estimates.

	Chemicals	22, 005, 500. (15.3%)
	Construction and Materials (Cement)	16, 996, 200. (11.8%)
	Personal Goods (Textile)	14, 741, 600. (10.3%)
	Fixed Line Telecommunication	13, 822, 000. (9.6%)
	Commercial Banks	11, 580, 300. (8.1%)
	Financial Services	8, 850, 000. (6.2%)
	Electricity	7, 147, 000. (5.0%)
	Oil and Gas	5,743,900 (4.0%)
	Food Producers	2,789,760 (1.9%)
	OTHERS	11,831,500 (8.2%)

The advantage of making polls is that we can compare the results of liberalized/non-liberalized, Large/Small, and Old/New firms separately. These results of pool data are more reliable and accurate as compare to the results of mixed data. We check the impact of stock market liberalization and other control variables on aggregated volatility by pooling our data into different pools. The results of pool data are same as the results of panel data. The detail of descriptive statistics of firms on the basis of liberalization, size and age are given in the table A-2 to A-7 of appendix.

Table 3.2: List of non-liberalized firms in KSE-100

This table shows the list of non-liberalized firms is selected for our study.

Abbott Lab.	Atlas Honda Ltd.
Attock Refinery Limited.	Bata Pakistan Ltd.
BannuWoolen.	Dawood Hercules Ltd.
Engro Corp.	Ghani Glass Ltd.
Inter. Industries Ltd.	K.E.S.C Ltd.
Kohinoor Energy Ltd.	Murree Brewery Co. Ltd.
Mari Petroleum and Gas	National Foods Ltd.
National Refinery Ltd.	Pakistan Cables Ltd.
P.T.C.L.A	Security Papers Ltd.
Shifa International Hospital.	Sui Southern Gas Ltd.

Table 3.3: List of liberalized firms in KSE-100

This table show the list of liberalized firms which are selected for our analysis.

Bank Al-Habib	Bank Al-Habib
Century Paper	Cherat Cement
D.G. Khan Cement	EFU General
Faysal Bank	Fauji Cement
GlaxoSmithKline Ltd.	ICI Pakistan Ltd.
Indus Motor Ltd.	JDW Sugar Mills Ltd.
Kohat Cement Ltd.	Lucky Cement Ltd.
Millat Tractors Ltd.	Nestle Pakistan Ltd.
Packages Ltd.	Pak Suzuki Motor Ltd.
Pioneer Cement Ltd.	Shell Pakistan Ltd.
Siemens (Pakistan) Co. Ltd.	S.N.G.P.L
Sonari Bank	

We collect our data from the websites of KSE, SBP and the respective companies for our analysis.

3.2. Estimation Methodology

We first calculate decomposed measures of volatility as suggested (theoretically) by Campbell et al. (2001) and then construct an aggregated measure or composite measure of volatility for our analysis. Aggregated volatility is considered as the sum of market, industry and idiosyncratic volatility. First of all we compute annual return volatility of individual stocks by taking variances of the returns then we take weighted average of volatility of all the stocks. The weighted average return volatility of all stocks formed aggregated volatility. Weighted average is taken on the basis of market capitalization of firms. In other words weighted average of a firm is the ratio of total number of outstanding shares of the firm to the total number of outstanding shares of whole industry.

Our decomposed model for aggregated volatility is as follow

First of all, we modify the CAPM equation for return of industry i in time t, as follow:

$$R_{it} = \beta_{mi} R_{mt} + \tilde{\varepsilon_{it}} \qquad (3.1)$$

$$R_{it} = R_{mt} + \varepsilon_{it} \qquad (3.2)$$

Comparing (3.1) and (3.2) we find ε_{it}, which represent the difference between industry return and market return.

$$\varepsilon_{it} = \tilde{\varepsilon_{it}} + (\beta_{mi} - 1)\, R_{mt} \qquad (3.3)$$

Taking variance of industry return of equation (3.2) by ignoring the covariance term gives the following:

$$Var\,(R_{it}) = Var\,(R_{mt}) + Var\,(\varepsilon_{it}) \quad (3.4)$$

Taking weighted average which exhibits the aggregated variance across industries and considering covariance term as zero we get:

$$\sum w_{it} Var\,(R_{it}) = Var\,(R_{mt}) + \sum w_{it} Var\,(\varepsilon_{it}) \quad (3.5)$$

$$\sum w_{it} Var\,(R_{it}) = \sigma^2_{mt} + \sigma^2_{\varepsilon t} \quad (3.6)$$

The return of individual firm can be written as follow

$$R_{ijt} = \beta_{mj} R_{mt} + \beta_{ij} \tilde{\varepsilon_{it}} + \tilde{\eta_{ijt}} \quad (3.7)$$

The beta free equation of firm level return is modified as follow:

$$R_{ijt} = R_{mt} + \varepsilon_{it} + \eta_{ijt} \quad (3.8)$$

After taking variance by considering covariance term as zero and taking weighted average of equation (3.8) we get weighted average of firm variances as follow:

$$\sum w_{ijt} Var\,(R_{ijt}) = Var\,(R_{mt}) + Var\,(\varepsilon_{it}) + \sigma^2_{\eta it} \quad (3.9)$$

Here $\sigma^2_{\eta it} = \sum w_{ijt} Var\,(\eta_{ijt})$. Now taking weighted average across industries, we will find the required aggregated volatility (σ^2_{ait}) as

$$\sum w_{it} \sum w_{ijt} Var\,(R_{ijt}) = Var\,(R_{mt}) + \sum w_{it} Var\,(\varepsilon_{it}) + \sum w_{it} \sigma^2_{\eta it} \quad (3.10)$$

Aggregated volatility can be written as the sum of market, industry and firm level volatility as

$$\sigma^2_{ait} = \sigma^2_{mt} + \sigma^2_{\varepsilon t} + \sigma^2_{\eta t} \quad (3.11)$$

Where $\sigma^2_{\eta t} = \sum w_{it} \sigma^2_{\eta it} = \sum w_{it} \sum w_{ijt} Var\,(\eta_{ijt})$

For Market volatility we calculate variance of market data and multiplying these variances with regression coefficient beta of equation (3.1).

Market volatility in time t is estimated as

$$MKT_t = \hat{\sigma}_{mt}^2 = \beta_{mi}{}^2 (\sum (R_{ms} - \mu_{mt})^2) \quad (3.12)$$

Where μ_{mt} represents the mean of market returns R_{ms}. And s represent the months in which returns are calculated. β_{mi} is the beta of industry with respect to market.

Industry volatility is calculated by summing all the industry specific residuals of equation (3.2).

$$\hat{\sigma}_{\varepsilon it}^2 = \sum \varepsilon_{is}^2 \quad (3.13)$$

Average industry volatility can be measure as

$$IND_t = \sum w_{it} \hat{\sigma}_{\varepsilon it}^2 \quad (3.14)$$

Idiosyncratic volatility is the weighted average sum of squares of firm specific residuals.

Idiosyncratic volatility is calculated by taking the weighted average sum of squares of firm specific residuals of equation (3.9).

$$\hat{\sigma}_{\eta ijt}^2 = \sum \eta_{ijs}^2 \quad (3.15)$$

Average firm volatility in an industry will be computed as

$$\hat{\sigma}_{\eta it}^2 = \sum w_{ijt} \hat{\sigma}_{\eta ijt}^2 \quad (3.16)$$

Focusing on the calculation of our measures, we consider partially integrated/segmented case of market. Therefore, we consider that individual stock return depends on portfolio return of market as well as industry. Unlike other studies,

we estimate aggregate volatility of individual stocks rather than volatility of market portfolio. This approach is used because the variance of market portfolios can be change due to the changes in the covariance of stocks included in portfolio, without a change in individual stock variance. This means that average stock volatility is not clearly explained in the previous approach. Therefore, we use a volatility measure that is independent from covariance and beta terms. There is only one beta in our study, which is the beta of market with respect to industry.

This study is different from most of the previous studies in the sense that in our final analysis we focus on a composited or aggregated measure of volatility rather than focusing on just market, industry or firm level measures. Further, to the best of our knowledge we are unable to find such study in case of KSE, Pakistan.

In order to proxy liberalization different measures are used in the literature which is divided into two groups' capital-flow base measures and restriction base measures. Accurate magnitude of stock market liberalization is hard to calculate in case of restriction base measures because of the binary use of classification (Liberalized/non liberalized). Capital flow-base measures broadly explain the intensity and magnitude of openness. Another advantage of using this approach is that, it treats stock market liberalization as a time-varying process rather than an event. We use capital flow base measures of stock market liberalization because we consider liberalization as a time varying process rather than an event. Hence we eliminate the dating problem of the existing literature.

Bekaert, et al. (2001) and Samy et al. (2008) use the ratio of sum of imports and exports to GDP as a proxy of openness and liberalization. This ratio indicates the trade openness. Lane and Millesi-Ferretti (2007) use a proxy (LMF) of liberalization

as the sum of foreign equity outflows and inflows and FDI outflows and inflows as a share of country's GDP. Umutlu et al. (2010) use FEL (Foreign Equity Liabilities) as a proxy of liberalization, which is the value of foreign equity portfolio to market capitalization of local stock market. We use modified Stock market liberalization (SML) ratio which is the ratio of total number of shares of a firm held by foreigners to total number of outstanding shares of that firm. The FEL ratio (the value of foreign equity portfolio to market capitalization of local stock market) is used by Umutlu et al. (2010) in an international prospective by considering country and world adjusted models. We use industry and market adjusted models in our study.

On the basis of above discussion, we formulate the following hypothesis for our study.

H_1: There exists a positive relationship between aggregated volatility and stock market liberalization.

H_2: There exists a positive relationship between market volatility and stock market liberalization.

H_3: There exists a positive relationship between industry volatility and stock market liberalization.

H_4: There exists a positive relationship between idiosyncratic volatility and stock market liberalization.

We use an indicator of size (SIZE) of the firm as a control variable, which is measured as the value of firm assets. Size is calculated by taking the log of Total Assets of a firm. The firms having the value (log value) of total assets as 5 or more than 5 are considered as the large size firms.

In the light of above discussion, we formulate the following hypothesis

H_5: There is a negative relationship between aggregated volatility and size of the firm.

H_6: There is a negative relationship between market volatility and size of the firm.

H_7: There is a negative relationship between industry volatility and size of the firm.

H_8: There is a negative relationship between idiosyncratic volatility and size of the firm.

Turnover shows the total number of shares traded of a firm in stock market during a specific period of time. Turnover shows the stock market efficiency and volume. We use turnover (TO) as a control variable as suggested by Umutlu et al. (2010). Turnover ratio in our analysis is calculated as the ratio of total number of outstanding shares of a firm to the total number of outstanding shares of market.

On the basis of above discussion, we formulate the following hypothesis

H_{13}: There is a negative correlation between aggregated volatility and efficiency of the firm.

H_{14}: There is a negative correlation between market volatility and efficiency of the firm.

H_{15}: There is a negative correlation between industry volatility and efficiency of the firm.

H_{16}: There is a negative correlation between idiosyncratic volatility and efficiency of the firm.

Moreover, profitability and age are also included as the control variables. Profitability ratio in our study is considered as the ratio of net profit after taxes to gross sales as used in the previous literature. The firms having value of profitability ratio more than 0.2 are considered as profitable firms in our study.

Following hypothesis are developed from here

H_9: There is a negative correlation between aggregated volatility and profitability of the firm.

H_{10}: There is a negative correlation between market volatility and profitability of the firm.

H_{11}: There is a negative correlation between industry volatility and profitability of the firm.

H_{12}: There is a negative correlation between idiosyncratic volatility and profitability of the firm.

The firms which are established before 1980 are considered as the old firms and the other firms are considered as the younger firms for our study. We assign the value '1' to the old firms and assign zero to the younger firms as used in the literature. The variable Age tells us that either old firm are less volatile than new firms or not.

Following hypothesis that can be formed for the variable age

H_{17}: There is a negative correlation between aggregated volatility and age of the firm.

H_{18}: There is a negative correlation between market volatility and age of the firm.

H_{19}: There is a negative correlation between industry volatility and age of the firm.

H_{20}: There is a negative correlation between idiosyncratic volatility and age of the firm.

3.3. Theoretical Framework

There is a difference of opinion about the impact of financial liberalization on aggregated volatility in the literature. Some studies find that financial liberalization is desirable for markets by showing a negative relation of it with aggregated volatility (Ahimud and Mendelson 1997; Kwan and Reyes 1997; Wang 1997; Foerster and Karoly 1999; Henry 2000; Samy et al 2008; Fernandus and Ferreira 2008; Umutlu et al 2010). Liberalization of stock market causes booms in private investment (Henry 2000). Samy et al. (2008) examine that there is a positive impact of liberalization on market development in the long run. Another study claims that the cost of capital declines after liberalization (Ahimud and Mendelson 1997).

On the other hand, some studies examine that liberalization have negative impacts on the market (Easley, Paperman and O'Hara 1998; Mougani 2012; Kim 2001; Stiglitz 2004; Aymen and Boughrara 2009). Aymen and Boughrara (2009) show that often, countries do not take benefits from liberalization because of weak financial and regulatory structure and volatile markets. Premature stock market liberalization in the presence of weak regulatory system causes misallocation of resources.

Some studies show mixed impacts of financial liberalization on volatility (Domovitz et al; 1998; De Santis and Imrohoroglu 1997). Domovitz et al (1998) examine the impact of firm level liberalization on volatility. They show that liberalization at a firm level may cause increase or decrease in volatility depends on transparency of

information. If price information is available freely than number of investors increase in both markets and volatility decreases. On the other hand, imperfect informational linkages cause increase in volatility. Fernandos and Ferreira (2008) shows that after cross-listing, there is an improvement in the price information for the developed markets only it has a negative impact on emerging market firms. While some of the literature shows little or no impact of stock market liberalization on volatility (De Santis and Imrohoroglu 1997, Kim & Signal 2000, and Hargis 2002).

The impact of variable size on volatility is mixed in the literature. Bali et al. (2008) and Campbell (2005) show that the upward trend in volatility is stronger for low priced, small size and younger firms. They show that the larger firms are less volatile. On the other hand, Umutlu et al. (2010) shows the negative relationship between aggregated volatility and financial liberalization especially for small size markets. So, the impact of size on volatility is mixed in the literature. Umutlu et al. (2010) use variable size as the ratio between market capitalization of stock market and country's GDP as a control variable in the literature. Sammy et al. (2008), Bekaert et al. (2002), Campbell et al. (2005) and Bali et al. (2008) also use variable size as a control variable. Turnover variable is also considered as a control variable in order to check the efficiency and volume of the firms.

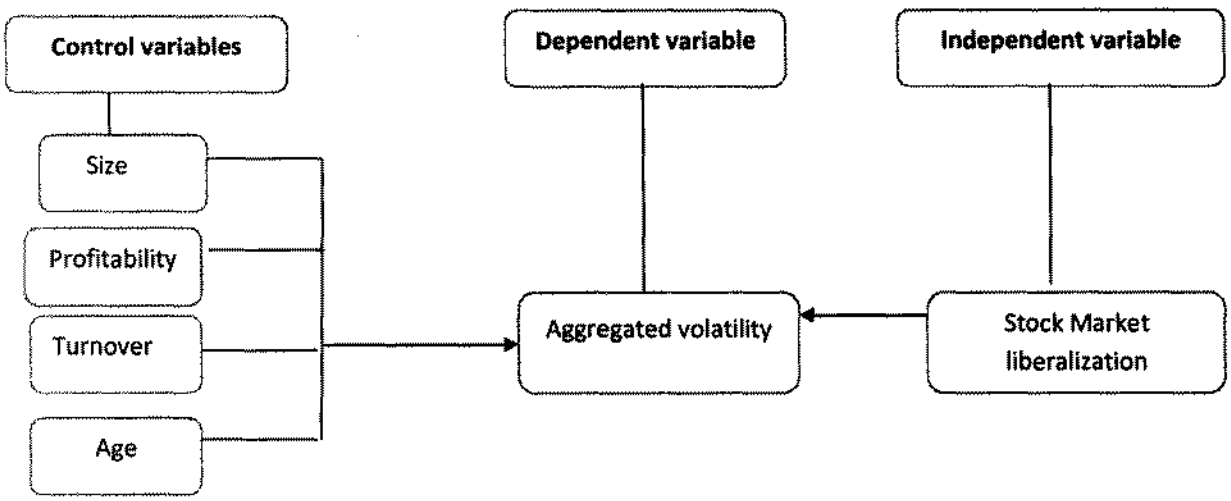
Profitability is considered as a key variable that affect volatility. Idiosyncratic volatility of a firm increases as a result of a decrease in corporate profit of the firm (Wei and Zhang 2006). It is examine that generally high priced firms are more profitable as compare to low priced firms. Idiosyncratic volatility is higher for those firms only which have low stock price or having low institutional ownership

(Bekaert et al. 2005, Brav et al. 2005, Bali et al. 2008,). From the above discussion, we find that profitability ratio can also affect the volatility. So, we include profitability ratio as a control variable in our study.

Age is another important component that can affect the market volatility. Wei and Zhang (2006) analyse that the old firms are less volatile as compare to new firms. They examine a decline in return on equity as a result of high idiosyncratic volatility for new listed firms. Brown and Kapadia (2007) show that idiosyncratic volatility increases only in case of new cross listed firms. Bali et al. (2008) shows a high trend of idiosyncratic volatility for small size, younger and low priced firms as compare to large size, old and high priced firms.

Diagram 3.1: Theoretical Framework

This Diagram shows the relationship between all the variables of our study.



It is noted that the volatility increases as a result of financial instability or crisis. Barro (2001) shows that, the economic growth decreases as a result of financial instability and financial instability occurs as a result of excessive capital inflows and

outflows in the market. Calvo (1996) analyse that, the excessive capital inflows is the major reason of Asian financial crisis. Mougni (2012) analyse that financial instability, crisis and poverty increases as a result of financial liberalization. On the other hand, Aymen and Boughrara; (2009) suggest that the probability of crisis as well as volatility tends to decrease after financial liberalization in case of Pakistani stock market.

CHAPTER 4

ESTIMATION AND DISCUSSION OF RESULTS

In order to estimate impact of stock market liberalization on aggregated volatility, first

We calculated the returns of the firms and then calculate firm, industry and market volatility by using return data. Finally, we sum these volatilities to get aggregated volatility. We use the following estimation model in which, we regress (aggregated volatility) on stock market liberalization by using some control variables like size, crises, turnover, profitability and age.

$$\hat{\sigma}^2_{alt} = \alpha + \hat{\beta}_1 SML_{lt} + \beta_2 size_{lt} + \beta_3 PR + \beta_4 TOR_{lt} + \beta_5 Age + \mu_{it} \qquad (4.1)$$

Here $\hat{\sigma}^2_{alt}$ is the aggregated volatility.SML_{lt}, is thestock market liberalization which is the ratio of total number of shares held by the foreigners to total number of outstanding shares of the firm. SML shows openness of the stock market. We use variable Size which is calculated by taking the log of total assets held by the firm. Variable Size determines size of the firm relative to stock market. In order to control liquidity effects, Turnover ratio (TOR) as the ratio between total numbers of shares traded by the firm to the total number of shares in the market is used.TOR_{lt}shows the stock market efficiency. PR is the profitability ratio. PR is the ratio between Net profits after tax to gross sales. Age shows the age of the firm. μ_{it}, is the error term.

We employ standard panel data methods of estimation like fixed effects or random effects for our study. The choice between these two methods may be decided by using Hausman test. Fixed effect and random effect models are used extensively particularly in case of panel data in the literature (Henry 2000, Fernandes, N.,

Ferreira, M., 2008, Umutlu et al. 2010). Our results of Hausman test are in favour of fixed effect model. So we employ fixed effect model for our analysis.

Table 4.1: Results of fixed effect estimates.

This table shows the detailed penal data results of fixed effect model of equation (4.1).

AGVOL	Coefficient	Robust Std. Error	t	P > t	95% Conf. Interval	95% Conf. Interval
SMLIB	3.5202*	1.9232	1.83	0.08	-0.468	7.509
Size	0.2257**	0.1038	-2.03	0.047	0.121	0.4392
PR	-1.622*	0.9011	-1.80	0.086	-3.49	0.247
TOR	-0.295	0.545	-0.54	0.593	-1.425	0.834
Constant	-1.06	0.532	-1.99	0.059	-2.163	0.0425
F (5, 22) = 3.10 Prob. > F = 0.0289						
Notes: The p-values are given in table. ***, **, * indicate significance at 1%, 5% and 10% respectively. AGVOL is Aggregated volatility which is taken as dependent variable. SMLIB is Stock market liberalization which is taken as an independent variable. PR is the profitability ratio and TOR is the Turnover Ratio.						

The objective of our study is to explore the relationship between aggregated volatility and stock market liberalization in case of Karachi Stock Exchange (KSE) Pakistan. The results of fixed panel estimate indicate a positive relationship between aggregated volatility and stock market liberalization. These results are significant at 10% level of significance. Our results are well in line with most of the previous literature (Shleifer and Vishny 1986; Merton 1987; Calvo 1996, Easley, Paperman and O'Hara 1998; Kim 2001; Stiglitz 2004; Achy 2005,Aymen and Boughrara 2009, Mougani 2012).

Our results indicate that liberalized firms are more volatile as compare to non-liberalized firms. Our study consist the sample of 43 firms including 23 liberalized and 20 non-liberalized firms. We can clearly see from descriptive statistics table A-2

and A-3of appendix that average aggregated volatility of non-liberalized firms is 0.138. On the other hand, average aggregated volatility of liberalized firms is 0.302 which is more than double as compared to the non-liberalized firms.

The impact of variable Size on aggregated volatility is also negative, which means that volatility of large size firms is low as compare to small size firms. The results are significant at 5% level. Our results are in line with Bali et al. (2008) and Campbell et al. (2005). Bali et al. (2008) and Campbell et al. (2005) show that the upward trend in volatility is stronger for low priced, small size and younger firms. They show that the larger firms are less volatile.

We also deal large and small size firms separately in order to check the impact of size separately. The firms having the value of variable Size (log of total asset) 5 or greater than 5 are considered as the large firms and the other firms are considered as the small size firms. The descriptive statistics of large and small size firms are given in the table A-4 and table A-5 respectively in the appendix. We can clearly see that the average aggregated volatility for large size firms (0.159) is less than the average aggregated volatility of small size firms (0.22). So we analyse a same negative relation between aggregated volatility and the size of the firm.

The impact of profitability ratio on aggregated volatility is negative. This means that the more profitable firms are less volatile as compare to less profitable firms. These results are significant at 10% level. Our results are in line with the previous literature. Wei and Zhang (2006) find that idiosyncratic volatility of a firm increases as a result of a decrease in corporate profit of the firm. It is examine that generally high priced firms are more profitable as compare to low priced firms. Barro et al; (1997) show that idiosyncratic volatility of low priced firms is high as compare to

high priced firms. Bekaert et al. (2005) shows that idiosyncratic volatility is higher for those firms only which have low stock price or having low institutional ownership. Bali et al. (2008) shows a high trend of idiosyncratic volatility for small size, younger and low priced firms as compared to large size, old and high priced firms.

The impact of variable Age on aggregated volatility is negative. Variable age is been omitted in the fixed effect model but the result of pool data shows a negative relation between age and aggregated volatility. Our results of Table A-6 and A-7 of appendix shows that Old firms are less volatile as compare to new firms. These results are well in line with most of the previous literature. Wei and Zhang (2006) analyse that the old firms are less volatile as compare to new firms. They examine a decline in return on equity as a result of high idiosyncratic volatility for new listed firms. Brown and Kapadia (2007) show that idiosyncratic volatility increases only in case of new cross listed firms. Bali et al. (2008) shows a high trend of idiosyncratic volatility for small size, younger and low priced firms as compare to large size, old and high priced firms. The descriptive statistics of volatility dynamics of old and new firms are given in Table A-6 and A-7 of appendix. From descriptive statistics of A-6 and A-7, we can clearly see that average volatility of new firms is (0.28) higher than the average volatility of old firms (0.188). So there is a negative impact of age on aggregated volatility.

4.2. Robustness

In order to check robustness for our results, we check the impact of stock market liberalization and other control variables on industry volatility. The results obtained from industry volatility are same as the results of aggregated volatility. We noted the

same positive relation between industry volatility and stock market liberalization. The results are significant at 10% level.

Table 4.2: Results of fixed effect model

This table shows the impact of stock market liberalization and other control variables on industry volatility.

INDVOL	Coefficient	Robust Std. Error	t	P > t	95% Conf. Interval	95% Conf. Interval
SMLIB	2.746*	1.559	1.76	0.092	-0.4877	5.979
Size	0.16*	-0.953	-1.68	0.10	-0.0376	0.358
PR	-1.249*	0.0676	-1.85	0.078	-2.65	0.1516
TOR	-0.402	0.408	-0.99	0.335	-1.247	0.443
Constant	-0.839**	0.386	-2.19	0.040	-1.634	-0.043
F (5, 22) = 1.69 Prob. > F = 0.1787						
Notes: The p-values are given in table. ***, **, * indicate significance at 1%, 5% and 10% respectively. INDVOL is Industry volatility which is taken as dependent variable. SMLIB is Stock market liberalization which is taken as an independent variable. PR is the profitability ratio and TOR is the Turnover Ratio.						

The impact of variable size on industry volatility is negative. We examine the same negative impact of profitability on industry volatility. The results are significant at 10% level.

4.3. Decision about the (Acceptance or Rejection) hypothesis

On the basis of above estimation and discussion, we can analyse that whether to accept or reject the formulated hypothesis.

Table 4.3: The decision about hypothesis

This table shows the detail of acceptance or rejection of our hypothesis.

Name of Hypothesis	Hypothesis Statement	Decision (Accept/Reject)
H_1	There exists a positive correlation between aggregated volatility and stock market liberalization.	Not rejected
H_2	There exists a positive correlation between market volatility and stock market liberalization.	Not rejected
H_3	There exists a positive correlation between industry volatility and stock market liberalization.	Not rejected
H_4	There exists a positive correlation between idiosyncratic volatility and stock market liberalization.	Not rejected
H_5	There exists a negative correlation between aggregated volatility and size of the firm.	Not rejected
H_6	There exists a negative correlation between market volatility and size of the firm.	Not rejected
H_7	There exists a negative correlation between industry volatility and size of the firm.	Not rejected
H_8	There exists a negative correlation between idiosyncratic volatility and size of the firm.	Not rejected
H_9	There is a negative relationship between aggregated volatility and profitability of the firm.	Not rejected
H_{10}	There is a negative relationship between market volatility and profitability of the firm.	Not rejected
H_{11}	There is a negative relationship between industry volatility and profitability of the firm.	Not rejected
H_{12}	There is a negative relationship between idiosyncratic volatility and profitability of the firm.	Not rejected
H_{13}	There exists a negative correlation between aggregated volatility and efficiency of the firm.	Rejected
H_{14}	There exists a negative correlation between market volatility and efficiency of the firm.	Rejected
H_{15}	There exists a negative correlation between industry volatility and efficiency of the firm.	Rejected
H_{16}	There exists a negative correlation	

	between idiosyncratic volatility and efficiency of the firm.	Rejected
H_{17}	There exists a negative correlation between aggregated volatility and age of the firm.	Not rejected
H_{18}	There exists a negative correlation between market volatility and age of the firm.	Not rejected
H_{19}	There exists a negative correlation between industry volatility and age of the firm.	Not rejected
H_{20}	There exists a negative correlation between idiosyncratic volatility and age of the firm.	Not rejected

CHAPTER 5

CONCLUSION AND POLICY IMPLICATIONS

The aim of our study is to explore the impact of stock market liberalization on aggregated volatility in case of KSE Pakistan. We employ fixed effect model on the monthly panel data of 43 firms for analysis. Our results show a positive relationship between stock market liberalization and aggregated volatility. Further, we observe that the average aggregated volatility of liberalized firms is more than the double as compared to the volatility of non-liberalized firms. These results indicate that liberalization is not desirable for KSE because the aggregated volatility of market increases after liberalization.

There might be several reasons for increasing the volatility as a result of liberalization in case of KSE. First, Pakistan is a developing country and KSE is still an emerging stock market. IMF (1998) documented that most of the developing countries having small markets with limited capacity do not absorb excess capital inflows. As a result volatility of the market increases. Mougni (2012) analyse that financial instability, crisis and poverty increase as a result of stock market liberalization in case of emerging markets. Further, Barro (2001) shows that, the financial instability occurs as a result of excessive capital inflows and outflows in the emerging markets. Fernandos and Ferreira (2008) shows that after cross-listing, there is an improvement in the price information for the developed markets only it has a negative impact on emerging market firms.

Second, KSE market is still considered as a small stock market having weak financial and regulatory structure as compared to the developed stock markets of the world. Aymen and Boughrara (2009) show that often, countries do not take benefits

from liberalization because of weak financial and regulatory structure and volatile markets. Premature stock market liberalization in the presence of weak regulatory system causes misallocation of resources. Samy et al. (2008) say that first of all financial reforms should be introduced at domestic level before liberalizing the market. So in order to take benefits from liberalization one must keep in view the regulatory and supervisory system of the market which is going to be liberalized.

Third, stock market liberalization is not cyclical in nature in case of KSE. There are a lot of variations in foreign outflows in the market. Stiglitz (2004) analyses that financial liberalization is pro cyclical in nature which causes consumption and output volatility to increase, particularly in case of emerging markets in the presence of market imperfections. Stock market liberalization should not be pre mature and inconsistent in nature. International monetary fund (IMF 2001) notes that market liberalization is desirable for market if and only if the liberalization is prudent and gradual.

Finally, KSE is not fully liberalized market. It is partially liberalized or segmented market. Edison and Warnock, (2003) prove that partial liberalization can be dangerous because the cost of capital and volatility tend to increase as a result of partial liberalization. However a huge decline in the cost of capital and increase in net capital inflows are recorded in case of full liberalization.

Idiosyncratic volatility is considered as the main source of risk followed by industry and market volatility in case of non-liberalized firms in our study. However, industry volatility is considered as the main source of risk followed by idiosyncratic and market volatility in case of liberalized firms. Market volatility is the least source of risk in case of both liberalized and non-liberalized firms.

Our results also show that the impact of variable size on aggregated volatility is negative. Large size firms are less volatile as compared to small size firms. Our results are in line with Bali et al. (2008) and Campbell et al. (2005). Bali et al. (2008) and Campbell et al. (2005) show that the upward trend in volatility is stronger for low priced, small size and younger firms. They show that the larger firms are less volatile.

Further, the impact of age and profitability on aggregated volatility is negative. Aggregated volatility for old firms is less than the new firms. More profitable firms are less volatile as compared to less profitable firms. These results are in line with Bekaert et al. (2005), Wei and Zhang (2006), Brown and Kapadia (2007) and Bali et al. (2008). The impact of turnover ratio on aggregated volatility is noted to be insignificant.

Despite of this positive relation of aggregated volatility and stock market liberalization, the later may be desired for several reasons. For example, there might be many factors other than stock market liberalization causing volatility to increase such as small and emerging stock markets, pre mature inconsistent or partial liberalization, inefficient corporate governance, weak financial structure and lack of regulatory reforms etc. Stock market liberalization may show different results in the presence of efficient corporate governance, strong financial structure, regulatory reforms and gradual stock market liberalization.

Our study may be helpful for the Government in order to design policies. For example, in order to get benefits from stock market liberalization, the Government may introduce in advance the financial and regulatory reforms. Liberalization

without reforms may not be beneficial because it causes volatility to increase (Samy et al; 2008).

Moreover, this study has some implications for investors as well. A risk averse person may invest in non-liberalized firms because these firms are less volatile, whereas the risk lovers may invest in liberalized firms because they can afford more risk in order to get higher return.

This relation is important for financial managers because cost of capital of a firm will increase as a result of increased volatility. On the other hand, with the reduction in cost of capital, net present value (NPV) of some projects becomes positive, which otherwise have a negative NPV. Our study is helpful for portfolio managers too, because they have to rebalance their portfolios according to the risk preferences of investors which change as a result of change in liberalization.

On the basis of our findings we recommend the similar work in case of Lahore Stock Exchange (LSE) or Islamabad Stock Exchange (ISE).Further, future research may use the data of all the listed firms rather than focusing on KSE-100 firms only. There is also a room for work on the reforms introduced by government in order to take benefits from stock market liberalization.

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Appendix

Table A-1: The summary of some famous studies regarding aggregated volatility and financial liberalization

This Table shows the summary of some famous studies related to aggregated volatility and financial liberalization.

Author	Data period	Estimation Technique	Result
Henry (2000)	1977-1994 for 11 emerging countries	Fixed and random effect model	Liberalization causes boom in investment.
Hargis (2002)	1978-1994 for 8 emerging countries.	Bi-variate GARCH model	Little impact of liberalization on volatility.
Umutlu et. Al; (2010)	1991-2005 for 25 emerging economies	Fixed and random effect model	Volatility decreases after liberalization.
Wang (2007)	Jan 1996-May 1999 for Indonesia and Thailand	ARCH model	Volatility decreases after liberalization.
Kwan and Reyes (1997)	1988-1994 for Taiwan	GARCH model	Volatility decreases after liberalization.
G.Mougani (2012)	1976-2009 for emerging African countries.	GMM model	Liberalization causes economic instability.
Samy et al; (2008)	1979-2005 for 11 MENA countries.	GARCH	Mixed results regarding financial liberalization.
De Santis, G., Imrohoroglu, S., 1997	Dec 1988-May 1994 17 emerging countries including Pakistan	AR (1), GARCH (1,1)	No effect of liberalization on market volatility.
Domowitz, I., Glen, J., Madhavan, A., 1998	Mexico market	GARCH Model	Effect may be positive or negative depending on accuracy of information flow
Fernandes, N., Ferreira, M., 2008.	1980-2003 Firm level data of 40 countries.	Country fixed and random effects models	Positive effects only for developed countries.

Table A-2: List of non-liberalized firms

This table shows the list of non-liberalized firms in our study.

Non-liberalized Firms	Aggregated Volatility	Market Volatility	Industry Volatility	Idiosyncratic Volatility	Size	Turnover Ratio
Abbott Lab.	0.06863	0.02690	0.03534	0.00554	3.54243	0.00152
Dawood Hercules Ltd.	0.08579	0.02690	0.03534	0.02355	3.94876	0.00292
Engro Corp.	0.09236	0.02690	0.03534	0.03012	4.49921	0.00578
Atlas Honda Ltd.	0.14152	0.03407	0.08271	0.02474	3.71138	0.00084
Pakistan Cables Ltd.	0.10249	0.02849	0.05391	0.00224	0.06068	0.00023
Security Papers Ltd.	0.09016	0.03590	0.03768	0.01785	3.01938	0.00092
Attock Refinery Ltd.	0.09262	0.05848	0.03307	0.00107	4.37844	0.00133
K.E.S.C Ltd.	0.1436	0.0585	0.0331	0.1246	5.0216	0.09833
Kohinoor Energy Ltd.	0.09177	0.05848	0.03307	0.00022	3.88673	0.00523
National Refinery Ltd.	0.09265	0.05848	0.03307	0.00110	4.44429	0.00259
Sui Southern Gas Ltd.	0.10678	0.05848	0.03307	0.01523	4.74573	0.02158
Mari Petroleum &Gas	0.09216	0.05848	0.03307	0.00061	3.96360	0.53365
Murree Brewery Co.	0.12447	0.02753	0.08516	0.01178	3.29366	0.00032
National Foods Ltd.	0.14058	0.02753	0.08516	0.02789	3.01415	0.00048
P.T.C.L.A	0.2643	0.02893	0.06797	0.18019	5.19805	0.04134
Bata Pakistan Ltd.	0.09693	0.02893	0.06797	0.00003	3.34481	0.00025

Ghani Glass Ltd.	0.09791	0.02893	0.06797	0.00101	3.35855	0.00158
Shifa International Hospital	0.09815	0.02893	0.06797	0.00125	3.25718	0.76083
Bannu Woolen	0.09692	0.02893	0.06797	0.00002	2.86236	0.00022
Inter. Industries Ltd.	0.148	0.02849	0.05041	0.06909	5.37911	0.67925
Mean	0.13895	0.03791	0.05197	0.08295	3.74509	0.10796
Median	0.09742	0.02893	0.04405	0.00866	3.79906	0.00208
Standard Deviation	0.12614	0.01399	0.02001	0.27669	1.14976	0.24103
Maximum	0.64146	0.05848	0.08516	1.24556	5.37911	0.76083
Minimum	0.06863	0.02690	0.03307	0.00002	0.06068	0.00022

Table A-3: Descriptive statistics of liberalized firms

The detailed descriptive statistics of liberalized firms are given in this table.

Liberalized Firms	Aggregated Volatility	Financial Liberalization	Market Volatility	Industry Volatility	Idiosyncratic Volatility	Size	Turnover Ratio
Colgate Palmolive Ltd.	0.06610	0.29230	0.02690	0.03534	0.00386	3.33957	0.00086
GlaxoSmithKline Ltd.	0.07748	0.00138	0.02690	0.03534	0.01524	3.85160	0.00543
ICI Pakistan Ltd.	0.23509	0.01599	0.02690	0.03534	0.19739	4.25606	0.01301
Indus Motor Ltd.	0.15131	0.76433	0.03407	0.08271	0.03453	4.15110	0.00332
Pak Suzuki	0.11325	0.06390	0.00243	0.08271	0.02811	4.13779	0.00262

Motor Ltd.							
Millat Tractors Ltd.	0.10102	0.01365	0.02849	0.05391	0.01862	3.71424	0.00079
Siemens (Pak.)	0.08769	0.18257	0.02849	0.05391	0.00529	3.99871	0.00033
Century Paper	0.28584	0.65201	0.00256	0.03768	0.24559	3.71755	0.00203
Packages Ltd.	0.05230	0.37409	0.00256	0.03768	0.01206	4.19347	0.00264
Cherat Cement	0.57826	0.24766	0.06063	0.51126	0.00637	3.48669	0.00291
D.G. Khan Cement	1.51353	0.07467	0.06063	0.51126	0.94164	4.37494	0.01078
Fauji Cement	0.63284	0.00881	0.06063	0.51126	0.06095	3.91647	0.02539
Kohat Cement Ltd.	0.73769	0.00013	0.06063	0.51126	0.01277	3.50725	0.00288
Lucky Cement Ltd.	0.55512	0.25483	0.06063	0.51126	0.03953	4.20945	0.01160
Pioneer Cement Ltd.	0.54772	0.00153	0.06063	0.51126	0.03213	3.88986	0.00585
Shell Pakistan Ltd.	0.03758	0.62347	0.00418	0.03307	0.00033	4.36119	0.00231
S.N.G.P.L	0.05590	0.00243	0.00418	0.03307	0.00851	5.0153	0.02170
Nestle Pakistan Ltd.	0.09298	0.56144	0.00197	0.08516	0.00585	4.03740	0.00189
DW Sugar Mills Ltd.	0.16844	0.00094	0.00197	0.08516	0.08131	3.66997	0.00146
Faysal Bank	0.1635	0.17268	0.07857	0.09982	0.03278	5.18356	0.02290
EFU General	0.17999	0.05883	0.07857	0.09982	0.00160	4.07660	0.00258

Bank Al-Habib	0.1735	0.02293	0.07857	0.09982	0.05374	5.09977	0.08344
Sonari Bank	0.1679	0.06019	0.07857	0.09982	0.05043	5.0472	0.02103
Mean	0.30184	0.19351	0.03781	0.18078	0.08211	4.12605	0.01077
Median	0.17999	0.06390	0.02849	0.08516	0.02811	4.07660	0.00291
Standard Deviation	0.33784	0.24164	0.02930	0.20218	0.19695	0.49810	0.01774
Maximum	1.51353	0.76433	0.07857	0.51126	0.94164	5.18356	0.08344
Minimum	0.03758	0.00013	0.00197	0.03307	0.00033	3.33957	0.00033

Table A-4: Descriptive statistics of large size firms

The detailed descriptive statistics of large size firms are given in this table.

Firm Name	Aggregated Volatility	Market Vol.	Industry Volatility	Idiosyncratic Volatility	Size
Faysal Bank	0.1635	0.0786	0.0998	0.0328	5.1836
Bank Al-Habib	0.1735	0.0786	0.0998	0.0537	5.0998
K.E.S.C Ltd.	0.1436	0.0585	0.0331	0.1246	5.0216
Sonari Bank	0.1679	0.0786	0.0998	0.0504	5.0471
S.N.G.P.L	0.0559	0.0042	0.0331	0.0085	5.0115
P.T.C.L.A	0.2643	0.0289	0.0680	0.1802	5.1981
Inter. Industries Ltd	0.1480	0.0285	0.0504	0.0691	5.3791
Mean	0.1595	0.0508	0.0691	0.0742	5.1344
Median	0.1635	0.0585	0.0680	0.0537	5.0998
Standard Deviation	0.0565	0.0281	0.0287	0.0545	0.1213
Maximum	0.2643	0.0786	0.0998	0.1802	5.3791
Minimum	0.0559	0.0042	0.0331	0.0085	5.0115

Table A-5: Descriptive statistics of small size firms

The detailed descriptive statistics of small size firms are given in this table.

Small Size Firms	Aggregated Volatility	Market Volatility	Industry Volatility	Idiosyncratic Volatility	Size
Colgate Palmolive Ltd.	0.06610	0.02690	0.03534	0.00386	3.33957
GlaxoSmithKline Ltd.	0.07748	0.02690	0.03534	0.01524	3.85160
Millat Tractors Ltd.	0.10102	0.02849	0.05391	0.01862	3.71424
Siemens (Pakistan) Co. Ltd.	0.08769	0.02849	0.05391	0.00529	3.99871
Century Paper	0.28584	0.00256	0.03768	0.24559	3.71755
Cherat Cement	0.57826	0.06063	0.51126	0.00637	3.48669
Fauji Cement	0.63284	0.06063	0.51126	0.06095	3.91647
KohatCement Ltd.	0.73769	0.06063	0.51126	0.01277	3.50725
Pioneer Cement	0.54772	0.06063	0.51126	0.03213	3.88986
JDW Sugar Mill	0.16844	0.00197	0.08516	0.08131	3.66997
Abbott Lab.	0.06863	0.02690	0.03534	0.00554	3.54243
Dawood Hercules Ltd.	0.08579	0.02690	0.03534	0.02355	3.94876
Atlas Honda Ltd.	0.14152	0.03407	0.08271	0.02474	3.71138
Pakistan Cables Ltd.	0.10249	0.02849	0.05391	0.00224	0.06068
Security Papers Ltd.	0.09016	0.03590	0.03768	0.01785	3.01938
Kohinoor Energy Ltd.	0.09177	0.05848	0.03307	0.00022	3.88673

Mari Petroleum and Gas	0.09216	0.05848	0.03307	0.00061	3.96360
Murree Brewery Co. Ltd.	0.12447	0.02753	0.08516	0.01178	3.29366
National Foods Ltd.	0.14058	0.02753	0.08516	0.02789	3.01415
Bata Pakistan	0.09693	0.02893	0.06797	0.00003	3.34481
Ghani Glass Ltd.	0.09791	0.02893	0.06797	0.00101	3.35855
Shifa International Hospital	0.09815	0.02893	0.06797	0.00125	3.25718
BannuWoolen	0.09692	0.02893	0.06797	0.00002	2.86236
ICI Pakistan Ltd.	0.2351	0.0269	0.0353	0.1974	4.2561
Indus Motor Ltd.	0.1513	0.0341	0.0827	0.0345	4.1511
Pak Suzuki Motor Ltd.	0.1133	0.0024	0.0827	0.0281	4.1378
Packages Ltd.	0.0523	0.0026	0.0377	0.0121	4.1935
D.G. Khan Cement	1.5135	0.0606	0.5113	0.9416	4.3749
Lucky Cement Ltd.	0.5551	0.0606	0.5113	0.0395	4.2095
Shell Pakistan Ltd.	0.0376	0.0042	0.0331	0.0003	4.3612
Nestle Pakistan Ltd.	0.0930	0.0020	0.0852	0.0059	4.0374
EFU General	0.1800	0.0786	0.0998	0.0016	4.0766
Engro Corp.	0.0924	0.0269	0.0353	0.0301	4.4992
Attock Refinery Ltd.	0.0926	0.0585	0.0331	0.0011	4.3784
National Refinery Ltd.	0.0927	0.0585	0.0331	0.0011	4.4443
Sui Southern Gas Ltd.	0.1068	0.0585	0.0331	0.0152	4.7457
Mean	0.2202	0.0353	0.1309	0.0530	3.7284

Median	0.0996	0.0289	0.0609	0.0124	3.8883
Standard Deviation	0.2831	0.0209	0.1713	0.1585	0.7666
Maximum	1.5135	0.0786	0.5113	0.9416	4.7457
Minimum	0.0376	0.0020	0.0331	0.0000	0.0607

Table A-6: Descriptive statistics of old firm

The detailed descriptive statistics of old firm are given in the table A-6.

Old Firms	Aggregated Volatility	Market Volatility	Industry Volatility	Idiosyncratic Volatility
Colgate	0.06610	0.02690	0.03534	0.00386
ICI	0.23509	0.02690	0.03534	0.19739
Millat Tractors	0.10102	0.02849	0.05391	0.01862
Siemmens	0.08769	0.02849	0.05391	0.00529
Packages Ltd.	0.05230	0.00256	0.03768	0.01206
DGK Cement	1.51353	0.06063	0.51126	0.94164
Shell	0.03758	0.00418	0.03307	0.00033
SNGPL	0.05590	0.00418	0.03307	0.00851
Bank AL-Habib	0.1736	0.07857	0.09982	0.05374
EFU General	0.17999	0.07857	0.09982	0.00160
Abbott Lab.	0.06863	0.02690	0.03534	0.00554
Dawood Herc.	0.08579	0.02690	0.03534	0.02355
Engro Corp.	0.09236	0.02690	0.03534	0.03012
Pak. Cables	0.10249	0.02849	0.05391	0.00224
Intl. Industries	0.148	0.02849	0.05041	0.06909
Security Paper	0.09016	0.03590	0.03768	0.01785
Attock Refinary	0.09262	0.05848	0.03307	0.00107
KESC	0.14360	0.05848	0.03307	0.1246
National Ref.	0.09265	0.05848	0.03307	0.00110

Mari Gas	0.09216	0.05848	0.03307	0.00061
Murree Brewery	0.12447	0.02753	0.08516	0.01178
National Foods	0.14058	0.02753	0.08516	0.02789
PTCLA	0.2643	0.02893	0.06797	0.18019
Bata	0.09693	0.02893	0.06797	0.00003
Ghani Glass	0.09791	0.02893	0.06797	0.00101
Bannu Woolen	0.09692	0.02893	0.06797	0.00002
Mean	0.18854	0.03530	0.06984	0.11003

Table A-7: Descriptive statistics of new firms

The detailed descriptive statistics of new firms are given in the table A-7.

New Firms	Aggregated Volatility	Market Volatility	Industry Volatility	Idiosyncratic Volatility
Atlas Honda Ltd.	0.14152	0.03407	0.08271	0.02474
Kohinoor Energy	0.09177	0.05848	0.03307	0.00022
SSGPL	0.10678	0.05848	0.03307	0.01523
Shifa Intr.	0.09815	0.02893	0.06797	0.00125
GSK	0.07748	0.02690	0.03534	0.01524
Indus Motors	0.15131	0.03407	0.08271	0.03453

Pak Suzuki	0.11325	0.00243	0.08271	0.02811
Century Paper	0.28584	0.00256	0.03768	0.24559
Cherat Cement	0.57826	0.06063	0.51126	0.00637
Fauji Cement	0.63284	0.06063	0.51126	0.06095
Kohat Cement	0.73769	0.06063	0.51126	0.01277
Lucky Cement	0.55512	0.06063	0.51126	0.03953
Pioneer Cement	0.54772	0.06063	0.51126	0.03213
Nestle	0.09298	0.00197	0.08516	0.00585
JDW Sugar	0.16844	0.00197	0.08516	0.08131
Faysal Bank	0.1635	0.07857	0.09982	0.03278
Sonari Bank	0.1679	0.07857	0.09982	0.05043
Mean	0.28348	0.04177	0.19891	0.04041

Table A-8: Correlation matrix of different variables

The correlation matrix of different variables of our study is shown in the Table A-8.

	Aggregated Volatility	Financial Liberalization	Size	Turnover
Aggregated Volatility	**1**	**0.1934**	**0.09896**	**-0.1415**
Financial Liberalization	**0.1934**	**1**	**0.8383**	**0.473**
Size	**0.09896**	**0.8383**	**1**	**0.1346**
Turnover	**-0.1415**	**0.473**	**0.1346**	**1**