IMPACT OF FUTURES TRADING ON SPOT PRICE VOLATILITY: EVIDENCE FROM PAKISTAN

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Submitted in partial fulfillment of the requirements for the
MS degree with the specialization in finance
at the faculty of management sciences,
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Oct, 2010

FORWARDING SHEET

The thesis entitled "IMPACT OF FUTURES TRADING ON SPOT PRICE VOLATILITY: EVIDENCE FROM PAKISTAN" submitted by Mr. Habib Ahmad in partial fulfillment of M.S degree in Management Sciences with specialization in Finance, has been 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 & regulations.

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Title of Thesis: "IMPACT OF FUTURES TRADING ON SPOT PRICE VOLATILITY: EVIDENCE FROM PAKISTAN."

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Accepted by the Faculty of Management Sciences International Islamic University Islamabad, in partial fulfillment of the requirements for the Master of Science/Philosophy Degree in Management Sciences with specialization in Finance.

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Date: 1 - 10 - **2010**

IN THE NAME OF
ALLAH, THE MOST MERCIFUL AND BENEFICENT

Dedication

"To my father Mahmood Ahmad, my mother and to my teachers, for their unconditional love, prayers, and support to make my dreams come true."

ABSTRACT

The purpose of this study is to investigate an impact of futures on spot price volatility. Those firms that are trading futures on Karachi stock exchange were analyzed from July, 2001 to January, 2010. Three time series i.e. Futures Index, Spot Index and KSE-100 Index were used in the process. To make futures and spot indices comparable with KSE-100 index, indices were calculated by using market value weighted index method. GARCH model is used to assess volatility in Spot, KSE-100 and futures returns. GARCH analysis confirmed volatility clustering. It was appraised that the existed soaring volatility in the previous period will continue to be high in the current period. Volatility shocks were also found to be quite persistent. The results of Granger Causality direct us to the fact that KSE-100 market assist in the forecast of both spot and futures markets but on the contrary spot and futures were not found to forecast each other and KSE-100 market. Empirical evidence showed that KSE-100, spot and futures markets are highly volatile and every market contributes to increase the volatility of other market. The study evaluated that introduction of futures market has increased the volatility of underlying spot market. No long-term relationship was found among the variables when Johansen methodology was applied to the three time series. These findings will facilitate the national and international investors to prudently makeup their strategies in investing in capital market of Pakistan.

Keywords: Futures Index, Volatility, Lead lag relationship

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DECLARATION

I hereby declare that this thesis, neither as a whole nor as part thereof, has been copied out from any source. It is further declared that I have prepared this thesis entirely on the basis of my personal effort made under the sincere guidenance of my supervisor.

No portion of the work, presented in this thesis, has been submitted in support of any application for any degree or qualification of this or any other university or institute of learning.

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CHAPTER 1
INTRODUCTION

The perception that futures market can lead to overkill volatility in spot market is common. As a result, the impact of trading futures on the volatility of spot market is widely debated and the role of futures trading has been the focus of ample recent attention. Increased regulation of futures trading has been put into practice, regardless of the lack of reliable statistical evidence that futures trading is associated with increased volatility. The sizeable blame for 2005 and 2008 market crash in Pakistan is also put on stock Index futures, Index arbitrage and program trading. However we cannot disregard the benefits of futures trading as it plays an important role in price discovery, portfolio diversification and hedging.

Futures can guide firms to selectively shift risks and it can be done at low cost and on supple terms using futures. It discharges the superfluous burden on managers and enables them to concentrate on running their core business. Banks in Pakistan may have better information about credit risk of their borrowers than the direction of futures interest rates. So they can selectively hedge their interest rate risk by using interest rate swaps and futures. Various studies demonstrate that the impact of futures trading on the volatility of spot market differs depending on model specification, time period and country inspected. Taking into consideration the above factors there is a need to study the impact of futures on Pakistani market.

1.1 Problem Statement

The study aims to find the following research questions:

- Does volatility in spot price increases with introduction of futures trading in stock market?
- Does the relationship between spot and futures stable?

- Whether spot lead futures or futures lead spot market?

Stock Index futures are perceived as one of the most successful financial innovations of the 1980s (Edwards, 1988), that is the reason that financial futures markets have far outgrown as compared to commodity futures. Trading in financial futures was first introduced in 1982 by the Kansas City Board of Trade in USA. Most of the developed countries followed US in this regard. Derivative markets in Asia comprise one third of worldwide foreign exchange and over 40% of equity derivatives trading. Korea is leading in Asia as it is hosting the world's largest derivatives exchange whereas India has the world fastest growing exchange (Fratzscher, 2006).

Like other emerging markets in Asia, Pakistan has witnessed a lot of issues in development of its capital markets (Chou, 1997). Futures trading were first introduced on KSE in July 1, 2001. The KSE is the largest and oldest stock exchange in Pakistan, and services a number of markets, including stock index futures, deliverable futures and cash settled futures. In Pakistan, futures contracts mature in thirty days, and the last day for trading in a contract is the last Friday of each month, for those contracts that have reached maturity. It is argued that the introduction of options on Karachi stock exchange will make the Asian capital markets more competitive and it is expected that within 5 years, the volume of trades in derivatives will reach 50% of the total trading volume at KSE.

In futures markets all three market players try to take advantage in their favour. They are hedgers, who try to alleviate their future risks. Speculators in contrast try to make proceeds, arbitragers adopt strategy opposite to hedgers and they try to take benefit of

anomalies among different markets. These three players offset actions of each other leading equilibrium in the market.

Economies that do not have systems for derivative trading are supposed to be deprived of the benefits of beneficial financial instruments and are considered to be at comparative disadvantage. Stulz (2004) while unfolding some benefits of derivatives argued that derivatives allow individuals and businesses to achieve payoffs that they would not be able to achieve in the absence of derivatives. Derivatives can make the underlying markets more efficient. Derivatives facilitate investors to trade on information that otherwise might be costly to trade on. Fratzscher et al., (2006) compared advantages of derivatives such as market efficiency, risk sharing & transfer, low transaction costs, capital intermediation, liquidity enhancement, price discovery, cash market development, provide hedging tools and regulatory savings, with their disadvantages such as more leverage, less transparency, dubious accounting, regulatory arbitrage, hidden systematic risk, counter-party risk, tail-risk future exposure, weak capital requirements and zero-sum transfer tools, and concluded that derivatives trading is increasingly migrating towards some of the world's largest and most innovative areas but at the same time dangers are still lurking. In developing countries investors have to combat certain challenges. Developing economies like Pakistan may not be strong enough to carry on defaults of huge number of major market participants. Protection against systematic risk is therefore the prime challenge for developing countries.

1.2 Significance of the study

Regardless of the vast literature that has scrutinized the impact of futures on spot price volatility, little consensus has emerged. Furthermore hardly any study has been conducted so far to examine the effect of futures trading on level of volatility with respect to Pakistani market. This study will help the policy makers, regulators and financial analysts to forecast the outcomes of introducing options. Estimates of market volatility will help them in this regard as it is considered as a barometer of the susceptibility of financial markets (Batra, 2004). The study will also help portfolio managers to identify the level of risk which they can bear and to hedge that risk by making efficient portfolios. The study will provide researchers with better understandability of Pakistan's futures market. This will generate new ways for researchers to deeply gauge the Pakistani market. It is a common perception that the March 2005 crisis was due to delivery pressure owing to deliverable futures contracts. This study will empirically test this view and will provide grounds for further research.

There is also difference of opinion about crucial crises of 2008, due to which Karachi stock exchange suspended trading for about four months. Some economist thought that these crises were due to global financial crises, other agued that the cause may be on going war on terrorism and political instability. Some researchers also put the blame on stock exchange futures. This study will help to find that whether futures were responsible for crucial stock exchange crises of 2008 or not.

1.3 Organization of the study

The study is planned as follows. Chapter 1 reviews the role of futures with respect to Pakistani market, then problems that Karachi stock Exchange is facing are discussed, problem statement of the study and objects of the study are also part of this chapter. It is also discussed in this part that how the study will help policy makers, regulators and financial analysts in decision making. Chapter 2 examines the relationship of futures with volatility and speculation by means of previous empirical results. Chapter 3 discusses the methodology, sample taken and tools used to undertake the study. Chapter 4 discusses the outcomes of the study and Chapter 5 appraises the conclusion drawn form the results.

CHAPTER 2
LITERATURE REVIEW

2.1 Futures: Good or Bad?

After the international market crash in 1987, it was concluded that the share prices are more volatile (Reyes, 1996). This image of instability is often attributed due to stock-Index futures trading and methods derived from these instruments. Because of the introduction of futures for trading the debate regarding the impact of futures on spot prices arises among the researchers and regulators (Debasish, 2009). Financial market de-regularization along with automation of trading mechanisms in the 1980s has sometime been argued to have directed to brisk fluctuations of interest rates, exchange rates and stock prices (Brooks et al., 2001). High volatility and allied market risk have increased the requirement for hedging instruments planned to guard value by shifting risk from one party to another. One of the most important hedging instruments in a hedging contract is futures because it had reduced business failure rates, made available wider range of products in high risk markets, had facilitated companies to invest in inventive but perilous production technologies and relocation of risks to those who are eager to bear and handle them (Culp, 2009). Nguyen et al., (2009) proposed that although derivatives trim down the volatility and enhanced the certainty of earnings, it also bring in a source of confidential information and insiders can take advantage of that information.

In literature we find both aspects of the picture i.e. some critics argue that futures trading destabilize stock market, which results in increase in volatility (Stein, 1987). Others argue that futures trading smoothens price fluctuations which result in decrease in volatility (Ryoo and Smith, 2004), so futures help to stabilize spot markets in this way. Literature also showed mixed results for the impact of futures on spot price volatility

(Bhat and Srinivasan, 2009). Vougas and Floros (2006) inspected the impact of futures trading on volatility of the underlying spot market for FTSE/ASE-20 and FTSE/ASE Mid 40 indices in Greece. His results for FTSE/ASE-20 proposed that futures trading had led to decrease stock market volatility (negative effect) but the results for the FTSE/ASE Mid 40 index indicated that the introduction of stock Index futures had led to increase volatility (positive effect), while the estimations of the unconditional variances showed lower market volatility after the introduction of stock index futures.

Literature demonstrated that the impact of derivatives trading on the volatility of underlying asset is a controversial issue among the critics and financial market regulators.(Mckenzie et al., 2000). One school of thought believed that futures trading draw speculators attention that is responsible for subverting the spot price (Figlewski, 1981). Others argue that futures trading will decrease spot price volatility and will result in efficient functioning of the market (Powers, 1970; Rafael and Pilar 2002). Third school of thought suggests that the spot market volatility may be attributed due to the frequent and faster information processing that is provided by the futures (Debasish et al., 2009). This fickle (indecisive) effect of futures trading on prices in the underlying spot market has directed many researchers to analyze that whether there is an asymmetrical (irregular) relationship between the two variables or not (Ragunathan and Peker, 1997).

Edwards et al., (1988) termed the advent of futures trading as one of the most important and extraordinary innovation that occurs in the financial markets and further explained that it is the tradition of financial critics that whenever high market volatility occured, the

blame is placed on whatever new is going on at that time. He examined the spot price volatility before and after the introduction of futures and found that futures may induce price volatility in the short run but this volatility did not appear in the long run.

2.2 Futures and Speculation

Usually investors with no or very little cash, invests in derivatives market so most of the trading is based on speculation. Due to their levered position they cannot wait for long time and they had to take quick decisions based on speculation and that is the reason that derivatives market is considered as high risk area (Bandivadekar and Ghosh, 2003).

Since futures markets have a higher degree of leverage than spot markets do, they are more likely to attract uninformed speculative investors and thus destabilize spot markets by increasing volatility. But futures markets increase the overall market depth and in formativeness, are important for price discovery, allow the transfer of risk and may actually reduce spot volatility. Now the questions arises that, Is speculation matters? If yes then when speculation does really matters? And what is the relationship between speculation like futures market trading and volatility? The answer can be found by examining the specific conditions prevailing in the relevant market. Movements in interest rate, exchange rate, commodities and securities prices are generally termed as market volatility. Since futures and spot prices are generally closely related, futures are attractive to speculators. Financial speculation entails the buying, holding, selling, and short-selling of stocks, bonds, commodities, or any valuable financial instrument to profit

from fluctuations in its price as opposed to buying it for use or for dividend or interest income. Speculation is one of four market activities in financial markets, along with hedging, long- or short-term investing, and arbitrage (Robles et al., 2009).

The advent of futures trading depends on speculator's information. In other words, when speculators have perfect information, the introduction of futures market stabilizes prices. But when speculators have a noisy signal, there is a destabilizing effect. In some cases, however, the introduction of a futures contract leads to a more stable spot price (Vougas et al., 2006)

Previous studies of corporate risk management believe that companies use derivatives merely to hedge risk exposures brought about during their normal course of business, which attach value by reducing transaction and contracting costs, taxes, and other market imperfection (Mello and Parsons, 2000). According to Adam and Fernando (2006) firms hedge selectively but they established no proof of economically significant cash flow growth taking place from selective hedging. This surfaces questions on management intentions to speculate in this way. There is substantial support for the view that firms use derivatives to speculate, but the gains from speculation appear to be little. This raises the mystery of why managers entrust time and resources to an activity that does not appear to increase shareholder's value. Researchers also keep the view that probability of financial distress might have an effect on the possibility of corporate speculation. It is found that higher the probability of bankruptcy of the firms, greater will be the speculation by the firms.

For futures markets, one must be aware of the fact that they work on the rule of convergence of futures prices to the spot prices at the time of delivery. In case the futures prices go above or below to anticipated spot prices then clearly traders would have a clear arbitrage opportunity and would take advantage of it either by going short or long. If a hedger tends to short his position and speculator tends to long his position then futures price will fall below the expected future spot price. This is because the speculator would require compensation for the risk he is bearing. Hence he will trade only if there is an expectation that the futures price will rise again. Converse will happen in case hedger tends to long his position and speculator tends to short his position.

2.3 Futures and volatility

It is argued that derivatives financing is not only originated from market volatility but it can also create market volatility (Figlewski et al., 1981). An unexpected change in market volatility in one way or another is always a concern for market regulators, because it can cause systematic risk. Investors are always worried about the present and future value of their wealth. It is perceived that greater volatility lead to greater risk which intimidates investor's wealth. There is a clear evidence of the imperative relationship between financial markets uncertainty and public confidence (Karmakar, 2006). That is the reason; policymakers consider estimates of market volatility as a barometer of the susceptibility of financial markets (Batra et al., 2004). When there is downturn in the stock market then the investors see loosing their wealth so investors lose confidence in the market and start to blame financial markets as the place of the speculators and insiders, not of the rational long-term investor. If this view persists, investors simply

withdraw their wealth from the market (Karmakar et al., 2006). On the other hand Friedman (1953) states that people who have argued that speculation can be subverting hardly ever realize that this is principally equivalent to saying that speculators lose money, since speculation can be destabilizing in general only if speculators sell when the security is low in price and buy when it is high. He also points out that speculators who regularly lose money this way will be driven out of the market by speculators with more successful strategies. In sum, Friedman's position is that only rational speculators will survive in the market, and that rational speculation cannot be destabilizing. Investors in the financial markets are aware of perils and benefits of using derivative instruments like futures. When used within discreet strategies they have the potential to produce significant cost savings for an end-user (Dixon and Bhandari, 1997).When volatility is construed as uncertainty it turns out to be a key input into many investment decisions and portfolio creations. Investors and portfolio managers have certain levels of risk, which they can bear. A good forecast of the volatility of asset prices over the investment holding period is a good starting point for assessing risk (Batra et al., 2004).

Bae et al., (2004) found that introduction of futures trading is linked with larger market efficiency but, at the same time spot price volatility in the underlying spot market increases. He proposed that the increase in spot price volatility and market efficiency because of introduction of futures is due to the existence of volatility spillover to stocks against which futures are not traded. These findings gave us the idea that futures trading brought in both cost and gain to the underlying stock markets.

Summarizing the discussion, we can conclude that existing literature is unable to settle the impact of futures on spot price volatility. However it is observed that majority of studies conducted in developed countries show that futures increased spot price volatility (Stein , 1987). Also a good number of studies conducted in developing countries suggests that either there is positive or no significant impact of futures on spot price volatility (Bandivadekar and Ghosh, 2003 ; Debasish, 2009). As Pakistan is emerging economy so we can develop our hypothesis that:

H1: There is positive impact of futures on spot price volatility.

Researchers have showed a lot of attention in scrutinizing the role of spot and futures in the price discovery process. It has been one of the vital questions in market microstructure to explore how prices are dogged inside the "black box" of a security market and the procedure by which prices come to confiscate new information (Cabrera et al., 2009). In the absence of derivatives the prices of the securities traded in the market would most probably reflect market expectations. Due to comparatively low transaction costs and high liquidity of many derivatives markets, new information regarding assets is primarily reflected in derivatives prices initially (Clup, 2009).

2.4 Lead Lag Relationship

Kuo et al., (2008) observed that futures market leads the spot market so as to incorporate the influx of new information after the liberalization and deregulation strategies have been espoused in Taiwan futures market. His findings support deregulation of futures market and found that deregulation of futures market has augmented the rate of

information flow and enhanced the quality and transmissions of futures market in Taiwan. Researchers also suggest that policymakers do not need to force a larger regulation to the derivative markets since these restrictions could limit the opportunity of investment and reduce the competence of the markets (Kasman and Kasman, 2008).

Several papers have inspected the connection between futures and spot prices for a variety of commodities as well as financial assets (Khan, 2006 ; Asche and Guttormen, 2002). Empirical evidence to date is mix, although majority of the study point out that futures markets have a price discovery role. So we develop our second hypothesis that:

H2: Futures will lead spot price.

2.5 Does futures and spot moving together?

It is argued by some researchers that futures may tempt price volatility in the short run but this volatility does not appear in the long run (Edward et al., 1988). To test the claim we develop our third hypothesis.

H3: There is stable relationship between futures and spot prices.

CHAPTER 3
METHODOLOGY

3.1 Sample

Karachi stock exchange (KSE) is the main and the most important stock exchange of Pakistan. It is the national stock exchange of Pakistan and at present, about 660 companies are listed on KSE. Other two stock exchanges are Lahore stock exchange (LSE) and Islamabad stock exchange (ISE). The history of KSE starts with the creation of Pakistan in 1947. Initially it started trading with 50 shares Index but remained dormant till 1991. After the liberalization measures, KSE became more vigorous. KSE-100 Index was established in 1991 and is a market value weighted Index comprising of 100 companies. Non random sampling is used in the selection of companies for KSE-100 Index. Thirty four companies are selected from 34 sectors, 1 from each sector and 66 remaining companies are selected on the basis of market capitalization.

This study utilizes the data of all those companies trading futures on Karachi stock exchange. The study makes use of monthly closing spot and futures prices and returns. The data starting from July, 2001 to January, 2010 is used to empirically test the impact of futures on Karachi stock exchange.

3.2 Data

Data of companies trading futures was obtained from official website of Karachi stock exchange. Market capitalization of companies was derived from Business recorder and KSE-100 Index was pulled out from (yahoo finance). We made Index of futures and spot prices for those companies that are trading futures (Table VIIA to Table VIIJ). As KSE-100 index is a Value weighted index so for computation of futures Index and spot Index, Value weighted index was employed. This will make the two time series comparable. Only those futures trading companies that had been trading futures for at least two

incessant months were included in the index. Minimum number of companies included in the index at any instance was seven and maximum number of companies at a particular point of time was fourty five.

3.3 Descriptive Statistics

To judge the distributional properties of the spot Index, futures Index and KSE-100 Index, an assortment of descriptive statistics is reported in Table II, that consists of mean, median, maximum, minimum, standard deviation, kurtosis, skewness and jaurque – Bera statistics.

3.4 Testing Stationarity

3.4.1 Graphical Analysis

Before going for formal tests of stationarity, line graphs are plotted for time series of futures, spot and KSE-100 Index and returns. These plots give us preliminary evidence about the nature of time series. Time-series data usually has a trend, which has to be removed before undertaking any estimation (Hendry and Juselius, 1999) and we removed the trend by taking first difference of each series (returns).

3.4.2 ACF (Autocorrelation function) and correlogram:

ACF at lag k, denoted by ρ_k is defined as:

$$\rho_k = \frac{\text{covariance at lag k}}{\text{variance}}$$

ρ_k being correlation lies between -1 and +1. The graph of ρ_k against k, known as correlogram is shown in figure IIIA, IIIB and IIIC for all the three series. With the help

of ACF we will be able to check that either the series is stationary or not. Q statistics is also used to test whether the series is white noise or not.

3.4.3 Unit root tests

As stock prices follow random walk, so we can say that this period's stock price is equal to previous period's stock price plus a random shock. Mathematically it can be expressed as:

$$p_{Ft} = \rho P_{F(t-1)} + \mu_t$$

. Where as p_{Ft} is the price of futures index at time t and $P_{F(t-1)}$ is price of futures index at time t-1. Where μ_t is a white noise term. If the value of ρ becomes 1 that is, in the case of unit root the above equation will become a random walk model without drift, which is a non stationary stochastic process.

Subtracting $P_{F(t-1)}$ from both sides of the equation we get

$$p_{Ft} - P_{F(t-1)} = \rho P_{F(t-1)} - P_{F(t-1)} + \mu_t$$

$$\Delta p_{Ft} = (\rho - 1) P_{F(t-1)} + \mu_t$$

$$\Delta p_{Ft} = \delta P_{F(t-1)} + \mu_t \text{ ---------- (1)}$$

If $\delta \rightarrow 0$ then $\rho \rightarrow 1$ in equation (1) that is we have a unit root. Meaning the time series under consideration is not stationary. If $\delta = 0$ equation (1) will become $\Delta p_{Ft} = \mu_t$. Since μ_t is a white noise error term and it is stationary that is the reason that the first

difference of the futures Index, spot Index and KSE-100 Index is stationary. Augmented Dickey Fuller test and Phillips-Perron unit root tests are applied to check that either the three series i.e. futures returns, spot returns and KSE-100 returns has a unit root or not.

3.5 Estimating the Volatility

For the determination of the impact of futures on spot price volatility, volatility in the spot, KSE-100 and futures returns is inspected using Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model. Many researchers have uncovered the capability of GARCH to effectively measure volatility clustering in assets returns (Engle and Patton, 2001: Abdrew and Higgs, 2004). Bolerslev (1986) extended the ARCH model, set up by Engle (1982), to the GARCH model which permits for more flexible lag structures. The ARCH group of models has later found extensive use in characterizing time-varying financial market volatility. The ARCH regression model is defined as follows:

$$\sigma^2_t = \alpha_o + \sum_{i=1}^{p} \alpha_i \varepsilon^2_{t-i}$$

The GARCH (p,q) model is the extension of ARCH model . By adding one more term to the ARCH specification i.e. $\sum_{i=1}^{q} \beta_i \, \sigma^2_{t-l}$ we get the GARCH model. The GARCH (p,q) model is given by :

$$R_{St} = \gamma R_{Ft} + \varepsilon_t \qquad (1)$$

$$\sigma^2_t = \alpha_o + \sum_{i=1}^{p} \alpha_i \varepsilon^2_{t-i} + \sum_{i=1}^{q} \beta_i \, \sigma^2_{t-l} \qquad (2)$$

Where as σ^2_t is conditional variance. ε^2_{t-i} is an ARCH term and σ^2_{t-i} is a GARCH term

$\alpha_i \geq 0$ and $\beta_i \geq 0$ to guarantee that the conditional variance is always positive.

$i = 1,2,3, \ldots\ldots, q$ $i = 1,2,3, \ldots\ldots, p$ $p \geq 0$, $q \geq 0$,

Under the GARCH (p,q) model the conditional variance depends on the square residuals in the previous p periods and the conditional variance in the previous q periods. The order of p and q used in this paper is (1,1) on the basis of the values of Akaike Information Criteria and Schwarz Criterion. The first term (1,1) in parentheses refers to the ARCH term and the second refers to the GARCH term.

3.6 Lead Lag Relationship

After estimation of GARCH (1,1), clear indication of volatility clustering is found. Now the next step is to find that either that volatility is due to KSE-100 Index, spot Index or futures Index. To find the causal relationship between spot Index, futures Index and KSE-100 Index, Granger Causality was applied. Granger causality test work under the assumption that the information related to the forecasting of the particular variables is contained solely in the time series data on these variables. Granger Causality helps us in finding the lead lag relationship between KSE-100 Index, Spot Index and Futures Index.

3.7 Co-integration Test

Engle and Granger (1987) showed that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination subsists, the non-stationary time series are considered to be cointegrated. The stationary

linear combination is called the cointegrating equation and may be interpreted as a stable relationship among the variables. The rationale of the cointegration test is to conclude whether a group of non-stationary series is cointegrated or not.

As cointegration test is valid only for non stationary data, so prices of futures, KSE-100 and spot are used instead of returns. If the variables are non stationary but are cointegrated then applying regression with first differenced variables may fail to capture the long run information, as the first difference regression outcomes is for short run relationship.

The Johansen procedure was used for testing of cointegration. Although other tests (for example, Engle and Granger, 1987: Johansen 1990: Pesaran et al., 2001) can be used for checking cointegration but Johansen test is much more convenient. Both types of Johansen tests i.e. trace test and eigenvalue test are applied to test the existence of cointegration between spot & futures, kse-100 & futures, kse-100 & spot, and at last kse-100, spot & futures.

CHAPTER 4
RESULTS & ANALYSIS

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Maximum return that a spot market can offer is 29.024 %, for futures market it is 28.689 % and KSE-100 can present a maximum return of 24.111 %. On the other hand, the minimum limit of returns for spot, futures and KSE-100 Index is -0.66741, -0.66259 and -0.4488 respectively. Standard deviation of spot returns is reported to be 0.135789, standard deviation of futures returns to be 0.13849 and for KSE-100 returns, the standard deviation is 0.09356.

The statistics in table I shows that returns are negatively skewed having value of -1.80672 for spot, -1.718802 for futures and -1.26006 for KSE-100. It means that the distribution has a long left tail, although the skewness statistics is small. The negative skewness put in picture the fact that the return distributions of spot, futures and KSE-100 has a higher probability of negative returns. As the kurtosis of the distribution is greater than 3 i.e. 10.81684 for spot, 10.52431 for futures and 8.343709 for KSE-100, so the distribution is peaked (Leptokurtic). It means that the distribution of returns have fat tails compared with normal distribution. That is the reason that Jarque-Bera test leads to the decision of rejecting the null hypothesis of a normal distribution for all the series i.e. Spot, Futures and KSE-100. Similar results were found by other researchers for Pakistani Market. (Khilji, 1993: Khan and Rizwan, 2002).

Correlation between the three variables is reported in table II which indicates that futures returns and spot returns are more correlated with each other as compared correlation of KSE-100 returns with spot and futures returns. It is due to the fact that KSE-100 may include those companies which are not trading futures and the companies included in futures and spot market are same.

Table II: Correlation analysis for Spot Index, Futures Index and KSE-100 Index

	SPOT_INDEX	KSE_INDEX	FUT_INDEX
SPOT_INDEX	1.000000		
KSE_INDEX	0.796746	1.000000	
FUT_INDEX	0.978072	0.802328	1.000000

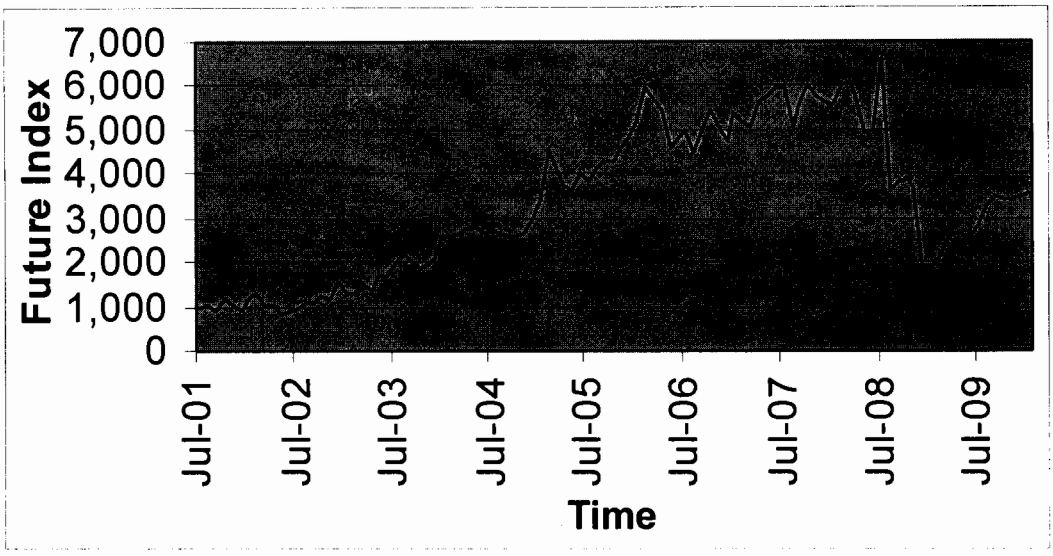
4.2 Line Graphs

The line graphs of prices of all the three series in figure IA, IB and IC show that the mean of the Indices i.e. futures Index, spot Index and KSE-100 Index has been changing. This suggests that the time series is not stationary. To calculate returns, we take first difference of the three series as below.

$$R_{Ft} = Ln\left(\frac{p_{Ft}}{P_{F(t-1)}}\right), \quad R_{St} = Ln\left(\frac{p_{St}}{P_{S(t-1)}}\right), \quad R_{Kt} = Ln\left(\frac{p_{Kt}}{P_{K(t-1)}}\right)$$

Where R_{Ft}, R_{St} and R_{Kt} are the returns of futures, spot and kse 100 Index. Where as p_{Ft}, p_{St}, p_{Kt} are the futures, spot and KSE-100 Index prices at time t and $P_{F(t-1)}$, $P_{S(t-1)}$ and $P_{K(t-1)}$ are futures, spot and KSE-100 index prices at time t-1. The line graphs of the three series after taking the first difference (Returns) are show in Figure IIA, IIB and IIC. Line graphs of returns exhibiting no trend, lead to the conclusion that returns of the three series is stationary.

Figure IA: Line Graph of Futures Index (Prices)



From figure IA, it is clear that futures Index starting from July, 2001, has an increasing trend up to July, 2008 and reaches at the maximum of 6629 points on that date. Then immediately the futures market crashes and reaches 3657 points in one month period i.e. August, 2008. After reaching 3713 points on Sep, 2008, a record decrease is found in January, 2009 i.e. the Index reaches 1858 points. After decrease, the index again starts increasing and reaches 3591 on January, 2010

Figure IB: Line Graph of Spot Index (Prices)

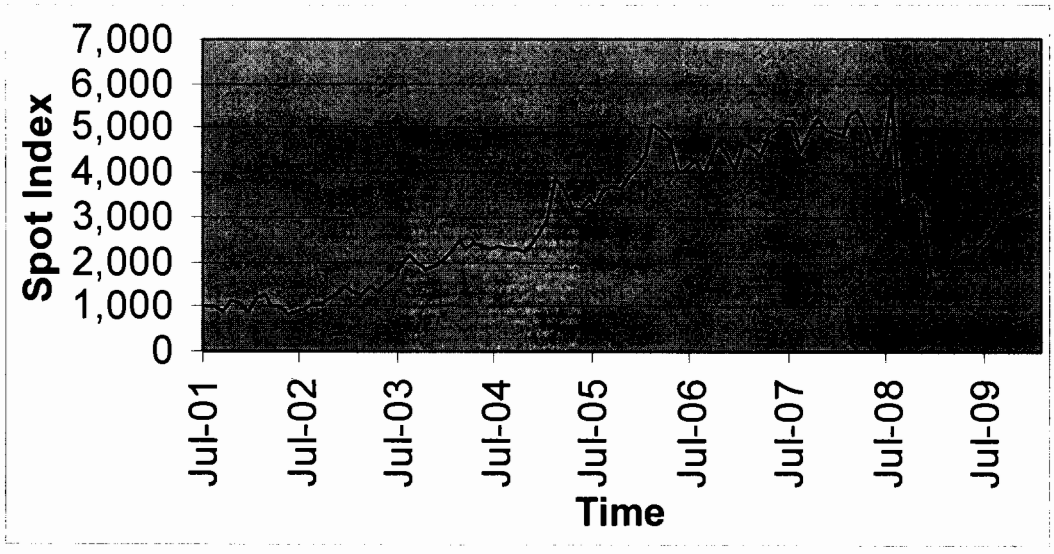
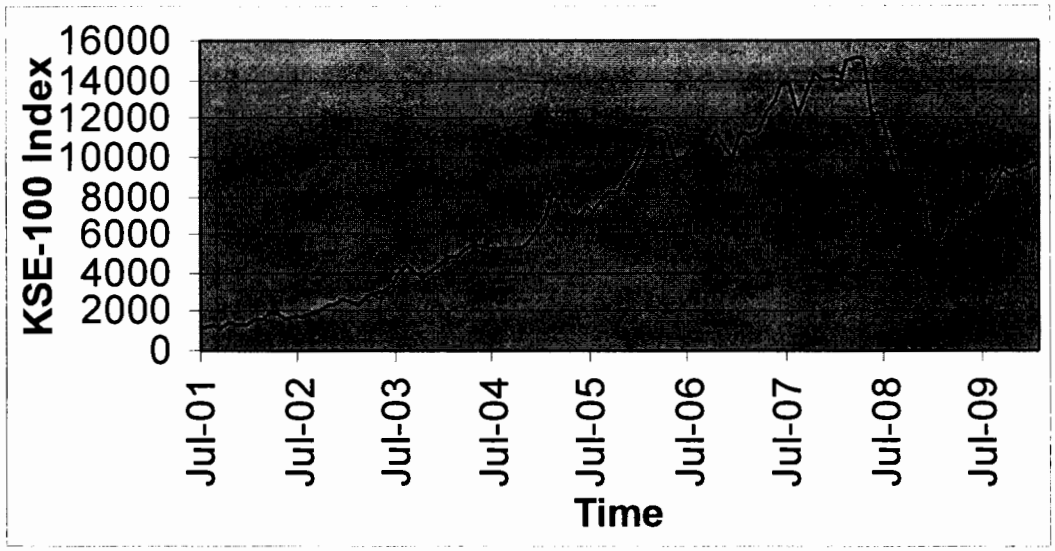


Figure IIA demonstrates line graph of spot prices (for those companies that are trading futures on Karachi Stock Exchange) from July, 2001 to January, 2010. The line pattern of the spot prices is almost similar to that of futures prices. It is obvious from graph that like futures Index, spot Index starting from July, 2001, has an escalating trend up to July, 2008 and attain maximum of 5755 points on that date. Then, without delay, the spot market crashes and reaches 3253 points in one month period i.e. August, 2008. In January 2009, the spot index reaches at the minimum level 1632 points and then again shows an increasing trend and reaches 3183 point in January, 2010

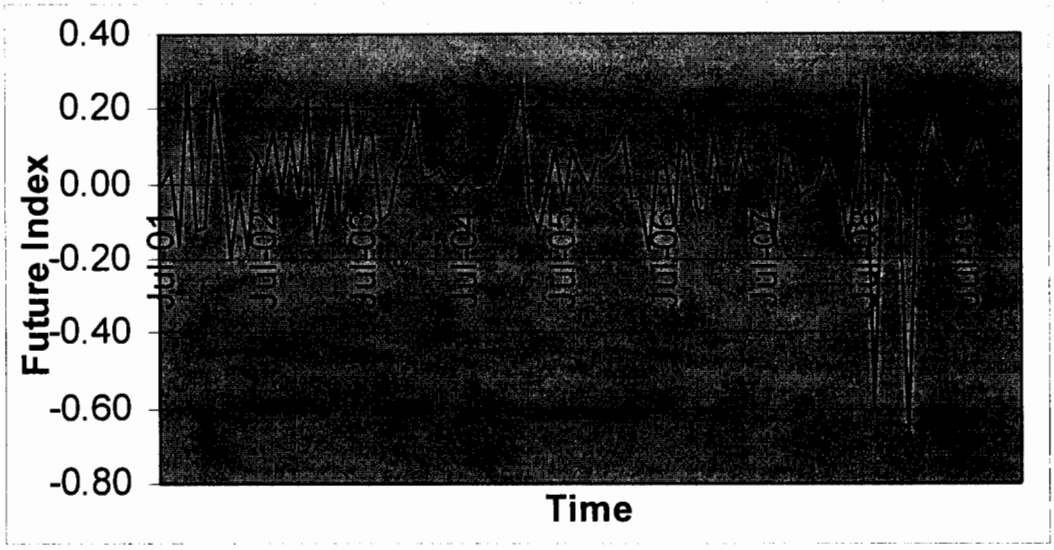
Figure IC: Line Graph of KSE-100 Index (Prices)



The line graph of KSE-100 index has the same pattern as that of spot and futures index but the timings are diverse. In July, 2001, KSE-100 Index closes at 1229 points then like futures and spot Index, KSE-100 Index also increases and reaches at 15125 points in March, 2008. A continuous decrease was found up to September, 2008 and KSE attains 9179 points on that date. In February, 2009, KSE-100 Index touches its lowest ebb by

declining to 5727 points. Subsequently an increasing trend was found in the market and KSE-100 Index gets to 9667 points in January, 2010.

Figure IIA: Line Graph of Futures (Returns)



Returns of futures Index are shown in figure IIA. Figure IIA indicates that returns are volatile to a great extent as the deviation from their mean is gigantic. In addition, it is found that the intensity of downside risk is high, having a value of -0.66259 as compared to 0.28689.

Similar results are shown by spot returns as shown in figure IIB. However, the upper and lower limit of returns are found to be slightly higher i.e. minimum limit of return is -0.66741 and maximum limit of 0.29024 for spot Index.

Figure IIB: Line Graph of Spot (Returns)

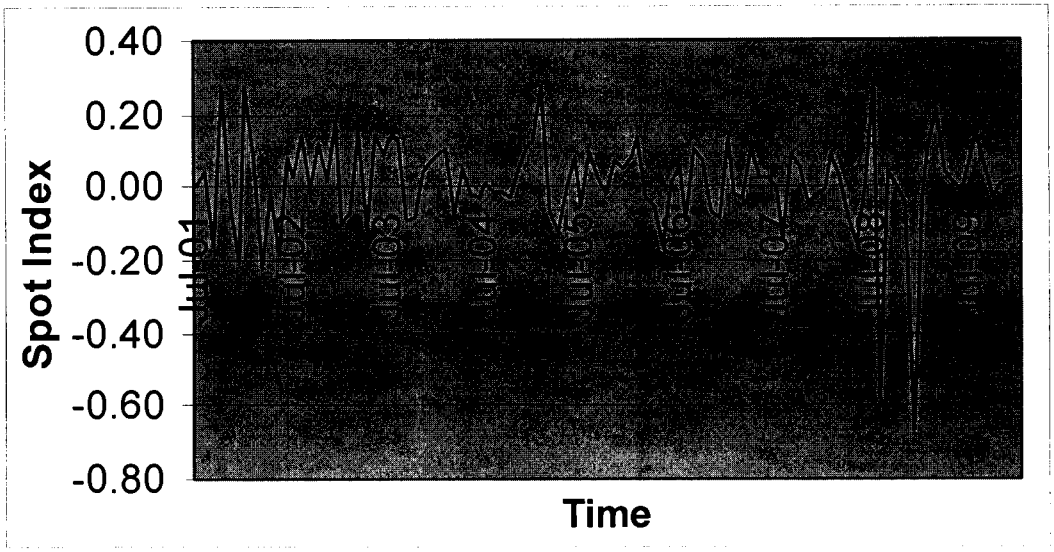
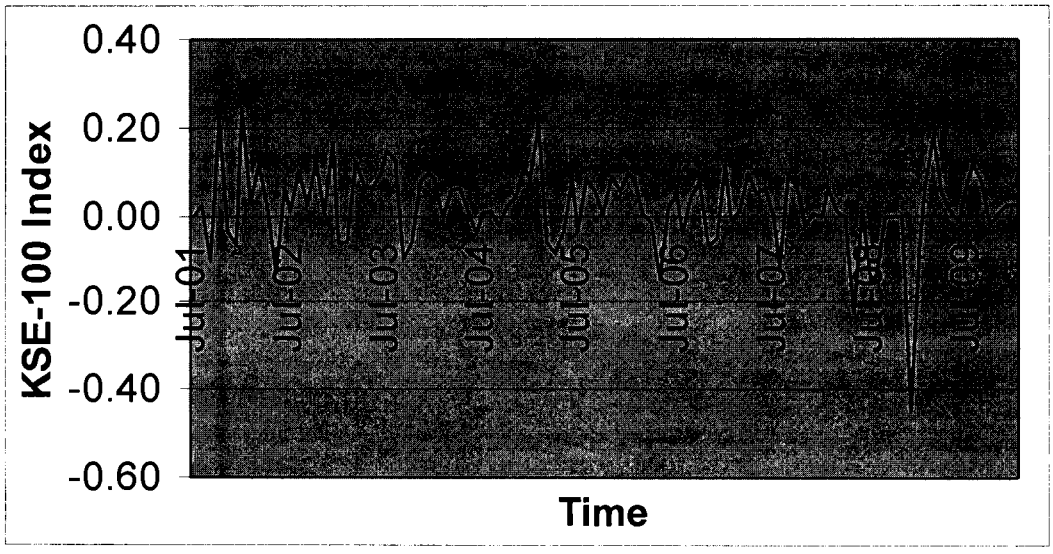


Figure IIC: Line Graph of KSE-100 (Returns)

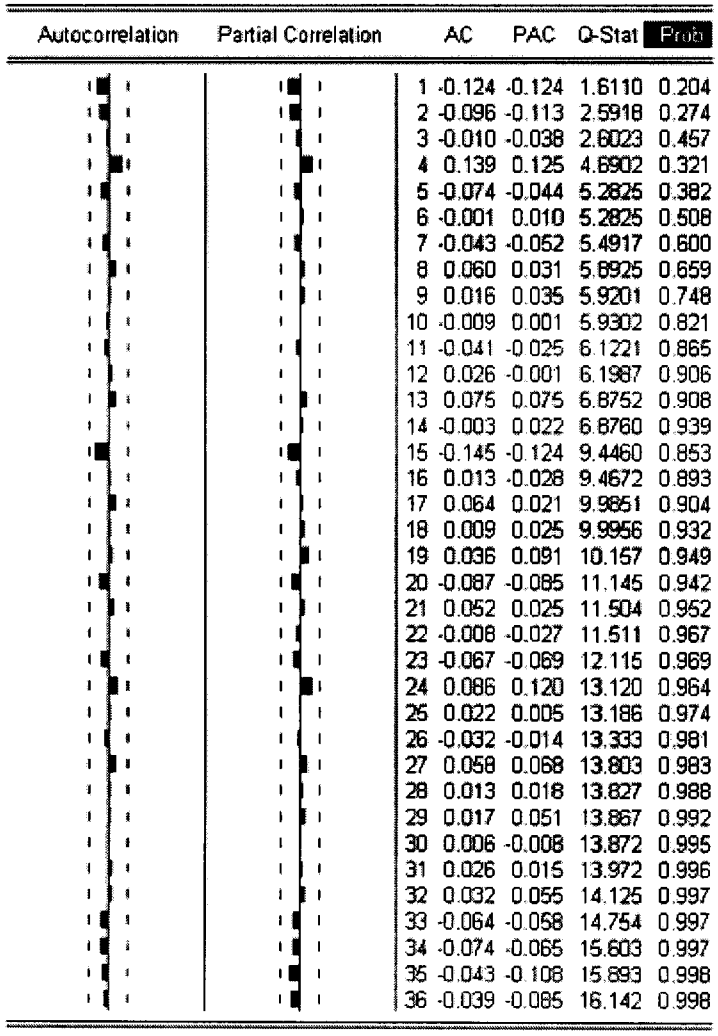


Line graph of returns for KSE-100 index is shown in figure IIC which depicts that KSE can offer a maximum return of 0.24111 and a minimum of -0.4488.

4.3 ACF (Autocorrelation function) and correlogram

Figures IIIA, IIIB and IIIC presents that the autocorrelations at various lags hover around zero. As the correllogram of all the three time series resembles the correlogram of a white noise time series which indicates that the time series is stationary.

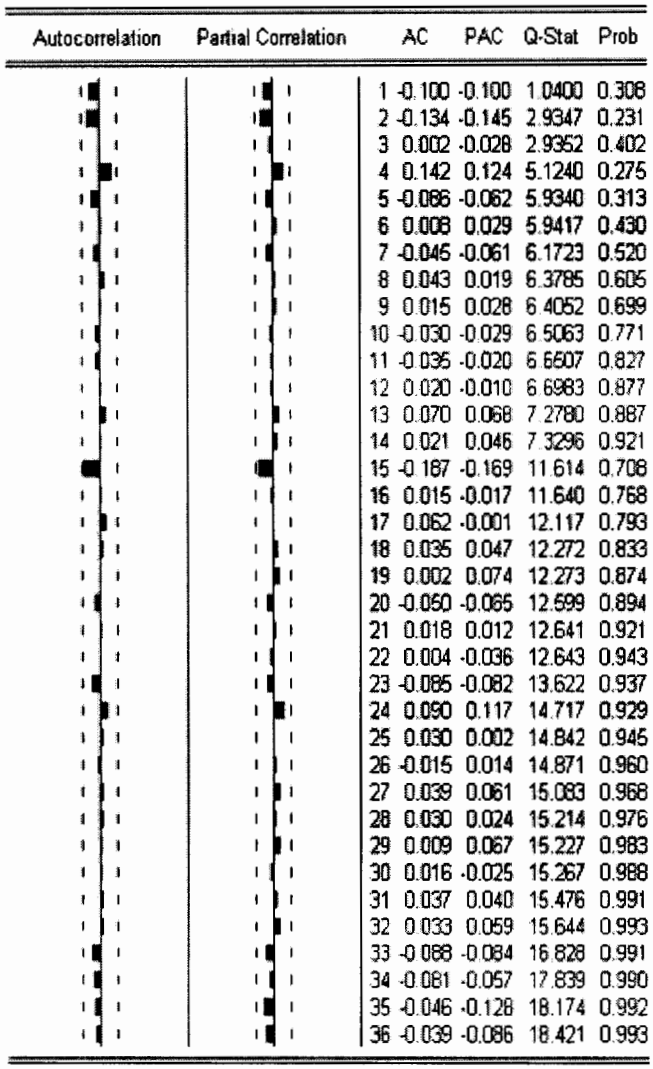
Figure IIIA: Autocorrelation function and correlogram for Futures returns



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.124	-0.124	1.6110	0.204
		2	-0.096	-0.113	2.5918	0.274
		3	-0.010	-0.038	2.6023	0.457
		4	0.139	0.125	4.8902	0.321
		5	-0.074	-0.044	5.2825	0.382
		6	-0.001	0.010	5.2825	0.508
		7	-0.043	-0.052	5.4917	0.600
		8	0.060	0.031	5.8925	0.659
		9	0.016	0.035	5.9201	0.748
		10	-0.009	0.001	5.9302	0.821
		11	-0.041	-0.025	6.1221	0.865
		12	0.026	-0.001	6.1987	0.906
		13	0.075	0.075	6.6752	0.908
		14	-0.003	0.022	6.6760	0.939
		15	-0.145	-0.124	9.4460	0.853
		16	0.013	-0.028	9.4672	0.893
		17	0.064	0.021	9.9851	0.904
		18	0.009	0.025	9.9956	0.932
		19	0.036	0.091	10.157	0.949
		20	-0.087	-0.085	11.145	0.942
		21	0.052	0.025	11.504	0.952
		22	-0.008	-0.027	11.511	0.967
		23	-0.067	-0.069	12.115	0.969
		24	0.086	0.120	13.120	0.964
		25	0.022	0.005	13.186	0.974
		26	-0.032	-0.014	13.333	0.981
		27	0.058	0.068	13.803	0.983
		28	0.013	0.018	13.827	0.988
		29	0.017	0.051	13.867	0.992
		30	0.006	-0.008	13.872	0.995
		31	0.026	0.015	13.972	0.996
		32	0.032	0.055	14.125	0.997
		33	-0.064	-0.058	14.754	0.997
		34	-0.074	-0.065	15.603	0.997
		35	-0.043	-0.108	15.893	0.998
		36	-0.039	-0.085	16.142	0.998

The P-values in the last column of figure IIIA give us the signal of no-autocorrelation for futures returns.

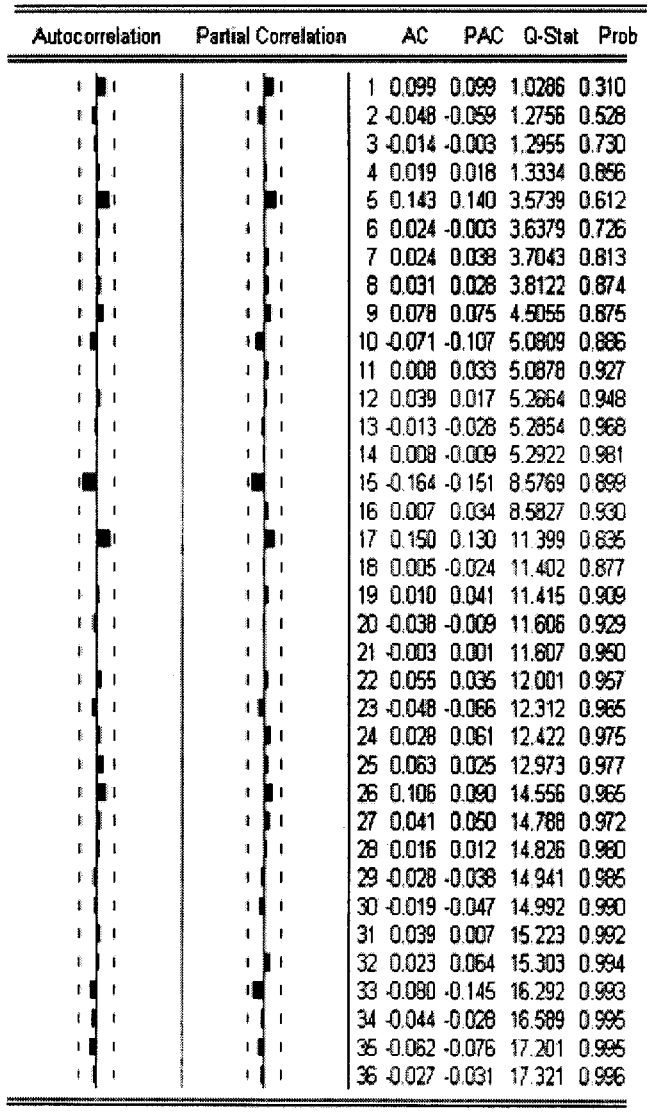
Figure IIIB: Autocorrelation function and correlogram for Spot returns



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.100	-0.100	1.0400	0.308
		2	-0.134	-0.145	2.9347	0.231
		3	0.002	-0.028	2.9352	0.402
		4	0.142	0.124	5.1240	0.275
		5	-0.086	-0.062	5.9340	0.313
		6	0.008	0.029	5.9417	0.430
		7	-0.045	-0.061	6.1723	0.520
		8	0.043	0.019	6.3785	0.605
		9	0.015	0.028	6.4052	0.699
		10	-0.030	-0.029	6.5063	0.771
		11	-0.035	-0.020	6.6607	0.827
		12	0.020	-0.010	6.6983	0.877
		13	0.070	0.068	7.2780	0.887
		14	0.021	0.046	7.3296	0.921
		15	-0.167	-0.169	11.614	0.708
		16	0.015	-0.017	11.640	0.768
		17	0.062	-0.001	12.117	0.793
		18	0.035	0.047	12.272	0.833
		19	0.002	0.074	12.273	0.874
		20	-0.050	-0.065	12.599	0.894
		21	0.018	0.012	12.641	0.921
		22	0.004	-0.036	12.643	0.943
		23	-0.085	-0.082	13.622	0.937
		24	0.090	0.117	14.717	0.929
		25	0.030	0.002	14.842	0.945
		26	-0.015	0.014	14.871	0.960
		27	0.039	0.061	15.083	0.968
		28	0.030	0.024	15.214	0.976
		29	0.009	0.067	15.227	0.983
		30	0.016	-0.025	15.267	0.988
		31	0.037	0.040	15.476	0.991
		32	0.033	0.059	15.644	0.993
		33	-0.088	-0.084	16.828	0.991
		34	-0.081	-0.057	17.839	0.990
		35	-0.046	-0.128	18.174	0.992
		36	-0.039	-0.086	18.421	0.993

Figure IIIB reveals the fact that there is no autocorrelation in spot returns. As, for all lags the p-value is greater than 0.05 so it is concluded that there is no autocorrelation in spot returns. The minimum p-value shown in the correlogram is 0.231 and the maximum p-value is 0.993.

Figure IIIC: Autocorrelation function and correlogram for KSE-100 returns



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.099	0.099	1.0286	0.310
		2	-0.048	-0.059	1.2756	0.528
		3	-0.014	-0.003	1.2955	0.730
		4	0.019	0.018	1.3334	0.856
		5	0.143	0.140	3.5739	0.612
		6	0.024	-0.003	3.6379	0.726
		7	0.024	0.038	3.7043	0.813
		8	0.031	0.026	3.8122	0.874
		9	0.078	0.075	4.5055	0.875
		10	-0.071	-0.107	5.0809	0.886
		11	0.008	0.033	5.0878	0.927
		12	0.039	0.017	5.2664	0.948
		13	-0.013	-0.026	5.2854	0.968
		14	0.008	-0.009	5.2922	0.981
		15	-0.164	-0.151	8.5769	0.899
		16	0.007	0.034	8.5827	0.930
		17	0.150	0.130	11.399	0.835
		18	0.005	-0.024	11.402	0.877
		19	0.010	0.041	11.415	0.909
		20	-0.038	-0.009	11.606	0.929
		21	-0.003	0.001	11.607	0.950
		22	0.055	0.035	12.001	0.957
		23	-0.048	-0.066	12.312	0.965
		24	0.028	0.061	12.422	0.975
		25	0.063	0.025	12.973	0.977
		26	0.106	0.090	14.556	0.965
		27	0.041	0.050	14.788	0.972
		28	0.016	0.012	14.826	0.980
		29	-0.028	-0.038	14.941	0.985
		30	-0.019	-0.047	14.992	0.990
		31	0.039	0.007	15.223	0.992
		32	0.023	0.064	15.303	0.994
		33	-0.090	-0.145	16.292	0.993
		34	-0.044	-0.028	16.589	0.995
		35	-0.062	-0.076	17.201	0.995
		36	-0.027	-0.031	17.321	0.996

Correlogram for KSE-100 returns is shown in Figure IIIC. Same results were found for KSE-100 returns as were in case of futures and spot returns. We found no sign of autocorrelation in the series.

4.4 ADF and PP tests

The ADF test statistic and PP test statistics reported in table II also support the rejection of hypothesis of unit root. ADF statistics for spot, futures and KSE-100 returns was found to be -6.463643, -6.445590 and -5.615213 respectively. Whereas PP statistics was found to be -10.99159 for spot returns, -11.25139 for futures returns and -8.887795 for KSE-100 returns. In all these cases, the absolute values of ADF and PP test statistics are greater than |-3.497029| which suggests that the three series are stationary. These outcome calls for the use of GARCH model in testing volatility for KSE-100 returns, spot returns and futures returns.

4.5 GARCH (1,1) Model

After the estimation of GARCH (1,1), the coefficients of ARCH and GARCH are found to be highly significant for all the three time series i.e. futures, spot and KSE-100 returns (Tables IIIA, IIIB, IIIC, IIID, IIIE, IIIF). It means that today's volatility is function of last period's volatility and last period's squared residuals. Also coefficient of GARH (1,1) is found to be close to 0.8 when spot and futures are regressed on each other which imply that large values of σ^2_{t-1} will be followed by large values of σ^2_t and the existed high volatility in the previous period will continue to be high in the current period indicating volatility clustering. Values of Maximum Likelihood, Akaike Information Criterion and Schwarz Criterion are reported with each GARCH(1,1) estimation (TABLES IIIA, IIIB, IIIC, IIID, IIIE, IIIF). From these values, we found that GARCH of order 1 is most suitable model to be applied for Karachi stock exchange.

$\alpha_1+\beta_1$ is closer to 1 when spot and futures are regressed on each other which demonstrate that volatility shocks are quite persistent. But when relation of KSE is tested with either of series i.e. spot and futures, it is found that $\alpha_1+\beta_1 > 1$ which according to Chou (1988) is the indication that response function of volatility increases with time. He further explains when $\alpha_1+\beta_1 < 1$ it point to the fact that shocks decay with time and $\alpha_1+\beta_1$ approximately equal to one means slower is the decay rate. For volatility persistence, we can measure the half life which measures the time it takes for a shock to die out. (Poterba and summers, 1986). The half life of volatility persistence can be calculated by using the formula: Half life = $\frac{Ln(0.5)}{Ln(\beta_1)}$

Where β_1 is the GARCH (1,1) term. By using this formula, we can find how much time it would take in futures returns, Spot returns and KSE-100 returns for a shock to die out by using Tables IIIA, IIIB, IIIC, IIID, IIIE and IIIF.

Table IIIA: GARCH(1,1) Model : Spot returns as dependent variable and Futures returns as Independent Variable.

	Coefficient	**Std.Error**	**Z-Statistics**	**Prob**
	Mean Equation			
Futures returns	0.981457	0.007772	126.2794	0.0000*
	Variance Equation			
ARCH(1)	0.199528	0.085764	2.326490	0.0200**
GARCH(1)	0.786041	0.045737	17.18628	0.0000*
Log Likelihood	251.1531			
Akaike Info Criterion	-4.894120			
Schwarz Criterion	-4.790551			

* Shows significance at 1% level
** Shows significance at 5% level

TABLE IIIA illustrates the GARCH results. Spot returns were regressed with Futures returns by taking spot returns as dependent variable and futures returns as independent variable. As return of spot is function of futures return (equation 1) and we also know that variance of spot is derived by using returns of spot. So indirectly effect of futures is incorporated in the variance equation (equation 2). In mean equation of TABLE IIIA p-value shows highly significant relationship which indicates that spot returns will increase due to increase in futures returns.

In variance equation of Table IIIA, β_1 is found to be closer to one i.e. 0.786041 where as α_1 is found to be 0.199528. Similarly ARCH term is found to be significant at 5% confidence level but not at 1% confidence level. GARCH term is found to be significant at 1% level. It means that the volatility in the spot is mainly due to GARCH term. As the p-values of variance equation are significant and spot and futures are directly proportional to each other (as shown by mean equation) so the study concludes that futures increases volatility in the spot market.

Table IIIB: GARCH(1,1) Model : KSE-100 returns as dependent variable and Futures returns as Independent Variable.

	Coefficient	**Std.Error**	**Z-Statistics**	**Prob**
	Mean Equation			
Futures returns	0.661545	0.023704	27.90864	0.0000*
	Variance Equation			
ARCH(1)	1.229257	0.332601	3.695891	0.0002*
GARCH(1)	0.411480	0.114864	3.582314	0.0003*
Log Likelihood	166.6450			
Akaike Info Criterion	-3.220693			
Schwarz Criterion	-3.117124			

* Shows significance at 1% level

When KSE-100 returns were regressed with futures returns, by treating KSE-100 returns as regressand and futures returns as regressor we found the results, shown in Table IIIB.

From mean equation, the result shows an increase in KSE-100 returns due to increase in futures returns. ARCH term (1.229257) in variance equation is found to be greater than GARCH term (0.411480). It means that the conditional variance is mainly due to lagged square residuals and not due to the lagged squared variance. ARCH and GARCH, both terms are found to be significant at 1% level. Likewise, sum of $\alpha_1 + \beta_1$ is found to be greater than one which means that response function of volatility increases with time. In variance equation of figure IIIB, p values are found to be significant which indicates increase in volatility in KSE-100 due to futures.

Regression results, while keeping futures returns as predictand and spot returns as predictor are shown in Table IIIC. In this case the study finds that spot and futures are directly proportional to each other (mean equation) and also spot market induces volatility in futures market (variance equation). ARCH term is found to be 0.196263 and GARCH term to be 0.788413 which indicates volatility clustering. The sum of both is approximately equal to 1 which means that volatility shocks are quite persistent.

Table IIIC: GARCH(1,1) Model : Futures returns as dependent variable and Spot returns as Independent Variable.

	Coefficient	**Std.Error**	**Z-Statistics**	**Prob**
	Mean Equation			
Spot returns	1.009673	0.009553	105.6928	0.0000*
	Variance Equation			
ARCH(1)	0.196263	0.083415	2.352849	0.0186**
GARCH(1)	0.788413	0.045339	17.38945	0.0000*
Log Likelihood	336.0417			
Akaike Info Criterion	-6.510622			
Schwarz Criterion	-6.407682			

* Shows significance at 1% level

** Shows significance at 5% level

Table IIID: GARCH(1,1) Model : KSE-100 returns as dependent variable and Spot returns as Independent Variable.

	Coefficient	Std.Error	Z-Statistics	Prob
	Mean Equation			
Spot returns	0.637697	0.024483	26.04599	0.0000*
	Variance Equation			
ARCH(1)	1.093328	0.343418	3.183669	0.0015*
GARCH(1)	0.366710	0.104916	3.495290	0.0005*
Log Likelihood		159.8435		
Akaike Info Criterion		-3.086010		
Schwarz Criterion		-2.982441		

* Shows significance at 1% level

GARCH analysis, while holding KSE-100 returns as endogenous variable and spot returns as exogenous variable are reported in Table IIID. Mean equation predicts spot returns increase KSE-100 returns. Both ARCH and GARCH term are found to be significant having values of 1.093328 and 0.366710. P-values in variance equation lead us to the conclusion that volatility in KSE-100 market increases due to spot market.

In Table IIIE KSE-100 returns were taken as exogenous and spot returns as endogenous variable which is reverse of Table IIID. Here we found $\alpha_1 = 2.033465$ and $\beta_1 = 0.336801$. Both ARCH and GARCH terms are found to be significant. From mean equation the study concludes that KSE-100 returns and spot returns are directly proportional. P-values in variance equation tell us that KSE-100 market induces volatility in spot market.

Table IIIE: GARCH(1,1) Model : Spot returns as dependent variable and KSE-100 returns as Independent Variable.

	Coefficient	Std.Error	Z-Statistics	Prob
	Mean Equation			
KSE-100 returns	1.041888	0.023069	45.16309	0.0000*
	Variance Equation			
ARCH(1)	2.033465	0.662432	3.069698	0.0021*
GARCH(1)	0.336801	0.104698	3.216871	0.0013*
Log Likelihood		130.7808		
Akaike Info Criterion		-2.510511		
Schwarz Criterion		-2.406942		

* Shows significance at 1% level

At last we treat futures returns as controlled variable and KSE-100 returns as control variable and the regression results are reported in Table IIIF. Value of ARCH term was found to be very high i.e. 2.245368 and for GARCH term, it was found to be 0.313122. As p-value for both ARCH and GARCH term is less than 0.01 so both are significant at 1 percent level of confidence. From variance equation in table IIIF the study concludes that KSE-100 increases volatility in futures market. Also both the markets are directly proportional to each other with respect to returns.

Table IIIF: GARCH(1,1) Model : Futures returns as dependent variable and KSE-100 returns as Independent Variable.

	Coefficient	**Std.Error**	**Z-Statistics**	**Prob**
	Mean Equation			
KSE-100 returns	1.192963	0.034344	34.73530	0.0000
	Variance Equation			
ARCH(1)	2.245368	0.454843	4.936580	0.0000
GARCH(1)	0.313122	0.077589	4.035622	0.0001
Log Likelihood	136.3639			
Akaike Info Criterion	-2.621067			
Schwarz Criterion	-2.517497			

* Shows significance at 1% level

4.6 Granger Causality

From the results in table IV, we observe that only coefficients of KSE-100 returns were found to be statistically significant showing that KSE-100 market assists in forecasting of both spot and futures markets but futures and spot markets are not able to forecast each other and KSE-100. Thus KSE-100 market leads and futures and spot markets follow it. Table IV shows that KSE-100 returns Granger causes futures returns and spot returns. P-Values were found to be 0.00692 and 0.00322 respectively. As both P-values are less than 0.01 so we can reject the null hypothesis of no Granger causality. For all other combinations, we found no indication of Granger causality i.e. P-Values are greater than 0.01 so we accept null hypothesis of no Granger Causality.

Table IV: Granger Causality between Futures, Spot and KSE 100 returns

Null Hypothesis	F-Statistic	Prob
KSE Index does not Granger Cause Futures Index	5.24265	0.00692
Futures Index does not Granger Cause KSE Index	0.09705	0.90760
Spot Index does not Granger Cause Futures Index	0.07740	0.92557
Futures Index does not Granger Cause Spot Index	0.92422	0.40038
Spot Index does not Granger Cause KSE Index	0.09578	0.90875
KSE Index does not Granger Cause Spot Index	6.09868	0.00322

* Shows significance at 1% level

4.7 Johansen Cointegration test.

The results for Johansen cointegration test are shown in tables VA, VB, VC and VD. For all the groups of series, p-value is found to be > 0.05 which leads to the acceptance of the null hypothesis of no-cointegration meaning that futures, spot and KSE-100 Index are not moving together in the long run, although they may have some significant relationship in the short run.

Table VA: Unrestricted Cointegration Rank test between Futures Index and KSE-100 Index

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob
None	0.033811	5.546825	15.49471	0.7483
At most 1	0.022531	2.210472	3.841466	0.1371

Table VA demonstrates the results for cointegration between futures Index and KSE-100 Index. P-values were found to be 0.7483 and 0.1371. This leads to the fact

that both series are not cointegrated with each other and have no long term relationship.

When cointegration test was applied between futures index and spot index the same result was found as in the previous case. P-values were found to be 0.2631 and 0.0769 which are greater than 0.01 and 0.05, so we can say that there is no long term relationship between futures index and spot index. The results of the test are reported in Table VB.

Table VB: Unrestricted Cointegration Rank test between Futures Index and Spot Index

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob
None	0.070639	10.23482	15.49471	0.2631
At most 1	0.031741	3.128838	3.841466	0.0769

Table VC shows the results of cointegration test between KSE-100 Index and spot Index. In both cases, we found no sign of cointegration between the variables.

Table VC: Unrestricted Cointegration Rank test between KSE Index and Spot Index

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob
None	0.037943	6.000243	15.49471	0.6955
At most 1	0.022910	2.248097	3.841466	0.1338

In Table VD all the three series are checked for cointegration and the results were found to be same as previous. P-values were found to be 0.8533, 0.6950 and 0.1039

so we conclude that there is no cointegration among the three time series and they will not move together in the long run.

Table VD: Unrestricted Cointegration Rank test between KSE Index, Futures Index and Spot Index

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob
None	0.076925	13.76939	29.79707	0.8533
At most 1	0.034051	6.005039	15.49471	0.6950
At most 2	0.026895	2.644577	3.841466	0.1039

CHAPTER 5
CONCLUSION

5.1 Conclusion

This paper adds to the body of knowledge in finance by taking in hand the issue of whether futures will contribute to the volatility in the stock market or not. Using Garch(1,1) methodology, this article found the evidence of volatility clustering .It was evaluated that high volatility in the previous period will persist to be high in the current period. Emperical evidence shows that not only all the three markets i.e. KSE-100, spot and futures are highly volatile but also transfers this volatility to other markets. Volatility shocks are found to be quite persistent. Results further demonstrate that volatility in KSE-100, spot and futures market increases with time. Lead lag relationship confirms the results that KSE-100 leads futures and spot market. It was further concluded that futures are responsible for increase in volatility in the spot market. The results also maintain that volatility in kse-100 and spot market also increases the volatility of futures market. Results further suggest that the markets under study are not cointegrated with each other thus rejecting the hypothesis of existence of long term relationship. It means that all the three markets do not have a long run relationship.

With the help of this study, we can accept our first hypothesis H1 and conclude that there is positive impact of futures on spot price volatility. Second hypothesis is rejected in the light of findings. The results also suggest rejecting the third hypothesis of stable relationship between spot and futures.

It is further concluded that the probability of negative returns is high than positive returns in all the three markets under consideration i.e. downside risk is more than upside risk.

The blame for 2008 stock crises could not be put only on futures trading. Spot and KSE-100 markets all are equally responsible for the loss. The cause may also be political instability as in the month of March, unsuccessful meetings were held between two mainstreams political parties of Pakistan regarding the restoration of deposed judges. The resignation of former President of Pakistan Mr. Pervez Musharaf on August 18, 2008 further worsens the political situation. The reason for the stock exchange crises may also be attributed to the global financial crises. Appalling law and order situation in 2008 may also be considered responsible for crash of Karachi stock exchange in 2008.

5.2 Practical Implications

The findings of the study hold important practical implications especially with respect to futures market in Pakistan. Although the three markets are found to be highly volatile but the relationship does not exists in the long run so the volatility may not increase in the long run and Karachi stock exchange may provide good investing opportunities after the burst of this bubble.

5.3 Futures Research Directions

Futures research may gain further insight by considering the role of other sources of instability in the stock market, for example, investor's sentiments, capital market reforms, introduction of VAT, Law and order situation etc.

Bibliography

Adam, T.R. and Fernando, C.S. (2006), "Hedging, Speculation and Shareholder Value", *Journal of Financial Economics*, Vol. 81, pp. 283-309.

Andrew, W. and Higgs, H. (2004), "Transmission of equity returns and volatility in Asian developed and emerging Markets: A multivariate GARCH analysis", *International journal of Finance and Economics,* Vol. 96, pp. 71-80.

Asche, F. and Guttormen, G.A. (2002), "Lead Lag relationships between futures and spot prices", working paper, Institute for research in economics and Business Administration.

Bae, C.S., Kwon, H.T. and Park, W.J. (2004), "Futures trading, spot market volatility and market efficiency: The case of Korean Index Futures Markets", *The Journal of Futures Markets,* Vol. 24, pp. 1195-1228.

Bandivadekar, S. and Gosh, S. (2003), "Derivatives and volatility on Indian Stock Markets", *Reserve Bank of India Occasional Papers,* Vol. 24, pp. 187-201.

Batra, A. (2004), "Stock return volatility pattern in India", working paper, Indian council of research on international economic relations.

Brooks, C., Rew G.A. and Ritson, S. (2001), "A trading strategy based on the lead-lag relationship between the spot index futures contract for FTSE 100". *International Journal of Forecasting,* Vol. 17, pp. 31-34.

Bollerslev, T. (1986), "Generalized Autoregressive Conditional Heteroscedasticity", *Journal of Econometrics,* Vol. 31, pp. 307-327.

Cabrera, J., Wang T. and Yang, J. (2009), "Do futures lead price discovery in electronic foreign exchange markets?", *The Journal of Futures Markets,* Vol. 29, pp. 137-156.

Chou, R.Y. (1988), "Volatility persistence and stock valuations: some empirical evidence using GARCH", *Journal of Applied econometrics,* Vol. 3, pp. 279-294.

Chou, C. (1997), "Reforming Pakistan's Capital Markets", working paper, Indosuez (WI Carr) securities.

Culp, L.C. (2009), "The social functions of derivatives", *Financial Derivatives.*

Debasish, S.S. (2009), "Effect of futures trading on spot price volatility: evidence for NSE Nifty using GARCH", *The Journal of Risk Finance,* Vol. 10, pp. 67-77.

Dixon, R. and Bhandari, R.K. (1997), "Derivatives, risk and regulation: chaos or confidence", *International Journal of Bank Marketing*, Vol.15, pp. 191-198.

Edwards, R.F. (1988), "Does futures trading increase stock market volatility?", Financial *Analysts Journal,* Vol. 44, pp. 63-69.

Engle, R.F. (1982), "Autoregressive conditional heteroscedasticity with estimates of variance of United Kingdom", *Econometrica*, Vol. 50, pp. 987-1007.

Engle, R.F. and Granger, J.W.C. (1987), "Co-integration and error correction: Representation, Estimation and Testing", *Econometrica*, Vol. 55, pp.251-276.

Engle, R.F. and Patton, A. J. (2001), "What good is a volatility model?", *Quantitative Finance,* Vol. 1, pp. 237-245.

Figlewski, S. (1981), "Futures trading and volatility in GNMA Market", *Journal of Finance,* Vol. 36, pp. 445-484.

Fratzscher, O. (2006), "Emerging derivative markets in Asia", *Asian Financial Market Development,* The World Bank.

Friedman, M. (1953), "Essays in Positive Economics", *University of Chicago Press*, Chicago.

Hendry, D.F. and Juselius, K. (1999), "Explaining Cointegration Analysis: Part1", working paper, European University Institute, Florence.

Johansen, S. (1991), "Estimation and Hypothesis testing of cointegration vectors in Gaussian vector Autoregressive models", *Econometrica*, Vol. 59, pp. 1551-1580.

Karmakar, M. (2006), "Stock market volatility in the long run, 1961-2005", *Economic and political weekly*, pp. 1796-1802.

Kasman, S. and Kasman, A. (2008), "The impact of futures trading on volatility of the underlying asset in Turkish stock market", Physica *A,* pp. 2837-2845.

Khan, S. (2006), "Role of the futures market on volatility and price discovery of the spot market: Evidence from Pakistan's stock market", *The Lahore Journal of Economics,* Vol. 11, pp. 107-121.

Khan, S. and Rizwan, F. (2008), "Trading volume and stock returns: evidence from Pakistan's Stock market", *International Review of Business Research Papers,* Vol. 4, pp. 151-162.

Khilji, M.N. (1993), "The behavior of stock returns in an emerging Market: A case study of Pakistan", *The Pakistan development review,* Vol. 4, pp. 593-604.

Kuo, H.W., Hsu, H. and Chiang, H.M. (2008), "Foreign investment, regulation, volatility spillovers between the futures and spot markets: evidence from Taiwan", *Applied Financial Economics*, Vol. 18, pp. 421-430.

Mckenzie, D.M., Brailsford, J.T. and Faff, R.W. (2000), "New insight into the impact of the introduction of futures trading on stock price volatility", working paper series in finance.

Mello, A. and Parsons. (2000), "Hedging and Liquidity", *Review of Financial Studies*, Vol.13, pp. 127-153.

Nguyen, H., Faff, R.W. and Hodgson, A. (2009), "Corporate usage of financial derivatives, Information Asymmetry and insider trading", *The Journal of Futures Markets*, Vol. 01, pp. 1-3.

Pesaran, H.M. and Hendry, F.D. (2001), "Bounds testing approaches to the analysis of level relationships", *Journal of Applied Econometrics*, Vol. 16, pp. 197-202.

Powers, M.J. (1970), "Does futures trading reduce price fluctuations in the cash Markets?", *American Economic Review,* Vol. 60, pp. 460-464.

Poterba, J.M. and Summers, L. H. (1986), "The persistence of volatility and stock market functions", *American Economic Review,* Vol. 76, pp. 1141-1151.

Rafael, A.S. and Pilar, C. (2002), "Does derivatives trading destabilize the underlying assets? Evidence from the Spanish stock market", *Applied Economics Letters,* Vol. 9, pp. 107-110.

Ragunthan, V. and Peker, A. (1997), "Price variability, trading volume and market depth: Evidence from the Australian futures market", *Applied Financial Economics,* Vol. 7, pp. 447-454.

Reyes, G.M. (1996), "Index futures trading and stock price volatility: Evidence from Denmark and France", *Journal of Economics and Finance* Vol. 20_9, pp. 81-88.

Robles, M., Terero, M. and Braun, V.J. (2009), "When speculation matters", International food policy research institute, sustainable solution for ending hunger and poverty, supported by the CGIAR.

Ryoo, H. J. and Smith, G. (2004), "The impact of stock index futures on the Korean stock Market", *Applied Financial Economics*, Vol. 14, pp. 243-251.

Srinivasan, P. and Bhat, S.K. (2009), "Spot and futures markets of selected commercial Banks in India: What causes what?", *International Research Journal of Finance and Economics,* Vol. 31.

Stulz, M.R. (2004), "Should we fear derivatives?", *The Journal of Economic Perspectives,* Vol. 18, pp. 73-192.

Stein, J.C. (1987), "Information externalities and welfare reducing speculation", *Journal of political economy,* Vol. 95, pp. 1123-1145.

Vougas, V.D. and Floros, C. (2006), "Index futures trading, information and stock market volatility: The case of Greece", *Derivatives Use, Trading & Regulation,* Vol. 12, pp. 46-166.

APPENDIX

TABLE VIA: KSE-100 Index, self designed Futures and Spot Indices and their returns

Month	Futures Index	$Ln(P_t / P_{t-1})$	Spot Index	$Ln(P_t / P_{t-1})$	KSE-100 Index	$Ln(P_t / P_{t-1})$
Jul-01	1,000	-	1,000	-	1228.89	-
Aug-01	1,043	0.04176	1,039	0.03849	1258.43	0.02375
Sep-01	885	-0.16362	884	-0.16178	1133.43	-0.10462
Oct-01	1,163	0.27247	1,166	0.27712	1406.05	0.21554
Nov-01	1,029	-0.12221	1,108	-0.05086	1358.16	-0.03465
Dec-01	915	-0.11724	902	-0.20602	1273.06	-0.06471
Jan-02	1,204	0.27417	1,188	0.27566	1620.18	0.24111
Feb-02	1,295	0.07305	1,298	0.08844	1670.89	0.03082
Mar-02	1,059	-0.20139	1,041	-0.22128	1868.11	0.11157
Apr-02	1,035	-0.02270	1,024	-0.01565	1898.95	0.01637
May-02	867	-0.17757	849	-0.18737	1663.34	-0.13247
Jun-02	933	0.07435	921	0.08142	1770.11	0.06221
Jul-02	959	0.02750	948	0.02805	1787.59	0.00983
Aug-02	1,106	0.14186	1,089	0.13902	1974.58	0.09949
Sep-02	1,078	-0.02506	1,087	-0.00142	2018.75	0.02212
Oct-02	1,239	0.13853	1,222	0.11625	2278.54	0.12106
Nov-02	1,199	-0.03254	1,244	0.01834	2285.87	0.00321
Dec-02	1,525	0.24092	1,495	0.18385	2701.41	0.16703
Jan-03	1,298	-0.16125	1,358	-0.09639	2545.07	-0.05962
Feb-03	1,275	-0.01771	1,270	-0.06715	2399.14	-0.05905
Mar-03	1,474	0.14469	1,476	0.15086	2715.71	0.12394
Apr-03	1,358	-0.08226	1,320	-0.11182	2902.41	0.06649
May-03	1,695	0.22214	1,527	0.14547	3099.04	0.06555
Jun-03	1,695	0.00000	1,666	0.08732	3402.47	0.09341
Jul-03	1,945	0.13720	1,907	0.13496	3933.37	0.14499
Aug-03	2,220	0.13251	2,186	0.13639	4461.47	0.12598
Sep-03	2,003	-0.10311	1,991	-0.09330	4027.34	-0.10237
Oct-03	1,848	-0.08042	1,829	-0.08469	3781.03	-0.06311
Nov-03	1,935	0.04602	1,903	0.03944	4068.29	0.07323
Dec-03	2,083	0.07362	2,046	0.07240	4471.6	0.09452
Jan-04	2,584	0.21580	2,237	0.08926	4841.33	0.07944
Feb-04	2,609	0.00945	2,479	0.10303	4840.37	-0.00020
Mar-04	2,666	0.02141	2,307	-0.07196	5106.66	0.05355
Apr-04	2,755	0.03292	2,429	0.05129	5430.43	0.06147
May-04	2,755	0.00000	2,380	-0.02011	5497.79	0.01233
Jun-04	2,674	-0.02970	2,310	-0.02999	5279.18	-0.04058
Jul-04	2,691	0.00629	2,328	0.00781	5289.92	0.00203
Aug-04	2,653	-0.01432	2,305	-0.01019	5346.15	0.01057
Sep-04	2,613	-0.01517	2,274	-0.01349	5217.65	-0.02433
Oct-04	2,581	-0.01223	2,215	-0.02612	5332.24	0.02172

Month	Futures Index	$Ln(P_t / P_{t-1})$	Spot Index	$Ln(P_t / P_{t-1})$	KSE-100 Index	$Ln(P_t / P_{t-1})$
Nov-04	2,680	0.03754	2,329	0.05007	5567.79	0.04323
Dec-04	3,002	0.11368	2,595	0.10820	6218.4	0.11051
Jan-05	3,430	0.13325	2,939	0.12447	6747.39	0.08164
Feb-05	4,533	0.27862	3,876	0.27667	8260.06	0.20228
Mar-05	4,239	-0.06684	3,635	-0.06403	7770.33	-0.06112
Apr-05	3,730	-0.12791	3,206	-0.12564	7104.65	-0.08956
May-05	3,644	-0.02358	3,184	-0.00698	6857.67	-0.03538
Jun-05	4,021	0.09860	3,453	0.08130	7450.12	0.08286
Jul-05	3,802	-0.05593	3,276	-0.05290	7178.93	-0.03708
Aug-05	4,150	0.08739	3,618	0.09934	7796.86	0.08257
Sep-05	4,279	0.03066	3,720	0.02794	8225.66	0.05354
Oct-05	4,248	-0.00717	3,649	-0.01931	8247.37	0.00264
Nov-05	4,545	0.06759	3,928	0.07374	9026.59	0.09028
Dec-05	4,821	0.05889	4,132	0.05057	9556.61	0.05706
Jan-06	5,214	0.07841	4,484	0.08173	10523.37	0.09637
Feb-06	5,950	0.13199	5,116	0.13183	11456.12	0.08493
Mar-06	5,717	-0.04000	4,983	-0.02619	11485.9	0.00260
Apr-06	5,471	-0.04389	4,746	-0.04884	11342.17	-0.01259
May-06	4,599	-0.17356	4,035	-0.16222	9800.69	-0.14607
Jun-06	4,752	0.03262	4,089	0.01318	9989.41	0.01907
Jul-06	5,014	0.05362	4,330	0.05735	10497.66	0.04963
Aug-06	4,502	-0.10763	3,947	-0.09272	10063.54	-0.04223
Sep-06	5,000	0.10496	4,391	0.10679	10512.52	0.04365
Oct-06	5,476	0.09082	4,724	0.07309	11327.71	0.07469
Nov-06	5,083	-0.07435	4,427	-0.06498	10619.47	-0.06456
Dec-06	4,707	-0.07690	4,070	-0.08414	10040.5	-0.05606
Jan-07	5,358	0.12945	4,648	0.13281	11272.33	0.11572
Feb-07	5,213	-0.02736	4,559	-0.01941	11180.02	-0.00822
Mar-07	5,085	-0.02492	4,419	-0.03108	11271.59	0.00816
Apr-07	5,639	0.10351	4,889	0.10103	12369.7	0.09296
May-07	5,776	0.02394	5,031	0.02872	12961.14	0.04671
Jun-07	5,978	0.03443	5,169	0.02699	13772.46	0.06072
Jul-07	5,959	-0.00324	5,155	-0.00265	13739.53	-0.00239
Aug-07	5,084	-0.15879	4,494	-0.13730	12214.26	-0.11767
Sep-07	5,545	0.08681	4,904	0.08735	13353.68	0.08919
Oct-07	5,999	0.07864	5,191	0.05682	14321.39	0.06996
Nov-07	5,746	-0.04305	4,982	-0.04102	13998.52	-0.02280
Dec-07	5,646	-0.01759	4,885	-0.01972	14077.16	0.00560
Jan-08	5,606	-0.00709	4,856	-0.00601	14016.94	-0.00429
Feb-08	6,045	0.07539	5,289	0.08539	14934.3	0.06339
Mar-08	6,075	0.00495	5,421	0.02483	15125.89	0.01275
Apr-08	5,732	-0.05802	5,006	-0.07981	15122.47	-0.00023
May-08	4,925	-0.15188	4,309	-0.14984	12130.51	-0.22046
Jun-08	4,976	0.01037	4,305	-0.00096	12289.03	0.01298
Jul-08	6,629	0.28689	5,755	0.29024	10583.58	-0.14940
Aug-08	3,657	-0.59482	3,253	-0.57032	9208.26	-0.13920
Sep-08	3,854	0.05242	3,390	0.04114	9179.68	-0.00311

Month	Futures Index	$Ln(P_t / P_{t-1})$	Spot Index	$Ln(P_t / P_{t-1})$	KSE-100 Index	$Ln(P_t / P_{t-1})$
Oct-08	3,878	0.00631	3,411	0.00628	9182.88	0.00035
Nov-08	3,713	-0.04346	3,268	-0.04288	9187.1	0.00046
Dec-08	1,914	-0.66259	1,677	-0.66741	5865.01	-0.44880
Jan-09	1,858	-0.02994	1,632	-0.02691	5377.42	-0.08680
Feb-09	2,057	0.10180	1,815	0.10615	5727.46	0.06306
Mar-09	2,501	0.19541	2,249	0.21456	6860.22	0.18047
Apr-09	2,651	0.05825	2,348	0.04283	7202.1	0.04863
May-09	2,700	0.01841	2,363	0.00652	7276.61	0.01029
Jun-09	2,671	-0.01103	2,332	-0.01316	7162.18	-0.01585
Jul-09	2,861	0.06879	2,519	0.07725	7720.93	0.07512
Aug-09	3,277	0.13574	2,922	0.14833	8675.67	0.11659
Sep-09	3,511	0.06915	3,101	0.05942	9349.67	0.07482
Oct-09	3,426	-0.02464	3,011	-0.02939	9159.18	-0.02058
Nov-09	3,425	-0.00021	3,032	0.00691	9206.21	0.00512
Dec-09	3,501	0.02207	3,091	0.01917	9422.23	0.02319
Jan-10	3,591	0.02516	3,183	0.02938	9667.21	0.02567

TABLE: VIIA

Futures trading companies (2001)
Dewan Salman Fiber Ltd (DSFL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)
FFC-Jordan Fertilizer Co Ltd (FFCJ)
Fauji Fertilizer Co Ltd (FFCL)
Hub Power Co Ltd (HUBC)
Ibrahim FibresLimited
ICI Pakistan Ltd (ICI)
Muslim Commercial Bank Ltd (MCBL)
Nishat Mills Ltd (NISM)
Pakistan PTA Ltd (PPTA)
Pakistan State Oil Co Ltd (PSOC)
Pakistan Telecommunication Ltd (A) (PTC)
Sui Northern Gas Pipelines Co Ltd (SNGP)

TABLE: VIIB

Futures trading companies (2002)
Dewan Salman Fiber Ltd (DSFL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)
FFC-Jordan Fertilizer Co Ltd (FFCJ)
Fauji Fertilizer Co Ltd (FFCL)
Hub Power Co Ltd (HUBC)
Ibrahim FibresLimited
ICI Pakistan Ltd (ICI)
Muslim Commercial Bank Ltd (MCBL)
Nishat Mills Ltd (NISM)
Pakistan PTA Ltd (PPTA)
Pakistan State Oil Co Ltd (PSOC)
Pakistan Telecommunication Ltd (A) (PTC)
Sui Northern Gas Pipelines Co Ltd (SNGP)

TABLE: VIIC

Futures trading companies (2003)
Dewan Salman Fiber Ltd (DSFL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)
Fauji Fertilizer Bin Qasim (FFBL)
FFC-Jordan Fertilizer Co Ltd (FFCJ)
Fauji Fertilizer Co Ltd (FFCL)
Hub Power Co Ltd (HUBC)
Ibrahim FibresLimited
ICI Pakistan Ltd (ICI)
Muslim Commercial Bank Ltd (MCBL)
Nishat Mills Ltd (NISM)
Pakistan PTA Ltd (PPTA)
Pakistan State Oil Co Ltd (PSOC)
Pakistan Telecommunication Ltd (A) (PTC)
Sui Northern Gas Pipelines Co Ltd (SNGP)

TABLE: VIID

Futures trading companies (2004)
Askari Commercial Bank Ltd (ACBL)
The Bank of Punjab Ltd (BOPL)
BSJS Balanced Fund Ltd (BSBF)
D.G. Khan Cement Co Ltd (DGKC)
Dewan Salman Fiber Ltd (DSFL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)
Fauji Fertilizer Bin Qasim (FFBL)
Fauji Fertilizer Co Ltd (FFC)
Hub Power Co Ltd (HUBC)
Ibrahim FibresLimited
ICI Pakistan Ltd (ICI)
Lucky Cement Ltd (LUCK)
Muslim Commercial Bank Ltd (MCBL)
Maple Leaf Cement Factory Ltd (MLCF)
National Bank of Pakistan (NBP)
Nishat Mills Ltd (NML)
Oil and Gas Development Corporation (OGDC)
PICIC Growth Fund (PGF)
P.I.C.I.C. (PICIC)
PICIC Commercial Bank Ltd (PICB)
Pakistan Oilfields Ltd (POL)
Pakistan PTA Ltd (PPTA)
Pakistan Petroleum Ltd. (PPL)
Pakistan State Oil Co Ltd (PSO)
Pakistan Telecommunication Ltd (A) (PTC)
Sui Northern Gas Pipelines Co Ltd (SNGP)
Sui Southern Gas Pipline Co Ltd (SSGC)
Telecard Ltd (TELE)
Union Bank Ltd (UNBL)
World Call Communications Ltd (WCCL)

TABLE: VIIE

Futures trading companies (2005)
Askari Commercial Bank Ltd (ACBL)
The Bank of Punjab Ltd (BOPL)
BSJS Balanced Fund Ltd (BSBF)
Crescent Steel & Allied Products Ltd (CSAP)
D.G. Khan Cement Co Ltd (DGKC)
Dewan Salman Fiber Ltd (DSFL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)
Fauji Fertilizer Bin Qasim (FFBL)
Fauji Fertilizer Co Ltd (FFC)
Hub Power Co Ltd (HUBC)
ICI Pakistan Ltd (ICI)
Lucky Cement Ltd (LUCK)
Muslim Commercial Bank Ltd (MCBL)
Maple Leaf Cement Factory Ltd (MLCF)
National Bank of Pakistan (NBP)
Nishat Mills Ltd (NML)
Oil and Gas Development Corporation (OGDC)
PICIC Growth Fund (PGF)
P.I.C.I.C. (PICIC)
Pakistan Oilfields Ltd (POL)
Pakistan Petroleum Ltd. (PPL)
Pakistan State Oil Co Ltd (PSO)
Pakistan Telecommunication Ltd (A) (PTC)
Southern Electric Power Co Ltd (SEPCO)
Sui Northern Gas Pipelines Co Ltd (SNGP)
Sui Southern Gas Pipline Co Ltd (SSGC)
Telecard Ltd (TELE)
Union Bank Ltd (UNBL)
World Call Communications Ltd (WCCL)

TABLE: VIIF

Futures trading companies (2006)
Askari Commercial Bank Ltd (ACBL)
Bank Al-Falah (BAFL)
The Bank of Punjab Ltd (BOPL)
BSJS Balanced Fund Ltd (BSBF)
D.G. Khan Cement Co Ltd (DGKC)
Dewan Salman Fiber Ltd (DSFL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)
Fauji Fertilizer Bin Qasim (FFBL)
Fauji Fertilizer Co Ltd (FFC)
Hub Power Co Ltd (HUBC)
ICI Pakistan Ltd (ICI)
Kot Addu Power Company (KAPCO)
Karachi Electric Supply Corp Ltd (KESC)
Lucky Cement Ltd (LUCK)
Muslim Commercial Bank Ltd (MCBL)
Muslim Commercial Bank Ltd (MCBL)
Maple Leaf Cement Factory Ltd (MLCF)
National Bank of Pakistan (NBP)
Nishat Mills Ltd (NML)
Oil and Gas Development Corporation (OGDC)
PICIC Growth Fund (PGF)
Pakistan International Airlines Corp (A) (PIAA)
P.I.C.I.C. (PICIC)
Pioneer Cement Ltd (PIOC)
Pakistan Oilfields Ltd (POL)
Pakistan Petroleum Ltd. (PPL)
Pakistan State Oil Co Ltd (PSO)
Pakistan Telecommunication Ltd (A) (PTC)
Southern Electric Power Co Ltd (SEPCO)
Sui Northern Gas Pipelines Co Ltd (SNGP)
Sui Southern Gas Pipline Co Ltd (SSGC)
Telecard Ltd (TELE)
Union Bank Ltd (UNBL)
World Call Communications Ltd (WCCL)

TABLE: VIIG

Futures trading companies (2007)
Askari Commercial Bank Ltd (ACBL)
Askari Commercial Bank Ltd (AKBL)
Bank Al-Falah (BAFL)
The Bank of Punjab Ltd (BOPL)
D.G. Khan Cement Co Ltd (DGKC)
Dewan Salman Fiber Ltd (DSFL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)
Fauji Fertilizer Bin Qasim (FFBL)
Fauji Fertilizer Co Ltd (FFC)
Hub Power Co Ltd (HUBC)
Kot Addu Power Company (KAPCO)
Karachi Electric Supply Corp Ltd (KESC)
Lucky Cement Ltd (LUCK)
Muslim Commercial Bank Ltd (MCBL)
Maple Leaf Cement Factory Ltd (MLCF)
National Bank of Pakistan (NBP)
Nishat Mills Ltd (NML)
Oil and Gas Development Corporation (OGDC)
Pakistan International Airlines Corp (A) (PIAA)
Pioneer Cement Ltd (PIOC)
Pakistan Oilfields Ltd (POL)
Pakistan Petroleum Ltd. (PPL)
Pakistan State Oil Co Ltd (PSO)
Pakistan Telecommunication Ltd (A) (PTC)
Sui Northern Gas Pipelines Co Ltd (SNGP)
Sui Southern Gas Pipline Co Ltd (SSGC)
Telecard Ltd (TELE)

TABLE: VIIH

Futures trading companies (2008)	
Allied Bank (ABL)	Lucky Cement Ltd (LUCK)
Arif Habib Bank Ltd (AHBL)	Muslim Commercial Bank Ltd (MCBL)
Arif Habib Securities Ltd (AHSL)	Maple Leaf Cement Factory Ltd (MLCF)
Adamjee Insurance Co Ltd (AICL)	National Bank of Pakistan (NBP)
Askari Commercial Bank Ltd (AKBL)	Netstol Technologies (NESTOL)
Azgard Nine (Legler-Nafees Denim) (ANL)	NDLC-IFIC Bank Ltd. (NIB)
Attock Refinery Ltd (ATRL)	Nishat Mills Ltd (NML)
Bank Al-Falah (BAFL)	National Refinery Ltd (NRL)
The Bank of Punjab Ltd (BOPL)	Oil and Gas Development Corporation (OGDC)
Crescent Steel & Allied Products Ltd (CSAP)	Pace (Pakistan) (PACE)
D.G. Khan Cement Co Ltd (DGKC)	Pakistan International Airlines Corp (A) (PIAA)
Dewan Salman Fiber Ltd (DSFL)	Pioneer Cement Ltd (PIOC)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)	Packages Ltd (PKGS)
Faysal Bank Ltd (FABL)	Pakistan Oilfields Ltd (POL)
Fauji Cement Co Ltd (FCCL)	Pakistan Petroleum Ltd. (PPL)
Fauji Fertilizer Bin Qasim (FFBL)	Pakistan State Oil Co Ltd (PSO)
Fauji Fertilizer Co Ltd (FFC)	Pakistan Telecommunication Ltd (A) (PTC)
Habib Bank Limited. (HBL)	Soneri Bank Ltd (SNBL)
Hub Power Co Ltd (HUBC)	Sui Northern Gas Pipelines Co Ltd (SNGP)
ICI Pakistan Ltd (ICI)	Sui Southern Gas Pipline Co Ltd (SSGC)
JS Bank Ltd (JSBL)	Sitara Peroxide Pvt Ltd (SPL)
Jahangir Siddiqui & Co Ltd (JSCL)	Telecard Ltd (TELE)
Kot Addu Power Company (KAPCO)	Union Bank Ltd (UNBL)
Karachi Electric Supply Corp Ltd (KESC)	Worldcall Telecom ltd (WTL)

TABLE: VIII

Futures trading companies (2009)	
Allied Bank (ABL)	Lucky Cement Ltd (LUCK)
Arif Habib Bank Ltd (AHBL)	Muslim Commercial Bank Ltd (MCBL)
Arif Habib Securities Ltd (AHSL)	National Bank of Pakistan (NBP)
Adamjee Insurance Co Ltd (AICL)	Netstol Technologies (NESTOL)
Askari Commercial Bank Ltd (AKBL)	NDLC-IFIC Bank Ltd. (NIB)
Azgard Nine (Legler-Nafees Denim) (ANL)	Nishat Mills Ltd (NML)
Attock Refinery Ltd (ATRL)	National Refinery Ltd (NRL)
Bank Al-Falah (BAFL)	Oil and Gas Development Corporation (OGDC)
Bank Al-Habib Ltd (BAHL)	Pace (Pakistan) (PACE)
The Bank of Punjab Ltd (BOPL)	Pak Int Cont. (PICT)
Crescent Steel & Allied Products Ltd (CSAP)	Packages Ltd (PKGS)
D.G. Khan Cement Co Ltd (DGKC)	Pakistan Oilfields Ltd (POL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)	Pakistan Petroleum Ltd. (PPL)
Fauji Cement Co Ltd (FCCL)	Pakistan Refinery Ltd (PRL)
Fauji Fertilizer Bin Qasim (FFBL)	Pakistan State Oil Co Ltd (PSO)
Fauji Fertilizer Co Ltd (FFC)	Pakistan Telecommunication Ltd (A) (PTC)
Habib Bank Limited. (HBL)	Soneri Bank Ltd (SNBL)
Hub Power Co Ltd (HUBC)	Sui Northern Gas Pipelines Co Ltd (SNGP)
ICI Pakistan Ltd (ICI)	Sui Southern Gas Pipline Co Ltd (SSGC)
JS Bank Ltd (JSBL)	Sitara Peroxide Pvt Ltd (SPL)
Jahangir Siddiqui & Co Ltd (JSCL)	Union Bank Ltd (UNBL)
Kot Addu Power Company (KAPCO)	Worldcall Telecom ltd (WTL)

TABLE: VIIJ

Futures trading companies (2010)	
Allied Bank (ABL)	Lucky Cement Ltd (LUCK)
Arif Habib Bank Ltd (AHBL)	Muslim Commercial Bank Ltd (MCBL)
Arif Habib Securities Ltd (AHSL)	National Bank of Pakistan (NBP)
Adamjee Insurance Co Ltd (AICL)	Netstol Technologies (NESTOL)
Askari Commercial Bank Ltd (AKBL)	NDLC-IFIC Bank Ltd. (NIB)
Azgard Nine (Legler-Nafees Denim) (ANL)	Nishat Mills Ltd (NML)
Attock Refinery Ltd (ATRL)	National Refinery Ltd (NRL)
Bank Al-Falah (BAFL)	Oil and Gas Development Corporation (OGDC)
Bank Al-Habib Ltd (BAHL)	Pace (Pakistan) (PACE)
The Bank of Punjab Ltd (BOPL)	Pak Int Cont. (PICT)
Crescent Steel & Allied Products Ltd (CSAP)	Packages Ltd (PKGS)
D.G. Khan Cement Co Ltd (DGKC)	Pakistan Oilfields Ltd (POL)
Engro Chemical (Pakistan) Ltd(R) (ENGROR)	Pakistan Petroleum Ltd. (PPL)
Fauji Cement Co Ltd (FCCL)	Pakistan Refinery Ltd (PRL)
Fauji Fertilizer Bin Qasim (FFBL)	Pakistan State Oil Co Ltd (PSO)
Fauji Fertilizer Co Ltd (FFC)	Pakistan Telecommunication Ltd (A) (PTC)
Habib Bank Limited. (HBL)	Soneri Bank Ltd (SNBL)
Hub Power Co Ltd (HUBC)	Sui Northern Gas Pipelines Co Ltd (SNGP)
ICI Pakistan Ltd (ICI)	Sui Southern Gas Pipline Co Ltd (SSGC)
JS Bank Ltd (JSBL)	Sitara Peroxide Pvt Ltd (SPL)
Jahangir Siddiqui & Co Ltd (JSCL)	Union Bank Ltd (UNBL)
Kot Addu Power Company (KAPCO)	Worldcall Telecom ltd (WTL)